HEWLETT
PACKARD

Internal Design Specification Volume II

For the HP-71 HP-IL Module

Hewlett-Packard -- Portable Computer Division

Corvallis, Oregon

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%                                             %
%             HP-71 HP-IL Module              %
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%        Internal Design Specification        %
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%               VOLUME   II                   %
%                                             %
%             Source  Listings                %
%                                             %
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HP Part No. 82401-90023

ROM Release 1B -- March 1984

Table of Contents

INTRODUCTION — CHAPTER 1

This volume contains the complete source code listings for the HP-71 HP-IL Module. The program modules which comprise the 16K-byte ROM are presented here in address order according to their position in the ROM, from lowest address to highest address. For purposes of presentation the modules are assembled relative to a ROM starting address of F0000 hex. In actuality the ROM is soft-configurable, and may be automatically configured by the HP-71 to other sections of the address space.

The following sections give a list of the program module names in address order, followed by an alphabetical list of the module names. A module's source file is denoted with an ampersand (&) in the file name, and its object (binary) file with a percent sign (%) in the file name.

Interface information to an entry point or poll is described in a documentation header in the source file that contains that entry point or or handles that poll. In this version of this document, supported entry points are not yet indicated in the source listings as they are in the HP-71 operating system source listings. However, the poll interfaces and certain entry point interfaces will be supported.

It is the intent of HP to preserve such supported interfaces, as well as the absolute address position of each supported entry point, through any future updates of the HP-71 HP-IL Module. In general this allows external software which uses these interfaces to work predictably without regard to the version of the HP-71 HP-IL Module with which it is run. However, HP reserves the right to adjust the supported interfaces in any manner it chooses.

LIST OF MODULES IN ADDRESS ORDER | CHAPTER 2

Address Range	Module	Title
NZZRST	F0000 - F0007	ROM Start (Header)
NZZTBL	F0008 - F0409	Lexical Analyzer Tables--ID=FF
NZZERR	F040A - F06B4	Error Message Table
NZZDIR	F06B5 - F07C1	Directory Section
NZZGPR	F07C2 - F0F99	General Routines
NZZBAS	F0F9A - F1F33	BASIC Routines
SCZENT	F1F34 - F2C95	ENTER Execution
NZZUTL	F2C96 - F2ED6	User Utility Routines
NZZBIF	F2ED7 - F362D	Basic interface
NZZIOB	F362E - F3636	I/O Buffer Routines
NZZDSP	F3637 - F3BF6	Display Driver
NZZBUT	F3BF7 - F4292	BASIC Utilities
NZZCAS	F4293 - F511A	Cassette Routines
NZZHND	F511B - F5E90	Poll Handlers
NZZCAT	F5E91 - F66D1	HP-IL CAT
NZZIOR	F66D2 - F6BD7	I/O (NEW Mailbox)
NZZFRA	F6BD8 - F6D55	HP-IL Frame Routines
NZZLOW	F6D56 - F6E18	Low-level User HP-IL
NZZFXQ	F6E19 - F74FC	File Execution
NZZPAR	F74FD - F7BD2	HP-IL Parse Routines
NZZDEC	F7BD3 - F7EF0	HP-IL Deconpile Routines
SAZRMT	F7FFC - F7FFD	Zero File - ROM Checksum
SAZRMT	F7FFE - F7FFF	Zero File - End of chain
NZZSYM	No Address	Symbolic Assignments

LIST OF MODULES SORTED BY MODULE NAME | CHAPTER 3

Module	Address Range	Title
NZZBAS	F0F9A - F1F33	BASIC Routines
NZZBIF	F2ED7 - F362D	Basic interface
NZZBUT	F3BF7 - F4292	BASIC Utilities
NZZCAS	F4293 - F511A	Cassette Routines
NZZCAT	F5E91 - F66D1	HP-IL CAT
NZZDEC	F7BD3 - F7EF0	HP-IL Decompile Routines
NZZDIR	F06B5 - F07C1	Directory Section
NZZDSP	F3637 - F3BF6	Display Driver
NZZERR	F040A - F06B4	Error Message Table
NZZFRA	F6BD8 - F6D55	HP-IL Frame Routines
NZZFXQ	F6E19 - F74FC	File Execution
NZZGPR	F07C2 - F0F99	General Routines
NZZHND	F511B - F5E90	Poll Handlers
NZZIOB	F362E - F3636	I/O Buffer Routines
NZZIOR	F66D2 - F6BD7	I/O (NEW Mailbox)
NZZLOW	F6D56 - F6E18	Low-level User HP-IL
NZZPAR	F74FD - F7BD2	HP-IL Parse Routines
NZZRST	F0000 - F0007	ROM Start (Header)
NZZSYM	No Address	Symbolic Assignments
NZZTBL	F0008 - F0409	Lexical Analyzer Tables--ID=FF
NZZUTL	F2C96 - F2ED6	User Utility Routines
SRXRMT	F7FFC - F7FFD	Zero File - ROM Checksum
SRXRMT	F7FFE - F7FFF	Zero File - End of chain
SCXENT	F1F34 - F2C95	ENTER Execution

Table of Contents

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***************************************************
***************************************************
**                                               **
**  H   H  PPPP   III  L              1    BBBB  **
**  H   H  P   P   I   L             11    B   B **
**  H   H  P   P   I   L        ::    1    B   B **
**  HHHHH  PPPP    I   L        ::    1    BBBB  **
**  H   H  P       I   L              1    B   B **
**  H   H  P       I   L        ::    1    B   B **
**  H   H  P      III  LLLLL    ::   111   BBBB  **
**                                               **
***************************************************
***************************************************
/SLOAD:  Duplicate entry point A-MULT found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CATC++ found in modules NZXPAR and TIXR6S
/SLOAD:  Duplicate entry point CONVUC found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC1  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC10 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC11 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC12 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC13 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC14 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC15 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC2  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC3  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC4  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC5  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC6  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC7  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC8  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSLC9  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC1  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC10 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC11 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC12 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC13 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC14 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC15 found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC2  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC3  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC4  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC5  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC6  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC7  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC8  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point CSRC9  found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point D1=AVE found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point D1@AVS found in modules NZXGPR and TIXR6S
/SLOAD:  Duplicate entry point EXPEX+ found in modules NZXBUT and TIXR6S
/SLOAD:  Duplicate entry point FIND   found in modules NZXBAS and TIXR6S
/SLOAD:  Duplicate entry point FINDF+ found in modules NZXCAS and TIXR6S
/SLOAD:  Duplicate entry point GETST- found in modules NZXIOR and TIXR6S
/SLOAD:  Duplicate entry point NUMCK  found in modules NZXPAR and TIXR6S
/SLOAD:  Duplicate entry point OUT3TC found in modules NZXPAR and TIXR6S
/SLOAD:  Duplicate entry point OUTBYT found in modules NZXPAR and TIXR6S
/SLOAD:  Duplicate entry point OUTNBC found in modules NZXPAR and TIXR6S
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/SLOAD:  Duplicate entry point POP1N  found in modules NZZLOW and TIZR6S
/SLOAD:  Duplicate entry point RANGE  found in modules NZZGPR and TIZR6S
/SLOAD:  Duplicate entry point RDINFO found in modules NZZBUT and TIZR6S
/SLOAD:  Duplicate entry point READIN found in modules NZZBAS and TIZR6S
/SLOAD:  Duplicate entry point RESPTR found in modules NZZPAR and TIZR6S
/SLOAD:  Duplicate entry point SENDIT found in modules NZZIOR and TIZR6S
SLOAD Rev. 2309/Ver. 1.40

Output module:
TIZHP7::MS::-1        Start=F0000 End=F7FFF Length=08000 Syms=2486 Refs=1612
      Date=Thu Mar  1, 1984   6:25 pm  Title=(HPIL:1B) HP-IL Interface ROM

Source modules:
NZZRST::MS             Start=F0000 End=F0007 Length=00008
      Date=Thu Mar  1, 1984   2:02 pm  Title=Rom start (header) <840301.1402>

NZZTBL::MS             Start=F0008 End=F0409 Length=00402
      Date=Thu Mar  1, 1984   2:03 pm  Title=Lexical Analyzer Tables--ID=FF

NZZERR::MS             Start=F040A End=F06B4 Length=002AB
      Date=Thu Mar  1, 1984   1:46 pm  Title=

NZZDIR::MS             Start=F06B5 End=F07C1 Length=0010D
      Date=Thu Mar  1, 1984   1:44 pm  Title=DIRECTORY SECTION <840301.1344>

NZZGPR::MS             Start=F07C2 End=F0F99 Length=007D8
      Date=Thu Mar  1, 1984   1:51 pm  Title=GENERAL ROUTINES <840301.1351>

NZZBAS::MS             Start=F0F9A End=F1F33 Length=00F9A
      Date=Thu Mar  1, 1984   1:23 pm  Title=BASIC ROUTINES <840301.1323>

SCZENT::MS             Start=F1F34 End=F2C95 Length=00D62
      Date=Thu Mar  1, 1984   2:06 pm  Title=ENTER Execution <840301.1406>

NZZUTL::MS             Start=F2C96 End=F2ED6 Length=00241
      Date=Thu Mar  1, 1984   2:04 pm  Title=User Utility Routines <840301.1404>

NZZBIF::MS             Start=F2ED7 End=F362D Length=00757
      Date=Thu Mar  1, 1984   1:28 pm  Title=Basic interface <840301.1328>

NZZIOB::MS             Start=F362E End=F3636 Length=00009
      Date=Thu Mar  1, 1984   1:55 pm  Title=I/O Buffer routines <840301.1355>

NZZDSP::MS             Start=F3637 End=F3BF6 Length=005C0
      Date=Thu Mar  1, 1984   1:44 pm  Title=Display driver <840301.1344>

NZZBUT::MS             Start=F3BF7 End=F4292 Length=0069C
      Date=Thu Mar  1, 1984   1:31 pm  Title=BASIC UTILITIES <840301.1331>

NZZCAS::MS             Start=F4293 End=F511A Length=00E88
      Date=Thu Mar  1, 1984   1:34 pm  Title=CASSETTE ROUTINES<840301.1334>

NZZHND::MS             Start=F511B End=F5E90 Length=00D76
      Date=Thu Mar  1, 1984   5:53 pm  Title=POLL HANDLERS <840301.1747>

NZZCAT::MS             Start=F5E91 End=F66D1 Length=00841
      Date=Thu Mar  1, 1984   1:39 pm  Title=HPIL CAT <840301.1339>

NZZIOR::MS             Start=F66D2 End=F6BD7 Length=00506
      Date=Thu Mar  1, 1984   1:56 pm  Title=I/O(NEW Mailbox)<840301.1356>
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NZXFRA::MS           Start=F6BD8 End=F6D55 Length=0017E
      Date=Thu Mar  1, 1984   1:47 pm  Title=PIL Frame Routines<840301.1347>

NZXLOW::MS           Start=F6D56 End=F6E18 Length=000C3
      Date=Thu Mar  1, 1984   1:58 pm  Title=Low-level USER HP-IL <840301.1358>

NZXFXQ::MS           Start=F6E19 End=F74FC Length=006E4
      Date=Thu Mar  1, 1984   1:48 pm  Title=File Execution <840301.1348>

NZXPAR::MS           Start=F74FD End=F7BD2 Length=006D6
      Date=Thu Mar  1, 1984   1:59 pm  Title=NZ'S PARSE ROUTINES <840301.1359>

NZXDEC::MS           Start=F7BD3 End=F7EF0 Length=0031E
      Date=Thu Mar  1, 1984   1:42 pm  Title=PIL DECOMPILE ROUTINES<840301.1342>

NZXSYM::MS          Module Contains No Code
      Date=Thu Mar  1, 1984   2:02 pm  Title=Symbolic Assignments <840301.1402>

SAXRMT               Start=F7FFC End=F7FFD Length=00002
      Date=Mon Nov 22, 1982   8:48 am  Title=ROM/IRAM tail end

SAXRMT               Start=F7FFE End=F7FFF Length=00002
      Date=Mon Nov 22, 1982   8:48 am  Title=ROM/IRAM tail end

TIXR6S              Module Contains No Code
      Date=Tue Jan 17, 1984  10:07 am  Title=Titan External Symbol File
```

Saturn Long Cross Reference Listing

```
#CK     =  03356 TI%R6S        -
#Timeo  =  0001E NZ%SYM        - F16DE NZ%BAS(00744) Type=0.0 Nibs=2

-LINE   =  15275 TI%R6S        -

1/X15   =  0C33E TI%R6S        -

?A=CLN  =  F7EE6 NZ%DEC        -
?A=CM+  =  F7EDB NZ%DEC        - F75A6 NZ%PAR(000A9) Type=1.1 Nibs=4 Dist=00935
                               + F76E0 NZ%PAR(001E3) Type=1.1 Nibs=3 Dist=007FB
?A=CMA  =  F7ED8 NZ%DEC        -
?PRFI+  =  17380 TI%R6S        -
?PRFIL  =  1737E TI%R6S        -

A-MULT  =  F0E22 NZ%GPR        - F5276 NZ%HND(0015B) Type=1.1 Nibs=4 Dist=04454
                               + F650A NZ%CAT(00679) Type=1.1 Nibs=4 Dist=056E8
ACCEPT  =  0450F TI%R6S        -
ACOS12  =  0DBD3 TI%R6S        -
ACOS15  =  0DBD7 TI%R6S        -
ACTIVE  =  2F5A8 TI%R6S        -
AD15M   =  0C366 TI%R6S        -
AD15S   =  0E19D TI%R6S        -
AD15s   =  0C369 TI%R6S        -
AD2-12  =  0C35F TI%R6S        -
AD2-15  =  0C363 TI%R6S        -
ADDF    =  0C372 TI%R6S        -
ADDONE  =  0C330 TI%R6S        -
ADDP    =  03A03 TI%R6S        -
ADDRSS  =  0F527 TI%R6S        -
ADHEAD  =  181B7 TI%R6S        -
ADJA    =  1289A TI%R6S        -
ADJN    =  12825 TI%R6S        -
ADRS40  =  0F52B TI%R6S        -
ADRS50  =  0F551 TI%R6S        -
ADRS80  =  0F567 TI%R6S        -
ADRSUB  =  0F4CF TI%R6S        -
ALLDUN  =  04BEF TI%R6S        -
ALMSRV  =  1257D TI%R6S        -
ALRM1   =  2F719 TI%R6S        -
ALRM2   =  2F725 TI%R6S        -
ALRM3   =  2F731 TI%R6S        -
ALRM4   =  2F73D TI%R6S        -
ALRM5   =  2F749 TI%R6S        -
ALRM6   =  2F755 TI%R6S        -
ALRNOG  =  F0EA8 NZ%GPR        -
ALRNOS  =  F0EDA NZ%GPR        -
ANN1.5  =  2E101 TI%R6S        -
ANNAD1  =  2E100 TI%R6S        -
ANNAD2  =  2E102 TI%R6S        -
ANNAD3  =  2E34C TI%R6S        -
ANNAD4  =  2E34E TI%R6S        -
ARG12   =  0D67B TI%R6S        -
ARG15   =  0D67F TI%R6S        -
ARGERR  =  0BF19 TI%R6S        -
ARGF    =  0D6A4 TI%R6S        -
ARGPR+  =  0E8EB TI%R6S        -
ARGPRP  =  0E8EF TI%R6S        -
ARGST-  =  0E910 TI%R6S        -
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ARGSTA =  0E90C TI%R6S        -
ARITH  =  061E0 TI%R6S        -
ARLNOS =  F0EC2 NZ%GPR        -
ARRYCK =  0366A TI%R6S        -
ARYDC  =  05178 TI%R6S        -
ARYELM =  085A7 TI%R6S        -
ARYSIZ =  0B61B TI%R6S        -
ASCICK =  0514E TI%R6S        -
ASCII  =  0079B TI%R6S        -
ASGNIO =  F19CD NZ%BAS        - F0116 NZ%TBL(0010E) Type=1.2 Nibs=5 Dist=018B7
ASGNd  =  F7D06 NZ%DEC        - F19C3 NZ%BAS(00A29) Type=1.2 Nibs=5 Dist=06343
ASGNp  =  F769C NZ%PAR        - F19C8 NZ%BAS(00A2E) Type=1.2 Nibs=5 Dist=05CD4
ASIN12 =  0DBC8 TI%R6S        -
ASIN15 =  0DBCC TI%R6S        -
ASLC1  =  F0F11 NZ%GPR        -
ASLC10 =  F0F19 NZ%GPR        -
ASLC11 =  F0F1C NZ%GPR        -
ASLC12 =  F0F1F NZ%GPR        - F576C NZ%HND(00651) Type=1.1 Nibs=4 Dist=0484D
                              + F6F34 NZ%FXQ(0011B) Type=1.1 Nibs=4 Dist=06015
ASLC13 =  F0F22 NZ%GPR        -
ASLC14 =  F0F25 NZ%GPR        -
ASLC15 =  F0F28 NZ%GPR        -
ASLC2  =  F0F0E NZ%GPR        - F1AEB NZ%BAS(00B51) Type=1.1 Nibs=4 Dist=00BDD
ASLC3  =  F0F0B NZ%GPR        - F49CA NZ%CAS(00737) Type=1.1 Nibs=4 Dist=03ABF
                              + F5248 NZ%HND(0012D) Type=1.1 Nibs=4 Dist=0433D
ASLC4  =  F0F08 NZ%GPR        - F1421 NZ%BAS(00487) Type=1.1 Nibs=3 Dist=00519
                              + F35CA NZ%BIF(006F3) Type=1.1 Nibs=4 Dist=026C2
                              + F43BD NZ%CAS(0012A) Type=1.1 Nibs=4 Dist=034B5
                              + F43CF NZ%CAS(0013C) Type=1.1 Nibs=4 Dist=034C7
                              + F453C NZ%CAS(002A9) Type=1.1 Nibs=4 Dist=03634
                              + F56AC NZ%HND(00591) Type=1.1 Nibs=4 Dist=047A4
ASLC5  =  F0F05 NZ%GPR        - F18A5 NZ%BAS(0090B) Type=1.1 Nibs=4 Dist=009A0
ASLC6  =  F0F02 NZ%GPR        - F56CC NZ%HND(005B1) Type=1.1 Nibs=4 Dist=047CA
ASLC7  =  F0EFF NZ%GPR        -
ASLC8  =  F0EFC NZ%GPR        -
ASLC9  =  F0F16 NZ%GPR        - F4936 NZ%CAS(006A3) Type=1.1 Nibs=4 Dist=03A20
ASLW3  =  0ED21 TI%R6S        -
ASLW4  =  0ED1E TI%R6S        -
ASLW5  =  0ED1B TI%R6S        -
ASNMNT =  0F5E0 TI%R6S        -
ASRC1  =  F0F28 NZ%GPR        -
ASRC10 =  F0F02 NZ%GPR        - F4711 NZ%CAS(0047E) Type=1.1 Nibs=4 Dist=0380F
                              + F56E4 NZ%HND(005C9) Type=1.1 Nibs=4 Dist=047E2
ASRC11 =  F0F05 NZ%GPR        -
ASRC12 =  F0F08 NZ%GPR        -
ASRC13 =  F0F0B NZ%GPR        -
ASRC14 =  F0F0E NZ%GPR        -
ASRC15 =  F0F11 NZ%GPR        -
ASRC2  =  F0F25 NZ%GPR        - F1AC7 NZ%BAS(00B2D) Type=1.1 Nibs=4 Dist=00BA2
ASRC3  =  F0F22 NZ%GPR        - F49BF NZ%CAS(0072C) Type=1.1 Nibs=4 Dist=03A9D
                              + F55E3 NZ%HND(004C8) Type=1.1 Nibs=4 Dist=046C1
ASRC4  =  F0F1F NZ%GPR        - F137B NZ%BAS(003E1) Type=1.1 Nibs=3 Dist=0045C
                              + F140C NZ%BAS(00472) Type=1.1 Nibs=3 Dist=004ED
                              + F14CB NZ%BAS(00531) Type=1.1 Nibs=3 Dist=005AC
                              + F4AA6 NZ%CAS(00813) Type=1.0 Nibs=4 Dist=03B87
                              + F5574 NZ%HND(00459) Type=1.1 Nibs=4 Dist=04655
                              + F6EAF NZ%FXQ(00096) Type=1.1 Nibs=4 Dist=05F90
ASRC5  =  F0F1C NZ%GPR        - F18B3 NZ%BAS(00919) Type=1.1 Nibs=4 Dist=00997
                              + F2B90 SC%ENT(00C69) Type=1.1 Nibs=4 Dist=01C81
                              + F415E NZ%BUT(00567) Type=1.1 Nibs=4 Dist=03242
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                                 + F467E NZXCAS(003EB) Type=1.1 Nibs=4 Dist=03762
                                 + F5593 NZXHND(00478) Type=1.1 Nibs=4 Dist=04677
                                 + F5A1A NZXHND(008FF) Type=1.1 Nibs=4 Dist=04AFE
ASRC6  =  F0F19 NZXGPR           -
ASRC7  =  F0F16 NZXGPR           -
ASRC8  =  F0EFC NZXGPR           - F4E72 NZXCAS(00BDF) Type=1.1 Nibs=4 Dist=03F76
ASRC9  =  F0EFF NZXGPR           - F49A6 NZXCAS(00713) Type=1.1 Nibs=4 Dist=03AA7
ASRW3  =  0ED10 TIXR6S           -
ASRW4  =  0ED0D TIXR6S           -
ASRW5  =  0ED0A TIXR6S           -
ATAN15 =  0DBBE TIXR6S           -
ATNCHK =  F0BC5 NZXGPR           - F34FF NZXBIF(00628) Type=1.1 Nibs=4 Dist=0293A
ATNCLR =  00510 TIXR6S           -
ATNDIS =  2F441 TIXR6S           -
ATNFLG =  2F442 TIXR6S           - F0BD1 NZXGPR(0040F) Type=0.0 Nibs=5
                                 + F2F81 NZXBIF(000AA) Type=0.0 Nibs=5
                                 + F67A4 NZXIOR(000D2) Type=0.0 Nibs=5
                                 + F6A0D NZXIOR(0033B) Type=0.0 Nibs=5
                                 + F6AE2 NZXIOR(00410) Type=0.0 Nibs=5
AUTINC =  2F6CB TIXR6S           -
AVE=C  =  18BBB TIXR6S           -
AVE=D1 =  18BB8 TIXR6S           - F21BD SCXENT(00289) Type=0.1 Nibs=5
AVM+16 =  F40C2 NZXBUT           -
AVMEME =  2F599 TIXR6S           - F0F76 NZXGPR(007B4) Type=0.0 Nibs=5
AVMEMS =  2F594 TIXR6S           - F0F7F NZXGPR(007BD) Type=0.0 Nibs=5
AVS2DS =  09708 TIXR6S
Attn   =  0000C NZXSYM           - F0BC7 NZXGPR(00405) Type=0.0 Nibs=1
                                 + F679C NZXIOR(000CA) Type=0.0 Nibs=1
                                 + F69B1 NZXIOR(002DF) Type=0.0 Nibs=1
                                 + F69F5 NZXIOR(00323) Type=0.0 Nibs=1
                                 + F6A26 NZXIOR(00354) Type=0.0 Nibs=1
                                 + F6A88 NZXIOR(003B6) Type=0.0 Nibs=1
                                 + F6AAA NZXIOR(003D8) Type=0.0 Nibs=1
                                 + F6B62 NZXIOR(00490) Type=0.0 Nibs=1
                                 + F6B93 NZXIOR(004C1) Type=0.0 Nibs=1

BACK   =  1BA4F TIXR6S           -
BACK1B =  13B0C TIXR6S           -
BACK2B =  13B0A TIXR6S           -
BACK3B =  13B08 TIXR6S           -
BAKCHR =  F3FC2 NZXBUT           - F1ADD NZXBAS(00B43) Type=1.1 Nibs=4 Dist=024E5
                                 + F74D0 NZXFXQ(006B7) Type=1.0 Nibs=4 Dist=0350E
BASCHA =  07741 TIXR6S           -
BASCHK =  0773E TIXR6S           -
BASE   =  0F953 TIXR6S           -
BASICs =  000B5 TIXR6S           -
BDISPJ =  F3637 NZXDSP           - F3001 NZXBIF(0012A) Type=1.2 Nibs=5 Dist=00636
BEEP   =  0EA6E TIXR6S           -
BF2DSP =  01C0E TIXR6S           - F1871 NZXBAS(008D7) Type=0.1 Nibs=5
                                 + F1914 NZXBAS(0097A) Type=0.1 Nibs=5
                                 + F5F35 NZXCAT(000A4) Type=0.1 Nibs=5
BF2STK =  18663 TIXR6S           -
BIASA+ =  0052D TIXR6S           -
BIASC+ =  00540 TIXR6S           -
BIG    =  0B747 TIXR6S           -
BINAND =  F1E66 NZXBAS           - F0098 NZXTBL(00090) Type=1.2 Nibs=5 Dist=01DCE
BINCMP =  F1EB7 NZXBAS           - F00A1 NZXTBL(00099) Type=1.2 Nibs=5 Dist=01E16
BINEOR =  F1E96 NZXBAS           - F00AA NZXTBL(000A2) Type=1.2 Nibs=5 Dist=01DEC
BINIOR =  F1E86 NZXBAS           - F00B3 NZXTBL(000AB) Type=1.2 Nibs=5 Dist=01DD3
BIT    =  F1ECF NZXBAS           - F00BC NZXTBL(000B4) Type=1.2 Nibs=5 Dist=01E13
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BLANK  =  F7B2A NZZPAR       -
BLANKC =  F0F5E NZZGPR       - F1811 NZZBAS(00877) Type=1.1 Nibs=4 Dist=008B3
                             + F38BB NZZDSP(00284) Type=1.1 Nibs=4 Dist=0295D
                             + F4429 NZZCAS(00196) Type=1.1 Nibs=4 Dist=034CB
                             + F58DE NZZHND(007C3) Type=1.1 Nibs=4 Dist=04980
                             + F63C3 NZZCAT(00532) Type=1.1 Nibs=4 Dist=05465
                             + F7433 NZZFXQ(0061A) Type=1.1 Nibs=4 Dist=064D5
BLDBIT =  019BC TIZR6S       -
BLDCAT =  F6395 NZZCAT       -
BLDCON =  16279 TIZR6S       - F213E SCZENT(0020A) Type=0.1 Nibs=5
BLDDSP =  01898 TIZR6S       -
BLDLCD =  0189C TIZR6S       -
BLNKCK =  051C1 TIZR6S       -
BOPNM- =  1B864 TIZR6S       -
BP+C   =  0EB40 TIZR6S       -
BRT30  =  0DBE3 TIZR6S       -
BRTF   =  0DC15 TIZR6S       -
BSCEX2 =  0743A TIZR6S       -
BSCEXC =  07437 TIZR6S       -
BSCEXT =  075CF TIZR6S       -
BSERR  =  0939A TIZR6S       - F1A32 NZZBAS(00A98) Type=0.1 Nibs=5
BitsOK =  00001 TIZR6S       -
BldIM+ =  1BA6A TIZR6S       -
BldIMA =  1BA66 TIZR6S       -
BldIMG =  1BA68 TIZR6S       -

C+A2D1 =  1C053 TIZR6S       -
CALBIN =  18D8C TIZR6S       -
CALL   =  18DAE TIZR6S       -
CALLP  =  0389C TIZR6S       -
CALSTK =  2F5AD TIZR6S       -
CAT$20 =  06746 TIZR6S       -
CATC++ =  F7B11 NZZPAR       -
CATCH+ =  03F69 TIZR6S       - F7B16 NZZPAR(00619) Type=0.1 Nibs=5
CATCHR =  03F70 TIZR6S       -
CATEDT =  06435 TIZR6S       -
CHAIN+ =  07C12 TIZR6S       -
CHAIN- =  07C1C TIZR6S       - F56FA NZZHND(005DF) Type=0.1 Nibs=5
CHECKD =  F6864 NZZIOR       -
CHEDIT =  14C99 TIZR6S       -
CHIRP  =  0EC5A TIZR6S       -
CHKAIO =  F411B NZZBUT       - F7217 NZZFXQ(003FE) Type=1.1 Nibs=4 Dist=030FC
CHKASN =  F3CEC NZZBUT       - F0FBC NZZBAS(00022) Type=1.1 Nibs=4 Dist=02D30
                             + F22AE SCZENT(0037A) Type=1.1 Nibs=4 Dist=01A3E
                             + F2FEA NZZBIF(00113) Type=1.1 Nibs=4 Dist=00002
                             + F3643 NZZDSP(0000C) Type=1.1 Nibs=3 Dist=006A9
                             + F53ED NZZHND(002D2) Type=1.1 Nibs=4 Dist=01701
CHKBIT =  F430E NZZCAS       - F5601 NZZHND(004E6) Type=1.1 Nibs=4 Dist=012F3
                             + F5786 NZZHND(0066B) Type=1.1 Nibs=4 Dist=01478
CHKEND =  F6881 NZZIOR       -
CHKEOL =  13D6D TIZR6S       - F1FC5 SCZENT(00091) Type=0.1 Nibs=5
                             + F2233 SCZENT(002FF) Type=0.1 Nibs=5
CHKMAS =  F42F1 NZZCAS       - F11F2 NZZBAS(00258) Type=1.1 Nibs=4 Dist=030FF
                             + F14F3 NZZBAS(00559) Type=1.1 Nibs=4 Dist=02DFE
                             + F3596 NZZBIF(006BF) Type=1.1 Nibs=4 Dist=00D5B
                             + F51C8 NZZHND(000AD) Type=1.1 Nibs=4 Dist=00ED7
                             + F60E8 NZZCAT(00257) Type=1.1 Nibs=4 Dist=01DF7
CHKSEC =  F5CEB NZZHND       - F4BD6 NZZCAS(00943) Type=1.1 Nibs=4 Dist=01115
CHKSET =  F31DE NZZBIF       - F0C31 NZZGPR(0046F) Type=1.1 Nibs=4 Dist=025AD
CHKST+ =  F3[illegible] NZZBIF       [illegible] NZZHND([illegible]) Type=1.1 Nibs=4 Dist=03C11
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CHKSTS =  F0C24 NZ%GPR        - F2A58 SC%ENT(00824) Type=1.0 Nibs=4 Dist=01E34
                              + F3069 NZ%BIF(00192) Type=1.1 Nibs=4 Dist=02445
                              + F3160 NZ%BIF(00289) Type=1.1 Nibs=4 Dist=0253C
CHKmem =  012C7 TI%R6S        -
CHN#SV =  2F96F TI%R6S        - F2219 SC%ENT(002E5) Type=0.0 Nibs=5
CHNHED =  0F579 TI%R6S        -
CHNLST =  2F5BE TI%R6S        -
CK"ON" =  076A0 TI%R6S        -
CK=ATN =  F6A03 NZ%IOR        -
CK=ATn =  F6A08 NZ%IOR        - F2B47 SC%ENT(00C13) Type=1.1 Nibs=4 Dist=03EC1
                              + F5F66 NZ%CAT(000D5) Type=1.1 Nibs=4 Dist=00AA2
CKBITL =  F5784 NZ%HND        - F5E92 NZ%CAT(00001) Type=1.1 Nibs=3 Dist=0070E
CKHPI+ =  F5790 NZ%HND        -
CKHPIL =  F578D NZ%HND        -
CKINF- =  18534 TI%R6S        - F661B NZ%CAT(0078A) Type=0.1 Nibs=5
CKINFO =  18542 TI%R6S        -
CKLOP# =  F297B SC%ENT        - F153E NZ%BAS(005A4) Type=1.1 Nibs=4 Dist=0143D
                              + F1981 NZ%BAS(009E7) Type=1.1 Nibs=4 Dist=00FFA
CKSREQ =  00721 TI%R6S        -
CKSTR  =  F7A84 NZ%PAR        -
CKSUM2 =  0AA81 TI%R6S        -
CKSUM3 =  153A9 TI%R6S        -
CKSUM4 =  1DBA6 TI%R6S        -
CKmode =  F28FF SC%ENT        - F15CA NZ%BAS(00630) Type=1.1 Nibs=4 Dist=01335
CLASSA =  0D590 TI%R6S        -
CLCBFR =  2F576 TI%R6S        -
CLCSTK =  2F585 TI%R6S        -
CLEAR  =  F1585 NZ%BAS        - F010D NZ%TBL(00105) Type=1.2 Nibs=5 Dist=01478
CLEARN =  F4318 NZ%CAS        -
CLEARd =  F7CC7 NZ%DEC        - F157B NZ%BAS(005E1) Type=1.2 Nibs=5 Dist=0674C
CLEARp =  F761E NZ%PAR        - F1580 NZ%BAS(005E6) Type=1.2 Nibs=5 Dist=0609E
CLLOOP =  F431D NZ%CAS        -
CLMODE =  F24CE SC%ENT        - F5A73 NZ%HND(00958) Type=1.1 Nibs=4 Dist=035A5
CLOSEA =  120E4 TI%R6S        -
CLOSEF =  12087 TI%R6S        -
CLRFRC =  0C6F4 TI%R6S        -
CLRPRM =  04827 TI%R6S        -
CLRTSR =  0FD00 NZ%SYM        -
CMD1ST =  01654 TI%R6S        -
CMDFND =  01693 TI%R6S        -
CMDINI =  016D1 TI%R6S        -
CMDPR" =  01627 TI%R6S        -
CMDPTR =  2F6D4 TI%R6S        -
CMDS20 =  01672 TI%R6S        -
CMOSTV =  0168F TI%R6S        -
CMOSTW =  2F438 TI%R6S        -
CMPT   =  125B2 TI%R6S        -
CNFFND =  109AC TI%R6S        - F3C91 NZ%BUT(C009A) Type=0.1 Nibs=5
CNFLCT =  0BD15 TI%R6S        -
CNTADR =  2F67E TI%R6S        -
CNTRLd =  F7EA2 NZ%DEC        - F2A69 SC%ENT(00835) Type=1.2 Nibs=5 Dist=05439
CNTRLp =  F7B9A NZ%PAR        - F2A6E SC%ENT(00B3A) Type=1.2 Nibs=5 Dist=0512C
CNVUCR =  152A7 TI%R6S        -
CNVWUC =  03FB8 TI%R6S        - F7BCE NZ%PAR(006D1) Type=0.1 Nibs=5
COLDST =  00000 TI%R6S        -
COLLAP =  091FB TI%R6S        -
COMCK  =  036CD TI%R6S        -
COMCK+ =  032AE TI%R6S        -
CONCOM =  0467E TI%R6S        -
CONF   =  10212 TI%R6S        -
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CONFST =  2F9E6 TIXR6S          -
CONTRL =  F2A73 SCXENT          - F01CA NZXTBL(001C2) Type=1.2 Nibs=5 Dist=028A9
CONVUC =  F0E6D NZXGPR          - F2E3C NZXUTL(001A6) Type=1.1 Nibs=4 Dist=01FCF
CONWUC =  F7BCC NZXPAR          -
COPYu  =  08269 TIXR6S          -
CORUPT =  09083 TIXR6S          -
COS12  =  0D721 TIXR6S          -
COS15  =  0D725 TIXR6S          -
COUNTC =  1C346 TIXR6S          - F270D SCXENT(007D9) Type=0.1 Nibs=5
CPLW10 =  07887 TIXR6S          -
CPLXER =  F2631 SCXENT          - F2629 SCXENT(006F5) Type=1.2 Nibs=3 Dist=00008
CR     =  2C000 TIXR6S          -
CRDFIL =  1D21D TIXR6S          -
CREATE =  115A7 TIXR6S          -
CRETF+ =  084C4 TIXR6S          -
CRFSB- =  11664 TIXR6S          -
CRLFND =  0229E TIXR6S          - F664E NZXCAT(0078D) Type=0.1 Nibs=5
CRLFOF =  02296 TIXR6S          -
CRLFSD =  022A2 TIXR6S          -
CRTF   =  116C1 TIXR6S          - F5975 NZXHND(0085A) Type=0.1 Nibs=5
CSL9R0 =  1BA0D TIXR6S          -
CSLC1  =  F0F42 NZXGPR          -
CSLC10 =  F0F4A NZXGPR          - F465F NZXCAS(003CC) Type=1.1 Nibs=4 Dist=03715
                                + F5BDC NZXHND(00AC1) Type=1.0 Nibs=4 Dist=04C92
CSLC11 =  F0F4D NZXGPR          -
CSLC12 =  F0F50 NZXGPR          - F1C1F NZXBAS(00C85) Type=1.1 Nibs=4 Dist=00CCF
CSLC13 =  F0F53 NZXGPR          -
CSLC14 =  F0F56 NZXGPR          -
CSLC15 =  F0F59 NZXGPR          -
CSLC2  =  F0F3F NZXGPR          - F139B NZXBAS(00401) Type=1.1 Nibs=3 Dist=0045C
                                + F4FC3 NZXCAS(00D30) Type=1.1 Nibs=4 Dist=04084
                                + F5731 NZXHND(00616) Type=1.1 Nibs=4 Dist=047F2
CSLC3  =  F0F3C NZXGPR          - F12D3 NZXBAS(00339) Type=1.1 Nibs=3 Dist=00397
                                + F4AA0 NZXCAS(0080D) Type=1.0 Nibs=4 Dist=03B64
                                + F5462 NZXHND(00347) Type=1.1 Nibs=4 Dist=04526
CSLC4  =  F0F39 NZXGPR          - F1677 NZXBAS(006DD) Type=1.0 Nibs=3 Dist=0073E
                                + F3E1C NZXBUT(00225) Type=1.1 Nibs=4 Dist=02EE3
                                + F40FD NZXBUT(00506) Type=1.0 Nibs=4 Dist=031C4
                                + F54B4 NZXHND(00399) Type=1.0 Nibs=4 Dist=0457B
CSLC5  =  F0F36 NZXGPR          - F2176 SCXENT(00242) Type=1.1 Nibs=4 Dist=01240
                                + F217E SCXENT(0024A) Type=1.1 Nibs=4 Dist=01248
                                + F274B SCXENT(00817) Type=1.1 Nibs=4 Dist=01815
                                + F3092 NZXBIF(001BB) Type=1.1 Nibs=4 Dist=0215C
                                + F66B6 NZXCAT(00825) Type=1.0 Nibs=4 Dist=05780
                                + F7A9B NZXPAR(0059E) Type=1.1 Nibs=4 Dist=06B65
CSLC6  =  F0F33 NZXGPR          - F5286 NZXHND(0016B) Type=1.1 Nibs=4 Dist=04353
CSLC7  =  F0F30 NZXGPR          - F519F NZXHND(00084) Type=1.1 Nibs=4 Dist=0426F
CSLC8  =  F0F2D NZXGPR          - F4CBF NZXCAS(00A2C) Type=1.1 Nibs=4 Dist=03D92
CSLC9  =  F0F47 NZXGPR          - F3E80 NZXBUT(00289) Type=1.1 Nibs=4 Dist=02F39
                                + F52E4 NZXHND(001C9) Type=1.1 Nibs=4 Dist=04390
CSLW3  =  0ED43 TIXR6S          -
CSLW4  =  0ED40 TIXR6S          -
CSLW5  =  0ED3D TIXR6S          -
CSPEED =  2F977 TIXR6S          -
CSRC1  =  F0F59 NZXGPR          -
CSRC10 =  F0F33 NZXGPR          - F5C69 NZXHND(00B4E) Type=1.0 Nibs=4 Dist=04D36
                                + F66BC NZXCAT(0082B) Type=1.0 Nibs=4 Dist=05789
CSRC11 =  F0F36 NZXGPR          -
CSRC12 =  F0F39 NZXGPR          - F6F05 NZXFXQ(000EC) Type=1.1 Nibs=4 Dist=05FCC
CSRC13 =  F0F3C NZXGPR          -
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CSRC14 =  F0F3F NZZGPR        -
CSRC15 =  F0F42 NZZGPR        -
CSRC2  =  F0F56 NZZGPR        - F4F63 NZZCAS(00CD0) Type=1.1 Nibs=4 Dist=0400D
                              + F7130 NZZFXQ(00317) Type=1.1 Nibs=4 Dist=061DA
CSRC3  =  F0F53 NZZGPR        - F3EB8 NZZBUT(002C4) Type=1.1 Nibs=4 Dist=02F68
                              + F4A91 NZZCAS(007FE) Type=1.0 Nibs=4 Dist=03B3E
                              + F547E NZZHND(00363) Type=1.1 Nibs=4 Dist=0452B
CSRC4  =  F0F50 NZZGPR        - F167E NZZBAS(006E4) Type=1.0 Nibs=3 Dist=0072E
                              + F40F4 NZZBUT(004FD) Type=1.0 Nibs=4 Dist=031A4
                              + F5257 NZZHND(0013C) Type=1.1 Nibs=4 Dist=04307
                              + F52A5 NZZHND(0018A) Type=1.1 Nibs=4 Dist=04355
CSRC5  =  F0F4D NZZGPR        - F2195 SCZENT(00261) Type=1.1 Nibs=4 Dist=01248
                              + F219E SCZENT(0026A) Type=1.1 Nibs=4 Dist=01251
                              + F2586 SCZENT(00652) Type=1.1 Nibs=4 Dist=01639
                              + F2738 SCZENT(00807) Type=1.1 Nibs=4 Dist=017EE
                              + F309F NZZBIF(001C8) Type=1.1 Nibs=4 Dist=02152
                              + F5486 NZZHND(0036B) Type=1.1 Nibs=4 Dist=04539
                              + F551C NZZHND(00401) Type=1.1 Nibs=4 Dist=045CF
                              + F5726 NZZHND(0060B) Type=1.1 Nibs=4 Dist=047D9
                              + F66AC NZZCAT(0081B) Type=1.0 Nibs=4 Dist=0575F
                              + F7AB2 NZZPAR(005B5) Type=1.1 Nibs=4 Dist=06B65
CSRC6  =  F0F4A NZZGPR        -
CSRC7  =  F0F47 NZZGPR        -
CSRC8  =  F0F2D NZZGPR        - F49B6 NZZCAS(00723) Type=1.1 Nibs=4 Dist=03A89
                              + F4B69 NZZCAS(008D6) Type=1.1 Nibs=4 Dist=03C3C
CSRC9  =  F0F30 NZZGPR        - F4DB6 NZZCAS(00B23) Type=1.1 Nibs=4 Dist=03E86
                              + F53AE NZZHND(00293) Type=1.1 Nibs=4 Dist=0447E
CSRW3  =  0ED32 TIZR6S        -
CSRW4  =  0ED2F TIZR6S        -
CSRW5  =  0ED2C TIZR6S        -
CURBOT =  10059 TIZR6S        -
CURDVC =  0A60B TIZR6S        -
CURREN =  2F56C TIZR6S        -
CURRL  =  2F7E8 TIZR6S        -
CURRST =  2F55D TIZR6S        -
CURSFL =  151DF TIZR6S        - F6647 NZZCAT(007B6) Type=0.1 Nibs=5
CURSFR =  151D7 TIZR6S        -
CURSOR =  2F47E TIZR6S        - F3A90 NZZDSP(00459) Type=0.0 Nibs=5
                              + F3BA7 NZZDSP(00570) Type=0.0 Nibs=5
CURSRD =  100A4 TIZR6S        -
CURSRT =  096C1 TIZR6S        -
CURSRU =  1009A TIZR6S        -
CURTOP =  10063 TIZR6S        -
CVUCW  =  03FBC TIZR6S        -
ChainE =  F7FFE Define        - F0028 NZZTBL(00020) Type=1.2 Nibs=5 Dist=07FD6
Checks =  F7FFC Define        -
CkLoop =  1B669 TIZR6S        -
CkLpNC =  1B66D TIZR6S        -
CkTape =  00005 NZZSYM        -
Clear  =  00005 TIZR6S        - F3B78 NZZDSP(00541) Type=0.0 Nibs=1
CloseR =  00008 NZZSYM        - F12EF NZZBAS(00355) Type=0.0 Nibs=1
Calc10 =  F5BDA NZZHND        - F6091 NZZCAT(00200) Type=1.1 Nibs=3 Dist=004B7
                              + F61D1 NZZCAT(00340) Type=1.1 Nibs=3 Dist=005F7
                              + F6349 NZZCAT(004B8) Type=1.1 Nibs=3 Dist=0076F
CurOff =  00006 TIZR6S        -

DO+2RD =  13A32 TIZR6S
DO=AVS =  09B2C TIZR6S
DO=FIB =  13AC5 TIZR6S        - F5433 NZZHND(00318) Type=0.1 Nibs=5
DO=FRO =  F5C9C NZZHND        - F660A NZZCAT(00779) Type=1.1 Nibs=4 Dist=0096E
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                                         + F6629 NZ%CAT(00798) Type=1.1 Nibs=4 Dist=0098D
D0=PCA =  09837 TI%R6S                   - F2563 SC%ENT(0062F) Type=0.1 Nibs=5
D0ASC+ =  0982C TI%R6S                   -
D0ASCI =  09833 TI%R6S                   -
D12R0A =  1BA3C TI%R6S                   -
D1=AVE =  F0F74 NZ%GPR                   - F2C01 SC%ENT(00CCD) Type=1.1 Nibs=4 Dist=01C8D
                                         + F3F54 NZ%BUT(0035D) Type=1.1 Nibs=4 Dist=02FE0
                                         + F40CD NZ%BUT(004D6) Type=1.1 Nibs=4 Dist=03159
                                         + F4614 NZ%CAS(00381) Type=1.1 Nibs=4 Dist=036A0
                                         + F5FFB NZ%CAT(0016A) Type=1.1 Nibs=4 Dist=05087
D1=AVS =  F0F7D NZ%GPR                   - F253C SC%ENT(00608) Type=1.1 Nibs=4 Dist=015BF
                                         + F6239 NZ%CAT(003A8) Type=1.1 Nibs=4 Dist=052BC
                                         + F6ED1 NZ%FXQ(000B8) Type=1.1 Nibs=4 Dist=05F54
D1=DSP =  F3281 NZ%BIF                   - F1A04 NZ%BAS(00A6A) Type=1.1 Nibs=4 Dist=0187D
D1=DST =  F328A NZ%BIF                   - F11BF NZ%BAS(00225) Type=1.1 Nibs=4 Dist=020CB
                                         + F195E NZ%BAS(009C4) Type=1.1 Nibs=4 Dist=0192C
                                         + F1994 NZ%BAS(009FA) Type=1.1 Nibs=4 Dist=018F6
D1=DSX =  F3293 NZ%BIF                   - F11B4 NZ%BAS(0021A) Type=1.1 Nibs=4 Dist=020DF
D1=S20 =  F5C93 NZ%HND                   -
D1=SCR =  F4A2C NZ%CAS                   - F5DC9 NZ%HND(00CAE) Type=1.1 Nibs=4 Dist=0139D
D1=SD0 =  F1690 NZ%BAS                   - F354F NZ%BIF(00678) Type=1.1 Nibs=4 Dist=01EBF
D1=SR0 =  F1687 NZ%BAS                   -
D1@AVE =  F0F86 NZ%GPR                   - F2652 SC%ENT(0071E) Type=1.0 Nibs=4 Dist=016CC
                                         + F3533 NZ%BIF(0065C) Type=1.1 Nibs=4 Dist=025AD
                                         + F66C2 NZ%CAT(00831) Type=1.0 Nibs=4 Dist=0573C
                                         + F6EE2 NZ%FXQ(000C9) Type=1.1 Nibs=4 Dist=05F5C
                                         + F6F21 NZ%FXQ(00108) Type=1.1 Nibs=4 Dist=05F9B
                                         + F74B8 NZ%FXQ(0069F) Type=1.1 Nibs=4 Dist=06532
D1@AVS =  F0F92 NZ%GPR                   - F46C4 NZ%CAS(00431) Type=1.1 Nibs=4 Dist=03732
                                         + F6190 NZ%CAT(002FF) Type=1.1 Nibs=4 Dist=051FE
D1C=R3 =  03047 TI%R6S                   -
D1FSTK =  1955D TI%R6S                   - F28EB SC%ENT(009B7) Type=0.1 Nibs=5
D1MST+ =  13E21 TI%R6S                   - F2251 SC%ENT(0031D) Type=0.1 Nibs=5
D1MSTK =  1954E TI%R6S                   -
D=AVME =  1A476 TI%R6S                   -
D=AVMS =  1A460 TI%R6S                   -
D=WORD =  04C0E TI%R6S                   -
DATLEN =  0B584 TI%R6S                   -
DATPTR =  2F692 TI%R6S                   -
DAY2JD =  13407 TI%R6S                   -
DAYYMD =  13335 TI%R6S                   -
DBLPI4 =  0DAFC TI%R6S                   -
DBLSUB =  0DADD TI%R6S                   -
DCHX=C =  1B2D0 TI%R6S                   -
DCHXF  =  1B223 TI%R6S                   -
DCHXW  =  0ECDC TI%R6S                   -
DCONTR =  2E3FE TI%R6S                   -
DCPLIN =  10108 TI%R6S                   -
DCRMNT =  1C177 TI%R6S                   - F2782 SC%ENT(0084E) Type=0.1 Nibs=5
DD1CTL =  2E3FF TI%R6S                   -
DD1END =  2E34C TI%R6S                   -
DD1ST  =  2E300 TI%R6S                   -
DD2CTL =  2E2FF TI%R6S                   -
DD2END =  2E260 TI%R6S                   -
DD2ST  =  2E200 TI%R6S                   -
DD3CTL =  2E1FF TI%R6S                   -
DD3END =  2E160 TI%R6S                   -
DD3ST  =  2E104 TI%R6S                   -
DDL    =  F6B8A NZ%IOR                   - F0BAE NZ%GPR(003EC) Type=1.1 Nibs=4 Dist=0600C
                                         + F166F NZ%BAS(006D5) Type=1.0 Nibs=4 Dist=0554B
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                              + F4A39 NZ%CAS(007A6) Type=1.0 Nibs=4 Dist=02181
                              + F5C8F NZ%HND(00B74) Type=1.0 Nibs=4 Dist=00F2B
DDT    =  F6BC9 NZ%IOR        - F0B60 NZ%GPR(0039E) Type=1.1 Nibs=4 Dist=06069
                              + F12FF NZ%BAS(00365) Type=1.0 Nibs=4 Dist=058CA
                              + F4A54 NZ%CAS(007C1) Type=1.0 Nibs=4 Dist=02175
                              + F6388 NZ%CAT(004F7) Type=1.1 Nibs=4 Dist=00841
DEBNCE =  00CF7 TI%R6S        -
DECHEX =  1B2D2 TI%R6S        -
DECP   =  0328F TI%R6S        -
DEFADC =  052FC TI%R6S        -
DEFADR =  2F967 TI%R6S        - F2C4B SC%ENT(00D17) Type=0.0 Nibs=5
DELAYT =  2F948 TI%R6S        -
DELAYp =  02AC6 TI%R6S        -
DEST   =  0F7B0 TI%R6S        -
DEVID  =  F1B39 NZ%BAS        - F00CE NZ%TBL(000C6) Type=1.2 Nibs=5 Dist=01A6B
DEVPAR =  F1C85 NZ%BAS        -
DEVPR$ =  F1CCB NZ%BAS        - F60CC NZ%CAT(0023B) Type=1.1 Nibs=4 Dist=04401
DEVSPp =  F78B2 NZ%PAR        - F06D1 NZ%DIR(0001C) Type=1.2 Nibs=5 Dist=071E1
DEVTYP =  F1C3C NZ%BAS        - F00D7 NZ%TBL(000CF) Type=1.2 Nibs=5 Dist=01B65
DISINT =  2F470 TI%R6S        -
DISPDC =  05450 TI%R6S        - F7C2D NZ%DEC(0005A) Type=0.1 Nibs=5
DISPIS =  F1142 NZ%BAS        - F0170 NZ%TBL(00168) Type=1.2 Nibs=5 Dist=00FD2
DISPP  =  035A4 TI%R6S        - F7518 NZ%PAR(0001B) Type=0.1 Nibs=5
DISPt  =  00000 TI%R6S        -
DIVF   =  0C4B8 TI%R6S        -
DMNSN  =  0AE39 TI%R6S        -
DONNA  =  09656 TI%R6S        -
DPART2 =  17EA3 TI%R6S        -
DPART3 =  17EF8 TI%R6S        -
DPOS   =  2F94D TI%R6S        -
DPVCTR =  0AC50 TI%R6S        -
DRANGE =  1B076 TI%R6S        -
DROPDC =  05470 TI%R6S        -
DSLEEP =  0056D TI%R6S        -
DSP$00 =  1850B TI%R6S        -
DSPBFE =  2F540 TI%R6S        -
DSPBFS =  2F480 TI%R6S        - F37A7 NZ%DSP(00170) Type=0.0 Nibs=2 Offset=      -2
                              + F37C6 NZ%DSP(0018F) Type=0.0 Nibs=5
                              + F3A84 NZ%DSP(0044D) Type=0.0 Nibs=5
DSPBUF =  09723 TI%R6S        -
DSPCAT =  F6606 NZ%CAT        -
DSPCHA =  01C3E TI%R6S        -
DSPCHC =  01C3C TI%R6S        -
DSPCHX =  2F674 TI%R6S        - F3295 NZ%BIF(003BE) Type=0.0 Nibs=5
DSPCL? =  020B6 TI%R6S        - F390D NZ%DSP(002D6) Type=0.1 Nibs=5
DSPCNA =  09721 TI%R6S        -
DSPCNB =  0971F TI%R6S        -
DSPCNO =  09716 TI%R6S        -
DSPDGT =  2F6DD TI%R6S        -
DSPFMT =  2F6DC TI%R6S        -
DSPLI+ =  1010F TI%R6S        -
DSPLIN =  10127 TI%R6S        -
DSPMSK =  2F540 TI%R6S        -
DSPRST =  02443 TI%R6S        -
DSPSET =  2F7B1 TI%R6S        - F30A8 NZ%BIF(001D1) Type=0.0 Nibs=5
                              + F328C NZ%BIF(003B5) Type=0.0 Nibs=5
                              + F365E NZ%DSP(00027) Type=0.0 Nibs=2
                              + F36D7 NZ%DSP(000A0) Type=0.0 Nibs=4
                              + F391D NZ%DSP(002E6) Type=0.0 Nibs=4
                              + F3981 NZ%DSP(0034A) Type=0.0 Nibs=5
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                                 + F3C61 NZ%BUT(0006A) Type=0.0 Nibs=5
DSPSTA =  2F475 TI%R6S           - F3914 NZ%DSP(002DD) Type=0.0 Nibs=4 Offset=       3
                                 + F39B6 NZ%DSP(0037F) Type=0.0 Nibs=5 Offset=       3
                                 + F3B6B NZ%DSP(00534) Type=0.0 Nibs=5 Offset=       3
DSPUPD =  01ADA TI%R6S           -
DSTRDC =  05280 TI%R6S           -
DTOH   =  F0D67 NZ%GPR           - F28A1 SC%ENT(0096D) Type=1.1 Nibs=4 Dist=0183A
                                 + F70E5 NZ%FXQ(002CC) Type=1.1 Nibs=4 Dist=0637E
                                 + F712A NZ%FXQ(00311) Type=1.1 Nibs=4 Dist=063C3
                                 + F7198 NZ%FXQ(0037F) Type=1.1 Nibs=4 Dist=06431
DV15M  =  0C4AC TI%R6S           -
DV15S  =  0C4B2 TI%R6S           -
DV2-12 =  0C4A8 TI%R6S           -
DV2-15 =  0C4AC TI%R6S           -
DVCPn* =  F79B0 NZ%PAR           -
DVCPy* =  F79B7 NZ%PAR           -
DVCSPp =  F79BA NZ%PAR           -
DVLBp  =  F788D NZ%PAR           -
DVSPp  =  F78B5 NZ%PAR           -
DVZNIB =  2F6FC TI%R6S           -
DWIDTH =  2F94F TI%R6S           -
DXP100 =  0CF7F TI%R6S           -
DZP    =  00003 TI%R6S           -
DdlPwr =  F5C73 NZ%HND           - F4EA3 NZ%CAS(00C10) Type=1.1 Nibs=4 Dist=00DD0
                                 + F501C NZ%CAS(00D89) Type=1.1 Nibs=4 Dist=00C57
DdtRd  =  F4A3D NZ%CAS           - F5A27 NZ%HND(0090C) Type=1.1 Nibs=4 Dist=00FEA
DevID  =  0003F NZ%SYM           - F0A23 NZ%GPR(00261) Type=0.0 Nibs=2
                                 + F3D86 NZ%BUT(0018F) Type=0.0 Nibs=2
                                 + F7256 NZ%FXQ(0043D) Type=0.0 Nibs=2
DevTyp =  0001F NZ%SYM           - F09BF NZ%GPR(001FD) Type=0.0 Nibs=2
                                 + F3D5E NZ%BUT(00167) Type=0.0 Nibs=2
                                 + F4033 NZ%BUT(0043C) Type=0.0 Nibs=3
                                 + F4250 NZ%BUT(00659) Type=0.0 Nibs=2
                                 + F70F5 NZ%FXQ(002DC) Type=0.0 Nibs=2
Device =  0000A NZ%SYM           - F0C0B NZ%GPR(00449) Type=0.0 Nibs=1 Offset=      -8
                                 + F0C62 NZ%GPR(004A0) Type=0.0 Nibs=1
Digit  =  00001 NZ%PAR           -
DispOK =  0000B NZ%SYM           - F2FAD NZ%BIF(000D6) Type=0.0 Nibs=1
                                 + F3676 NZ%DSP(0003F) Type=0.0 Nibs=1
                                 + F3685 NZ%DSP(0004E) Type=0.0 Nibs=1
                                 + F3695 NZ%DSP(0005E) Type=0.0 Nibs=1
                                 + F36D4 NZ%DSP(0009D) Type=0.0 Nibs=1
                                 + F397E NZ%DSP(00347) Type=0.0 Nibs=1
                                 + F3C6E NZ%BUT(00077) Type=0.0 Nibs=1
DsAddr =  00000 NZ%SYM           -
DsDevI =  00002 NZ%SYM           -
DsDevT =  00001 NZ%SYM           -
DsLoop =  00005 NZ%SYM           - F09B9 NZ%GPR(001F7) Type=0.0 Nibs=1 Offset=      -1
                                 + F1F6A SC%ENT(00036) Type=0.0 Nibs=1
                                 + F357D NZ%BIF(006A6) Type=0.0 Nibs=1
DsNull =  00004 NZ%SYM           - F09A3 NZ%GPR(001E1) Type=0.0 Nibs=1 Offset=      -1
                                 + F3DF5 NZ%BUT(001FE) Type=0.0 Nibs=1
DsVolL =  00003 NZ%SYM           -

EDIT80 =  0A5A5 TI%R6S           -
EDITWF =  0A533 TI%R6S           -
EFIELD =  00000 TI%R6S           -
ENABLE =  F29DF SC%ENT           - F01B8 NZ%TBL(001B0) Type=1.2 Nibs=5 Dist=02827
ENABLd =  F7D22 NZ%DEC           - F29D5 SC%ENT(00AA1) Type=1.2 Nibs=5 Dist=0534D
ENABLp =  F7B47 NZ%PAR           - F29DA SC%ENT(00AA6) Type=1.2 Nibs=5 Dist=0516D
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END    =  F0877 NZXGPR          -
ENDALL =  0769A TIXR6S          -
ENDBIN =  0764B TIXR6S          -
ENDFN  =  F0855 NZXGPR          - F1B8A NZXBAS(00BF0) Type=1.1 Nibs=4 Dist=01335
                                + F1C63 NZXBAS(00CC9) Type=1.1 Nibs=4 Dist=0140E
ENDIMG =  1C040 TIXR6S          - F26F8 SCXENT(007C4) Type=0.1 Nibs=5
ENDST  =  F084B NZXGPR          - F1642 NZXBAS(006A8) Type=1.0 Nibs=4 Dist=000F7
                                + F2D70 NZXUTL(000DA) Type=1.0 Nibs=4 Dist=02525
ENDSUB =  195A8 TIXR6S          -
ENDTAP =  F456E NZXCAS          - F13E8 NZXBAS(0044E) Type=1.1 Nibs=4 Dist=03186
                                + F5C2A NZXHND(00B0F) Type=1.0 Nibs=4 Dist=016BC
ENTER  =  F1F58 SCXENT          - F0143 NZXTBL(0013B) Type=1.2 Nibs=5 Dist=01E15
ENTERp =  F751D NZXPAR          - F1F53 SCXENT(0001F) Type=1.2 Nibs=5 Dist=055CA
ENTUSG =  F2561 SCXENT          - F075D NZXDIR(000A8) Type=1.2 Nibs=5 Dist=01E04
EOLCK  =  02A7E TIXR6S          - F79BF NZXPAR(004C2) Type=0.1 Nibs=5
                                + F7BB4 NZXPAR(006B7) Type=0.1 Nibs=5
EOLCKR =  02A7A TIXR6S          -
EOLDC  =  05402 TIXR6S          -
EOLLEN =  2F95A TIXR6S          - F110D NZXBAS(00173) Type=0.0 Nibs=5
                                + F2DB1 NZXUTL(0011B) Type=0.0 Nibs=5
EOLSCN =  08AA7 TIXR6S          -
EOLSTR =  2F95B TIXR6S          -
EOLXC* =  052EC TIXR6S          -
EOLXCK =  05405 TIXR6S          -
ERRM   =  2F7E4 TIXR6S          -
ERRADR =  2F688 TIXR6S          -
ERRL#  =  2F7EC TIXR6S          -
ERRLCH =  2F97C TIXR6S          -
ERRM$f =  09806 TIXR6S          -
ERROR  =  F34E5 NZXBIF          - F1F46 SCXENT(00012) Type=1.0 Nibs=4 Dist=0159F
                                + F5CB9 NZXHND(00B9E) Type=1.0 Nibs=4 Dist=027D4
ERROR! =  F34D8 NZXBIF          - F7591 NZXPAR(00094) Type=1.0 Nibs=4 Dist=040B9
ERRORP =  F34CE NZXBIF          - F76C0 NZXPAR(001C3) Type=1.0 Nibs=4 Dist=041F2
ERRORR =  F34CB NZXBIF          - F7B0D NZXPAR(00610) Type=1.0 Nibs=4 Dist=04642
ERRORX =  F34C1 NZXBIF          - F1607 NZXBAS(0066D) Type=1.0 Nibs=4 Dist=01EBA
                                + F1F74 SCXENT(00040) Type=1.0 Nibs=4 Dist=0154D
                                + F2D38 NZXUTL(000A2) Type=1.0 Nibs=3 Dist=00789
                                + F2E28 NZXUTL(00192) Type=1.0 Nibs=3 Dist=00699
                                + F2EA5 NZXUTL(0020F) Type=1.0 Nibs=3 Dist=0061C
                                + F3EED NZXBUT(002F6) Type=1.0 Nibs=4 Dist=00A2C
                                + F52FE NZXHND(001E3) Type=1.0 Nibs=4 Dist=01E3D
                                + F6DBC NZXLOW(00066) Type=1.0 Nibs=4 Dist=038FB
ERRRTN =  074ED TIXR6S          -
ERRSUB =  2F683 TIXR6S          -
ESCSEQ =  023C1 TIXR6S          -
ESCSTA =  2F47B TIXR6S          - F3722 NZXDSP(000EB) Type=0.0 Nibs=5
EX-115 =  0CF48 TIXR6S          -
EX12   =  0D5C6 TIXR6S          -
EX15M  =  0D5CA TIXR6S          -
EX15S  =  0D5CE TIXR6S          -
EXAB1  =  0D3E7 TIXR6S          -
EXAB2  =  0D40E TIXR6S          -
EXACT  =  128B0 TIXR6S          -
EXCAD+ =  08631 TIXR6S          -
EXCHR@ =  02E81 TIXR6S          -
EXCPAR =  187E8 TIXR6S          -
EXDCLP =  0592E TIXR6S          -
EXF    =  005DF TIXR6S          -
EXP15  =  0CF5A TIXR6S          -
EXPEX+ =  F4101 NZXBUT          - F74F3 NZXFXQ(006DA) Type=1.0 Nibs=4 Dist=033F2
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EXPEX-  =  0F178 TIXR6S        -
EXPEXC  =  0F186 TIXR6S        - F4109 NZXBUT(00512) Type=0.1 Nibs=5
EXPP10  =  03FE3 TIXR6S        -
EXPPAR  =  03FD9 TIXR6S        - F7A62 NZXPAR(00565) Type=0.1 Nibs=5
EXPPLS  =  03FDC TIXR6S        -
EXPR    =  0F23C TIXR6S        -
EXPRDC  =  06922 TIXR6S        - F7E73 NZXDEC(002A0) Type=0.1 Nibs=5
EXPSKP  =  1A9AC TIXR6S        -
EndNum  =  000E6 TIXR6S        -
Endtap  =  F5C28 NZXHND        - F600C NZXCAT(0017B) Type=1.1 Nibs=3 Dist=003E4
EolOK   =  00009 NZXPAR        - F7705 NZXPAR(00208) Type=0.0 Nibs=1
                               + F77E0 NZXPAR(002E3) Type=0.0 Nibs=1
                               + F780E NZXPAR(00311) Type=0.0 Nibs=1
Error   =  F5CB7 NZXHND        - F5F20 NZXCAT(0008F) Type=1.0 Nibs=3 Dist=00269
                               + F60DE NZXCAT(0024D) Type=1.0 Nibs=3 Dist=00427
Except  =  0000C TIXR6S        - F2B39 SCXENT(00C05) Type=0.0 Nibs=1
                               + F318E NZXBIF(002B7) Type=0.0 Nibs=1
ExprOK  =  00008 NZXPAR        - F76D5 NZXPAR(001D8) Type=0.0 Nibs=1
                               + F77E3 NZXPAR(002E6) Type=0.0 Nibs=1
                               + F77EB NZXPAR(002EE) Type=0.0 Nibs=1

F->SCR  =  F4A12 NZXCAS        - F12C4 NZXBAS(0032A) Type=1.1 Nibs=4 Dist=0374E
F-R0-0  =  2F89B TIXR6S        -
F-R0-1  =  2F8A0 TIXR6S        - F6151 NZXCAT(002C0) Type=0.0 Nibs=5
                               + F6161 NZXCAT(002D0) Type=0.0 Nibs=5
F-R0-2  =  2F8A5 TIXR6S        -
F-R0-3  =  2F8AA TIXR6S        -
F-R1-0  =  2F8AB TIXR6S        -
F-R1-1  =  2F8B0 TIXR6S        -
F-R1-2  =  2F8B5 TIXR6S        -
F-R1-3  =  2F8BA TIXR6S        -
FASCFD  =  110C3 TIXR6S        -
FCHAIN  =  F0008 Define        -
FCHLBL  =  0782C TIXR6S        -
FCSTRT  =  0E757 TIXR6S        -
FGTBL   =  00C9B TIXR6S        -
FIBAD-  =  11478 TIXR6S        -
FIBADR  =  11457 TIXR6S        -
FIBOFF  =  12132 TIXR6S        - F3098 NZXBIF(001C1) Type=0.1 Nibs=5
FILCRD  =  1C879 TIXR6S        -
FILDC*  =  06759 TIXR6S        - F7C4F NZXDEC(0007C) Type=0.1 Nibs=5
FILEF   =  09FB0 TIXR6S        -
FILEP   =  03E9C TIXR6S        -
FILEP!  =  03F0F TIXR6S        -
FILEP+  =  03F07 TIXR6S        -
FILEP-  =  03F00 TIXR6S        -
FILEP1  =  03EFC TIXR6S        -
FILFIL  =  011CE TIXR6S        -
FILSK+  =  06F1D TIXR6S        -
FILSPp  =  F7B62 NZXPAR          F06E0 NZXDIR(0002B) Type=1.2 Nibs=5 Dist=07182
FILSPx  =  F3528 NZXBIF        - F06E5 NZXDIR(00030) Type=1.2 Nibs=5 Dist=02E43
FILSp   =  F7857 NZXPAR        -
FILXQ$  =  09B95 TIXR6S        -
FILXQ^  =  09B76 TIXR6S
FIND    =  F1BDB NZXBAS          F0015 NZXTBL(000AD) Type=1.2 Nibs=5 Dist=01B16
FINDA   =  023E3 TIXR6S          F251D SCXENT(00699) Type=0.1 Nibs=5
                               + F3747 NZXDSP(00110) Type=0.1 Nibs=5
                               + F5FE7 NZXCAT(00136) Type=0.1 Nibs=5
FINDD0  =  023E0 TIXR6S
FINDF   =  09F22 TIXR6S          F5620 NZXHND(00512) Type=0.1 Nibs=5
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                               + F5929 NZZHND(0080E) Type=0.1 Nibs=5
FINDF+ =  F473B NZZCAS         - F5C6F NZZHND(00854) Type=1.0 Nibs=4 Dist=01534
FINDFL =  F4734 NZZCAS         - F550F NZZHND(003F4) Type=1.1 Nibs=4 Dist=00DDB
                               + F57A6 NZZHND(0068B) Type=1.1 Nibs=4 Dist=01072
FINDFx =  F47C7 NZZCAS         - F5163 NZZHND(00048) Type=1.1 Nibs=4 Dist=0099C
                               + F5DB8 NZZHND(00C9D) Type=1.1 Nibs=4 Dist=015F1
FINDL  =  0FFE4 TIZR6S         -
FINDLB =  07786 TIZR6S         -
FINITA =  0CD03 TIZR6S         -
FINITC =  0CD0F TIZR6S         -
FINLIN =  18A3A TIZR6S         -
FIRSTC =  2F47C TIZR6S         -
FIXDC  =  05493 TIZR6S         -
FIXP   =  02A6E TIZR6S         -
FIXSPC =  00000 Define         - F1078 NZZBAS(000DE) Type=0.0 Nibs=1
                               + F10B6 NZZBAS(0011C) Type=0.0 Nibs=1
                               + F11CA NZZBAS(00230) Type=0.0 Nibs=1
                               + F11E6 NZZBAS(0024C) Type=0.0 Nibs=1
                               + F133B NZZBAS(003A1) Type=0.0 Nibs=1
                               + F1CAB NZZBAS(00D11) Type=0.0 Nibs=1
                               + F1D37 NZZBAS(00D9D) Type=0.0 Nibs=1
                               + F222B SCZENT(002F7) Type=0.0 Nibs=1
                               + F226E SCZENT(0033A) Type=0.0 Nibs=1
                               + F24AB SCZENT(00577) Type=0.0 Nibs=1
                               + F297A SCZENT(00A46) Type=0.0 Nibs=1
                               + F2A66 SCZENT(00B32) Type=0.0 Nibs=1
                               + F2AD9 SCZENT(00BA5) Type=0.0 Nibs=1
                               + F2B06 SCZENT(00BD2) Type=0.0 Nibs=1
                               + F2B90 SCZENT(00C5C) Type=0.0 Nibs=1
                               + F2C84 SCZENT(00D50) Type=0.0 Nibs=1
                               + F3115 NZZBIF(0023E) Type=0.0 Nibs=1
                               + F31CE NZZBIF(002F7) Type=0.0 Nibs=1
                               + F3BE7 NZZDSP(005B0) Type=0.0 Nibs=1
                               + F3D0A NZZOUT(00113) Type=0.0 Nibs=1
                               + F44F8 NZZCAS(00265) Type=0.0 Nibs=1
                               + F5D91 NZZHND(00C76) Type=0.0 Nibs=1
                               + F6143 NZZCAT(002B2) Type=0.0 Nibs=1
FLADDR =  0126B TIZR6S         -
FLDEVX =  01154 TIZR6S         -
FLGREG =  2F6E9 TIZR6S         -
FLIP10 =  0DB9C TIZR6S         -
FLIP11 =  0DBAB TIZR6S         -
FLIP8  =  0DB8D TIZR6S         -
FLOAT  =  1B322 TIZR6S         -
FLOAT! =  F6D56 NZZLOW         - F1C5D NZZBAS(00CC3) Type=1.1 Nibs=4 Dist=050F9
                               + F1D87 NZZBAS(00DED) Type=1.1 Nibs=4 Dist=04FCF
                               + F1E77 NZZBAS(00EDD) Type=1.1 Nibs=4 Dist=04EDF
FLOAT+ =  F6D59 NZZLOW         -
FLOAT- =  F6D62 NZZLOW         -
FLTDH  =  1B223 TIZR6S         - F1F2F NZZBAS(00F95) Type=0.1 Nibs=5
FLTYPp =  03E71 TIZR6S         -
FNDCH- =  F0C10 NZZGPR         - F15A7 NZZBAS(0060D) Type=1.1 Nibs=4 Dist=00997
                               + F2ABC SCZENT(00B88) Type=1.1 Nibs=4 Dist=01EAC
FNDCHK =  F0C1B NZZGPR         - F1DE2 NZZBAS(00E48) Type=1.0 Nibs=4 Dist=011C7
                               + F294F SCZENT(00A1B) Type=1.1 Nibs=4 Dist=01D34
FNDCLR =  1DAEF TIZR6S         -
FNDFCN =  1A0A1 TIZR6S         -
FNDMB+ =  F3C3C NZZOUT         - F560A NZZHND(004EF) Type=1.1 Nibs=4 Dist=019CE
FNDMB- =  F3C40 NZZOUT         - F0C12 NZZGPR(00450) Type=1.1 Nibs=4 Dist=0302E
                               + F6DEA NZZLOW(00094) Type=1.1 Nibs=4 Dist=031AA
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FNDMBD =  F3C5F NZXBUT        - F2A98 SCXENT(00B64) Type=1.1 Nibs=4 Dist=011C7
FNDMBX =  F3C75 NZXBUT        - F0C1D NZXGPR(0045B) Type=1.1 Nibs=4 Dist=03058
                              + F28F5 SCXENT(009C1) Type=1.0 Nibs=4 Dist=01380
                              + F2EFF NZXBIF(00028) Type=1.1 Nibs=4 Dist=00D76
                              + F3060 NZXBIF(00189) Type=1.1 Nibs=4 Dist=00C15
                              + F3147 NZXBIF(00270) Type=1.1 Nibs=4 Dist=00B2E
                              + F3652 NZXDSP(0001B) Type=1.1 Nibs=3 Dist=00623
FNPWDS =  0D3C0 TIXR6S        -
FNRTN1 =  0F216 TIXR6S        - F1D91 NZXBAS(00DF7) Type=0.1 Nibs=5
FNRTN2 =  0F219 TIXR6S        -
FNRTN3 =  0F235 TIXR6S        -
FNRTN4 =  0F238 TIXR6S        - F1E7D NZXBAS(00EE3) Type=0.1 Nibs=5
FORMAT =  F4326 NZXCAS        - F14FC NZXBAS(00562) Type=1.1 Nibs=4 Dist=02E2A
FORSTK =  2F59E TIXR6S        - F21C4 SCXENT(00290) Type=0.0 Nibs=5
                              + F21E2 SCXENT(002AE) Type=0.0 Nibs=5
FORUPD =  0A6AE TIXR6S        -
FPOLL  =  1250A TIXR6S        -
FRAC15 =  0C70E TIXR6S        -
FRAME+ =  F07C2 NZXGPR        - F683C NZXIOR(0016A) Type=1.1 Nibs=4 Dist=0607A
                              + F6866 NZXIOR(00194) Type=1.1 Nibs=4 Dist=060A4
                              + F6883 NZXIOR(001B1) Type=1.1 Nibs=4 Dist=060C1
FRAME- =  F07D0 NZXGPR        - F2411 SCXENT(004DD) Type=1.1 Nibs=4 Dist=01C41
                              + F5BAE NZXHND(00A93) Type=1.1 Nibs=4 Dist=0530E
                              + F6715 NZXIOR(00043) Type=1.1 Nibs=4 Dist=05F45
                              + F6950 NZXIOR(0027E) Type=1.1 Nibs=4 Dist=06180
FRAMEE =  F6B08 NZXFRA        - F2CD5 NZXUTL(0003F) Type=1.1 Nibs=4 Dist=03F03
                              + F77BE NZXPAR(002C1) Type=1.1 Nibs=4 Dist=00BE6
FRAMET =  F6C81 NZXFRA        -
FRASPd =  F7D5E NZXDEC        -
FRASPp =  F7769 NZXPAR        -
FRange =  0B46A TIXR6S        -
FSPECe =  02F02 TIXR6S        -
FSPECp =  03CC5 TIXR6S        -
FSPECx =  09F2D TIXR6S        -
FTBSCH =  11093 TIXR6S        -
FTYPDC =  06902 TIXR6S        -
FTYPFN =  11059 TIXR6S        - F5CB2 NZXHND(00B97) Type=0.1 Nibs=5
FUNCD0 =  2F8B8 TIXR6S        - F0FEC NZXBAS(00052) Type=0.0 Nibs=5
                              + F1002 NZXBAS(00068) Type=0.0 Nibs=5
                              + F33AD NZXBIF(004D6) Type=0.0 Nibs=5
                              + F33D9 NZXBIF(00502) Type=0.0 Nibs=5
FUNCD1 =  2F8C0 TIXR6S        - F33C3 NZXBIF(004EC) Type=0.0 Nibs=5
                              + F33EC NZXBIF(00515) Type=0.0 Nibs=5
                              + F3401 NZXBIF(0052A) Type=0.0 Nibs=5
                              + F3418 NZXBIF(00541) Type=0.0 Nibs=5
FUNCR0 =  2F898 TIXR6S        - F188A NZXBAS(008F0) Type=0.0 Nibs=5
                              + F1910 NZXBAS(00976) Type=0.0 Nibs=2
                              + F5949 NZXHND(0082E) Type=0.0 Nibs=2
                              + F5987 NZXHND(0086C) Type=0.0 Nibs=2 Offset=       5
                              + F599C NZXHND(00881) Type=0.0 Nibs=5 Offset=       5
                              + F5C9E NZXHND(00B83) Type=0.0 Nibs=5
FUNCR1 =  2F8A8 TIXR6S        - F3433 NZXBIF(0055C) Type=0.0 Nibs=5
                              + F344D NZXBIF(00576) Type=0.0 Nibs=5
                              + F5936 NZXHND(0081B) Type=0.0 Nibs=2
                              + F697B NZXIOR(002A9) Type=0.0 Nibs=5
FXQPIL =  F73E4 NZXFXQ        -
FXQPn+ =  F742E NZXFXQ        -
FXQPnm =  F742B NZXFXQ        -
Findf+ =  F5C6D NZXHND        - F6E9E NZXCAT(000CD) Type=1.1 Nibs=3 Dist=00231
Format =  00005 NZXSYM        - F43E7 NZXCAS(00154) Type=0.0 Nibs=1
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GADDR  =  F0994 NZZGPR        -
GADRR+ =  F404F NZZBUT        - F734F NZZFXQ(00536) Type=1.1 Nibs=4 Dist=03300
GADRRM =  F4040 NZZBUT        - F1CA1 NZZBAS(00D07) Type=1.1 Nibs=4 Dist=0239F
GADRST =  F70F9 NZZFXQ        -
GDIRSB =  F6346 NZZCAT        -
GDIRST =  F48D8 NZZCAS        - F1203 NZZBAS(00269) Type=1.1 Nibs=4 Dist=036D5
GDISP$ =  1C3C7 TIZR6S        -
GET    =  F67E6 NZZIOR        - F0D14 NZZGPR(00552) Type=1.0 Nibs=4 Dist=05AD2
GETALR =  F0EA2 NZZGPR        - F4901 NZZCAS(0066E) Type=1.1 Nibs=4 Dist=03A5F
                              + F491C NZZCAS(00689) Type=1.1 Nibs=4 Dist=03A7A
                              + F494D NZZCAS(006BA) Type=1.1 Nibs=4 Dist=03AAB
GETAVM =  1864D TIZR6S        -
GETBYT =  F50F6 NZZCAS        - F584B NZZHND(00730) Type=1.1 Nibs=3 Dist=00755
                              + F6470 NZZCAT(005DF) Type=1.1 Nibs=4 Dist=0137A
GETCH# =  11427 TIZR6S        -
GETCON =  0DAA3 TIZR6S        -
GETD   =  F685D NZZIOR        - F4840 NZZCAS(005AD) Type=1.0 Nibs=4 Dist=0201D
                              + F5AAB NZZHND(00990) Type=1.1 Nibs=4 Dist=00DB2
GETDID =  F6E19 NZZFXQ        - F10EE NZZBAS(00154) Type=1.1 Nibs=4 Dist=05D2B
                              + F1179 NZZBAS(001DF) Type=1.1 Nibs=4 Dist=05CA0
                              + F11D7 NZZBAS(0023D) Type=1.1 Nibs=4 Dist=05C42
                              + F132F NZZBAS(00395) Type=1.1 Nibs=4 Dist=05AEA
                              + F15C1 NZZBAS(00627) Type=1.1 Nibs=4 Dist=05858
                              + F1F5A SCZENT(00026) Type=1.1 Nibs=4 Dist=04EBF
                              + F2A0E SCZENT(00ADA) Type=1.1 Nibs=4 Dist=0440B
GETDIM =  0AD6B TIZR6S        -
GETDIR =  F48B5 NZZCAS        - F13DE NZZBAS(00444) Type=1.1 Nibs=4 Dist=034D7
GETDIX =  F6E37 NZZFXQ        - F1CF0 NZZBAS(00D56) Type=1.1 Nibs=4 Dist=05147
GETDR! =  F486C NZZCAS        - F5F50 NZZCAT(000BF) Type=1.1 Nibs=4 Dist=016E4
                              + F6114 NZZCAT(00283) Type=1.1 Nibs=4 Dist=018A8
GETDR" =  F4873 NZZCAS        - F1218 NZZBAS(0027E) Type=1.1 Nibs=4 Dist=0365B
                              + F1355 NZZBAS(003BB) Type=1.1 Nibs=4 Dist=0351E
GETDR# =  F4875 NZZCAS        -
GETDR+ =  F488E NZZCAS        - F12A2 NZZBAS(00308) Type=1.1 Nibs=4 Dist=035EC
                              + F6357 NZZCAT(004C6) Type=1.1 Nibs=4 Dist=01AC9
GETDVW =  F71C8 NZZFXQ        -
GETDev =  F0BF0 NZZGPR        - F28F8 SCZENT(009C7) Type=1.0 Nibs=4 Dist=01D08
                              + F4684 NZZCAS(003F1) Type=1.1 Nibs=4 Dist=03A94
                              + F46D6 NZZCAS(00443) Type=1.1 Nibs=4 Dist=03AE6
                              + F5AC5 NZZHND(009AA) Type=1.1 Nibs=4 Dist=04ED5
                              + F5BC0 NZZHND(00AA5) Type=1.1 Nibs=4 Dist=04FD0
                              + F5C1C NZZHND(00B01) Type=1.1 Nibs=4 Dist=0502C
GETEND =  F687A NZZIOR        -
GETERR =  F6826 NZZIOR        - F08EB NZZGPR(00129) Type=1.0 Nibs=4 Dist=05F3B
                              + F2D67 NZZUTL(000D1) Type=1.1 Nibs=4 Dist=03ABF
                              + F2F0F NZZBIF(00038) Type=1.1 Nibs=4 Dist=03917
                              + F362A NZZBIF(00753) Type=1.0 Nibs=4 Dist=031FC
                              + F6DFE NZZLOW(000A8) Type=1.1 Nibs=3 Dist=005D8
GETHEX =  F3FD1 NZZBUT        - F14A8 NZZBAS(0050E) Type=1.1 Nibs=4 Dist=02B29
GETHS2 =  F680C NZZIOR        - F0C26 NZZGPR(00464) Type=1.1 Nibs=4 Dist=05BE6
GETHSS =  F31CF NZZBIF        - F1E4D NZZBAS(00EB3) Type=1.1 Nibs=4 Dist=01382
                              + F2BBB SCZENT(00C87) Type=1.1 Nibs=3 Dist=00614
GETID  =  F68A3 NZZIOR        - F0A69 NZZGPR(002A7) Type=1.1 Nibs=4 Dist=05E3A
GETID+ =  F688F NZZIOR        - F1B4A NZZBAS(00BB0) Type=1.1 Nibs=4 Dist=04D45
GETLOP =  F2996 SCZENT        - F6DE4 NZZLOW(0008E) Type=1.1 Nibs=4 Dist=0444E
GETLPs =  F1DAA NZZBAS        -
GETMBX =  F3BF7 NZZBUT        - F0879 NZZGPR(000B7) Type=1.0 Nibs=4 Dist=0337E
                              + F108C NZZBAS(000F2) Type=1.1 Nibs=4 Dist=02B6B
                              + F162D NZZBAS(00693) Type=1.1 Nibs=4 Dist=025CA
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                             + F34FA NZ%BIF(00623) Type=1.1 Nibs=3 Dist=006FD
                             + F37D4 NZ%DSP(0019D) Type=1.1 Nibs=3 Dist=00423
                             + F37FC NZ%DSP(001C5) Type=1.1 Nibs=3 Dist=003FB
                             + F393F NZ%DSP(00308) Type=1.1 Nibs=3 Dist=002B8
                             + F3995 NZ%DSP(0035E) Type=1.1 Nibs=3 Dist=00262
                             + F39FE NZ%DSP(003C7) Type=1.1 Nibs=3 Dist=001F9
                             + F3B80 NZ%DSP(00549) Type=1.1 Nibs=3 Dist=00077
                             + F5427 NZ%HND(0030C) Type=1.0 Nibs=4 Dist=01830
                             + F61E3 NZ%CAT(00352) Type=1.1 Nibs=4 Dist=025EC
                             + F620B NZ%CAT(0037A) Type=1.1 Nibs=4 Dist=02614
                             + F6A20 NZ%IOR(0034E) Type=1.1 Nibs=4 Dist=02E29
GETMSK =  01BBA TI%R6S       - F3AE9 NZ%DSP(004B2) Type=0.1 Nibs=5
GETNAM =  1A085 TI%R6S       -
GETNE  =  F67D0 NZ%IOR       -
GETPI+ =  F6EA9 NZ%FXQ       - F356A NZ%BIF(00693) Type=1.1 Nibs=4 Dist=0393F
GETPIL =  F6EA0 NZ%FXQ       - F1458 NZ%BAS(004BE) Type=1.1 Nibs=4 Dist=05A48
GETPR1 =  06BFB TI%R6S       -
GETPR0 =  06BEE TI%R6S       -
GETSA  =  0E551 TI%R6S       -
GETST  =  F681C NZ%IOR       - F08F1 NZ%GPR(0012F) Type=1.1 Nibs=4 Dist=05F2B
                             + F0C41 NZ%GPR(0047F) Type=1.1 Nibs=4 Dist=05BDB
                             + F50C6 NZ%CAS(00E33) Type=1.1 Nibs=4 Dist=01756
GETST^ =  07716 TI%R6S       -
GETST+ =  F3F41 NZ%BUT       -
GETST- =  F6833 NZ%IOR       - F3175 NZ%BIF(0029E) Type=1.1 Nibs=4 Dist=036BE
GETSTC =  07726 TI%R6S       -
GETSTR =  F3F19 NZ%BUT       - F19CF NZ%BAS(00A35) Type=1.1 Nibs=4 Dist=0254A
                             + F6E1B NZ%FXQ(00002) Type=1.1 Nibs=4 Dist=02F02
                             + F6EA2 NZ%FXQ(00089) Type=1.1 Nibs=4 Dist=02F89
GETVAL =  0DAB2 TI%R6S       -
GETX   =  F6745 NZ%IOR       - F23B2 SC%ENT(0047E) Type=1.1 Nibs=4 Dist=04393
                             + F5BA0 NZ%HND(00A85) Type=1.1 Nibs=4 Dist=008A5
GETZER =  F13F3 NZ%BAS       - F483A NZ%CAS(005A7) Type=1.0 Nibs=4 Dist=03447
GFTYPE =  F2E2B NZ%UTL       -
GHEXB+ =  F4016 NZ%BUT       - F1DC0 NZ%BAS(00E26) Type=1.1 Nibs=4 Dist=02256
GHEXBT =  F4012 NZ%BUT       - F2EAF NZ%UTL(00219) Type=1.1 Nibs=4 Dist=01163
                             + F72BB NZ%FXQ(004A2) Type=1.1 Nibs=4 Dist=032A9
                             + F7329 NZ%FXQ(00510) Type=1.1 Nibs=4 Dist=03317
                             + F737A NZ%FXQ(00561) Type=1.1 Nibs=4 Dist=03368
GLOOPW =  F2DEF NZ%UTL       - F16B1 NZ%BAS(00717) Type=1.1 Nibs=4 Dist=0173E
                             + F291A SC%ENT(009E6) Type=1.1 Nibs=3 Dist=004D5
                             + F296F SC%ENT(00A3B) Type=1.1 Nibs=3 Dist=00480
GNXTCR =  03064 TI%R6S       -
GOSUB  =  079E9 TI%R6S       -
GOSUBp =  029F6 TI%R6S       -
GOTO   =  079FA TI%R6S       -
GOTODC =  0552E TI%R6S       -
GOTOp  =  029F6 TI%R6S       -
GSBSTK =  2F5A3 TI%R6S       -
GST!NO =  F2E7C NZ%UTL       -
GT2BY0 =  F50F2 NZ%CAS       - F64E9 NZ%CAT(00658) Type=1.1 Nibs=4 Dist=013F7
GT2BYT =  F50F4 NZ%CAS       - F1404 NZ%BAS(0046A) Type=1.0 Nibs=4 Dist=03CF0
                             + F5C63 NZ%HND(00B48) Type=1.0 Nibs=4 Dist=0086F
                             + F63EA NZ%CAT(00559) Type=1.1 Nibs=4 Dist=012F6
GTEXT  =  05079 TI%R6S       -
GTEXT+ =  05199 TI%R6S       - F7CA7 NZ%DEC(000D4) Type=0.1 Nibs=5
GTEXT1 =  051A5 TI%R6S       -
GTFLAG =  1365E TI%R6S       -
GTKYC+ =  08D9B TI%R6S       -
GTKYCD =  08D92 TI%R6S       -
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GTPTRS =  14636 TI%R6S        -
GTPTRX =  14670 TI%R6S        -
GTXT++ =  05192 TI%R6S        - F7EA4 NZ%DEC(002D1) Type=0.1 Nibs=5
GTYPE  =  F0C94 NZ%GPR        - F1C4A NZ%BAS(00CB0) Type=1.1 Nibs=4 Dist=00FB6
                              + F369A NZ%DSP(00063) Type=1.1 Nibs=4 Dist=02A06
                              + F42F3 NZ%CAS(00060) Type=1.1 Nibs=4 Dist=0365F
GTYPR+ =  F4001 NZ%BUT        - F2961 SC%ENT(00A2D) Type=1.1 Nibs=4 Dist=016A0
                              + F298F SC%ENT(00A5B) Type=1.1 Nibs=4 Dist=01672
GTYPRM =  F4003 NZ%BUT        - F2E05 NZ%UTL(0016F) Type=1.1 Nibs=4 Dist=011FE
                              + F6DDB NZ%LOW(00085) Type=1.1 Nibs=4 Dist=02DD8
GTYPST =  F7088 NZ%FXQ        -
GetEXP =  1C086 TI%R6S        -
Getmbx =  F5425 NZ%HND        - F4C93 NZ%CAS(00A00) Type=1.1 Nibs=3 Dist=00792
                              + F4E42 NZ%CAS(00BAF) Type=1.1 Nibs=3 Dist=005E3

H82163 =  0000A NZ%SYM        - F367B NZ%DSP(00044) Type=0.0 Nibs=1
                              + F36A3 NZ%DSP(0006C) Type=0.0 Nibs=1
                              + F36C8 NZ%DSP(00091) Type=0.0 Nibs=1
                              + F389F NZ%DSP(00268) Type=0.0 Nibs=1
                              + F3A03 NZ%DSP(003CC) Type=0.0 Nibs=1
                              + F3BD0 NZ%DSP(00599) Type=0.0 Nibs=1
HASH1  =  1B0A1 TI%R6S        -
HASH2  =  1B0A3 TI%R6S        -
HDFLT  =  1B31B TI%R6S        - F27D3 SC%ENT(0089F) Type=0.1 Nibs=5
HEXASC =  17148 TI%R6S        -
HEXDEC =  0ECAF TI%R6S        -
HMSSEC =  13274 TI%R6S        -
HNDLFL =  0CBC9 TI%R6S        -
HPSCRH =  2F97F TI%R6S        -
HTOD   =  F0DBC NZ%GPR        - F1805 NZ%BAS(0086B) Type=1.1 Nibs=4 Dist=00A49
                              + F1BF0 NZ%BAS(00C56) Type=1.1 Nibs=4 Dist=00E34
                              + F1C09 NZ%BAS(00C6F) Type=1.1 Nibs=4 Dist=00E4D
HTODX  =  F0DE4 NZ%GPR        - F6412 NZ%CAT(00581) Type=1.1 Nibs=4 Dist=0562E
                              + F6516 NZ%CAT(00685) Type=1.1 Nibs=4 Dist=05732
                              + F6D5B NZ%LOW(00005) Type=1.1 Nibs=4 Dist=05F77
HTRAP  =  0CB2F TI%R6S        -
HUGE   =  0B75D TI%R6S        -
HXDASC =  05FF4 TI%R6S        -
HXDCW  =  0ECB4 TI%R6S        -

I/OAL+ =  1197B TI%R6S        -
I/OALL =  1197D TI%R6S        - F1A28 NZ%BAS(00A8E) Type=0.1 Nibs=5
                              + F2C2E SC%ENT(00CFA) Type=0.1 Nibs=5
                              + F2EE5 NZ%BIF(0000E) Type=0.1 Nibs=5
                              + F3EA5 NZ%BUT(002AE) Type=0.1 Nibs=5
I/OCOL =  11979 TI%R6S        -
I/OCON =  11920 TI%R6S        -
I/ODAL =  11A41 TI%R6S        - F1B31 NZ%BAS(00B97) Type=0.1 Nibs=5
I/OEX2 =  11A0F TI%R6S        -
I/OEXP =  11A11 TI%R6S        -
I/OFND =  118BA TI%R6S        - F4110 NZ%BUT(00519) Type=0.1 Nibs=5
I/OFSC =  F362E NZ%IOB        - F3E92 NZ%BUT(0029B) Type=1.1 Nibs=4 Dist=00864
I/ORES =  118FF TI%R6S        - F302D NZ%BIF(00156) Type=0.1 Nibs=5
I/odal =  F1B2F NZ%BAS        - F3E6F NZ%BUT(00278) Type=1.1 Nibs=4 Dist=02340
IDIV   =  0EC7B TI%R6S        - F173D NZ%BAS(007A3) Type=0.1 Nibs=5
IDIVA  =  0EC6E TI%R6S        -
IF12A  =  0C739 TI%R6S        -
ILCNTe =  02E70 TI%R6S        -
IMDO+2 =  1BA2D TI%R6S        -
IMDO-2 =  1BA21 TI%R6S        -
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IMerr  =  1B989 TI&R6S        - F2633 SC&ENT(006FF) Type=0.1 Nibs=5
IMinit =  1B88F TI&R6S        -
IMoffs =  1BA58 TI&R6S        -
IMxq27 =  1B89C TI&R6S        -
INADDR =  2F6D4 TI&R6S        -
INBS   =  2F6C6 TI&R6S        -
INF*0  =  0C607 TI&R6S        -
INFR15 =  0C73D TI&R6S        -
INITD2 =  F7C6C NZ&DEC        -
INITFL =  F6979 NZ&IOR        - F50B9 NZ&CAS(00E26) Type=1.0 Nibs=4 Dist=018C0
INITIL =  F43F6 NZ&CAS        -
INITPR =  F75B8 NZ&PAR        -
INITXQ =  F1456 NZ&BAS        - F0104 NZ&TBL(000FC) Type=1.2 Nibs=5 Dist=01352
INITd  =  F7C3A NZ&DEC        - F144C NZ&BAS(004B2) Type=1.2 Nibs=5 Dist=067EE
INITp  =  F7571 NZ&PAR        - F1451 NZ&BAS(004B7) Type=1.2 Nibs=5 Dist=06120
INPOFF =  1B849 TI&R6S        -
INTA   =  2F410 TI&R6S        -
INTB   =  2F420 TI&R6S        -
INTGR  =  0F99B TI&R6S        -
INTM   =  2F430 TI&R6S        -
INTR4  =  2F400 TI&R6S        -
INTR50 =  000DB TI&R6S        -
INTRPT =  0000F TI&R6S        -
INVNaN =  0C65F TI&R6S        -
INXNIB =  2F6F9 TI&R6S        -
IOBFEN =  2F576 TI&R6S        -
IOBFST =  2F571 TI&R6S        -
IOFNDO =  118C1 TI&R6S        -
IOFSCR =  1188E TI&R6S        - F3632 NZ&IOB(00004) Type=0.1 Nibs=5
IOp    =  F765B NZ&PAR        - F17CE NZ&BAS(00834) Type=1.2 Nibs=5 Dist=05E8D
IS-DSP =  2F78D TI&R6S        - F1144 NZ&BAS(001AA) Type=0.0 Nibs=5
                              + F11A8 NZ&BAS(0020E) Type=0.0 Nibs=5
                              + F2FBC NZ&BIF(000E5) Type=0.0 Nibs=5 Offset=       3
                              + F30B6 NZ&BIF(001DF) Type=0.0 Nibs=4
                              + F3283 NZ&BIF(003AC) Type=0.0 Nibs=5
                              + F3639 NZ&DSP(00002) Type=0.0 Nibs=5
                              + F36E5 NZ&DSP(000AE) Type=0.0 Nibs=2
                              + F36FC NZ&DSP(000C5) Type=0.0 Nibs=4
                              + F3EF3 NZ&BUT(002FC) Type=0.0 Nibs=5 Offset=       3
IS-INP =  2F79B TI&R6S        -
IS-PLT =  2F7A2 TI&R6S        -
IS-PRT =  2F794 TI&R6S        - F0FA9 NZ&BAS(0000F) Type=0.0 Nibs=5
                              + F10CD NZ&BAS(00133) Type=0.0 Nibs=4
                              + F1166 NZ&BAS(001CC) Type=0.0 Nibs=5
IS-TBL =  2F78D TI&R6S        -
ISRAM? =  10192 TI&R6S        -
IVAERR =  0E920 TI&R6S        -
IVARG  =  0D749 TI&R6S        -
IVEXPe =  02E35 TI&R6S        -
IVLNIB =  2F6FD TI&R6S        -
IVP    =  00004 TI&R6S        -
IVPARe =  02E3F TI&R6S        -
IVVARe =  02E66 TI&R6S        -
InpByt =  00006 NZ&SYM        - F4495 NZ&CAS(00202) Type=0.0 Nibs=1
InhEOL =  00004 TI&R6S        -
Insert =  00007 TI&R6S        - F393B NZ&DSP(00304) Type=0.0 Nibs=1
                              + F3959 NZ&DSP(00322) Type=0.0 Nibs=1
                              + F39CF NZ&DSP(00398) Type=0.0 Nibs=1
                              + F3BBC NZ&DSP(00585) Type=0.0 Nibs=1
                              + F3BD5 NZ&DSP(0059E) Type=0.0 Nibs=1
```

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InvalE =  00000 NZXPAR        -

KCOL0  =  2F46F TIXR6S        -
KCOL1  =  2F46E TIXR6S        -
KCOL2  =  2F46D TIXR6S        -
KCOL3  =  2F46C TIXR6S        -
KCOL4  =  2F46B TIXR6S        -
KCOL5  =  2F46A TIXR6S        -
KCOL6  =  2F469 TIXR6S        -
KCOL7  =  2F468 TIXR6S        -
KCOL8  =  2F467 TIXR6S        -
KCOL9  =  2F466 TIXR6S        -
KCOLA  =  2F465 TIXR6S        -
KCOLB  =  2F464 TIXR6S        -
KCOLC  =  2F463 TIXR6S        -
KCOLD  =  2F462 TIXR6S        -
KEY$   =  1ACA8 TIXR6S        -
KEYBUF =  2F444 TIXR6S        -
KEYCOD =  1FD22 TIXR6S        -
KEYDEL =  08D2C TIXR6S        -
KEYFND =  08FB8 TIXR6S        -
KEYMRG =  08B8F TIXR6S        -
KEYNAM =  1AC04 TIXR6S        -
KEYPTR =  2F443 TIXR6S        - F31AB NZXBIF(002D4) Type=0.0 Nibs=5
KEYRD  =  14E11 TIXR6S        -
KEYSAV =  2F462 TIXR6S        -
KEYSCN =  00D4D TIXR6S        -
KYDN?  =  00774 TIXR6S        -

LABELP =  03E9F TIXR6S        -
LABLOC =  05702 TIXR6S        -
LASTFN =  000B4 TIXR6S        -
LBLINM =  2F871 TIXR6S        -
LBLINP =  02A04 TIXR6S        -
LBLNAM =  077E7 TIXR6S        -
LBLNIF =  02A0D TIXR6S        -
LCDINI =  00665 TIXR6S        -
LDCEXT =  04F5E TIXR6S        -
LDCM10 =  04F6F TIXR6S        -
LDCOMP =  04F69 TIXR6S        -
LDCSET =  05060 TIXR6S        -
LDCSPC =  2F6C1 TIXR6S        -
LDSST1 =  04F72 TIXR6S        -
LDSST2 =  04F9E TIXR6S        -
LEAVE  =  04C01 TIXR6S
LEEWAY =  000D4 TIXR6S        -
LEXBF+ =  100DF TIXR6S        - F5C06 NZXHND(00AFB) Type=0.1 Nibs=5
LEXPIL =  000FF Define        - F1522 NZXBAS(00588) Type=0.0 Nibs=2
                              + F3522 NZXBIF(0064B) Type=0.0 Nibs=2
                              + F76F4 NZXPAR(000F7) Type=0.0 Nibs=2
                              + F764E NZXPAR(00151) Type=0.0 Nibs=2
                              + F7661 NZXPAR(00164) Type=0.0 Nibs=2
                              + F767E NZXPAR(00181) Type=0.0 Nibs=2
                              + F7B4D NZXPAR(00650) Type=0.0 Nibs=2
                              + F7B79 NZXPAR(0067C) Type=0.0 Nibs=2
                              + F7C99 NZXDEC(000C6) Type=0.0 Nibs=2
LEXPTR =  2F6CF TIXR6S        - F7B1D NZXPAR(00620) Type=0.0 Nibs=5
LGT15  =  0D1AE TIXR6S        -
LIMITS =  0AC3E TIXR6S        -
LINWAU =  05122 TIXR6S        -
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```
LINMD+ =  05112 TIXR6S         -
LINMDC =  05115 TIXR6S         -
LINEP  =  02620 TIXR6S         -
LINEP^ =  02634 TIXR6S         -
LINEP+ =  02626 TIXR6S         -
LINP   =  02A07 TIXR6S         -
LISTDC =  05839 TIXR6S         -
LISTEN =  F0CF1 NZXGPR         -
LISTIO =  F17D3 NZXBAS         - F0131 NZXTBL(00129) Type=1.2 Nibs=5 Dist=016A2
LN1+15 =  0C044 TIXR6S         -
LN1+XF =  0C061 TIXR6S         -
LN12   =  0C07D TIXR6S         -
LN15   =  0C081 TIXR6S         -
LN30   =  0C09C TIXR6S         -
LNEP66 =  027EA TIXR6S         -
LNPEXT =  02617 TIXR6S         -
LNSKP- =  089FF TIXR6S         -
LOCADR =  0A611 TIXR6S         -
LOCAL  =  F1617 NZXBAS         - F0194 NZXTBL(0018C) Type=1.2 Nibs=5 Dist=01383
LOCALd =  F7C8E NZXDEC         - F150D NZXBAS(00573) Type=1.2 Nibs=5 Dist=06781
LOCALp =  F75E9 NZXPAR         - F1512 NZXBAS(00578) Type=1.2 Nibs=5 Dist=060D7
LOCFIL =  1721D TIXR6S         -
LOCKWD =  2F7B2 TIXR6S         -
LOOPWd =  F7D3F NZXDEC         -
LOOPWp =  F773C NZXPAR         -
LOOPST =  2F7AC TIXR6S         - F0BF7 NZXGPR(00435) Type=0.0 Nibs=5
                               + F0C65 NZXGPR(00493) Type=0.0 Nibs=5
                               + F1948 NZXBAS(009AE) Type=0.0 Nibs=5
                               + F1987 NZXBAS(009ED) Type=0.0 Nibs=5
                               + F1A56 NZXBAS(00ABC) Type=0.0 Nibs=6
                               + F2F44 NZXBIF(0006D) Type=0.0 Nibs=2
                               + F3038 NZXBIF(00161) Type=0.0 Nibs=4
                               + F30E9 NZXBIF(00212) Type=0.0 Nibs=5
                               + F3C42 NZXBUT(0004B) Type=0.0 Nibs=5
LSIFEP =  006CD TIXR6S         -
LSTCHR =  F3F92 NZXBUT         -
LSTENT =  F4AC9 NZXCAS         - F66CE NZXCAT(0083D) Type=1.0 Nibs=4 Dist=01C05
LSTLEN =  06C27 TIXR6S         -
LXFND  =  0979D TIXR6S         -
LXTXTT =  1EE9F TIXR6S         -
Loop   =  0009F NZXSYM         - F08A4 NZXGPR(000E2) Type=0.0 Nibs=2
                               + F09AE NZXGPR(001EC) Type=0.0 Nibs=2
                               + F724F NZXFXQ(00436) Type=0.0 Nibs=2
LoopOK =  00008 NZXSYM         - F1097 NZXBAS(000FD) Type=0.0 Nibs=1
                               + F196A NZXBAS(009D0) Type=0.0 Nibs=1
                               + F19A0 NZXBAS(00A06) Type=0.0 Nibs=1
                               + F310A NZXBIF(00233) Type=0.0 Nibs=1
                               + F366A NZXDSP(00033) Type=0.0 Nibs=1
                               + F397B NZXDSP(00344) Type=0.0 Nibs=1
                               + F3B45 NZXDSP(0050F) Type=0.0 Nibs=1
                               + F4A60 NZXCHS(007CD) Type=0.0 Nibs=1
                               + F6A05 NZXIOR(00333) Type=0.0 Nibs=1

MAIN05 =  00138 TIXR6S
MAIN30 =  0017E TIXR6S
MAINEN =  2F571 TIXR6S
MAINLP =  002FD TIXR6S
MAINST =  2F558 TIXR6S
MAKE1  =  0008F TIXR6S
MAKEAF =  01751 TIXR6S
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MAXCMD =  2F976 TIXR6S        -
MBOX^  =  2F7A9 TIXR6S        - F3136 NZXBIF(0025F) Type=0.0 Nibs=5
                              + F31BF NZXBIF(002F8) Type=0.0 Nibs=5
                              + F3BF9 NZXBUT(00002) Type=0.0 Nibs=5
                              + F3CD7 NZXBUT(000E0) Type=0.0 Nibs=5
MEMBER =  1B098 TIXR6S        - F25BF SCXENT(0068B) Type=0.1 Nibs=5
MEMCKL =  012A5 TIXR6S        -
MEMER* =  0945B TIXR6S        -
MEMERR =  0944D TIXR6S        - F28E4 SCXENT(009B0) Type=0.1 Nibs=5
MEMERX =  0944F TIXR6S        -
MESSG  =  0CC17 TIXR6S        -
MFER42 =  0962C TIXR6S        -
MFERR  =  09393 TIXR6S        -
MFERR* =  093F1 TIXR6S        -
MFERRS =  0939E TIXR6S        -
MFERsp =  0940D TIXR6S        -
MFLG=0 =  13DA1 TIXR6S        - F22D8 SCXENT(003A4) Type=0.1 Nibs=5
MFWRN  =  093BC TIXR6S        -
MFWRNQ =  093C5 TIXR6S        -
MFWRU8 =  093C3 TIXR6S        -
MGOSUB =  1AF01 TIXR6S        -
MIFFLG =  2F870 TIXR6S        - F1CB3 NZXBAS(00D19) Type=0.0 Nibs=5
                              + F1FB2 SCXENT(0007E) Type=0.0 Nibs=5
                              + F229A SCXENT(00366) Type=0.0 Nibs=5
MOVE*M =  01308 TIXR6S        -
MOVED0 =  1B0F4 TIXR6S        -
MOVED1 =  1B101 TIXR6S        -
MOVED2 =  1B104 TIXR6S        -
MOVED3 =  1B109 TIXR6S        -
MOVEDA =  1B0FA TIXR6S        -
MOVEDD =  1B106 TIXR6S        -
MOVEDM =  1B0FE TIXR6S        -
MOVEFL =  F4606 NZXCAS        - F13C5 NZXBAS(0042B) Type=1.1 Nibs=4 Dist=03241
                              + F55F3 NZXHND(004D8) Type=1.1 Nibs=4 Dist=00FED
MOVEU0 =  1B162 TIXR6S        -
MOVEU1 =  1B16F TIXR6S        -
MOVEU2 =  1B172 TIXR6S        -
MOVEU3 =  1B177 TIXR6S        -
MOVEU4 =  1B174 TIXR6S        -
MOVEUA =  1B168 TIXR6S        -
MOVEUM =  1B15C TIXR6S        -
MP1-12 =  0C436 TIXR6S        -
MP15S  =  0C440 TIXR6S        -
MP2-12 =  0C432 TIXR6S        -
MP2-15 =  0C43A TIXR6S        -
MPOP1N =  0BD8D TIXR6S        -
MPOP2N =  0BD54 TIXR6S        -
MPY    =  0ECBB TIXR6S        -
MSN12  =  0D553 TIXR6S        -
MSN15  =  0D557 TIXR6S        -
MSPARe =  02E5C TIXR6S        -
MTADDR =  08195 TIXR6S        -
MTADR+ =  081A1 TIXR6S        -
MTHSTK =  2F599 TIXR6S        -
MTYL   =  F0D18 NZXGPR        - F165D NZXDAS(006C3) Type=1.0 Nibs=4 Dist=00945
                              + F36CB NZXDSP(00094) Type=1.1 Nibs=4 Dist=029B3
                              + F4A7F NZXCAS(007EC) Type=1.0 Nibs=4 Dist=03D67
                              + F5C87 NZXHND(00B6C) Type=1.0 Nibs=4 Dist=04F6F
MTYLC  =  F0D26 NZXGPR        -
MTYLL  =  F0D1F NZXGPR        -
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MULTF  =  0C446 TIXR6S        -
MVMEM+ =  0133C TIXR6S        -
MaxRec =  00007 NZXSYM        - F435C NZXCAS(000C9) Type=0.0 Nibs=1

NAMEp  =  F7A2D NZXPAR        -
NAMEpb =  F7A29 NZXPAR        -
NEEDSC =  2F94A TIXR6S        - F5FEB NZXCAT(0015A) Type=0.0 Nibs=5
NEWFI+ =  F4ADE NZXCAS        - F55BD NZXHND(004A2) Type=1.1 Nibs=4 Dist=00ADF
                              + F5778 NZXHND(0065D) Type=1.1 Nibs=4 Dist=00C9A
NEWFIL =  F4AFA NZXCAS        - F62BA NZXHND(0019F) Type=1.1 Nibs=3 Dist=007C0
NORAMe =  F3EE9 NZXBUT        - F6254 NZXCAT(003C3) Type=1.0 Nibs=4 Dist=0236B
NORDIM =  0AE2D TIXR6S        -
NOSCRL =  14C8A TIXR6S        -
NRMCON =  161AF TIXR6S        - F2145 SCXENT(00211) Type=0.1 Nibs=5
NTOKEN =  0493B TIXR6S        - F7B42 NZXPAR(00645) Type=0.1 Nibs=5
NTOKNL =  048E6 TIXR6S        -
NULLP  =  07999 TIXR6S        -
NUMC++ =  03690 TIXR6S        -
NUMC+D =  03696 TIXR6S        -
NUMCK  =  F7AE4 NZXPAR        -
NUMCK+ =  F7AF0 NZXPAR        -
NUMSCN =  04D18 TIXR6S        - F212F SCXENT(001FB) Type=0.1 Nibs=5
NXTADR =  147E8 TIXR6S        -
NXTCHR =  F3F62 NZXBUT        - F1669 NZXBAS(006CF) Type=1.0 Nibs=4 Dist=028F9
                              + F749B NZXFXQ(00682) Type=1.0 Nibs=4 Dist=03639
NXTDST =  F2231 SCXENT        -
NXTELM =  148AC TIXR6S        -
NXTEN+ =  F4AB1 NZXCAS        -
NXTENT =  F4AB3 NZXCAS        - F124C NZXBAS(002B2) Type=1.1 Nibs=4 Dist=03867
                              + F12D0 NZXBAS(002E6) Type=1.1 Nibs=4 Dist=03833
                              + F1428 NZXBAS(0048E) Type=1.1 Nibs=4 Dist=0368B
                              + F66C8 NZXCAT(00837) Type=1.0 Nibs=4 Dist=01C15
NXTEXP =  1C2F7 TIXR6S        - F26A3 SCXENT(0076F) Type=0.1 Nibs=5
NXTIRQ =  2F70D TIXR6S        -
NXTLIN =  10031 TIXR6S        -
NXTP   =  03455 TIXR6S        -
NXTSTM =  08A48 TIXR6S        - F1782 NZXBAS(007E8) Type=0.1 Nibs=5
NXTVA- =  13E58 TIXR6S        - F224A SCXENT(00316) Type=0.1 Nibs=5
NoCont =  0000E TIXR6S        -
Null   =  0007F NZXSYM        - F089B NZXGPR(000D9) Type=0.0 Nibs=2
                              + F099B NZXGPR(001D6) Type=0.0 Nibs=2
                              + F723A NZXFXQ(00421) Type=0.0 Nibs=2
NumExp =  00003 NZXPAR        -
NwOFFS =  1C02D TIXR6S        -

ORGNXT =  03060 TIXR6S        -
OBCOLL =  01435 TIXR6S        -
OBEDIT =  17687 TIXR6S        -
OFFFLG =  2F442 TIXR6S        -
OFFIO  =  F192B NZXBAS        - F011F NZXTBL(00117) Type=1.2 Nibs=5 Dist=018OC
OFFIOd =  F7C09 NZXDEC        - F17C9 NZXBAS(0082F) Type=1.2 Nibs=5 Dist=06610
                              + F1921 NZXBAS(00987) Type=1.2 Nibs=5 Dist=0638B
OFFIOp =  F7648 NZXPAR        - F1926 NZXBAS(0098C) Type=1.2 Nibs=5 Dist=05D22
OKP    =  00000 TIXR6S        -
ONDC20 =  05501 TIXR6S        - F7EC1 NZXDEC(002EE) Type=0.1 Nibs=5
ONINTR =  2F68D TIXR6S        - F1939 NZXBAS(0099F) Type=0.0 Nibs=5
                              + F29C6 SCXENT(00A92) Type=0.0 Nibs=5
                              + F2B2A SCXENT(00BF6) Type=0.0 Nibs=5
                              + F2B7C SCXENT(00C48) Type=0.0 Nibs=5
ONINTd =  F7EBB NZXDEC        - F29B5 SCXENT(00A81) Type=1.2 Nibs=5 Dist=05506
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ONINTp =  F7678 NZ%PAR          - F29BA SC%ENT(00A86) Type=1.2 Nibs=5 Dist=04CBE
ONINTx =  F29BF SC%ENT          - F014C NZ%TBL(00144) Type=1.2 Nibs=5 Dist=02873
ONP40  =  02B7B TI%R6S          - F7697 NZ%PAR(0019A) Type=0.1 Nibs=5
ONTIMR =  08008 TI%R6S          - F2B88 SC%ENT(00C57) Type=0.1 Nibs=5
OPENF  =  11B06 TI%R6S          -
ORGSB  =  0D65B TI%R6S          -
ORSB   =  0D63C TI%R6S          -
ORXM   =  0D633 TI%R6S          -
OUT1T+ =  02CDF TI%R6S          -
OUT1TK =  02CEB TI%R6S          - F7AC0 NZ%PAR(005C3) Type=0.1 Nibs=5
OUT2TC =  02CFD TI%R6S          - F7AC7 NZ%PAR(005CA) Type=0.1 Nibs=5
OUT2TK =  02CFF TI%R6S          -
OUT3TC =  F7ACC NZ%PAR          - F7BDC NZ%DEC(00009) Type=1.1 Nibs=3 Dist=00110
OUT3TK =  02D15 TI%R6S          - F7AD1 NZ%PAR(005D4) Type=0.1 Nibs=5
OUTBS  =  2F58F TI%R6S          -
OUTBY+ =  02CE5 TI%R6S          -
OUTBYT =  F7ABB NZ%PAR          - F7DCA NZ%DEC(001F7) Type=1.0 Nibs=3 Dist=0030F
OUTC15 =  05421 TI%R6S          -
OUTEL1 =  05300 TI%R6S          -
OUTELA =  05303 TI%R6S          - F7C60 NZ%DEC(0008D) Type=0.1 Nibs=5
OUTLI1 =  03709 TI%R6S          -
OUTLIT =  036F3 TI%R6S          -
OUTNBC =  F7AD6 NZ%PAR          - F7C4A NZ%DEC(00077) Type=1.1 Nibs=3 Dist=00174
                                + F7D1B NZ%DEC(00148) Type=1.1 Nibs=3 Dist=00245
                                + F7E8D NZ%DEC(002BA) Type=1.1 Nibs=3 Dist=003B7
                                + F7ED5 NZ%DEC(00302) Type=1.0 Nibs=3 Dist=003FF
OUTNBS =  05426 TI%R6S          - F7ADB NZ%PAR(005DE) Type=0.1 Nibs=5
OUTNIB =  02D28 TI%R6S          -
OUTPTt =  00002 NZ%SYM          - F10DB NZ%BAS(00141) Type=0.0 Nibs=1
                                + F1126 NZ%BAS(0018C) Type=0.0 Nibs=1
                                + F5443 NZ%HND(00328) Type=0.0 Nibs=1
OUTPUT =  F10EC NZ%BAS          - F013A NZ%TBL(00132) Type=1.2 Nibs=5 Dist=00FB2
OUTPd  =  F7C06 NZ%DEC          - F10E2 NZ%BAS(00148) Type=1.2 Nibs=5 Dist=06B24
                                + F1F4E SC%ENT(0001A) Type=1.2 Nibs=5 Dist=05CB8
OUTPp  =  F750E NZ%PAR          - F10E7 NZ%BAS(0014D) Type=1.2 Nibs=5 Dist=06427
OUTRES =  0BC84 TI%R6S          -
OUTVAR =  0373E TI%R6S          -
OVFL   =  0CA73 TI%R6S          -
OVFNIB =  2F6FB TI%R6S          -
OVP    =  00002 TI%R6S          -
Offed  =  0000B NZ%SYM          - F1955 NZ%BAS(009BB) Type=0.0 Nibs=1
                                + F30F6 NZ%BIF(0021F) Type=0.0 Nibs=1
                                + F3C51 NZ%BUT(0005A) Type=0.0 Nibs=1
OptDev =  00008 NZ%PAR          - F79BC NZ%PAR(004BF) Type=0.0 Nibs=1
                                + F79C9 NZ%PAR(004CC) Type=0.0 Nibs=1
                                + F7B8E NZ%PAR(00691) Type=0.0 Nibs=1

P1-10  =  041C1 TI%R6S          -
PACK   =  F1346 NZ%BAS          - F0179 NZ%TBL(00171) Type=1.2 Nibs=5 Dist=011CD
PACKD  =  F11D5 NZ%BAS          - F0182 NZ%TBL(0017A) Type=1.2 Nibs=5 Dist=01053
PACKd  =  F7BDF NZ%DEC          - F11CB NZ%BAS(00231) Type=1.2 Nibs=5 Dist=06A14
                                + F133C NZ%BAS(003A2) Type=1.2 Nibs=5 Dist=068A3
PACKp  =  F79B0 NZ%PAR          - F11D0 NZ%BAS(00236) Type=1.2 Nibs=5 Dist=067E0
                                + F1341 NZ%BAS(003A7) Type=1.2 Nibs=5 Dist=0666F
PARERR =  02F08 TI%R6S          - F34E0 NZ%BIF(00609) Type=0.1 Nibs=5
PART3  =  18097 TI%R6S          -
PASS   =  F29FE SC%ENT          - F01AF NZ%TBL(001A7) Type=1.2 Nibs=5 Dist=0284F
PASSd  =  F7E78 NZ%DEC          - F29F4 SC%ENT(00AC0) Type=1.2 Nibs=5 Dist=05484
PASSp  =  F7B73 NZ%PAR          - F29F9 SC%ENT(00AC5) Type=1.2 Nibs=5 Dist=0517A
PCADDR =  2F679 TI%R6S          - F2A7C SC%ENT(00B48) Type=0.0 Nibs=5
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```
PDEV    =  09E9E TI%R6S         -
PDIR    =  F11ED NZ%BAS         -
PEDIT   =  0FF5F TI%R6S         -
PEDITD  =  0FF62 TI%R6S         -
PFINDL  =  078DF TI%R6S         -
PFNDZL  =  078E2 TI%R6S         -
PI/2    =  0DB77 TI%R6S         -
PI/2D   =  0DB7A TI%R6S         -
PI/4    =  0DAA1 TI%R6S         -
PILCNF  =  F2F91 NZ%BIF         - F07A9 NZ%DIR(000F4) Type=1.2 Nibs=5 Dist=027E8
                                + F1152 NZ%BAS(001B8) Type=1.1 Nibs=4 Dist=01E3F
                                + F19B7 NZ%BAS(00A1D) Type=1.1 Nibs=4 Dist=015DA
PILCST  =  F2ED7 NZ%BIF         - F0795 NZ%DIR(000E0) Type=1.2 Nibs=5 Dist=02742
PILDC   =  F7DA8 NZ%DEC         - F06D6 NZ%DIR(00021) Type=1.2 Nibs=5 Dist=076D2
PILMLP  =  F30E7 NZ%BIF         - F07AE NZ%DIR(000F9) Type=1.2 Nibs=5 Dist=02939
PILMSG  =  F040A Define         - F008C NZ%TBL(00084) Type=1.2 Nibs=4 Dist=0037E
PILPOF  =  F3032 NZ%BIF         - F07A4 NZ%DIR(000EF) Type=1.2 Nibs=5 Dist=0288E
PILPOL  =  F06B5 NZ%DIR         - F0090 NZ%TBL(00088) Type=1.2 Nibs=5 Dist=00625
PILSRQ  =  F3119 NZ%BIF         - F07B3 NZ%DIR(000FE) Type=1.2 Nibs=5 Dist=02966
PILVER  =  03142 Define         - F5149 NZ%HND(0002E) Type=0.0 Nibs=4
PILWKP  =  F3019 NZ%BIF         - F079F NZ%DIR(000EA) Type=1.2 Nibs=5 Dist=0287A
PILWNK  =  F2F68 NZ%BIF         - F079A NZ%DIR(000E5) Type=1.2 Nibs=5 Dist=027CE
PLOTt   =  00003 NZ%SYM         - F5448 NZ%HND(0032D) Type=0.0 Nibs=1
PNDALM  =  2F761 TI%R6S         -
POLL    =  12337 TI%R6S         -
POLLD+  =  1232D TI%R6S         -
POP1N   =  F6D81 NZ%LOW         - F1789 NZ%BAS(007EF) Type=1.0 Nibs=4 Dist=055F8
                                + F60F4 NZ%CAT(00263) Type=1.1 Nibs=4 Dist=00C8D
POP1N+  =  0BD91 TI%R6S         -
POP1R   =  0E8FD TI%R6S         -
POP1S   =  0BD38 TI%R6S         - F3539 NZ%BIF(00662) Type=0.1 Nibs=5
                                + F60C5 NZ%CAT(00234) Type=0.1 Nibs=5
POP2N   =  0BC8C TI%R6S         - F1EF9 NZ%BAS(00F5F) Type=0.1 Nibs=5
POP2N+  =  0BD58 TI%R6S         -
POPBUF  =  010EE TI%R6S         - F5F8C NZ%CAT(000FB) Type=0.1 Nibs=5
                                + F601E NZ%CAT(0018D) Type=0.1 Nibs=5
POPMTH  =  1B30B TI%R6S         - F21AB SC%ENT(00277) Type=0.1 Nibs=5
                                + F2284 SC%ENT(00350) Type=0.1 Nibs=5
POPSTK  =  08F55 TI%R6S         -
POPSTR  =  1B405 TI%R6S         -
POPUPD  =  08F3E TI%R6S         - F74A7 NZ%FXQ(0068E) Type=0.1 Nibs=5
PPOS    =  2F956 TI%R6S         -
PRASCI  =  F107F NZ%BAS         -
PREND   =  F10B7 NZ%BAS         - F107A NZ%BAS(000E0) Type=1.2 Nibs=5 Dist=0003D
PREP    =  0ADAF TI%R6S         -
PRESCN  =  04A49 TI%R6S         -
PREXT   =  F0FD7 NZ%BAS         - F0FD2 NZ%BAS(00038) Type=1.2 Nibs=5 Dist=00005
PRGFMF  =  0A146 TI%R6S         - F5B06 NZ%HND(009EB) Type=0.1 Nibs=5
PRGMEN  =  2F567 TI%R6S         -
PRGMST  =  2F562 TI%R6S         -
PRINT^  =  17F37 TI%R6S         - F112F NZ%BAS(00195) Type=0.1 Nibs=5
PRINTt  =  00001 TI%R6S         - F10C8 NZ%BAS(0012E) Type=0.0 Nibs=1
PRMCNT  =  2F94B TI%R6S         -
PRMPTR  =  2F5B7 TI%R6S         -
PRMSGA  =  F0D4E NZ%GPR         - F4437 NZ%CAS(001A4) Type=1.1 Nibs=4 Dist=036E9
PRNEXe  =  02E95 TI%R6S         -
PRNTOO  =  F116B NZ%BAS         -
PRNTDC  =  05450 TI%R6S         -
PRNTIS  =  F1164 NZ%BAS         - F0167 NZ%TBL(0015F) Type=1.2 Nibs=5 Dist=00FFD
PRNTSd     F7BD3 NZ%DEC         - F1138 NZ%BAS(0019E) Type=1.2 Nibs=5 Dist=06A9B
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                                 + F115A NZZBAS(001C0) Type=1.2 Nibs=5 Dist=06A79
PRNTSp =  F74FD NZZPAR           - F113D NZZBAS(001A3) Type=1.2 Nibs=5 Dist=063C0
                                 + F115F NZZBAS(001C5) Type=1.2 Nibs=5 Dist=0639E
PROCDW =  F7215 NZZFXQ           -
PROCLT =  F7263 NZZFXQ           -
PROCST =  F6F50 NZZFXQ           -
PRPSND =  06B17 TI%R6S           -
PRSCOO =  07B93 TI%R6S           -
PRSsc+ =  1BA84 TI%R6S           -
PRSscn =  1BA88 TI%R6S           -
PRT#DC =  06841 TI%R6S           -
PRTIS  =  F0FA1 NZZBAS           - F0717 NZZDIR(00062) Type=1.2 Nibs=5 Dist=0088A
PRTIS+ =  F0FAE NZZBAS           - F5470 NZZHND(00355) Type=1.1 Nibs=4 Dist=044C2
PRTISc =  F0F9A NZZBAS           -
PSHGSB =  08F13 TI%R6S           -
PSHMCR =  08F08 TI%R6S           - F74E6 NZZFXQ(006CD) Type=0.1 Nibs=5
PSHSTK =  08C7F TI%R6S           -
PSHSTL =  08C85 TI%R6S           -
PSHUPD =  08F0D TI%R6S           -
PT2BYT =  F5108 NZZCAS           - F13A0 NZZBAS(00406) Type=1.1 Nibs=4 Dist=03D6B
                                 + F5E78 NZZHND(00D5D) Type=1.1 Nibs=4 Dist=00D6D
PUGFIB =  12198 TI%R6S           - F4E3C NZZCAS(008A9) Type=0.1 Nibs=5
PURFIB =  F5D39 NZZHND           - F4C08 NZZCAS(00975) Type=1.1 Nibs=4 Dist=01131
PURGDC =  05745 TI%R6S           -
PURGEF =  17359 TI%R6S           -
PUTALR =  F0ED2 NZZGPR           - F4544 NZZCAS(002B1) Type=1.1 Nibs=4 Dist=03672
PUTARL =  F0EBA NZZGPR           -
PUTC   =  F6BB1 NZZIOR           - F0CFC NZZGPR(0053A) Type=1.0 Nibs=4 Dist=05EB5
                                 + F1651 NZZBAS(006B7) Type=1.0 Nibs=4 Dist=05560
                                 + F24E2 SCZENT(005AE) Type=1.0 Nibs=4 Dist=046CF
                                 + F2D30 NZZUTL(0009A) Type=1.1 Nibs=4 Dist=03E81
                                 + F2DA7 NZZUTL(00111) Type=1.1 Nibs=4 Dist=03E0A
                                 + F31FF NZZBIF(00328) Type=1.1 Nibs=4 Dist=039B2
                                 + F4A5A NZZCAS(007C7) Type=1.0 Nibs=4 Dist=02157
PUTC+  =  F6BAD NZZIOR           - F0A3B NZZGPR(00279) Type=1.1 Nibs=4 Dist=06172
                                 + F307F NZZBIF(001A8) Type=1.1 Nibs=4 Dist=03B2E
                                 + F4E63 NZZCAS(00BD0) Type=1.0 Nibs=4 Dist=01D4A
PUTC+N =  F6B7D NZZIOR           -
PUTCN  =  F6B81 NZZIOR           - F316F NZZBIF(00298) Type=1.1 Nibs=4 Dist=03A12
PUTD   =  F6B43 NZZIOR           - F0D0E NZZGPR(0054C) Type=1.0 Nibs=4 Dist=05E35
                                 + F2DD8 NZZUTL(00142) Type=1.1 Nibs=4 Dist=03D6B
                                 + F3B89 NZZDSP(00552) Type=1.0 Nibs=4 Dist=02FBA
                                 + F4A73 NZZCAS(007E0) Type=1.0 Nibs=4 Dist=020D0
PUTDIR =  F5044 NZZCAS           -
PUTDR" =  F5046 NZZCAS           - F1329 NZZBAS(0038F) Type=1.0 Nibs=4 Dist=03D1D
PUTDR# =  F5009 NZZCAS           - F13AF NZZBAS(00415) Type=1.1 Nibs=4 Dist=03C5A
                                 + F5D0C NZZHND(00BF1) Type=1.0 Nibs=4 Dist=00D03
PUTDX  =  F0EEA NZZGPR           - F4A79 NZZCAS(007E6) Type=1.0 Nibs=4 Dist=03B8F
PUTE   =  F6B55 NZZIOR           - F08D9 NZZGPR(00117) Type=1.1 Nibs=4 Dist=0627C
                                 + F0CA7 NZZGPR(004E5) Type=1.1 Nibs=4 Dist=05EAE
                                 + F1779 NZZBAS(007DF) Type=1.1 Nibs=4 Dist=053DC
                                 + F24F9 SCZENT(005C5) Type=1.0 Nibs=4 Dist=0465C
                                 + F327D NZZBIF(003A6) Type=1.0 Nibs=4 Dist=038D8
                                 + F42A6 NZZCAS(00013) Type=1.1 Nibs=4 Dist=028AF
                                 + F436B NZZCAS(000D8) Type=1.1 Nibs=4 Dist=027EA
                                 + F44AA NZZCAS(00217) Type=1.1 Nibs=4 Dist=026AB
                                 + F5AA2 NZZHND(00987) Type=1.1 Nibs=4 Dist=010B3
                                 + F5B92 NZZHND(00A77) Type=1.1 Nibs=4 Dist=00FC3
PUTEN  =  F6B86 NZZIOR           -
PUTEX  =  F6B5D NZZIOR           -
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PUTGF  =  F0C86 NZZGPR        -
PUTGF+ =  F0C82 NZZGPR        -
PUTGF- =  F0C7E NZZGPR        - F1D56 NZZBAS(000BC) Type=1.1 Nibs=4 Dist=010D8
                              + F2A3F SCZENT(00B0B) Type=1.1 Nibs=4 Dist=01DC1
PUTRES =  18115 TIZR6S        -
PUTX   =  F6A97 NZZIOR        - F3809 NZZDSP(001D2) Type=1.1 Nibs=4 Dist=0328E
                              + F394F NZZDSP(00318) Type=1.1 Nibs=4 Dist=03148
PWIDTH =  2F958 TIZR6S        -
PWROFF =  00526 TIZR6S        -
PWrite =  00006 NZZSYM        - F5C74 NZZHND(00859) Type=0.0 Nibs=1
PgmRun =  0000D TIZR6S        -
Positn =  00003 NZZSYM        -
Printr =  00009 NZZSYM        - F3680 NZZDSP(00049) Type=0.0 Nibs=1
                              + F36A6 NZZDSP(0006F) Type=0.0 Nibs=1
                              + F36B7 NZZDSP(00080) Type=0.0 Nibs=1
                              + F3733 NZZDSP(000FC) Type=0.0 Nibs=1
                              + F378D NZZDSP(00156) Type=0.0 Nibs=1
Putd   =  F0D0C NZZGPR        - F131F NZZBAS(00385) Type=1.1 Nibs=3 Dist=00613
Pute   =  F327B NZZBIF        - F2CC3 NZZUTL(0002D) Type=1.1 Nibs=3 Dist=005B8

QUOEXe =  02E88 TIZR6S        -
QUOTCK =  0623D TIZR6S        -

R1REV  =  00785 TIZR6S        -
R2REV  =  0AA83 TIZR6S        -
R3=D10 =  03526 TIZR6S        -
R3REV  =  153AB TIZR6S        -
R4REV  =  1DBA8 TIZR6S        -
R<RST2 =  014D8 TIZR6S        - F61DC NZZCAT(0034B) Type=0.1 Nibs=5
R<RSTK =  014DD TIZR6S        -
RAMEND =  2F5B2 TIZR6S        -
RAMROM =  0A5F7 TIZR6S        -
RANGE  =  F0E93 NZZGPR        -
RANGEA =  F0E83 NZZGPR        - F2E45 NZZUTL(001AF) Type=1.1 Nibs=4 Dist=01FC2
                              + F7D73 NZZDEC(001A0) Type=1.1 Nibs=4 Dist=06EF0
RANGEN =  F0E8D NZZGPR        - F20F9 SCZENT(001C5) Type=1.1 Nibs=4 Dist=0126C
                              + F74CA NZZFXQ(006B1) Type=1.0 Nibs=4 Dist=0663D
RAWBFR =  2F580 TIZR6S        -
RCCD1  =  0D3F5 TIZR6S        -
RCCD2  =  0D41C TIZR6S        -
RCL*   =  0E983 TIZR6S        -
RCLW1  =  0E981 TIZR6S        -
RCLW2  =  0E9BE TIZR6S        -
RCLW3  =  0E9C4 TIZR6S        -
RCSCR  =  0E954 TIZR6S        -
RCVOFS =  1C050 TIZR6S        - F26CC SCZENT(00798) Type=0.1 Nibs=5
RDATTY =  17CC6 TIZR6S        - F2269 SCZENT(00335) Type=0.1 Nibs=5
RDBAS  =  173FF TIZR6S        -
RDBYTA =  13A2F TIZR6S        -
RDCHD+ =  076EE TIZR6S        -
RDCHDR =  076F0 TIZR6S        -
RDHDR1 =  076FD TIZR6S        -
RDINFO =  F4254 NZZBUT        - F5C5B NZZHND(00840) Type=1.0 Nibs=4 Dist=01A07
RDLNAS =  13A1F TIZR6S        -
RDTEXT =  17489 TIZR6S        -
READDC =  F1D99 NZZBAS        - F00F2 NZZTBL(000EA) Type=1.2 Nibs=5 Dist=01CA7
READI3 =  F6736 NZZIOR        - F44FB NZZCAS(00268) Type=1.1 Nibs=4 Dist=0223B
READIN =  F1D46 NZZBAS        - F00E9 NZZTBL(000E1) Type=1.2 Nibs=5 Dist=01C5D
READIT =  F66DE NZZIOR        -
READNB =  17518 TIZR6S        -
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READPS =  0323B TIXR6S          - F7542 NZXPAR(00045) Type=0.1 Nibs=5
READRB =  F4594 NZXCAS          - F52D8 NZXHND(001BD) Type=1.1 Nibs=4 Dist=00D44
                                + F5361 NZXHND(00246) Type=1.1 Nibs=4 Dist=00DCD
READRG =  F689A NZXIOR          - F0B7A NZXGPR(003B8) Type=1.1 Nibs=4 Dist=05D20
                                + F1BC0 NZXBAS(00C26) Type=1.1 Nibs=4 Dist=04CDA
READSU =  F66D2 NZXIOR          - F4A6D NZXCAS(007DA) Type=1.0 Nibs=4 Dist=01C65
                                + F5A8A NZXHND(0096F) Type=1.1 Nibs=4 Dist=00C48
RECADR =  0F4B7 TIXR6S          -
RECALL =  0F281 TIXR6S          -
REDCHR =  F22F7 SCXENT          -
REDUCE =  15977 TIXR6S          -
RELJMP =  05047 TIXR6S          -
REMOTE =  F1570 NZXBAS          - F0190 NZXTBL(00195) Type=1.2 Nibs=5 Dist=013D3
REMOTd =  F7CC7 NZXDEC          - F1566 NZXBAS(005CC) Type=1.2 Nibs=5 Dist=06761
REMOTp =  F761E NZXPAR          - F156B NZXBAS(005D1) Type=1.2 Nibs=5 Dist=060B3
RENSUB =  1A753 TIXR6S          -
REPROM =  18A1E TIXR6S          -
REQST  =  F2919 SCXENT          - F018B NZXTBL(00183) Type=1.2 Nibs=5 Dist=0278E
REQSTd =  F7D29 NZXDEC          - F290F SCXENT(009D8) Type=1.2 Nibs=5 Dist=0541A
REQSTp =  F7B5D NZXPAR          - F2914 SCXENT(009E0) Type=1.2 Nibs=5 Dist=05249
RESCAN =  04A4C TIXR6S          -
RESERV =  2F986 TIXR6S          -
RESET  =  F6DCA NZXLOW          - F015E NZXTBL(00156) Type=1.2 Nibs=5 Dist=06C6C
RESETd =  F7D0E NZXDEC          - F6DC0 NZXLOW(0006A) Type=1.2 Nibs=5 Dist=00F4E
RESETp =  F7628 NZXPAR          - F6DC5 NZXLOW(0006F) Type=1.2 Nibs=5 Dist=00863
RESPTR =  F7B1B NZXPAR          -
RESREG =  2F7C2 TIXR6S          -
RESST+ =  F349C NZXBIF          -
RESSTS =  F348E NZXBIF          - F2B00 SCXENT(00BCC) Type=1.1 Nibs=4 Dist=0098E
REST*  =  03035 TIXR6S          - F766E NZXPAR(00171) Type=0.1 Nibs=5
REST10 =  F1985 NZXBAS          - F2AD5 SCXENT(00BA1) Type=1.0 Nibs=4 Dist=01150
REST1A =  F337E NZXBIF          - F14D3 NZXBAS(00539) Type=1.1 Nibs=4 Dist=01EAB
REST2C =  F3392 NZXBIF          - F14C3 NZXBAS(00529) Type=1.1 Nibs=4 Dist=01ECF
                                + F16FB NZXBAS(00761) Type=1.1 Nibs=4 Dist=01C97
                                + F172A NZXBAS(00790) Type=1.1 Nibs=4 Dist=01C68
                                + F2D0C NZXUTL(00076) Type=1.1 Nibs=3 Dist=00686
                                + F2D7B NZXUTL(000E5) Type=1.1 Nibs=3 Dist=00617
                                + F72EB NZXFXQ(004D2) Type=1.1 Nibs=4 Dist=03F59
                                + F73A9 NZXFXQ(00590) Type=1.1 Nibs=4 Dist=04017
RESTD0 =  F32F9 NZXBIF          - F117F NZXBAS(001E5) Type=1.1 Nibs=4 Dist=0217A
                                + F2076 SCXENT(00142) Type=1.1 Nibs=4 Dist=01283
                                + F296A SCXENT(00A36) Type=1.0 Nibs=4 Dist=0098F
                                + F2D62 NZXUTL(000CC) Type=1.1 Nibs=3 Dist=00597
RESTD1 =  F330C NZXBIF          - F14B8 NZXBAS(0051E) Type=1.1 Nibs=4 Dist=01E54
                                + F28B2 SCXENT(0097E) Type=1.1 Nibs=4 Dist=00A5A
                                + F5F3C NZXCAT(000AB) Type=1.1 Nibs=4 Dist=02C30
                                + F5FA9 NZXCAT(00118) Type=1.1 Nibs=4 Dist=02C9D
                                + F72E2 NZXFXQ(004C9) Type=1.1 Nibs=4 Dist=03FD6
                                + F739D NZXFXQ(00584) Type=1.1 Nibs=4 Dist=04091
RESTIO =  F197F NZXBAS          - F0128 NZXTBL(00120) Type=1.2 Nibs=5 Dist=01857
RESTOR =  F3EF1 NZXBUT          - F2FB6 NZXBIF(000DF) Type=1.1 Nibs=4 Dist=00F3B
RESTRT =  F308D NZXBIF          - F0916 NZXGPR(00154) Type=1.1 Nibs=4 Dist=02777
                                + F0923 NZXGPR(00161) Type=1.1 Nibs=4 Dist=0276A
RESTST =  F32B7 NZXBIF          - F4117 NZXBUT(00520) Type=1.0 Nibs=4 Dist=00E60
                                + F74C4 NZXFXQ(006AB) Type=1.0 Nibs=4 Dist=04200
RESTd  =  F7CFE NZXDEC          - F1975 NZXBAS(009DB) Type=1.2 Nibs=5 Dist=06389
RESTp  =  F7BAE NZXPAR          - F197A NZXBAS(009E0) Type=1.2 Nibs=5 Dist=06234
REV$   =  1B38E TIXR6S          - F61B4 NZXCAT(00323) Type=0.1 Nibs=5
REVPOP =  0B031 TIXR6S          - F1CC6 NZXBAS(00D2C) Type=0.1 Nibs=5
                                + F3F43 NZXBUT(0034C) Type=0.1 Nibs=5
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REWIND =  11365 TI%R6S         -
RFAD++ =  0A6FB TI%R6S         -
RFAD+I =  0A702 TI%R6S         -
RFAD-- =  0A652 TI%R6S         -
RFAD-I =  0A659 TI%R6S         -
RFNBFR =  2F57B TI%R6S         -
RFUPD+ =  0A66E TI%R6S         -
RJUST  =  12AE2 TI%R6S         -
RND-12 =  1B01F TI%R6S         -
RND12+ =  0C9D5 TI%R6S         -
RNDAHX =  136CB TI%R6S         -
RNDNRM =  0CAB1 TI%R6S         -
RNSEED =  2F6FE TI%R6S         -
ROMCID =  00BFE TI%R6S         -
ROMFND =  1102F TI%R6S         -
ROMSTT =  F0000 NZ%RST         -
ROMTYP =  F4167 NZ%BUT         - F7220 NZ%FXQ(00407) Type=1.1 Nibs=4 Dist=030B9
ROWDVR =  2E350 TI%R6S         -
RPLLIN =  013F7 TI%R6S         -
RPLSBH =  1799B TI%R6S         -
RPTKY  =  152BA TI%R6S         - F5F93 NZ%CAT(00102) Type=0.1 Nibs=5
RSDOD1 =  F7AAA NZ%PAR         -
RST2<R =  014A6 TI%R6S         - F6204 NZ%CAT(00373) Type=0.1 Nibs=5
RSTK<R =  014A8 TI%R6S         -
RSTKBF =  2F820 TI%R6S         -
RSTKBp =  2F81F TI%R6S         -
RSTST  =  0F5C5 TI%R6S         -
RTNCC  =  F79AE NZ%PAR         -
RTNCCX =  F2F62 NZ%BIF         -
RTNSXM =  F078F NZ%DIR         - F06DB NZ%DIR(00026) Type=1.2 Nibs=5 Dist=000B4
                               + F0708 NZ%DIR(00053) Type=1.2 Nibs=5 Dist=00087
                               + F070D NZ%DIR(00058) Type=1.2 Nibs=5 Dist=00082
                               + F072B NZ%DIR(00076) Type=1.2 Nibs=5 Dist=00064
                               + F0730 NZ%DIR(0007B) Type=1.2 Nibs=5 Dist=0005F
                               + F0735 NZ%DIR(00080) Type=1.2 Nibs=5 Dist=0005A
                               + F073A NZ%DIR(00085) Type=1.2 Nibs=5 Dist=00055
                               + F0758 NZ%DIR(000A3) Type=1.2 Nibs=5 Dist=00037
RUNRT1 =  074E7 TI%R6S         -
RUNRTN =  074EA TI%R6S         -
Read   =  00002 NZ%SYM         - F4A3E NZ%CAS(007AB) Type=0.0 Nibs=1
                               + F6385 NZ%CAT(004F4) Type=0.0 Nibs=1
Read0  =  00000 NZ%SYM         -
Read1  =  00001 NZ%SYM         - F45B0 NZ%CAS(0031D) Type=0.0 Nibs=1
ReadD1 =  F0F8A NZ%GPR         -
ResetC =  00008 TI%R6S         -
Rewind =  00007 NZ%SYM         - F0BAB NZ%GPR(003E9) Type=0.0 Nibs=1
                               + F4586 NZ%CAS(002F3) Type=0.0 Nibs=1

S-R0-0 =  2F871 TI%R6S         -
S-R0-1 =  2F876 TI%R6S         -
S-R0-2 =  2F87B TI%R6S         -
S-R0-3 =  2F880 TI%R6S         - F21FA SC%ENT(002C6) Type=0.0 Nibs=5
S-R1-0 =  2F881 TI%R6S         -
S-R1-1 =  2F886 TI%R6S         - F2499 SC%ENT(00565) Type=0.0 Nibs=5
S-R1-2 =  2F88B TI%R6S         -
S-R1-3 =  2F890 TI%R6S         -
SALLOC =  0153B TI%R6S         -
SAVE1A =  F334D NZ%BIF         - F14A2 NZ%BAS(00508) Type=1.1 Nibs=4 Dist=01EAB
SAVE2C =  F3361 NZ%BIF         - F1683 NZ%BAS(006E9) Type=1.0 Nibs=4 Dist=01CDE
                               + [illegible] Type=1.1 [illegible]
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                                  + F2DE8 NZ%UTL(00152) Type=1.1 Nibs=3 Dist=00579
                                  + F73E0 NZ%FXQ(005C7) Type=1.0 Nibs=4 Dist=0407F
SAVED0 =  F32CD NZ%BIF            - F1170 NZ%BAS(001D6) Type=1.1 Nibs=4 Dist=0215D
                                  + F2949 SC%ENT(00A15) Type=1.1 Nibs=4 Dist=00984
                                  + F2CA5 NZ%UTL(0000F) Type=1.1 Nibs=3 Dist=00628
SAVED1 =  F32E3 NZ%BIF            - F1492 NZ%BAS(004F8) Type=1.1 Nibs=4 Dist=01E51
                                  + F26BE SC%ENT(0078A) Type=1.1 Nibs=4 Dist=00C25
                                  + F5EAB NZ%CAT(0001A) Type=1.1 Nibs=4 Dist=02BC8
                                  + F5F2A NZ%CAT(00099) Type=1.1 Nibs=4 Dist=02C47
SAVEIT =  F3E4B NZ%BUT            - F1663 NZ%BAS(006C9) Type=1.0 Nibs=4 Dist=027E8
                                  + F1F84 SC%ENT(00050) Type=1.1 Nibs=4 Dist=01EC7
                                  + F1F97 SC%ENT(00063) Type=1.1 Nibs=4 Dist=01EB4
                                  + F361A NZ%BIF(00743) Type=1.1 Nibs=4 Dist=00831
SAVESB =  0D66E TI%R6S            -
SAVEST =  F329C NZ%BIF            - F4103 NZ%BUT(0050C) Type=1.1 Nibs=4 Dist=00E67
SAVEXM =  0D663 TI%R6S            -
SAVGSB =  0D64E TI%R6S            -
SAVST+ =  F3463 NZ%BIF            -
SAVSTK =  2F59E TI%R6S            - F4256 NZ%BUT(0065F) Type=0.0 Nibs=5
SAVSTS =  F345A NZ%BIF            - F2ADF SC%ENT(00BAB) Type=1.1 Nibs=4 Dist=0097B
SB15S  =  0E19A TI%R6S            -
SCAN   =  04C40 TI%R6S            -
SCNRT  =  022B9 TI%R6S            - F3879 NZ%DSP(00242) Type=0.1 Nibs=5
                                  + F39C5 NZ%DSP(0038E) Type=0.1 Nibs=5
SCOPCK =  0915B TI%R6S            -
SCREX0 =  2F941 TI%R6S            -
SCREX1 =  2F951 TI%R6S            -
SCREX2 =  2F961 TI%R6S            -
SCREX3 =  2F971 TI%R6S            -
SCRLLR =  0212E TI%R6S            - F5F9D NZ%CAT(0010C) Type=0.1 Nibs=5
SCROLT =  2F946 TI%R6S            -
SCRPTR =  2F966 TI%R6S            -
SCRST0 =  2F901 TI%R6S            -
SCRTCH =  2F901 TI%R6S            - F477F NZ%CAS(004EC) Type=0.0 Nibs=2
                                  + F4979 NZ%CAS(006E6) Type=0.0 Nibs=4 Offset=     16
                                  + F4A2E NZ%CAS(0079B) Type=0.0 Nibs=5
                                  + F4B4D NZ%CAS(008BA) Type=0.0 Nibs=2 Offset=     20
                                  + F4BBD NZ%CAS(0092A) Type=0.0 Nibs=2 Offset=     20
                                  + F4BEA NZ%CAS(00957) Type=0.0 Nibs=5 Offset=     28
                                  + F4C22 NZ%CAS(0098F) Type=0.0 Nibs=2 Offset=     36
                                  + F4C5E NZ%CAS(009CB) Type=0.0 Nibs=2 Offset=     56
                                  + F4C6D NZ%CAS(009DA) Type=0.0 Nibs=2 Offset=     20
                                  + F4C98 NZ%CAS(00A05) Type=0.0 Nibs=5 Offset=     56
                                  + F4CE7 NZ%CAS(00A54) Type=0.0 Nibs=2 Offset=     28
                                  + F4D27 NZ%CAS(00A94) Type=0.0 Nibs=2 Offset=     28
                                  + F4F32 NZ%CAS(00C9F) Type=0.0 Nibs=5 Offset=     16
                                  + F4FF4 NZ%CAS(00D61) Type=0.0 Nibs=5 Offset=     36
                                  + F55A7 NZ%HND(0048C) Type=0.0 Nibs=2 Offset=     56
                                  + F581D NZ%HND(00702) Type=0.0 Nibs=5 Offset=     56
                                  + F5845 NZ%HND(0072A) Type=0.0 Nibs=2 Offset=     32
                                  + F5C3A NZ%HND(00B1F) Type=0.0 Nibs=5
                                  + F5C95 NZ%HND(00B7A) Type=0.0 Nibs=5 Offset=     20
                                  + F6360 NZ%CAT(004CF) Type=0.0 Nibs=5 Offset=     20
                                  + F63A1 NZ%CAT(00510) Type=0.0 Nibs=5
                                  + F6498 NZ%CAT(00607) Type=0.0 Nibs=5 Offset=     56
                                  + F64D5 NZ%CAT(00644) Type=0.0 Nibs=5 Offset=     32
                                  + F6589 NZ%CAT(006F8) Type=0.0 Nibs=5 Offset=     40
SE1-10 =  04468 TI%R6S            -
SECHMS =  13252 TI%R6S            -
SEEKA  =  F42C7 NZ%CAS            - F0B4E NZ%GPR(0038C) Type=1.1 Nibs=4 Dist=03779
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                              + F12DD NZZBAS(00343) Type=1.1 Nibs=4 Dist=02FEA
                              + F5C30 NZZHND(00B15) Type=1.0 Nibs=4 Dist=01969
SEEKB  =  F42CE NZZCAS        -
SEEKRD =  F636D NZZCAT        -
SEND   =  F2CA0 NZZUTL        - F0155 NZZTBL(0014D) Type=1.2 Nibs=5 Dist=02B4B
SEND20 =  17DFA TIZR6S        - F6640 NZZCAT(007AF) Type=0.1 Nibs=5
SENDEL =  17DC1 TIZR6S        -
SENDI+ =  F6A1E NZZIOR        - F38C4 NZZDSP(0028D) Type=1.1 Nibs=4 Dist=0315A
                              + F3B3C NZZDSP(00505) Type=1.1 Nibs=4 Dist=02EE2
SENDIT =  F6A24 NZZIOR        - F3AB1 NZZDSP(0047A) Type=1.1 Nibs=4 Dist=02F73
                              + F4322 NZZCAS(0008F) Type=1.0 Nibs=4 Dist=02702
SENDWD =  17E15 TIZR6S        -
SENDd  =  F7D29 NZZDEC        - F2C96 NZZUTL(00000) Type=1.2 Nibs=5 Dist=05093
SENDp  =  F76C8 NZZPAR        - F2C9B NZZUTL(00005) Type=1.2 Nibs=5 Dist=04A2D
SETALM =  1290D TIZR6S        -
SETALR =  12917 TIZR6S        -
SETFMT =  0F01F TIZR6S        -
SETLP  =  F3C12 NZZBUT        - F087F NZZGPR(000BD) Type=1.1 Nibs=4 Dist=03393
                              + F364E NZZDSP(00017) Type=1.1 Nibs=3 Dist=005C4
SETSB  =  0D641 TIZR6S        -
SETTMO =  13158 TIZR6S        -
SETTSR =  0FD01 NZZSYM        -
SETUP  =  F3DC8 NZZBUT        - F6E9C NZZFXQ(00083) Type=1.0 Nibs=4 Dist=030D4
SFLAG? =  1364C TIZR6S        - F098B NZZGPR(001C9) Type=0.1 Nibs=5
SFLAGC =  13601 TIZR6S        -
SFLAGS =  135FA TIZR6S        -
SFLAGT =  13608 TIZR6S        -
SHF10  =  0C486 TIZR6S        -
SHFLAC =  0DB46 TIZR6S        -
SHFRAC =  0DB51 TIZR6S        -
SHFRBD =  0DB5F TIZR6S        -
SHRT   =  0F96C TIZR6S        -
SIGCHK =  0BD98 TIZR6S        -
SIGTST =  0E636 TIZR6S        -
SIN12  =  00716 TIZR6S        -
SIN15  =  0D71A TIZR6S        -
SKIP   =  F7B36 NZZPAR        -
SKIPDC =  057F6 TIZR6S        -
SLEEP  =  006C2 TIZR6S        -
SNAPBF =  2F7F0 TIZR6S        - F345E NZZBIF(00587) Type=0.0 Nibs=5
                              + F3492 NZZBIF(005BB) Type=0.0 Nibs=5 Offset=      33
SNAPR^ =  01578 TIZR6S        -
SNAPRS =  01571 TIZR6S        - F52F7 NZZHND(001DC) Type=0.1 Nibs=5
SNAPSV =  015A7 TIZR6S        -
SNDWD+ =  17E1F TIZR6S        -
SPACE  =  0AD9D TIZR6S        -
SPLITA =  0C6BF TIZR6S        -
SPLITC =  0C940 TIZR6S        -
SPLTAC =  0C934 TIZR6S        -
SPLTAX =  0E62B TIZR6S        -
SPOLL  =  F1B9D NZZBAS        - F00E0 NZZTBL(000D8) Type=1.2 Nibs=5 Dist=01ABD
SQR15  =  0C534 TIZR6S        -
SQR17  =  0C553 TIZR6S        -
SQR70  =  0C5C3 TIZR6S        -
SQRSAV =  0D629 TIZR6S        -
SRLEAS =  015EC TIZR6S        -
ST!NOd =  F7D83 NZZDEC        -
ST!NOp =  F782C NZZPAR        -
STAB1  =  0D3D9 TIZR6S        -
STAB2  =  0D400 TIZR6S        -
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STANBY =  F16AF NZ%BAS       - F01C1 NZ%TBL(001B9) Type=1.2 Nibs=5 Dist=014EE
STANDd =  F7C74 NZ%DEC       - F16A5 NZ%BAS(0070B) Type=1.2 Nibs=5 Dist=065CF
STANDp =  F75CD NZ%PAR       - F16AA NZ%BAS(00710) Type=1.2 Nibs=5 Dist=05F23
STANd+ =  F7C6C NZ%DEC       -
STANp+ =  F75BC NZ%PAR       -
START  =  F087D NZ%GPR       - F1029 NZ%BAS(0008F) Type=1.1 Nibs=3 Dist=007AC
                             + F14EA NZ%BAS(00550) Type=1.1 Nibs=4 Dist=00C6D
                             + F1D11 NZ%BAS(00D77) Type=1.1 Nibs=4 Dist=01494
                             + F22B6 SC%ENT(00382) Type=1.1 Nibs=4 Dist=01A39
                             + F2324 SC%ENT(003F0) Type=1.1 Nibs=4 Dist=01AA7
                             + F2A17 SC%ENT(00AE3) Type=1.1 Nibs=4 Dist=0219A
                             + F368C NZ%DSP(00055) Type=1.1 Nibs=4 Dist=02E0F
                             + F4A85 NZ%CAS(007F2) Type=1.0 Nibs=4 Dist=04208
                             + F542D NZ%HND(00312) Type=1.0 Nibs=4 Dist=04BB0
                             + F5F47 NZ%CAT(000B6) Type=1.1 Nibs=4 Dist=056CA
                             + F5FB6 NZ%CAT(00125) Type=1.1 Nibs=4 Dist=05739
                             + F6E93 NZ%FXQ(0007A) Type=1.1 Nibs=4 Dist=06616
START+ =  F0883 NZ%GPR       - F2CAC NZ%UTL(00016) Type=1.1 Nibs=4 Dist=02429
START- =  F0886 NZ%GPR       - F19AE NZ%BAS(00A14) Type=1.1 Nibs=4 Dist=01128
                             + F1A6E NZ%BAS(00AD4) Type=1.1 Nibs=4 Dist=011E8
STATAR =  2F7AD TI%R6S       -
STATRS =  172F3 TI%R6S       -
STATSV =  1732F TI%R6S       -
STATUS =  F1DEF NZ%BAS       - F00F8 NZ%TBL(000F3) Type=1.2 Nibs=5 Dist=01CF4
STCD2  =  0D427 TI%R6S       -
STKCHR =  18504 TI%R6S       -
STKCMD =  155ED TI%R6S       -
STKVCT =  1470C TI%R6S       - F2258 SC%ENT(00324) Type=0.1 Nibs=5
STMBCL =  090E7 TI%R6S       -
STMBUF =  090DF TI%R6S       -
STMTD0 =  2F891 TI%R6S       - F15D8 NZ%BAS(0063E) Type=0.0 Nibs=2 Offset=      2
                             + F1692 NZ%BAS(006F8) Type=0.0 Nibs=5
                             + F186D NZ%BAS(008D3) Type=0.0 Nibs=2
                             + F26AE SC%ENT(0077A) Type=0.0 Nibs=5
                             + F282A SC%ENT(008F6) Type=0.0 Nibs=5
                             + F32D4 NZ%BIF(003FD) Type=0.0 Nibs=5
                             + F3300 NZ%BIF(00429) Type=0.0 Nibs=5
                             + F3328 NZ%BIF(00451) Type=0.0 Nibs=5
                             + F333F NZ%BIF(00468) Type=0.0 Nibs=5
STMTD1 =  2F896 TI%R6S       - F2850 SC%ENT(0091C) Type=0.0 Nibs=5
                             + F28C4 SC%ENT(00990) Type=0.0 Nibs=5
                             + F32EA NZ%BIF(00413) Type=0.0 Nibs=5
                             + F3313 NZ%BIF(0043C) Type=0.0 Nibs=5
                             + F73CD NZ%FXQ(005B4) Type=0.0 Nibs=5
STMTR0 =  2F871 TI%R6S       - F1118 NZ%BAS(0017E) Type=0.0 Nibs=4 Offset=     11
                             + F1689 NZ%BAS(006EF) Type=0.0 Nibs=5
                             + F3354 NZ%BIF(0047D) Type=0.0 Nibs=5
                             + F3385 NZ%BIF(004AE) Type=0.0 Nibs=5
                             + F54A2 NZ%HND(00387) Type=0.0 Nibs=5 Offset=      1
STMTR1 =  2F881 TI%R6S       - F10C4 NZ%BAS(0012A) Type=0.0 Nibs=2 Offset=      2
                             + F10F7 NZ%BAS(0015D) Type=0.0 Nibs=5 Offset=      2
                             + F336B NZ%BIF(00494) Type=0.0 Nibs=5
                             + F3399 NZ%BIF(004C2) Type=0.0 Nibs=5
                             + F51E8 NZ%HND(000CD) Type=0.0 Nibs=5 Offset=      5
                             + F5453 NZ%HND(00338) Type=0.0 Nibs=5 Offset=      2
                             + F5499 NZ%HND(0037E) Type=0.0 Nibs=5 Offset=      9
                             + F59BE NZ%HND(008A3) Type=0.0 Nibs=5 Offset=     14
                             + F5A3D NZ%HND(00922) Type=0.0 Nibs=5 Offset=     14
STORE  =  0F5F8 TI%R6S       - F218B SC%ENT(00257) Type=0.1 Nibs=5
STR$00 =  1815C TI%R6S       -
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STR$SB =  18149 TI%R6S         -
STRASN =  0F6B3 TI%R6S         -
STREQL =  1B1EF TI%R6S         -
STRGCK =  036BA TI%R6S         -
STRHDR =  0F09A TI%R6S         -
STRMED =  14C2E TI%R6S         - F264B SC%ENT(00717) Type=0.1 Nibs=5
STRNGP =  0379D TI%R6S         -
STRTST =  1B1C7 TI%R6S         -
STSAVE =  2F6BE TI%R6S         - F32A3 NZ%BIF(003CC) Type=0.0 Nibs=5
                               + F32BE NZ%BIF(003E7) Type=0.0 Nibs=5
STSCR  =  0E92C TI%R6S         -
STUFF  =  1B0B2 TI%R6S         -
SUBONE =  0C327 TI%R6S         -
SVDOD1 =  F7A93 NZ%PAR         -
SVINF+ =  08457 TI%R6S         -
SVINFO =  0845A TI%R6S         -
SVIRC  =  0FA35 TI%R6S         - F22D1 SC%ENT(0039D) Type=0.1 Nibs=5
SWAPO1 =  F65FB NZ%CAT         - F093B NZ%GPR(00179) Type=1.1 Nibs=4 Dist=05CC0
                               + F094C NZ%GPR(0018A) Type=1.1 Nibs=4 Dist=05CAF
                               + F1185 NZ%BAS(001EB) Type=1.1 Nibs=4 Dist=05476
SWAPDO =  F331F NZ%BIF         - F2958 SC%ENT(00A24) Type=1.1 Nibs=4 Dist=009C7
                               + F2D05 NZ%UTL(0006F) Type=1.1 Nibs=3 Dist=0061A
                               + F2D42 NZ%UTL(000AC) Type=1.1 Nibs=3 Dist=005DD
                               + F2D77 NZ%UTL(000E1) Type=1.1 Nibs=3 Dist=005A8
SWPBYT =  17A24 TI%R6S         -
SYNTXe =  02E2B TI%R6S         -
SYSEN  =  2F58A TI%R6S         -
SYSFLG =  2F6D9 TI%R6S         -
SavLvl =  00005 TI%R6S         -
Seek   =  00004 NZ%SYM         - F42CF NZ%CAS(0003C) Type=0.0 Nibs=1
Seeka  =  F5C2E NZ%HND         - F637E NZ%CAT(004ED) Type=1.1 Nibs=3 Dist=00750
SetAVM =  1B9FA TI%R6S         -
SetBP  =  00003 NZ%SYM         - F130B NZ%BAS(00371) Type=0.0 Nibs=1
                               + F4896 NZ%CAS(00603) Type=0.0 Nibs=1
                               + F4EB2 NZ%CAS(00C1F) Type=0.0 Nibs=1
                               + F502B NZ%CAS(00D98) Type=0.0 Nibs=1
SngDev =  00004 NZ%SYM         - F3D4A NZ%BUT(00153) Type=0.0 Nibs=1
                               + F3E61 NZ%BUT(0026A) Type=0.0 Nibs=1
                               + F3EDF NZ%BUT(002E8) Type=0.0 Nibs=1
SpChar =  00002 NZ%PAR         -
StarOK =  0000A NZ%PAR         - F7623 NZ%PAR(00126) Type=0.0 Nibs=1
                               + F78B4 NZ%PAR(003B7) Type=0.0 Nibs=1
                               + F78CA NZ%PAR(003CD) Type=0.0 Nibs=1
                               + F79B2 NZ%PAR(004B5) Type=0.0 Nibs=1
                               + F79B9 NZ%PAR(004BC) Type=0.0 Nibs=1
                               + F7B8B NZ%PAR(0068E) Type=0.0 Nibs=1
StrOK  =  0000A NZ%PAR         - F7739 NZ%PAR(0023C) Type=0.0 Nibs=1
                               + F77DD NZ%PAR(002E0) Type=0.0 Nibs=1
                               + F7811 NZ%PAR(00314) Type=0.0 Nibs=1
                               + F7848 NZ%PAR(0034B) Type=0.0 Nibs=1
                               + F7B63 NZ%PAR(00666) Type=0.0 Nibs=1

TALK   =  F0D44 NZ%GPR         - F2A32 SC%ENT(00AFE) Type=1.1 Nibs=4 Dist=01CEE
TAN12  =  0D72F TI%R6S         -
TAN15  =  0D733 TI%R6S         -
TASTK  =  2F599 TI%R6S         -
TBLJMC =  02426 TI%R6S         -
TBLJMP =  0242A TI%R6S         -
TBMSG$ =  099AB TI%R6S         -
[illegible] = [illegible]      - F5BC9 NZ%HND(00AAE) Type=1.0 Nibs=4 Dist=036CC
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TERCHR =  2F97D TI%R6S          - F22EF SC%ENT(003B8) Type=0.0 Nibs=5
                                + F27F8 SC%ENT(008C4) Type=0.0 Nibs=5
                                + F2F57 NZ%BIF(00080) Type=0.0 Nibs=4
TFHDLR =  1702F TI%R6S          -
TFORN  =  2F59E TI%R6S          -
TGSBS  =  2F5A3 TI%R6S          -
TIMAF  =  2F787 TI%R6S          -
TIMER1 =  2E3F8 TI%R6S          -
TIMER2 =  2E2F8 TI%R6S          -
TIMER3 =  2E1F8 TI%R6S          -
TIMLAF =  2F77B TI%R6S          -
TIMLST =  2F76F TI%R6S          -
TIMOFS =  2F763 TI%R6S          -
TKSCN+ =  08A6B TI%R6S          -
TKSCN7 =  08A99 TI%R6S          -
TMRAD1 =  2F697 TI%R6S          -
TMRAD2 =  2F69C TI%R6S          -
TMRAD3 =  2F6A1 TI%R6S          -
TMRIN1 =  2F6A6 TI%R6S          -
TMRIN2 =  2F6AE TI%R6S          -
TMRIN3 =  2F6B6 TI%R6S          -
TODT   =  13229 TI%R6S          -
TONE   =  0EBEB TI%R6S          -
TRACDC =  052FC TI%R6S          -
TRACEM =  2F7B0 TI%R6S          -
TRC90  =  0DA11 TI%R6S          -
TRES2C =  F3446 NZ%BIF          - F5476 NZ%HND(0035B) Type=1.1 Nibs=4 Dist=02030
                                + F55C6 NZ%HND(004AB) Type=1.1 Nibs=4 Dist=02180
                                + F5B54 NZ%HND(00A39) Type=1.1 Nibs=4 Dist=0270E
                                + F6211 NZ%CAT(00380) Type=1.1 Nibs=4 Dist=020CB
TRESD0 =  F33D2 NZ%BIF          - F16A1 NZ%BAS(00707) Type=1.0 Nibs=4 Dist=01D31
                                + F1F9D SC%ENT(00069) Type=1.1 Nibs=4 Dist=01435
                                + F65F5 NZ%CAT(00764) Type=1.1 Nibs=4 Dist=03223
                                + F74BE NZ%FXQ(006A5) Type=1.1 Nibs=4 Dist=040EC
                                + F74ED NZ%FXQ(006D4) Type=1.1 Nibs=4 Dist=0411B
TRESD1 =  F33E5 NZ%BIF          - F0FE6 NZ%BAS(0004C) Type=1.0 Nibs=4 Dist=023FF
                                + F214C SC%ENT(00218) Type=1.1 Nibs=4 Dist=01299
TRFMBF =  2F8C5 TI%R6S          -
TRFROM =  0FE59 TI%R6S          -
TRIGER =  F155B NZ%BAS          - F01A6 NZ%TBL(0019E) Type=1.2 Nibs=5 Dist=013B5
TRIGd  =  F7CC7 NZ%DEC          - F1551 NZ%BAS(005B7) Type=1.2 Nibs=5 Dist=06776
TRIGp  =  F761E NZ%PAR          - F1556 NZ%BAS(005BC) Type=1.2 Nibs=5 Dist=060C8
TRKDON =  1CFAC TI%R6S          -
TRMNTR =  0F1DD TI%R6S          -
TRPREG =  2F6F9 TI%R6S          -
TRSFMu =  16B84 TI%R6S          -
TRTO+  =  0FE7B TI%R6S          -
TSAV2C =  F3429 NZ%BIF          - F546A NZ%HND(0034F) Type=1.1 Nibs=4 Dist=02041
                                + F55B4 NZ%HND(00499) Type=1.1 Nibs=4 Dist=0218B
                                + F5B1D NZ%HND(00A02) Type=1.1 Nibs=4 Dist=026F4
                                + F61FE NZ%CAT(0036D) Type=1.1 Nibs=4 Dist=02DD5
TSAVD0 =  F33A6 NZ%BIF          - F169B NZ%BAS(00701) Type=1.0 Nibs=4 Dist=01D0B
                                + F639B NZ%CAT(0050A) Type=1.1 Nibs=4 Dist=02FF5
                                + F6E85 NZ%FXQ(0006C) Type=1.1 Nibs=4 Dist=03ADF
                                + F74A1 NZ%FXQ(00688) Type=1.1 Nibs=4 Dist=040FB
                                + F74E0 NZ%FXQ(006C7) Type=1.1 Nibs=4 Dist=0413A
TSAVD1 =  F33BC NZ%BIF          - F0FA3 NZ%BAS(00009) Type=1.1 Nibs=4 Dist=02419
                                + F19DE NZ%BAS(00A44) Type=1.1 Nibs=4 Dist=019DE
                                + F1CDA NZ%BAS(00D40) Type=1.1 Nibs=4 Dist=016E2
                                + F2138 SC%ENT(00204) Type=1.1 Nibs=4 Dist=01284
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                                 + F544D NZ%HND(00332) Type=1.1 Nibs=4 Dist=02091
TST12A =  0D476 TI%R6S           -
TST15  =  0D47A TI%R6S           -
TSTAT  =  F4293 NZ%CAS           - F0B2E NZ%GPR(0036C) Type=1.1 Nibs=4 Dist=03765
                                 + F1657 NZ%BAS(006BD) Type=1.0 Nibs=4 Dist=02C3C
                                 + F5C7E NZ%HND(00B63) Type=1.1 Nibs=4 Dist=019EB
                                 + F6376 NZ%CAT(004E5) Type=1.1 Nibs=4 Dist=020E3
TSTATA =  F429A NZ%CAS           - F0B69 NZ%GPR(003A7) Type=1.1 Nibs=4 Dist=03731
                                 + F6391 NZ%CAT(00500) Type=1.0 Nibs=4 Dist=020F7
TSWAD1 =  F33F8 NZ%BIF           - F1A8F NZ%BAS(00AF5) Type=1.1 Nibs=4 Dist=01969
                                 + F1AE5 NZ%BAS(00B4B) Type=1.1 Nibs=4 Dist=01913
                                 + F1AF8 NZ%BAS(00B5E) Type=1.1 Nibs=4 Dist=01900
TWO*   =  0DB38 TI%R6S           -
Timout =  007D0 NZ%SYM           - F16D5 NZ%BAS(0073B) Type=0.0 Nibs=5
Trace  =  0000F TI%R6S           -
TstEnd =  1C0FF TI%R6S           - F2681 SC%ENT(0074D) Type=0.1 Nibs=5

UCRANG =  F0E66 NZ%GPR           - F1AA5 NZ%BAS(00B0B) Type=1.1 Nibs=4 Dist=00C3F
                                 + F1ABE NZ%BAS(00B24) Type=1.1 Nibs=4 Dist=00C58
                                 + F74F9 NZ%FXQ(006E0) Type=1.0 Nibs=4 Dist=06693
ULYL   =  F0CEA NZ%GPR           - F103A NZ%BAS(000A0) Type=1.1 Nibs=3 Dist=00350
                                 + F12EB NZ%BAS(00351) Type=1.1 Nibs=3 Dist=00601
UNFNIB =  2F6FA TI%R6S           -
UNLPUT =  F0D00 NZ%GPR           - F15E5 NZ%BAS(0064B) Type=1.1 Nibs=4 Dist=008E5
                                 + F2A29 SC%ENT(00AF5) Type=1.1 Nibs=4 Dist=01D29
UNP    =  00001 TI%R6S           -
UNT    =  F24E6 SC%ENT           - F0867 NZ%GPR(000A5) Type=1.1 Nibs=4 Dist=01C7F
                                 + F0AAE NZ%GPR(002EC) Type=1.1 Nibs=4 Dist=01A38
UPCPOS =  13C67 TI%R6S           -
UPD1EN =  2F599 TI%R6S           -
UPD1ST =  2F55D TI%R6S           -
UPD2EN =  2F6A6 TI%R6S           -
UPD2ST =  2F674 TI%R6S           -
UPDANN =  13571 TI%R6S           -
USGch+ =  1BC15 TI%R6S           -
USGch- =  1BC0B TI%R6S           -
USGrst =  1BC63 TI%R6S           - F27A0 SC%ENT(0086C) Type=0.1 Nibs=5
USING  =  1B446 TI%R6S           - F1FBE SC%ENT(0008A) Type=0.1 Nibs=5
USINGp =  03628 TI%R6S           - F7527 NZ%PAR(0002A) Type=0.1 Nibs=5
USloop =  1C14B TI%R6S           - F2790 SC%ENT(0085C) Type=0.1 Nibs=5
USnm05 =  1BD12 TI%R6S           -
USst03 =  1BBCE TI%R6S           -
USst05 =  1BBD4 TI%R6S           -
UTLEND =  F0861 NZ%GPR           - F10B0 NZ%BAS(00116) Type=1.1 Nibs=4 Dist=0084F
                                 + F4590 NZ%CAS(002FD) Type=1.0 Nibs=4 Dist=0302F
                                 + F4E69 NZ%CAS(008D6) Type=1.0 Nibs=4 Dist=04608
                                 + F5AD3 NZ%HND(009B8) Type=1.1 Nibs=4 Dist=05272
                                 + F5F6F NZ%CAT(000DE) Type=1.1 Nibs=4 Dist=0570E
                                 + F5F83 NZ%CAT(000F2) Type=1.1 Nibs=4 Dist=05722
Ucrang =  F74F7 NZ%FXQ           - F776A NZ%PAR(0026D) Type=1.1 Nibs=3 Dist=00273
                                 + F7793 NZ%PAR(00296) Type=1.1 Nibs=3 Dist=0029C
Utlend =  F4E67 NZ%CAS           - F52EB NZ%HND(001D0) Type=1.1 Nibs=3 Dist=00484

VAL00  =  1AD8F TI%R6S           -
VALCHK =  1AE61 TI%R6S           -
VARDC  =  0537C TI%R6S           -
VARNB- =  0E28D TI%R6S           -
VARNBR =  0E289 TI%R6S           -
VARP   =  0350E TI%R6S           -
VECTOR =  2F43C TI%R6S           -
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VIEWD1 =  15147 TI%R6S      -
VRIABL =  04BC4 TI%R6S      -
ValSub =  0000A TI%R6S      -
Verify =  0000B NZ%SYM      -
VolLbl =  0005F NZ%SYM      - F0AE3 NZ%GPR(00321) Type=0.0 Nibs=2
                            + F3D8F NZ%BUT(00198) Type=0.0 Nibs=2
                            + F700E NZ%FXQ(001F5) Type=0.0 Nibs=2
                            + F7311 NZ%FXQ(004F8) Type=0.0 Nibs=2

WFTMOT =  085DD TI%R6S      -
WINDLN =  2F473 TI%R6S      -
WINDST =  2F471 TI%R6S      -
WIPOUT =  1B0AF TI%R6S      -
WRBYTC =  13A73 TI%R6S      -
WRDSC+ =  02C26 TI%R6S      -
WRDSCN =  02C2A TI%R6S      - F7B95 NZ%PAR(00698) Type=0.1 Nibs=5
WRITE# =  F45D4 NZ%CAS      - F5327 NZ%HND(0020C) Type=1.1 Nibs=4 Dist=00D53
                            + F534C NZ%HND(00231) Type=1.1 Nibs=4 Dist=00D78
WRITIT =  F69AF NZ%IOR      - F109A NZ%BAS(00100) Type=1.1 Nibs=4 Dist=05915
                            + F37D9 NZ%DSP(001A2) Type=1.1 Nibs=4 Dist=031D6
                            + F3A59 NZ%DSP(00422) Type=1.1 Nibs=4 Dist=02F56
                            + F4A63 NZ%CAS(007D0) Type=1.0 Nibs=4 Dist=01F4C
WRITNB =  1752B TI%R6S      -
WRTASC =  F6653 NZ%CAT      - F1820 NZ%BAS(00886) Type=1.1 Nibs=4 Dist=04E33
                            + F18CA NZ%BAS(00930) Type=1.1 Nibs=4 Dist=04D89
WRTFIB =  11CEE TI%R6S      -
WRTNUM =  139C4 TI%R6S      -
WRTSTR =  1396F TI%R6S      -
WSTRFX =  138B5 TI%R6S      -
Write  =  00002 NZ%SYM      - F4A36 NZ%CAS(007A3) Type=0.0 Nibs=1
                            + F5C8C NZ%HND(00B71) Type=0.0 Nibs=1
Write0 =  00000 NZ%SYM      - F5045 NZ%CAS(00DB2) Type=0.0 Nibs=1
Write1 =  00001 NZ%SYM      - F1326 NZ%BAS(0038C) Type=0.0 Nibs=1

XDelay =  00009 TI%R6S      -
XMTADR =  08133 TI%R6S      -
XROM01 =  00001 TI%R6S      -
XWORDd =  F7C58 NZ%DEC      -
XWORDp =  F79AE NZ%PAR      -
XWRD1p =  F75B1 NZ%PAR      -
XXHEAD =  1A44E TI%R6S      -
XYEX   =  0C697 TI%R6S      -
XchgL  =  0000A NZ%SYM      -
XchgT  =  00004 NZ%SYM      - F12E5 NZ%BAS(0034B) Type=0.0 Nibs=1
                            + F12FC NZ%BAS(00362) Type=0.0 Nibs=1
                            + F45A7 NZ%CAS(00314) Type=0.0 Nibs=1
                            + F45C8 NZ%CAS(00335) Type=0.0 Nibs=1
Xfr01L =  00009 NZ%SYM      -
Xfr01T =  00005 NZ%SYM      -

YMDDAY =  13304 TI%R6S      -
YMDHO1 =  130E5 TI%R6S      -
YMDHMS =  130DB TI%R6S      - F4AAC NZ%CAS(00819) Type=0.1 Nibs=5
YTML   =  F0D30 NZ%GPR      - F1BAF NZ%BAS(00C15) Type=1.1 Nibs=4 Dist=00E7F
                            + F2396 SC%ENT(00462) Type=1.1 Nibs=4 Dist=01666
                            + F4846 NZ%CAS(005B3) Type=1.0 Nibs=4 Dist=03B16
                            + F6891 NZ%IOR(001BF) Type=1.1 Nibs=4 Dist=05B61
YTMLL  =  F0D37 NZ%GPR      - F68A7 NZ%IOR(001D5) Type=1.1 Nibs=4 Dist=05B70
YX2-12 =  0D274 TI%R6S      -
YX2-15 =  0D27A TI%R6S      -
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ZERBUF  =  18B20 TIXR6S         -

a!      =  00021 TIXR6S         -
a"      =  00022 TIXR6S         -
a$      =  00024 TIXR6S         -
a'      =  00027 TIXR6S         -
a.      =  0002E TIXR6S         -
a0      =  00030 TIXR6S         -
a1      =  00031 TIXR6S         -
a2      =  00032 TIXR6S         -
a3      =  00033 TIXR6S         -
a4      =  00034 TIXR6S         -
a5      =  00035 TIXR6S         -
a6      =  00036 TIXR6S         -
a7      =  00037 TIXR6S         -
a8      =  00038 TIXR6S         -
a9      =  00039 TIXR6S         -
aVE=D1  =  F21BB SCXENT         - F60FD NZXCAT(0026C) Type=1.1 Nibs=4 Dist=03F42
                                + F61AA NZXCAT(00319) Type=1.1 Nibs=4 Dist=03FEF

bALTCH  =  00BFB TIXR6S         -
bASSGN  =  00804 TIXR6S         -
bCARD   =  00807 TIXR6S         -
bCHARS  =  00BFB TIXR6S         -
bECOND  =  00809 TIXR6S         -
bFIB    =  00803 TIXR6S         - F4BF9 NZXCAS(00966) Type=0.0 Nibs=3
                                + F5D20 NZXHND(00C12) Type=0.0 Nibs=3
bFILE   =  00805 TIXR6S         -
bIEXKY  =  00802 TIXR6S         -
bLEX    =  00BFC TIXR6S         -
bPILAI  =  00810 TIXR6S         - F0941 NZXGPR(0017F) Type=0.0 Nibs=3
                                + F17D5 NZXBAS(0083B) Type=0.0 Nibs=3
                                + F1A23 NZXBAS(00A89) Type=0.0 Nibs=3
                                + F1B2C NZXBAS(00B92) Type=0.0 Nibs=3
                                + F2FD9 NZXBIF(00102) Type=0.0 Nibs=3
                                + F4126 NZXBUT(0052F) Type=0.0 Nibs=3
bPILSV  =  0080F TIXR6S         - F2EE0 NZXBIF(00009) Type=0.0 Nibs=3
                                + F2F93 NZXBIF(000BC) Type=0.0 Nibs=3
bROMTB  =  00BFE TIXR6S         -
bSCRTC  =  00E00 TIXR6S         -
bSERR   =  F1A30 NZXBAS         - F34C7 NZXBIF(005F0) Type=1.0 Nibs=4 Dist=01A97
bSTART  =  00808 TIXR6S         -
bSTAT   =  00806 TIXR6S         -
bSTMT   =  00801 TIXR6S         -
bSTMXQ  =  00811 TIXR6S         - F2C29 SCXENT(00CF5) Type=0.0 Nibs=3
                                + F2FD0 NZXBIF(000F9) Type=0.0 Nibs=3

cATCH+  =  F7B14 NZXPAR         - F1AD4 NZXBAS(00B3A) Type=1.1 Nibs=4 Dist=06040
cC->C   =  00068 TIXR6S         -
cR->C   =  00069 TIXR6S         -
cRCL    =  00067 TIXR6S         -

dCARD   =  00007 TIXR6S         -
dIRAM   =  00001 TIXR6S         -
dMAIN   =  00000 TIXR6S         -
dPCRD   =  00007 TIXR6S         -
dPORT   =  00001 TIXR6S         -

eNofN   =  000F7 TIXR6S         -
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e0^0   =  00006 TI%R6S        -
e0^NEG =  00005 TI%R6S        -
e1^INF =  00011 TI%R6S        -
e2MROM =  0001A TI%R6S        -
eABORT =  00034 NZ%ERR        - F0BEB NZ%GPR(00429) Type=0.0 Nibs=1
                              + F1604 NZ%BAS(0066A) Type=0.0 Nibs=1
                              + F240C SC%ENT(004D8) Type=0.0 Nibs=1
                              + F243A SC%ENT(00506) Type=0.0 Nibs=1
                              + F317E NZ%BIF(002A7) Type=0.0 Nibs=1
                              + F34F6 NZ%BIF(0061F) Type=0.0 Nibs=1
                              + F350F NZ%BIF(00638) Type=0.0 Nibs=1
                              + F3513 NZ%BIF(0063C) Type=0.0 Nibs=1
                              + F6710 NZ%IOR(0003E) Type=0.0 Nibs=1
                              + F67BF NZ%IOR(000ED) Type=0.0 Nibs=1
                              + F6947 NZ%IOR(00275) Type=0.0 Nibs=1
                              + F6B2A NZ%IOR(00458) Type=0.0 Nibs=1
eAF    =  0001B TI%R6S        -
eALGN  =  000F0 TI%R6S        -
eBADMD =  00029 NZ%ERR        - F08AD NZ%GPR(000EB) Type=0.0 Nibs=1
                              + F0C75 NZ%GPR(004B3) Type=0.0 Nibs=1
                              + F2908 SC%ENT(009D4) Type=0.0 Nibs=1
eBLANK =  00018 NZ%ERR        -
eCALGN =  00060 TI%R6S        -
eCHNLM =  00029 TI%R6S        -
eCHSUM =  0001A NZ%ERR        -
eDATTY =  0001F TI%R6S        - F061F NZ%ERR(00215) Type=0.0 Nibs=2
eDEVIC =  00041 NZ%ERR        - F0515 NZ%ERR(0010B) Type=0.0 Nibs=2
                              + F05E6 NZ%ERR(001DC) Type=0.0 Nibs=2
                              + F060E NZ%ERR(00204) Type=0.0 Nibs=2
eDIRFL =  0001F NZ%ERR        - F4DA4 NZ%CAS(00B11) Type=0.0 Nibs=1
eDSPEC =  00035 NZ%ERR        - F1193 NZ%BAS(001F9) Type=0.0 Nibs=1
                              + F1B13 NZ%BAS(00B79) Type=0.0 Nibs=1
                              + F1D1E NZ%BAS(00D84) Type=0.0 Nibs=1
                              + F1F71 SC%ENT(0003D) Type=0.0 Nibs=1
                              + F47B0 NZ%CAS(0051D) Type=0.0 Nibs=1
                              + F6005 NZ%CAT(00244) Type=0.0 Nibs=1
                              + F6E7E NZ%FXQ(00065) Type=0.0 Nibs=1
                              + F6F4D NZ%FXQ(00134) Type=0.0 Nibs=1
                              + F7204 NZ%FXQ(003EB) Type=0.0 Nibs=1
                              + F73B5 NZ%FXQ(0059C) Type=0.0 Nibs=1
                              + F7428 NZ%FXQ(0060F) Type=0.0 Nibs=1
eDTYPE =  0002F NZ%ERR        - F1508 NZ%BAS(0056E) Type=0.0 Nibs=1
                              + F35B0 NZ%BIF(006D9) Type=0.0 Nibs=1
                              + F4309 NZ%CAS(00076) Type=0.0 Nibs=1
eDVCNF =  00040 TI%R6S        - F050D NZ%ERR(00103) Type=0.0 Nibs=2
eEFILE =  0001E NZ%ERR        - F4BB5 NZ%CAS(00922) Type=0.0 Nibs=1
                              + F5D9E NZ%HND(00C83) Type=0.0 Nibs=1
eEOFIL =  00036 TI%R6S        -
eEOTAP =  00011 NZ%ERR        - F4DAD NZ%CAS(00B1A) Type=0.0 Nibs=1
eEXCHR =  0004E TI%R6S        - F0438 NZ%ERR(0002E) Type=0.0 Nibs=2
eEXPO  =  00003 TI%R6S        -
eEXPCT =  000E7 TI%R6S        -
eF2BIG =  0004A TI%R6S        -
eFACCS =  0003C TI%R6S        -
eFEXST =  0003B TI%R6S        - F04E2 NZ%ERR(000D8) Type=0.0 Nibs=2
eFILE  =  000EA TI%R6S        - F04DA NZ%ERR(000D0) Type=0.0 Nibs=2
eFLOST =  00024 NZ%ERR        - F055F NZ%ERR(00155) Type=0.0 Nibs=2
                              + F0567 NZ%ERR(0015D) Type=0.0 Nibs=2
                              + F058E NZ%ERR(00184) Type=0.0 Nibs=2
eFNNtF =  00021 TI%R6S        -
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eFOPEN =  0003E TI%R6S      -
eFPROT =  0003D TI%R6S      - F0460 NZ%ERR(00056) Type=0.0 Nibs=2
eFRAME =  00040 NZ%ERR      - F054C NZ%ERR(00142) Type=0.0 Nibs=2
                            + F0586 NZ%ERR(0017C) Type=0.0 Nibs=2
eFRTOI =  0002A NZ%ERR      -
eFRTOL =  0002B NZ%ERR      -
eFSPEC =  0003A TI%R6S      -
eFTYPE =  0003F TI%R6S      - F57F3 NZ%HND(006D8) Type=0.0 Nibs=4
eFnFND =  00039 TI%R6S      - F04A1 NZ%ERR(00097) Type=0.0 Nibs=2
                            + F5634 NZ%HND(00519) Type=0.0 Nibs=4
eFwoNX =  0002A TI%R6S      -
eHPIL  =  00000 NZ%ERR      -
eIF*ZR =  00010 TI%R6S      -
eIF-IF =  0000F TI%R6S      -
eIF/IF =  0000E TI%R6S      -
eILCNT =  0004F TI%R6S      -
eILEXP =  00050 TI%R6S      - F0450 NZ%ERR(00046) Type=0.0 Nibs=2
eILEXp =  00006 NZ%ERR      - F7A81 NZ%PAR(00584) Type=0.0 Nibs=1
                            + F7B0A NZ%PAR(0060D) Type=0.0 Nibs=1
eILKEY =  00055 TI%R6S      -
eILLEG =  000E6 TI%R6S      -
eILPAR =  00051 TI%R6S      - F0448 NZ%ERR(0003E) Type=0.0 Nibs=2
eILPAr =  00005 NZ%ERR      - F76BD NZ%PAR(001C0) Type=0.0 Nibs=1
                            + F78C7 NZ%PAR(003CA) Type=0.0 Nibs=1
eILTFM =  00037 TI%R6S      -
eILVAR =  00053 TI%R6S      -
eIMGOV =  0002F TI%R6S      -
eINF   =  000F3 TI%R6S      -
eINF^0 =  00012 TI%R6S      -
eINPUT =  000F4 TI%R6S      -
eINVAL =  00012 NZ%ERR      - F048A NZ%ERR(00080) Type=0.0 Nibs=2
                            + F04A9 NZ%ERR(0009F) Type=0.0 Nibs=2
                            + F04B1 NZ%ERR(000A7) Type=0.0 Nibs=2
                            + F04B9 NZ%ERR(000AF) Type=0.0 Nibs=2
                            + F04C1 NZ%ERR(000B7) Type=0.0 Nibs=2
eINVIM =  0002D TI%R6S      -
eINVLD =  000EC TI%R6S      - F047F NZ%ERR(00075) Type=0.0 Nibs=2
                            + F0596 NZ%ERR(0018C) Type=0.0 Nibs=2
                            + F060B NZ%ERR(00201) Type=0.0 Nibs=2
eINVST =  000ED TI%R6S      -
eINVUS =  0002E TI%R6S      -
eINX   =  00015 TI%R6S      -
eION   =  00043 NZ%ERR      - F0430 NZ%ERR(00026) Type=0.0 Nibs=2
                            + F065A NZ%ERR(00250) Type=0.0 Nibs=2
eIVARG =  00008 TI%R6S      - F0627 NZ%ERR(0021D) Type=0.0 Nibs=2
eIVSAR =  00033 TI%R6S      -
eIVSOP =  00035 TI%R6S      -
eIVSTA =  00034 TI%R6S      -
eIVTAB =  00030 TI%R6S      -
eL2LNG =  00041 TI%R6S      -
eLNO   =  0000C TI%R6S      -
eLOBAT =  00016 TI%R6S      -
eLOG-  =  0000D TI%R6S      -
eLPERR =  00026 NZ%ERR      -
eLTIMO =  00023 NZ%ERR      - F05A7 NZ%ERR(0019D) Type=0.0 Nibs=2
                            + F05AF NZ%ERR(001A5) Type=0.0 Nibs=2
eMEDIA =  00042 NZ%ERR      - F0477 NZ%ERR(0006D) Type=0.0 Nibs=2
                            + F0482 NZ%ERR(00078) Type=0.0 Nibs=2
                            + F0499 NZ%ERR(0008F) Type=0.0 Nibs=2
eMEM   =  00018 TI%R6S      - F0643 NZ%ERR(00239) Type=0.0 Nibs=2
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eMMCOR =  00017 TI%R6S        - F05B7 NZ%ERR(001AD) Type=0.0 Nibs=2
eMPI   =  00019 TI%R6S        -
eMSPAR =  00052 TI%R6S        - F0440 NZ%ERR(00036) Type=0.0 Nibs=2
eMSPAr =  00004 NZ%ERR        - F759B NZ%PAR(0009E) Type=0.0 Nibs=1
                              + F7910 NZ%PAR(00413) Type=0.0 Nibs=1
eNEG^X =  00009 TI%R6S        -
eNEWTA =  00017 NZ%ERR        - F0B40 NZ%GPR(0037E) Type=0.0 Nibs=1
                              + F4338 NZ%CAS(000A5) Type=0.0 Nibs=1
                              + F4B1C NZ%CAS(00889) Type=0.0 Nibs=1
eNFILE =  00016 NZ%ERR        - F4833 NZ%CAS(005A0) Type=0.0 Nibs=1
                              + F57D2 NZ%HND(006B7) Type=0.0 Nibs=1
                              + F5D8B NZ%HND(00C70) Type=0.0 Nibs=1
eNFOUN =  000E8 TI%R6S        -
eNMBOX =  00039 NZ%ERR        - F1DF8 NZ%BAS(00E5E) Type=0.0 Nibs=1
                              + F3CC0 NZ%BUT(000C9) Type=0.0 Nibs=1
eNNUMR =  00036 NZ%ERR        - F1DE7 NZ%BAS(00E4D) Type=0.0 Nibs=1
                              + F1F04 NZ%BAS(00F6A) Type=0.0 Nibs=1
                              + F2EA3 NZ%UTL(0020D) Type=0.0 Nibs=1
                              + F3FE6 NZ%BUT(003EF) Type=0.0 Nibs=1
                              + F4039 NZ%BUT(00442) Type=0.0 Nibs=1
                              + F6DB9 NZ%LOW(00063) Type=0.0 Nibs=1
eNOASN =  00001 NZ%ERR        - F17C2 NZ%BAS(00828) Type=0.0 Nibs=1
eNODAT =  00020 TI%R6S        -
eNOFND =  00020 NZ%ERR        - F0AB9 NZ%GPR(002F7) Type=0.0 Nibs=1
                              + F1D2A NZ%BAS(00D90) Type=0.0 Nibs=1
eNOLIF =  00013 NZ%ERR        - F4930 NZ%CAS(0069D) Type=0.0 Nibs=1
eNORAM =  0003B NZ%ERR        - F35E3 NZ%BIF(0070C) Type=0.0 Nibs=1
                              + F3EEA NZ%BUT(002F3) Type=0.0 Nibs=1
                              + F4633 NZ%CAS(003A0) Type=0.0 Nibs=1
                              + F613F NZ%CAT(002AE) Type=0.0 Nibs=1
                              + F6F49 NZ%FXQ(00130) Type=0.0 Nibs=1
eNORDY =  00022 NZ%ERR        - F0CE4 NZ%GPR(00522) Type=0.0 Nibs=1
                              + F2A4F SC%ENT(00B1B) Type=0.0 Nibs=1
eNOTAP =  00014 NZ%ERR        -
eNOTIN =  00043 TI%R6S        -
eNSVAR =  00033 TI%R6S        -
eNUMIN =  00026 TI%R6S        -
eNVSTA =  00033 TI%R6S        -
eNXwoF =  0002B TI%R6S        -
eOFFED =  0003C NZ%ERR        - F3C4E NZ%BUT(00057) Type=0.0 Nibs=1
eOVFL^ =  000F5 TI%R6S        -
eOVFLW =  00002 TI%R6S        -
eOVRUN =  00025 NZ%ERR        -
ePALGN =  0005E TI%R6S        -
ePARSE =  00000 NZ%SYM        - F17C4 NZ%BAS(0082A) Type=0.0 Nibs=1
                              + F34D3 NZ%BIF(005FC) Type=0.0 Nibs=1
                              + F34E7 NZ%BIF(00610) Type=0.0 Nibs=1
ePIL   =  00002 NZ%SYM        - F08AF NZ%GPR(000ED) Type=0.0 Nibs=1
                              + F0ABB NZ%GPR(002F9) Type=0.0 Nibs=1
                              + F0ADE NZ%GPR(0031C) Type=0.0 Nibs=1
                              + F0C77 NZ%GPR(004B5) Type=0.0 Nibs=1
                              + F0CDB NZ%GPR(00519) Type=0.0 Nibs=1
                              + F1D21 NZ%BAS(00D87) Type=0.0 Nibs=1
                              + F1D3E NZ%BAS(00DA4) Type=0.0 Nibs=1
                              + F2460 SC%ENT(0052C) Type=0.0 Nibs=1
                              + F290A SC%ENT(009D6) Type=0.0 Nibs=1
                              + F2A51 SC%ENT(00B1D) Type=0.0 Nibs=1
                              + F34F1 NZ%BIF(0061A) Type=0.0 Nibs=1
                              + F3519 NZ%BIF(00642) Type=0.0 Nibs=1 Offset=      1
                              + F35A7 NZ%BIF(006D0) Type=0.0 Nibs=1
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                                       + F430B NZ%CAS(00078) Type=0.0 Nibs=1
                                       + F53DC NZ%HND(002C1) Type=0.0 Nibs=1
                                       + F670B NZ%IOR(00039) Type=0.0 Nibs=1
                                       + F685A NZ%IOR(00188) Type=0.0 Nibs=1
ePLLC  =  0005A TI%R6S                 -
ePLLCN =  00059 TI%R6S                 -
ePRCER =  00054 TI%R6S                 -
ePRMIS =  00024 TI%R6S                 -
ePRNEX =  0004C TI%R6S                 -
ePROTD =  00042 TI%R6S                 -
ePRTCT =  000F8 TI%R6S                 -
ePULL  =  000F6 TI%R6S                 -
eQUOEX =  0004D TI%R6S                 -
eROWRN =  00056 TI%R6S                 -
eR1WRN =  00057 TI%R6S                 -
eRALGN =  0005D TI%R6S                 -
eRANGE =  00038 NZ%ERR                 - F0E1E NZ%GPR(0065C) Type=0.0 Nibs=1
                                       + F13FF NZ%BAS(00465) Type=0.0 Nibs=1
                                       + F141C NZ%BAS(00482) Type=0.0 Nibs=1
                                       + F14B0 NZ%BAS(00516) Type=0.0 Nibs=1
                                       + F16E6 NZ%BAS(0074C) Type=0.0 Nibs=1
                                       + F17BD NZ%BAS(00823) Type=0.0 Nibs=1
                                       + F1DCF NZ%BAS(00E35) Type=0.0 Nibs=1
                                       + F1EE2 NZ%BAS(00F48) Type=0.0 Nibs=1
                                       + F1F0A NZ%BAS(00F70) Type=0.0 Nibs=1
                                       + F29B0 SC%ENT(00A7C) Type=0.0 Nibs=1
                                       + F2E26 NZ%UTL(00190) Type=0.0 Nibs=1
                                       + F2EA9 NZ%UTL(00213) Type=0.0 Nibs=1
                                       + F3FFE NZ%BUT(00407) Type=0.0 Nibs=1
                                       + F403D NZ%BUT(00446) Type=0.0 Nibs=1
                                       + F40BF NZ%BUT(004C8) Type=0.0 Nibs=1
                                       + F43C7 NZ%CAS(00134) Type=0.0 Nibs=1
                                       + F4869 NZ%CAS(005D6) Type=0.0 Nibs=1
                                       + F51DF NZ%HND(000C4) Type=0.0 Nibs=1
                                       + F60DA NZ%CAT(00249) Type=0.0 Nibs=1
                                       + F6E14 NZ%LOW(000BE) Type=0.0 Nibs=1
                                       + F6FB5 NZ%FXQ(0019C) Type=0.0 Nibs=1
                                       + F7044 NZ%FXQ(0022B) Type=0.0 Nibs=1
                                       + F70A4 NZ%FXQ(0028B) Type=0.0 Nibs=1
                                       + F7115 NZ%FXQ(002FC) Type=0.0 Nibs=1
                                       + F72D4 NZ%FXQ(004BB) Type=0.0 Nibs=1
                                       + F7392 NZ%FXQ(00579) Type=0.0 Nibs=1
eRECOR =  0001D TI%R6S                 -
eRECRD =  00019 NZ%ERR                 -
eRRORX =  F2D37 NZ%UTL                 - F2A53 SC%ENT(00B1F) Type=1.0 Nibs=3 Dist=002E4
eRWERR =  00046 TI%R6S                 -
eRwoGS =  0002C TI%R6S                 -
eSIGOP =  00013 TI%R6S                 -
eSPGNF =  00031 TI%R6S                 -
eSQR-  =  0000A TI%R6S                 -
eSTALL =  00012 NZ%ERR                 -
eSTMNF =  0001E TI%R6S                 -
eSTROV =  00025 TI%R6S                 -
eSUBSC =  0001C TI%R6S                 -
eSYNTX =  0004B TI%R6S                 - F0458 NZ%ERR(0004E) Type=0.0 Nibs=2
eSYNTx =  00007 NZ%ERR                 - F756C NZ%PAR(0006F) Type=0.0 Nibs=1
                                       + F75C8 NZ%PAR(000CB) Type=0.0 Nibs=1
eSYSER =  00017 TI%R6S
eSYSer =  0002C NZ%ERR                 - F53DA NZ%HND(002BF) Type=0.0 Nibs=1
eTAPE  =  00001 NZ%SYM                 - F0837 NZ%GPR(00375) Type=0.0 Nibs=1
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                                    + F0B57 NZ%GPR(00395) Type=0.0 Nibs=1
                                    + F34EC NZ%BIF(00615) Type=0.0 Nibs=1
                                    + F432F NZ%CAS(0009C) Type=0.0 Nibs=1
                                    + F4835 NZ%CAS(005A2) Type=0.0 Nibs=1
                                    + F492C NZ%CAS(00699) Type=0.0 Nibs=1
                                    + F4B13 NZ%CAS(00880) Type=0.0 Nibs=1
                                    + F4BE3 NZ%CAS(00950) Type=0.0 Nibs=1
                                    + F4DA6 NZ%CAS(00B13) Type=0.0 Nibs=1
                                    + F57D4 NZ%HND(006B9) Type=0.0 Nibs=1
                                    + F57DF NZ%HND(006C4) Type=0.0 Nibs=1
                                    + F5D82 NZ%HND(00C67) Type=0.0 Nibs=1
                                    + F5DA0 NZ%HND(00C85) Type=0.0 Nibs=1
eTERM  =  00020 NZ%ERR              -
eTESTF =  0002D NZ%ERR              -
eTFFLD =  00038 TI%R6S              -
eTFM   =  000F1 TI%R6S              -
eTFWRN =  00058 TI%R6S              -
eTNINF =  00004 TI%R6S              -
eTOO   =  000EF TI%R6S              -
eTOOFI =  00028 TI%R6S              -
eTOOMI =  00027 TI%R6S              -
eTRKDN =  00061 TI%R6S              -
eTRKOF =  000E5 TI%R6S              -
eTSIZE =  0001C NZ%ERR              - F4926 NZ%CAS(00693) Type=0.0 Nibs=1
                                    + F57DD NZ%HND(006C2) Type=0.0 Nibs=1
eTUFAS =  00047 TI%R6S              -
eTUSLO =  00048 TI%R6S              -
eUALGN =  0005F TI%R6S              -
eUNEXP =  00027 NZ%ERR              - F0ADC NZ%GPR(0031A) Type=0.0 Nibs=1
                                    + F0CD5 NZ%GPR(00513) Type=0.0 Nibs=1
                                    + F1D3C NZ%BAS(00DA2) Type=0.0 Nibs=1
                                    + F245A SC%ENT(00526) Type=0.0 Nibs=1
                                    + F6709 NZ%IOR(00037) Type=0.0 Nibs=1
eUNFLW =  00001 TI%R6S              -
eUNKCD =  00045 TI%R6S              -
eUNORC =  00014 TI%R6S              -
eVALGN =  0005C TI%R6S              -
eVARTY =  00032 TI%R6S              -
eVFYER =  00044 TI%R6S              -
eWALGN =  0005B TI%R6S              -
eWRGNM =  00049 TI%R6S              -
eXCESS =  00003 NZ%ERR              -
eXFNNF =  00022 TI%R6S              -
eXPEXC =  F4107 NZ%BUT              - F178F NZ%BAS(007F5) Type=1.1 Nibs=4 Dist=02978
                                    + F2244 SC%ENT(00310) Type=1.1 Nibs=4 Dist=01EC3
                                    + F2E7E NZ%UTL(001E8) Type=1.1 Nibs=4 Dist=01289
eXWORD =  00023 TI%R6S              -
eXXXXX =  00028 NZ%ERR              -
eZRDIV =  00008 TI%R6S              -
eZRO/O =  00007 TI%R6S              -
efPROT =  00010 NZ%ERR              - F4BE1 NZ%CAS(0094E) Type=0.0 Nibs=1
enull  =  00000 TI%R6S              -
ew/o   =  000EB TI%R6S              -

fAOS   =  000DF TI%R6S              -
fASCII =  00001 TI%R6S              -
fBASIC =  0E214 TI%R6S              - F56BC NZ%HND(005A1) Type=0.0 Nibs=4
fBIN   =  0E204 TI%R6S              -
fDATA  =  0E0F0 TI%R6S              -
fEOF   =  000FF TI%R6S              -
```

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fEOR   =  000EF TI%R6S       -
fEOS   =  0006F TI%R6S       -
fKEY   =  0E20C TI%R6S       - F58F3 NZ%HND(007D8) Type=0.0 Nibs=5
fLEX   =  0E208 TI%R6S       - F0018 NZ%TBL(00010) Type=0.0 Nibs=4
                             + F5BFB NZ%HND(00AE0) Type=0.0 Nibs=4
fLIF1  =  00001 TI%R6S       -
fLTDH  =  F1F20 NZ%BAS       - F3FEB NZ%BUT(003F4) Type=1.1 Nibs=4 Dist=020BE
                             + F4020 NZ%BUT(00429) Type=1.1 Nibs=4 Dist=020F3
                             + F6103 NZ%CAT(00272) Type=1.1 Nibs=4 Dist=041D6
fMOS   =  0007F TI%R6S       -
fPROT  =  F4BDD NZ%CAS       - F5CE4 NZ%HND(00BC9) Type=1.1 Nibs=4 Dist=01107
fSDATA =  0E0D0 TI%R6S       -
fSOS   =  000CF TI%R6S       -
fTEXT  =  00001 TI%R6S       -
fTYPFN =  F5CB0 NZ%HND       - F4BCD NZ%CAS(0093A) Type=1.1 Nibs=4 Dist=010E3
                             + F63F6 NZ%CAT(00565) Type=1.1 Nibs=3 Dist=00746
f1AC   =  FFFC7 TI%R6S       -
f1ALRM =  FFFC4 TI%R6S       -
f1BASE =  FFFF0 TI%R6S       -
f1BAT  =  FFFC3 TI%R6S       -
f1BEEP =  FFFFE TI%R6S       -
f1BPLD =  FFFE7 TI%R6S       -
f1CALC =  FFFC0 TI%R6S       -
f1CLOC =  FFFD3 TI%R6S       -
f1CMDS =  FFFD1 TI%R6S       -
f1CTON =  FFFFD TI%R6S       -
f1CTRL =  FFFD0 TI%R6S       -
f1DG0  =  FFFEF TI%R6S       -
f1DG1  =  FFFEE TI%R6S       -
f1DG2  =  FFFED TI%R6S       -
f1DG3  =  FFFEC TI%R6S       -
f1DORM =  FFFD5 TI%R6S       - F319E NZ%BIF(002C7) Type=0.0 Nibs=2
f1DVZ  =  FFFF9 TI%R6S       -
f1EOT  =  FFFE9 TI%R6S       - F2309 SC%ENT(003D5) Type=0.0 Nibs=2
f1EXAC =  FFFD2 TI%R6S       -
f1EXTD =  FFFEA TI%R6S       - F092C NZ%GPR(0016A) Type=0.0 Nibs=2
f1FXEN =  FFFF3 TI%R6S       -
f1INFR =  FFFF5 TI%R6S       -
f1INX  =  FFFFC TI%R6S       -
f1IVL  =  FFFF8 TI%R6S       -
f1LC   =  FFFF1 TI%R6S       -
f1MKOF =  FFFCE TI%R6S       -
f1NEGR =  FFFF4 TI%R6S       -
f1NOFN =  FFFD6 TI%R6S       -
f1NOPR =  FFFE6 TI%R6S       -
f1NZ4  =  FFFE8 TI%R6S       - F090B NZ%GPR(00149) Type=0.0 Nibs=2
f1OVF  =  FFFFA TI%R6S       -
f1PDWN =  FFFEB TI%R6S       - F304D NZ%BIF(00176) Type=0.0 Nibs=2
f1PRGM =  FFFC2 TI%R6S       -
f1PWDN =  FFFCF TI%R6S       -
f1QIET =  FFFFF TI%R6S       -
f1RAD  =  FFFF6 TI%R6S       -
f1RPTD =  FFFC5 TI%R6S       -
f1RTN  =  FFFD4 TI%R6S       -
f1SCEN =  FFFF2 TI%R6S       -
f1SUSP =  FFFC1 TI%R6S       -
f1TNOF =  FFFCD TI%R6S       -
f1UNF  =  FFFFB TI%R6S       -
f1USER =  FFFF7 TI%R6S       -
f1USRX =  FFFC6 TI%R6S       -
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fIVIEW =  FFFCC TI%R6S         -

getdev =  F28F9 SC%ENT         - F2CB4 NZ%UTL(0001E) Type=1.1 Nibs=3 Dist=003B8

hCAT   =  F5E91 NZ%CAT         - F06EA NZ%DIR(00035) Type=1.2 Nibs=5 Dist=057A7
hCAT$  =  F60BF NZ%CAT         - F06EF NZ%DIR(0003A) Type=1.2 Nibs=5 Dist=059D0
hCOPYx =  F54B8 NZ%HND         - F06F4 NZ%DIR(0003F) Type=1.2 Nibs=5 Dist=04DC4
hCPY5e =  F5C15 NZ%HND         - F23A3 SC%ENT(0046F) Type=1.1 Nibs=4 Dist=03872
                               + F46B7 NZ%CAS(00424) Type=1.1 Nibs=4 Dist=0155E
                               + F47C0 NZ%CAS(0052D) Type=1.1 Nibs=4 Dist=01455
hCREAT =  F51B3 NZ%HND         - F06F9 NZ%DIR(00044) Type=1.2 Nibs=5 Dist=04ABA
hDIDST =  F35FD NZ%BIF         - F06FE NZ%DIR(00049) Type=1.2 Nibs=5 Dist=02EFF
hENTER =  F1F34 SC%ENT         - F0726 NZ%DIR(00071) Type=1.2 Nibs=5 Dist=0180E
hEXCPT =  F2B0A SC%ENT         - F07B8 NZ%DIR(00103) Type=1.2 Nibs=5 Dist=02352
hFINDF =  F5153 NZ%HND         - F073F NZ%DIR(0008A) Type=1.2 Nibs=5 Dist=04A14
hFPROT =  F5E03 NZ%HND         - F0703 NZ%DIR(0004E) Type=1.2 Nibs=5 Dist=05700
hKYDF  =  F2B98 SC%ENT         - F0753 NZ%DIR(0009E) Type=1.2 Nibs=5 Dist=02445
hPRTCL =  F5438 NZ%HND         - F0712 NZ%DIR(0005D) Type=1.2 Nibs=5 Dist=04D26
hPURGE =  F5CBD NZ%HND         - F071C NZ%DIR(00067) Type=1.2 Nibs=5 Dist=055A1
hRDCBF =  F52C4 NZ%HND         - F0744 NZ%DIR(0008F) Type=1.2 Nibs=5 Dist=04B80
hRDNBF =  F532F NZ%HND         - F0749 NZ%DIR(00094) Type=1.2 Nibs=5 Dist=04BE6
hRENAM =  F5D6E NZ%HND         - F0721 NZ%DIR(0006C) Type=1.2 Nibs=5 Dist=0564D
hVER$  =  F511B NZ%HND         - F06CC NZ%DIR(00017) Type=1.2 Nibs=5 Dist=04A4F
hWRCBF =  F5313 NZ%HND         - F074E NZ%DIR(00099) Type=1.2 Nibs=5 Dist=04BC5
hZERPG =  F2ADD SC%ENT         - F07BD NZ%DIR(00108) Type=1.2 Nibs=5 Dist=02320
hs3BYT =  00007 NZ%SYM         -
hsAWKE =  00002 NZ%SYM         -
hsERRO =  00004 NZ%SYM         -
hsLPRQ =  00005 NZ%SYM         - F1E53 NZ%BAS(00EB9) Type=0.0 Nibs=1
hsMANL =  00006 NZ%SYM         -
hsMGAV =  00000 NZ%SYM         -
hsNRD  =  00001 NZ%SYM         -
hsRQSR =  00003 NZ%SYM         - F2BC3 SC%ENT(00C8F) Type=0.0 Nibs=1
                               + F3154 NZ%BIF(0027D) Type=0.0 Nibs=1

i/OFND =  F410E NZ%BUT         - F0946 NZ%GPR(00184) Type=1.1 Nibs=4 Dist=037C8
                               + F17DA NZ%BAS(00840) Type=1.1 Nibs=4 Dist=02934
                               + F4BFE NZ%CAS(0096B) Type=1.1 Nibs=4 Dist=00AF0
                               + F53D1 NZ%HND(002B6) Type=1.1 Nibs=4 Dist=012C3
                               + F5D32 NZ%HND(00C17) Type=1.1 Nibs=4 Dist=01C24

k#-CHR =  00068 TI%R6S         -
k#-LIN =  0006B TI%R6S         -
k#1    =  00027 TI%R6S         -
k#2    =  00028 TI%R6S         -
k#3    =  00029 TI%R6S         -
k#ATTN =  0002B TI%R6S         -
k#BKSP =  00067 TI%R6S         -
k#BOT  =  000A3 TI%R6S         - F5FD6 NZ%CAT(00145) Type=0.0 Nibs=2
k#CALC =  0006F TI%R6S         -
k#CONT =  00070 TI%R6S         -
k#CTRL =  0009E TI%R6S         -
k#DOWN =  00033 TI%R6S         - F5FCC NZ%CAT(0013B) Type=0.0 Nibs=2
k#EOL  =  00026 TI%R6S         -
k#FLFT =  0009F TI%R6S         -
k#FRT  =  000A0 TI%R6S         -
k#GON  =  0009B TI%R6S         -
k#I/R  =  00069 TI%R6S         -
k#LAST =  000A4 TI%R6S         -
k#LC   =  0006A TI%R6S         -
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k#LERR =  000A1 TIXR6S          -
k#LFT  =  0002F TIXR6S          -
k#OFF  =  00063 TIXR6S          -
k#RT   =  00030 TIXR6S          -
k#RUN  =  0002E TIXR6S          -
k#SST  =  00066 TIXR6S          -
k#TOP  =  000A2 TIXR6S          - F5FDB NZXCAT(0014A) Type=0.0 Nibs=2
k#UP   =  00032 TIXR6S          - F5FD1 NZXCAT(00140) Type=0.0 Nibs=2
k#USER =  0006D TIXR6S          -
k#USEX =  000A5 TIXR6S          -
k#VIEW =  0006E TIXR6S          -
kc-CHR =  00000 TIXR6S          -
kc-LIN =  00004 TIXR6S          -
kcATTN =  0000E TIXR6S          -
kcBKSP =  00007 TIXR6S          -
kcBOT  =  00015 TIXR6S          -
kcCALC =  00017 TIXR6S          -
kcCONT =  00010 TIXR6S          -
kcCTRL =  0000A TIXR6S          -
kcDOWN =  00013 TIXR6S          -
kcEOL  =  0000D TIXR6S          -
kcFLFT =  00005 TIXR6S          -
kcFRT  =  00006 TIXR6S          -
kcGON  =  00016 TIXR6S          -
kcI/R  =  00002 TIXR6S          -
kcLAST =  00019 TIXR6S          -
kcLC   =  00001 TIXR6S          -
kcLERR =  0001A TIXR6S          -
kcLFT  =  00008 TIXR6S          -
kcOFF  =  00018 TIXR6S          -
kcRT   =  00009 TIXR6S          -
kcRUN  =  0000F TIXR6S          -
kcSST  =  00011 TIXR6S          -
kcTOP  =  00014 TIXR6S          -
kcUP   =  00012 TIXR6S          -
kcUSER =  00003 TIXR6S          -
kcUSEX =  0000C TIXR6S          -
kcVIEW =  0000B TIXR6S          -

lACCSb =  00001 TIXR6S          -
lAp    =  00010 TIXR6S          -
lBPOSp =  00005 TIXR6S          -
lCOPYb =  00001 TIXR6S          -
lCPOSb =  00006 TIXR6S          -
lD0p   =  00005 TIXR6S          -
lD1p   =  00005 TIXR6S          -
lDATEh =  00006 TIXR6S          -
lDBEGb =  0000B TIXR6S          -
lDEVC  =  00005 TIXR6S          - F426D NZXBUT(00676) Type=0.0 Nibs=1 Offset=       3
                                + F4278 NZXBUT(00681) Type=0.0 Nibs=1 Offset=       3
lDEVCb =  00001 TIXR6S          -
lDLENb =  00006 TIXR6S          -
lDp    =  00010 TIXR6S          -
lEOL   =  00002 TIXR6S          -
lFBEGb =  00006 TIXR6S          -
lFBF#b =  00003 TIXR6S          -
lFIB   =  0003F TIXR6S          -
lFIL#b =  00002 TIXR6S          -
lFILSV =  00032 TIXR6S          -
lFLAGh    00002 TIXR6S          -
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lFLENh =  00005 TI%R6S          - F5665 NZ%HND(0054A) Type=0.0 Nibs=1
                                + F56A1 NZ%HND(00586) Type=0.0 Nibs=1
                                + F574B NZ%HND(00630) Type=0.0 Nibs=1 Offset=     -1
                                + F5758 NZ%HND(0063D) Type=0.0 Nibs=1 Offset=     -1
                                + F575B NZ%HND(00640) Type=0.0 Nibs=1 Offset=      8
                                + F58B4 NZ%HND(00799) Type=0.0 Nibs=2
                                + F59E3 NZ%HND(008C8) Type=0.0 Nibs=1
                                + F64AA NZ%CAT(00619) Type=0.0 Nibs=2
lFNAM+ =  00004 TI%R6S          -
lFNAM8 =  00010 TI%R6S          -
lFNAMh =  00010 TI%R6S          -
lFSIZb =  00006 TI%R6S          -
lFTYPb =  00004 TI%R6S          -
lFTYPh =  00004 TI%R6S          -
lLXADR =  00005 TI%R6S          -
lLXENT =  00008 TI%R6S          -
lLXFAD =  00005 TI%R6S          -
lLXID  =  00002 TI%R6S          -
lLXTKR =  00004 TI%R6S          -
lMSGp  =  00004 TI%R6S          -
lPOLMp =  00005 TI%R6S          -
lPOLLp =  00005 TI%R6S          -
lPOLSV =  0003E TI%R6S          - F4264 NZ%BUT(0066D) Type=0.0 Nibs=2
lPOLra =  00006 TI%R6S          -
lPROTb =  00001 TI%R6S          -
lREC#b =  00004 TI%R6S          -
lRECLb =  00004 TI%R6S          -
lRLENb =  00005 TI%R6S          -
lRTN1p =  00005 TI%R6S          -
lRTN2p =  00005 TI%R6S          -
lRTN3p =  00005 TI%R6S          -
lSHLNb =  00002 TI%R6S          -
lSPDTB =  0004E TI%R6S          -
lSPDn  =  00001 TI%R6S          -
lSPDn2 =  00001 TI%R6S          -
lTEXTp =  00004 TI%R6S          -
lTIMEh =  00004 TI%R6S          -

mADDRL =  05000 NZ%SYM          - F0CF3 NZ%GPR(00531) Type=0.0 Nibs=4
mADDRM =  02000 NZ%SYM          - F0D28 NZ%GPR(00566) Type=0.0 Nibs=4 Offset=      4
                                + F0D39 NZ%GPR(00577) Type=0.0 Nibs=4 Offset=      2
mADDRT =  04000 NZ%SYM          - F0D46 NZ%GPR(00584) Type=0.0 Nibs=4
mAUTO  =  00009 NZ%SYM          -
mAUTOA =  00070 NZ%SYM          - F0934 NZ%GPR(00172) Type=0.0 Nibs=2 Offset=      1
                                + F0952 NZ%GPR(00190) Type=0.0 Nibs=2
mAUTOE =  00007 NZ%SYM          -
mAUTOS =  00071 NZ%SYM          -
mCLRBF =  000F8 NZ%SYM          -
mCLRCA =  00F00 NZ%SYM          - F2AA8 SC%ENT(00B74) Type=0.0 Nibs=4
mCMD2  =  00014 NZ%SYM          -
mCMD3  =  00140 NZ%SYM          - F6BC2 NZ%IOR(004F0) Type=0.0 Nibs=3 Offset=     10
                                + F6BD1 NZ%IOR(004FF) Type=0.0 Nibs=3 Offset=     12
mCMDf  =  01400 NZ%SYM          - F1648 NZ%BAS(006AE) Type=0.0 Nibs=4
mCSRQ  =  00004 NZ%SYM          -
mDATA2 =  00010 NZ%SYM          -
mDATAf =  01000 NZ%SYM          -
mEAR   =  01418 NZ%SYM          -
mENDM  =  00003 NZ%SYM          - F4E5F NZ%CAS(00BCC) Type=0.0 Nibs=2
mENDf  =  01200 NZ%SYM          - F4EE1 NZ%CAS(00C4E) Type=0.0 Nibs=4
                                + F50DB NZ%CAS(00E48) Type=0.0 Nibs=4
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mERSTS =  00006 NZXSYM        - F682A NZXIOR(00158) Type=0.0 Nibs=2
mETE   =  01541 NZXSYM        -
mETO   =  01540 NZXSYM        -
mFIND1 =  00006 NZXSYM        - F09CD NZXGPR(0020B) Type=0.0 Nibs=1
mFINDD =  06000 NZXSYM        - F0B11 NZXGPR(0034F) Type=0.0 Nibs=4 Offset=      16
mFRAME =  01000 NZXSYM        -
mGETCA =  0000C NZXSYM        - F0A9A NZXGPR(002D8) Type=0.0 Nibs=2
mIDYf  =  01600 NZXSYM        -
mIFC   =  01490 NZXSYM        -
mINCCA =  00000 NZXSYM        - F0AC2 NZXGPR(00300) Type=0.0 Nibs=2
mMADDR =  0000E NZXSYM        -
mMANUL =  00008 NZXSYM        -
mNOP   =  00000 NZXSYM        -
mPDLOP =  00030 NZXSYM        - F307B NZXBIF(001A4) Type=0.0 Nibs=2
mPULOP =  000FE NZXSYM        - F08BD NZXGPR(000FB) Type=0.0 Nibs=2
mRDADR =  00001 NZXSYM        -
mRDYf  =  01500 NZXSYM        -
mREADC =  000FC NZXSYM        - F1DA2 NZXBAS(00E08) Type=0.0 Nibs=2
mREADI =  000FB NZXSYM        - F1D4F NZXBAS(00DB5) Type=0.0 Nibs=2
mRSTCA =  0000B NZXSYM        - F0A37 NZXGPR(00275) Type=0.0 Nibs=2
mRdMem =  00000 NZXSYM        -
mSAI   =  00000 NZXSYM        - F0C9F NZXGPR(004DD) Type=0.0 Nibs=6 Offset=       2
mSCOPE =  00801 NZXSYM        -
mSDA   =  00000 NZXSYM        - F0B72 NZXGPR(003B0) Type=0.0 Nibs=6 Offset=       8
                              + F4363 NZXCAS(000D0) Type=0.0 Nibs=6 Offset=       2
                              + F449F NZXCAS(0020C) Type=0.0 Nibs=6 Offset=      12
                              + F45BA NZXCAS(00327) Type=0.0 Nibs=6 Offset=     256
                              + F4769 NZXCAS(004D6) Type=0.0 Nibs=6 Offset=      32
                              + F48BE NZXCAS(0062B) Type=0.0 Nibs=6 Offset=      32
                              + F48EC NZXCAS(00659) Type=0.0 Nibs=6 Offset=      24
                              + F496A NZXCAS(006D7) Type=0.0 Nibs=6 Offset=      12
                              + F4B3E NZXCAS(008AB) Type=0.0 Nibs=6 Offset=      32
mSDA@5 =  00008 NZXSYM        - F5C19 NZXHND(00AFE) Type=0.0 Nibs=1
mSDI   =  00000 NZXSYM        - F68AD NZXIOR(001D8) Type=0.0 Nibs=6 Offset=       8
mSETAI =  30321 NZXSYM        - F3217 NZXBIF(00340) Type=0.0 Nibs=6
mSETA1 =  30120 NZXSYM        - F3208 NZXBIF(00331) Type=0.0 Nibs=6
mSETCA =  00F01 NZXSYM        - F2AC5 SCXENT(00B91) Type=0.0 Nibs=4
mSETDI =  30011 NZXSYM        - F324B NZXBIF(00374) Type=0.0 Nibs=6
mSETDR =  30000 NZXSYM        -
mSETD1 =  30610 NZXSYM        - F3226 NZXBIF(0034F) Type=0.0 Nibs=6
mSETFC =  00000 NZXSYM        - F2CBC NZXUTL(00026) Type=0.0 Nibs=6 Offset=1048575
mSETIC =  0F600 NZXSYM        - F1762 NZXBAS(007C8) Type=0.0 Nibs=4
mSETIM =  0FA00 NZXSYM        - F29E5 SCXENT(00AB1) Type=0.0 Nibs=4
                              + F2A5E SCXENT(00B2A) Type=0.0 Nibs=4
mSETIT =  0F700 NZXSYM        - F31F9 NZXBIF(00322) Type=0.0 Nibs=4 Offset=      50
mSETST =  30041 NZXSYM        - F2935 SCXENT(00A01) Type=0.0 Nibs=2
mSETS1 =  30140 NZXSYM        - F2923 SCXENT(009EF) Type=0.0 Nibs=6
mSETTC =  0F500 NZXSYM        - F251B SCXENT(005E7) Type=0.0 Nibs=4
mSETTM =  0F400 NZXSYM        - F237C SCXENT(00448) Type=0.0 Nibs=4 Offset=      12
                              + F24D2 SCXENT(0059E) Type=0.0 Nibs=4
                              + F24DC SCXENT(005A8) Type=0.0 Nibs=4 Offset=       8
                              + F250E SCXENT(005DA) Type=0.0 Nibs=4 Offset=       1
mSETTO =  00000 NZXSYM        -
mSFC@5 =  0000E NZXSYM        - F24F6 SCXENT(005C2) Type=0.0 Nibs=1
                              + F5C25 NZXHND(00B0A) Type=0.0 Nibs=1
mSPDIS =  0FF00 NZXSYM        -
mSPEN  =  0FF01 NZXSYM        -
mSPTO  =  0F900 NZXSYM        -
mSSRQ  =  00005 NZXSYM        -
mSST   =  00000 NZXSYM        - F1BB8 NZXBAS(00C1E) Type=0.0 Nibs=6 Offset=       8
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                              + F429E NZ%CAS(0000B) Type=0.0 Nibs=6 Offset=      1
nSTATS =  00002 NZ%SYM        - F6820 NZ%IOR(0014E) Type=0.0 Nibs=2
nSTO@5 =  0000D NZ%SYM        - F1774 NZ%BAS(007DA) Type=0.0 Nibs=1
nSTS@4 =  000F3 NZ%SYM        - F293B SC%ENT(00A07) Type=0.0 Nibs=2
nSTSTC =  00201 NZ%SYM        - F3169 NZ%BIF(00292) Type=0.0 Nibs=4
nTAKEC =  00F03 NZ%SYM        -
nTAKEI =  F0390 NZ%SYM        - F08D1 NZ%GPR(0010F) Type=0.0 Nibs=6
nTAKEO =  F0310 NZ%SYM        -
nTCT   =  00000 NZ%SYM        -
nTCT@4 =  000C0 NZ%SYM        - F2A3B SC%ENT(00B07) Type=0.0 Nibs=2
nTEST  =  000F2 NZ%SYM        -
nUNADM =  02010 NZ%SYM        -
nUNL   =  0143F NZ%SYM        - F0D04 NZ%GPR(00542) Type=0.0 Nibs=4
nUNT   =  0145F NZ%SYM        - F24EA SC%ENT(005B6) Type=0.0 Nibs=4
nUPDSC =  00A00 NZ%SYM        -
nWrMen =  10000 NZ%SYM        -
naddrL =  00002 NZ%SYM        -
naddrT =  00004 NZ%SYM        -

nXTSTM =  F1780 NZ%BAS        - F0851 NZ%GPR(0008F) Type=1.0 Nibs=4 Dist=00F2F
                              + F1F8A SC%ENT(00056) Type=1.0 Nibs=4 Dist=0080A
                              + F6E0F NZ%LOW(000B9) Type=1.0 Nibs=4 Dist=0568F

o41sod =  00005 TI%R6S        - F573C NZ%HND(00621) Type=0.0 Nibs=1
oACCSb =  0000B TI%R6S        - F5308 NZ%HND(001ED) Type=0.0 Nibs=1 Offset=     -1
                              + F53B0 NZ%HND(002A2) Type=0.0 Nibs=1 Offset=     -1
oAp    =  0003E TI%R6S        -
oBNsod =  00011 TI%R6S        -
oBPOSp =  00005 TI%R6S        -
oBSsod =  00011 TI%R6S        -
oCOPYb =  0000A TI%R6S        -
oCPOSb =  00028 TI%R6S        -
oD0p   =  00019 TI%R6S        -
oD1p   =  0001E TI%R6S        -
oDATEh =  0001A TI%R6S        -
oDAsod =  0000D TI%R6S        - F59DC NZ%HND(008C1) Type=0.0 Nibs=1 Offset=     -5
                              + F5A6B NZ%HND(00950) Type=0.0 Nibs=1 Offset=     -5
oDBEGb =  00015 TI%R6S        -
oDEVCb =  0000C TI%R6S        - F539A NZ%HND(0027F) Type=0.0 Nibs=1 Offset=     -1
oDLENb =  0002E TI%R6S        -
oDp    =  0002E TI%R6S        -
oFBEGb =  0000D TI%R6S        - F5D45 NZ%HND(00C2A) Type=0.0 Nibs=1 Offset=     -1
oFBFNb =  00002 TI%R6S        -
oFILNb =  00000 TI%R6S        -
oFLAGh =  00014 TI%R6S        - F5640 NZ%HND(00525) Type=0.0 Nibs=1 Offset=     -1
                              + F59AE NZ%HND(00893) Type=0.0 Nibs=2
oFLENh =  00020 TI%R6S        - F56EE NZ%HND(005D3) Type=0.0 Nibs=2 Offset=     17
oFLSTr =  00031 TI%R6S        -
oFNAMh =  00000 TI%R6S        -
oFSIZb =  00039 TI%R6S        -
oFT-FL =  00010 TI%R6S        -
oFTYPb =  00005 TI%R6S        -
oFTYPh =  00010 TI%R6S        - F563D NZ%HND(00522) Type=0.0 Nibs=1 Offset=     -1
                              + F5BEC NZ%HND(00AD1) Type=0.0 Nibs=2
oIMPLh =  00025 TI%R6S        - F5A35 NZ%HND(0091A) Type=0.0 Nibs=2
oINHS  =  00008 NZ%IOR        - F31D3 NZ%BIF(002FC) Type=0.0 Nibs=1 Offset=     -1
                              + F31D9 NZ%BIF(00302) Type=0.0 Nibs=1 Offset=     -1
oINST  =  00009 NZ%IOR        -
oKYsod =  00005 TI%R6S        -
oLXsod =  00005 TI%R6S        -
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oMAINT =  0005D TIXR6S      -
oMSGPT =  00009 TIXR6S      -
oOUTHS =  00007 NZZIOR      - F31E0 NZZBIF(00309) Type=0.0 Nibs=1 Offset=      -1
                            + F31E7 NZZBIF(00310) Type=0.0 Nibs=1 Offset=      -1
oOUTST =  00006 NZZIOR      -
oPOLNp =  0000A TIXR6S      -
oPROTb =  00009 TIXR6S      -
oRECNb =  00020 TIXR6S      -
oRECLb =  00024 TIXR6S      -
oRLENb =  00034 TIXR6S      -
oRTN1p =  0000A TIXR6S      -
oRTN2p =  0000F TIXR6S      -
oRTN3p =  00014 TIXR6S      -
oSHLNb =  00013 TIXR6S      -
oSPDTB =  00111 TIXR6S      -
oSPDn2 =  0000E TIXR6S      -
oSUBLn =  00025 TIXR6S      -
oTIMEh =  00016 TIXR6S      -
oTXsod =  00005 TIXR6S      -
oUT1TK =  F7ABE NZZPAR      - F7D68 NZZDEC(00195) Type=1.1 Nibs=3 Dist=002AA
                            + F7E32 NZZDEC(0025F) Type=1.1 Nibs=3 Dist=00374
oUT2TC =  F7AC5 NZZPAR      - F7CFB NZZDEC(00128) Type=1.0 Nibs=3 Dist=00236
oUT3TK =  F7ACF NZZPAR      -
oUTNBS =  F7AD9 NZZPAR      -

p3DATA =  0000F NZZSYM      - F07CD NZZGPR(0000B) Type=0.0 Nibs=1
pACK   =  00000 NZZSYM      - F0815 NZZGPR(00053) Type=0.0 Nibs=1
                            + F2A48 SCZENT(00B14) Type=0.0 Nibs=1
pADDR  =  00004 NZZSYM      - F07EF NZZGPR(0002D) Type=0.0 Nibs=1
                            + F096A NZZGPR(001A8) Type=0.0 Nibs=1
                            + F09D7 NZZGPR(00215) Type=0.0 Nibs=1
                            + F0AA5 NZZGPR(002E3) Type=0.0 Nibs=1
                            + F0ACD NZZGPR(0030B) Type=0.0 Nibs=1
                            + F0B29 NZZGPR(00367) Type=0.0 Nibs=1
pBSCen =  000F5 TIXR6S      -
pBSCex =  000F6 TIXR6S      -
pCALRS =  00036 TIXR6S      -
pCALSV =  00037 TIXR6S      -
pCAT   =  00006 TIXR6S      -
pCAT$  =  00007 TIXR6S      -
pCLDST =  000FF TIXR6S      -
pCMD   =  0000C NZZSYM      -
pCMPLX =  00038 TIXR6S      -
pCONFG =  000FB TIXR6S      -
pCOPYx =  00008 TIXR6S      -
pCRDAB =  00033 TIXR6S      -
pCREAT =  00009 TIXR6S      -
pCRT=8 =  00023 TIXR6S      -
pCURSR =  00029 TIXR6S      -
pDATA  =  0000B NZZSYM      - F07E6 NZZGPR(00024) Type=0.0 Nibs=1
                            + F0CB4 NZZGPR(004F2) Type=0.0 Nibs=1
                            + F686C NZZIOR(0019A) Type=0.0 Nibs=1
pDATLN =  0002A TIXR6S      -
pDEVCp =  00001 TIXR6S      -
pDIAGL =  00003 NZZSYM      - F1D5F NZZBAS(00DC5) Type=0.0 Nibs=1
pDIAGR =  00002 NZZSYM      -
pDIDST =  0000A TIXR6S      -
pDSWKY =  000FD TIXR6S      -
pDSWNK =  000FE TIXR6S      -
pEDIT  =  0002B TIXR6S      -
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pENTER =  00012 TI%R6S         -
pEOFIL =  00025 TI%R6S         -
pEOT   =  00006 NZ%SYM         - F0827 NZ%GPR(00065) Type=0.0 Nibs=1
                               + F0CCC NZ%GPR(0050A) Type=0.0 Nibs=1
                               + F2417 SC%ENT(004E3) Type=0.0 Nibs=1
                               + F44EF NZ%CAS(0025C) Type=0.0 Nibs=1
                               + F5B89 NZ%HND(00A9E) Type=0.0 Nibs=1
                               + F6723 NZ%IOR(00051) Type=0.0 Nibs=1
                               + F6889 NZ%IOR(00187) Type=0.0 Nibs=1
                               + F695B NZ%IOR(00289) Type=0.0 Nibs=1
pERROR =  000F2 TI%R6S         -
pETE   =  00009 NZ%SYM         - F081E NZ%GPR(0005C) Type=0.0 Nibs=1
pExcpt =  000F8 TI%R6S         -
pFASCH =  0002C TI%R6S         -
pFILDC =  00002 TI%R6S         -
pFILXQ =  00003 TI%R6S         -
pFINDF =  00017 TI%R6S         -
pFNIN  =  0003D TI%R6S         -
pFNOUT =  0003E TI%R6S         -
pFPROT =  0000B TI%R6S         -
pFSPCp =  00004 TI%R6S         -
pFSPCx =  00005 TI%R6S         -
pFTYPE =  0002D TI%R6S         -
pHALTD =  00007 NZ%SYM         - F0830 NZ%GPR(0006E) Type=0.0 Nibs=1
pIDY   =  0000E NZ%SYM         -
pIFC   =  00005 NZ%SYM         - F0839 NZ%GPR(00077) Type=0.0 Nibs=1
pIMCHR =  0001E TI%R6S         -
pIMXCH =  0001F TI%R6S         -
pIMXQT =  0001D TI%R6S         -
pIMbck =  00020 TI%R6S         -
pIMcpi =  00021 TI%R6S         -
pIMcpw =  00022 TI%R6S         -
pKYDF  =  0001B TI%R6S         -
pLIST  =  0000C TI%R6S         -
pLIST2 =  0002E TI%R6S         -
pMEM   =  000F1 TI%R6S         -
pMERGE =  0000D TI%R6S         -
pMNLP  =  000FA TI%R6S         -
pMRGE2 =  0002F TI%R6S         -
pPARSE =  000F4 TI%R6S         -
pPRGPR =  00032 TI%R6S         -
pPRINW =  00026 TI%R6S         -
pPRTCL =  0000E TI%R6S         -
pPRTIS =  0000F TI%R6S         -
pPURGE =  00010 TI%R6S         -
pPWROF =  000FC TI%R6S         -
pRCRD  =  00034 TI%R6S         -
pRDCBF =  00018 TI%R6S         -
pRDNBF =  00019 TI%R6S         -
pRDY   =  0000D NZ%SYM         -
pREADN =  00027 TI%R6S         -
pREN   =  00039 TI%R6S         -
pRNAME =  00011 TI%R6S         -
pRTNTp =  0003A TI%R6S         -
pRUNft =  00030 TI%R6S         -
pRUNnB =  00031 TI%R6S         -
pSRECN =  00028 TI%R6S         -
pSREQ  =  000F9 TI%R6S         -
pSTATE =  00001 NZ%SYM         - F08C8 NZ%GPR(00106) Type=0.0 Nibs=1
                               + F0AD5 NZ%GPR(00313) Type=0.0 Nibs=1
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                                   + F0CD1 NZZGPR(0050F) Type=0.0 Nibs=1
                                   + F244F SCZENT(0051B) Type=0.0 Nibs=1
                                   + F671B NZZIOR(00049) Type=0.0 Nibs=1
                                   + F6842 NZZIOR(00170) Type=0.0 Nibs=1
                                   + F6956 NZZIOR(00284) Type=0.0 Nibs=1
pTERM  =  00008 NZZSYM             - F0842 NZZGPR(00080) Type=0.0 Nibs=1
                                   + F2425 SCZENT(004F1) Type=0.0 Nibs=1
                                   + F5BB4 NZZHND(00A99) Type=0.0 Nibs=1
                                   + F6728 NZZIOR(00056) Type=0.0 Nibs=1
pTEST  =  000F0 TIZR6S             -
pTIMRW =  0003B TIZR6S             -
pTRANS =  000EF TIZR6S             -
pTRFMx =  0003C TIZR6S             -
pUTYPE =  0000A NZZSYM             - F0848 NZZGPR(00086) Type=0.0 Nibs=1
pVER$  =  00000 TIZR6S             -
pWARN  =  000F3 TIZR6S             -
pWCRD  =  00035 TIZR6S             -
pWCRD8 =  00024 TIZR6S             -
pWRCBF =  0001A TIZR6S             -
pWTKY  =  0001C TIZR6S             -
pZERPG =  000F7 TIZR6S             -

rEV$   =  F61B2 NZZCAT             - F200B SCZENT(000D7) Type=1.1 Nibs=4 Dist=041A7
                                   + F20C7 SCZENT(00193) Type=1.1 Nibs=4 Dist=040EB

s3BYTE =  00003 NZZSYM             -
sARITH =  00007 TIZR6S             -
sBYEx  =  00000 TIZR6S             -
sC/P   =  00001 TIZR6S             -
sCARD  =  00002 TIZR6S             - F54C5 NZZHND(003AA) Type=0.0 Nibs=1
sCARDC =  00008 TIZR6S             -
sCHAIN =  0000B TIZR6S             -
sCONT  =  0000A TIZR6S             -
sCONTK =  00009 TIZR6S             -
sCONTR =  00000 NZZSYM             - F0C4C NZZGPR(0048A) Type=0.0 Nibs=1
                                   + F3074 NZZBIF(0019D) Type=0.0 Nibs=1
sCURBT =  00003 TIZR6S             -
sCURUD =  00004 TIZR6S             -
sCURUP =  00002 TIZR6S             -
sCntg  =  00002 TIZR6S             -
sCplxP =  00007 TIZR6S             -
sDATAO =  00009 NZZSYM             -
sDATAV =  00008 NZZSYM             - F2BD2 SCZENT(00C9E) Type=0.0 Nibs=1
                                   + F3194 NZZBIF(002BD) Type=0.0 Nibs=1
sDEST  =  00003 TIZR6S             - F4273 NZZBUT(0067C) Type=0.0 Nibs=1
                                   + F5A04 NZZHND(008E9) Type=0.0 Nibs=1
                                   + F5C58 NZZHND(00B3D) Type=0.0 Nibs=1
                                   + F5DAB NZZHND(00C90) Type=0.0 Nibs=1
                                   + F5DEF NZZHND(00CD4) Type=0.0 Nibs=1
sDevOK =  00008 NZZSYM             - F35E8 NZZBIF(00711) Type=0.0 Nibs=1
                                   + F6E8B NZZFXQ(00072) Type=0.0 Nibs=1
                                   + F6EC2 NZZFXQ(000A9) Type=0.0 Nibs=1
sENDx  =  00001 TIZR6S             -
sEOF   =  00007 TIZR6S             -
sERROR =  00000 NZZSYM             - F6792 NZZIOR(000C0) Type=0.0 Nibs=1
                                   + F6AFC NZZIOR(0042A) Type=0.0 Nibs=1
sEXTDV =  00000 TIZR6S             - F54BA NZZHND(0039F) Type=0.0 Nibs=1
sEXTGS =  00005 TIZR6S             - F2B88 SCZENT(00C54) Type=0.0 Nibs=1
sFLAG? =  F0989 NZZGPR             - F230D SCZENT(00309) Type=1.1 Nibs=4 Dist=01984
                                   + F3051 NZZBIF(0017A) Type=1.1 Nibs=4 Dist=026C8
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                                  + F31A2 NZ%BIF(002CB) Type=1.1 Nibs=4 Dist=02819
sFOUND =  0000A TI%R6S            -
sFirst =  00000 NZ%SYM            - F742D NZ%FXQ(00614) Type=0.0 Nibs=1
                                  + F744D NZ%FXQ(00634) Type=0.0 Nibs=1
                                  + F7459 NZ%FXQ(00640) Type=0.0 Nibs=1
                                  + F747D NZ%FXQ(00664) Type=0.0 Nibs=1
sGOSUB =  00003 TI%R6S            -
sI/OBF =  0000A TI%R6S            -
sINFRD =  0000A TI%R6S            -
sINTR  =  00004 NZ%SYM            - F2B1F SC%ENT(00BEB) Type=0.0 Nibs=1
                                  + F3189 NZ%BIF(002B2) Type=0.0 Nibs=1
sINX   =  00005 TI%R6S            -
sIRAM  =  00002 TI%R6S            -
sIX    =  00007 TI%R6S            -
sInit  =  00003 TI%R6S            -
sKEYS  =  00005 TI%R6S            -
sLISTR =  00001 NZ%SYM            -
sLOCKD =  0000B NZ%SYM            -
sLoop? =  00005 NZ%SYM            - F4736 NZ%CAS(004A3) Type=0.0 Nibs=1
                                  + F473D NZ%CAS(004AA) Type=0.0 Nibs=1
                                  + F475D NZ%CAS(004CA) Type=0.0 Nibs=1
                                  + F47B5 NZ%CAS(00522) Type=0.0 Nibs=1
                                  + F47C9 NZ%CAS(00536) Type=0.0 Nibs=1
                                  + F5A12 NZ%HND(008F7) Type=0.0 Nibs=1
                                  + F5AB8 NZ%HND(0099D) Type=0.0 Nibs=1
                                  + F5B77 NZ%HND(00A5C) Type=0.0 Nibs=1
sMAINc =  00005 TI%R6S            -
sMANUL =  00002 NZ%SYM            - F0C2C NZ%GPR(0046A) Type=0.0 Nibs=1
sMBXsr =  00001 NZ%SYM            - F2F77 NZ%BIF(000A0) Type=0.0 Nibs=1
                                  + F3128 NZ%BIF(00251) Type=0.0 Nibs=1
sMULT  =  00008 TI%R6S            -
sNAPRS =  F52F5 NZ%HND            - F360B NZ%BIF(00734) Type=1.1 Nibs=4 Dist=01CEA
sNEGRD =  0000B TI%R6S            -
sNoChn =  00002 TI%R6S            -
sONERR =  00004 TI%R6S            -
sONTMR =  00006 TI%R6S            -
sOVERW =  00008 NZ%SYM            - F4B88 NZ%CAS(00925) Type=0.0 Nibs=1
                                  + F52B8 NZ%HND(0019D) Type=0.0 Nibs=1
                                  + F55BA NZ%HND(0049F) Type=0.0 Nibs=1
                                  + F5775 NZ%HND(0065A) Type=0.0 Nibs=1
sPCRD  =  00008 TI%R6S            -
sPOLLE =  00006 NZ%SYM            -
sPRGCF =  0000B TI%R6S            -
sPRIVT =  0000B NZ%SYM            - F5E2A NZ%HND(00D0F) Type=0.0 Nibs=1
sRAD   =  00009 TI%R6S            -
sRDX   =  0000B TI%R6S            -
sREADI =  00004 TI%R6S            -
sRENAM =  00006 TI%R6S            -
sRENUM =  00008 TI%R6S            -
sRESTR =  0000A TI%R6S            -
sRETRN =  00000 TI%R6S            -
sRFILE =  00008 TI%R6S            -
sRMOTE =  0000A NZ%SYM            - F3199 NZ%BIF(002C2) Type=0.0 Nibs=1
sRUNBn =  00004 TI%R6S            -
sRUNDC =  00007 TI%R6S            -
sReadd =  00004 NZ%SYM            - F0885 NZ%GPR(000C3) Type=0.0 Nibs=1
                                  + F08B8 NZ%GPR(000F6) Type=0.0 Nibs=1
                                  + F08FA NZ%GPR(00138) Type=0.0 Nibs=1
                                  + F0929 NZ%GPR(00167) Type=0.0 Nibs=1
                                  + F19A9 NZ%BAS(00A0F) Type=0.0 Nibs=1
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                                     + F1A6B NZXBAS(00AD1) Type=0.0 Nibs=1
sSCNTR =  00003 NZXSYM               -
sSIGN  =  00009 TIXR6S               -
sSRQIN =  00001 NZXSYM               -
sSST   =  00002 TIXR6S               -
sSSTdc =  00001 TIXR6S               -
sSTAND =  00007 NZXSYM               -
sSTAT  =  00006 TIXR6S               -
sSTK   =  00007 NZXSYM               - F19D5 NZXBAS(00A3B) Type=0.0 Nibs=1
                                     + F1C8B NZXBAS(00CF1) Type=0.0 Nibs=1
                                     + F352E NZXBIF(00657) Type=0.0 Nibs=1
                                     + F3F1B NZXBUT(00324) Type=0.0 Nibs=1
                                     + F3F4A NZXBUT(00353) Type=0.0 Nibs=1
                                     + F3F64 NZXBUT(0036D) Type=0.0 Nibs=1
                                     + F3F94 NZXBUT(0039D) Type=0.0 Nibs=1
                                     + F3FC4 NZXBUT(003CD) Type=0.0 Nibs=1
                                     + F4007 NZXBUT(00410) Type=0.0 Nibs=1
                                     + F4044 NZXBUT(0044D) Type=0.0 Nibs=1
                                     + F6E24 NZXFXQ(0000B) Type=0.0 Nibs=1
                                     + F6EC5 NZXFXQ(000AC) Type=0.0 Nibs=1
                                     + F73EC NZXFXQ(00503) Type=0.0 Nibs=1
sSTOP  =  00005 TIXR6S               -
sSpecl =  00006 TIXR6S               -
sTALKA =  00002 NZXSYM               - F50D1 NZXCAS(00E3E) Type=0.0 Nibs=1
sUNCNF =  00005 NZXSYM               - F0901 NZXGPR(0013F) Type=0.0 Nibs=1
sUNDEF =  00001 TIXR6S               - F5508 NZXHND(003ED) Type=0.0 Nibs=1
sUNSEC =  0000A NZXSYM               - F5E3B NZXHND(00020) Type=0.0 Nibs=1
sXCPT  =  00004 TIXR6S               -
sXQT   =  00000 TIXR6S               -
sXWORD =  00009 TIXR6S               -

t'     =  000FC TIXR6S               -
tX     =  00085 TIXR6S               - F7318 NZXFXQ(004FF) Type=0.0 Nibs=2
                                     + F78D0 NZXPAR(003E0) Type=0.0 Nibs=2
                                     + F7DE3 NZXDEC(00210) Type=0.0 Nibs=2
t&     =  00089 TIXR6S               -
t^     =  00083 TIXR6S                 F7336 NZXFXQ(0051D) Type=0.0 Nibs=2
                                     + F76AD NZXPAR(001B0) Type=0.0 Nibs=2
                                     + F78BF NZXPAR(003C2) Type=0.0 Nibs=2
                                     + F7DB8 NZXDEC(001E5) Type=0.0 Nibs=2
t+     =  00087 TIXR6S               -
t-     =  00082 TIXR6S               -
t/     =  00084 TIXR6S               -
t@     =  000F4 TIXR6S               - F7561 NZXPAR(00064) Type=0.0 Nibs=2
tABS   =  000A2 TIXR6S               -
tACOS  =  0009A TIXR6S               -
tADD   =  00005 TIXR6S               -
tADIG0 =  00060 TIXR6S               -
tADIG1 =  00061 TIXR6S               -
tADIG2 =  00062 TIXR6S               -
tADIG3 =  00063 TIXR6S               -
tADIG4 =  00064 TIXR6S               -
tADIG5 =  00065 TIXR6S               -
tADIG6 =  00066 TIXR6S               -
tADIG7 =  00067 TIXR6S               -
tADIG8 =  00068 TIXR6S               -
tADIG9 =  00069 TIXR6S               -
tALL   =  000F8 TIXR6S               -
tAND   =  0008B TIXR6S               -
tANGLE =  [illegible] TIXR6S         -
```

```
tARRAY =  0007D TI&R6S     -
tASIN  =  00099 TI&R6S     -
tATAN  =  0009B TI&R6S     -
tAUTO  =  000EE TI&R6S     -
tBASE  =  000E9 TI&R6S     -
tBEEP  =  000E8 TI&R6S     -
tBIG   =  00010 TI&R6S     -
tCALL  =  000F9 TI&R6S     -
tCARD  =  000D0 TI&R6S     -
tCAT   =  000EC TI&R6S     -
tCEIL  =  00072 TI&R6S     -
tCFLAG =  000FA TI&R6S     -
tCHR$  =  000A4 TI&R6S     -
tCLOCK =  501EF TI&R6S     -
tCMPLX =  0007A TI&R6S     -
tCNTRL =  00023 NZ&TBL     - F7B7B NZ&PAR(0067E) Type=0.0 Nibs=2
tCOLON =  000E2 TI&R6S     - F2D56 NZ&UTL(000C0) Type=0.0 Nibs=2
                           + F3F23 NZ&BUT(0032C) Type=0.0 Nibs=2
                           + F726E NZ&FXQ(00455) Type=0.0 Nibs=2
                           + F72AA NZ&FXQ(00491) Type=0.0 Nibs=2
                           + F7892 NZ&PAR(00395) Type=0.0 Nibs=2
                           + F7BC6 NZ&PAR(006C9) Type=0.0 Nibs=2
                           + F7EE8 NZ&DEC(00315) Type=0.0 Nibs=2
tCOMMA =  000F1 TI&R6S     - F146B NZ&BAS(004D1) Type=0.0 Nibs=2
                           + F1598 NZ&BAS(005FE) Type=0.0 Nibs=2
                           + F1710 NZ&BAS(00776) Type=0.0 Nibs=2
                           + F2A03 SC&ENT(00ACF) Type=0.0 Nibs=2
                           + F2CF6 NZ&UTL(00060) Type=0.0 Nibs=2
                           + F2D4D NZ&UTL(000B7) Type=0.0 Nibs=2
                           + F6DD2 NZ&LOW(0007C) Type=0.0 Nibs=2
                           + F7614 NZ&PAR(00117) Type=0.0 Nibs=2
                           + F7832 NZ&PAR(00335) Type=0.0 Nibs=2
                           + F79D8 NZ&PAR(004DB) Type=0.0 Nibs=2
                           + F7D85 NZ&DEC(001B2) Type=0.0 Nibs=2
                           + F7EDD NZ&DEC(0030A) Type=0.0 Nibs=2
tCOPY  =  000B5 TI&R6S     -
tCOS   =  00097 TI&R6S     -
tCVAL  =  000E1 TI&R6S     -
tDATA  =  000C6 TI&R6S     -
tDATE  =  00077 TI&R6S     -
tDATE$ =  00078 TI&R6S     -
tDEF   =  000B9 TI&R6S     -
tDEG   =  0006F TI&R6S     -
tDEGRE =  000D3 TI&R6S     -
tDELAY =  000D6 TI&R6S     -
tDELET =  000B7 TI&R6S     -
tDIM   =  000CC TI&R6S     -
tDISP  =  000C5 TI&R6S     -
tDIV   =  00086 TI&R6S     -
tDMYAR =  0007E TI&R6S     -
tDSTRY =  000BE TI&R6S     -
tDVZ   =  000B1 TI&R6S     -
tEDIT  =  000B8 TI&R6S     -
tELSE  =  000F5 TI&R6S     -
tEND   =  000DA TI&R6S     -
tENDDF =  000BA TI&R6S     -
tENDSB =  000C2 TI&R6S     -
tENTER =  4FFEF TI&R6S     - F2570 SC&ENT(0063C) Type=0.0 Nibs=6
tEOL   =  000F0 TI&R6S     - F2B6A SC&ENT(00C36) Type=0.0 Nibs=2
tEPS   =  00071 TI&R6S     -
```

```
tERRL  =  00075 TIXR6S        -
tERRN  =  00076 TIXR6S        -
tERROR =  000E3 TIXR6S        -
tEXOR  =  0008C TIXR6S        -
tEXP   =  00094 TIXR6S        -
tEXTIF =  000F4 TIXR6S        -
tEXTND =  601EF TIXR6S        -
tFACT  =  000A8 TIXR6S        -
tFETCH =  000C8 TIXR6S        -
tFFN   =  000B4 TIXR6S        -
tFLOW  =  901EF TIXR6S        -
tFLT1  =  0001D TIXR6S        -
tFLT10 =  00014 TIXR6S        -
tFLT11 =  00013 TIXR6S        -
tFLT12 =  00012 TIXR6S        -
tFLT2  =  0001C TIXR6S        -
tFLT3  =  0001B TIXR6S        -
tFLT4  =  0001A TIXR6S        -
tFLT5  =  00019 TIXR6S        -
tFLT6  =  00018 TIXR6S        -
tFLT7  =  00017 TIXR6S        -
tFLT8  =  00016 TIXR6S        -
tFLT9  =  00015 TIXR6S        -
tFN    =  0007C TIXR6S        -
tFOR   =  000C3 TIXR6S        -
tFP    =  0006B TIXR6S        -
tGOSUB =  000DC TIXR6S        -
tGOTO  =  000D0 TIXR6S        -
tIF    =  000DF TIXR6S        -
tIMAGE =  000FF TIXR6S        -
tIN    =  000F2 TIXR6S        -
tINF   =  00070 TIXR6S        -
tINPUT =  000C9 TIXR6S        -
tINT   =  0009C TIXR6S        -
tINT10 =  00004 TIXR6S        -
tINT11 =  00003 TIXR6S        -
tINT12 =  00002 TIXR6S        -
tINT2  =  0000C TIXR6S        -
tINT3  =  0000B TIXR6S        -
tINT4  =  0000A TIXR6S        -
tINT5  =  00009 TIXR6S        -
tINT6  =  00008 TIXR6S        -
tINT7  =  00007 TIXR6S        -
tINT8  =  00006 TIXR6S        -
tINT9  =  00005 TIXR6S        -
tINTEG =  000CA TIXR6S        -
tINTO  =  E01EF TIXR6S        -
tINTR  =  015FF TIXR6S        -
tINTRR =  00026 NZXTBL        - F7650 NZXPAR(00153) Type=0.0 Nibs=2
                              + F7680 NZXPAR(00183) Type=0.0 Nibs=2
                              + F784F NZXPAR(00652) Type=0.0 Nibs=2
tINX   =  00082 TIXR6S        -
tIO    =  00024 NZXTBL        - F7663 NZXPAR(00166) Type=0.0 Nibs=2
tIP    =  0006A TIXR6S        -
tIS    =  000E7 TIXR6S        - F7503 NZXPAR(00006) Type=0.0 Nibs=2
tISUB$ =  000A7 TIXR6S        -
tIVL   =  000AE TIXR6S        -
tKEY   =  000E5 TIXR6S        -
tKEY$  =  00073 TIXR6S        -
tKEYS  =  000EF TIXR6S        -
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tLBLRF =  0000E TIZR6S        -
tLBLST =  000F6 TIZR6S        -
tLEN   =  000A9 TIZR6S        -
tLET   =  000C0 TIZR6S        -
tLINE# =  0000F TIZR6S        -
tLINPT =  000BF TIZR6S        -
tLIST  =  000BB TIZR6S        -
tLITRL =  000C4 TIZR6S        - F355E NZZBIF(00687) Type=0.0 Nibs=2
                              + F3F2F NZZBUT(00338) Type=0.0 Nibs=2
                              + F7281 NZZFXQ(00468) Type=0.0 Nibs=2
                              + F7866 NZZPAR(00369) Type=0.0 Nibs=2
                              + F797F NZZPAR(00482) Type=0.0 Nibs=2
                              + F7E19 NZZDEC(00246) Type=0.0 Nibs=2
tLN    =  00091 TIZR6S        -
tLOCKO =  00025 NZZTBL        - F1524 NZZBAS(0058A) Type=0.0 Nibs=2
                              + F75F6 NZZPAR(000F9) Type=0.0 Nibs=2
                              + F7C9B NZZDEC(000C8) Type=0.0 Nibs=2
tLOG   =  00090 TIZR6S        -
tLOG10 =  00093 TIZR6S        -
tLPRP  =  000AA TIZR6S        -
tLR    =  000B6 TIZR6S        -
tMAIN  =  000D2 TIZR6S        -
tMATH  =  601EF TIZR6S        -
tMAX   =  000AD TIZR6S        -
tMAXRL =  0006C TIZR6S        -
tMEAN  =  0009D TIZR6S        -
tMIN   =  000AC TIZR6S        -
tMOD   =  00074 TIZR6S        -
tNAME  =  000BD TIZR6S        -
tNEAR  =  C01EF TIZR6S        -
tNEG   =  D01EF TIZR6S        -
tNEXT  =  000C4 TIZR6S        -
tNOT   =  00081 TIZR6S        -
tNUM   =  000A3 TIZR6S        -
tOFF   =  000E1 TIZR6S        - F16BD NZZBAS(00723) Type=0.0 Nibs=2
                              + F75DA NZZPAR(000DD) Type=0.0 Nibs=2
                              + F7BA3 NZZPAR(006A6) Type=0.0 Nibs=2
                              + F7C83 NZZDEC(000B0) Type=0.0 Nibs=2
tON    =  000E0 TIZR6S        - F16C6 NZZBAS(0072C) Type=0.0 Nibs=2
                              + F2A8F SCZENT(00B5B) Type=0.0 Nibs=2
                              + F75D5 NZZPAR(000D8) Type=0.0 Nibs=2
                              + F7B9E NZZPAR(006A1) Type=0.0 Nibs=2
                              + F7C7A NZZDEC(000A7) Type=0.0 Nibs=2
tOPT'N =  000ED TIZR6S        -
tOR    =  0008D TIZR6S        -
tOVF   =  000AF TIZR6S        -
tPAUSE =  000D7 TIZR6S        -
tPCRD  =  E01EF TIZR6S        -
tPI    =  00079 TIZR6S        -
tPORT  =  000D1 TIZR6S        -
tPOS   =  201B3 TIZR6S        -
tPREDV =  0009F TIZR6S        -
tPRINT =  000CD TIZR6S        -
tPRMEN =  000F8 TIZR6S        -
tPRMST =  000F3 TIZR6S        -
tPURGE =  000EB TIZR6S        -
tRAD   =  0006E TIZR6S        -
tRDIAN =  00004 TIZR6S        -
tREAD  =  000C7 TIZR6S        -
tREAL  =  000BC TIZR6S        -
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tRELOP =  0008A TIXR6S          -
tREM   =  000E6 TIXR6S          -
tRES   =  0007F TIXR6S          -
tRESTR =  000DE TIXR6S          -
tRETRN =  000DB TIXR6S          -
tRFILE =  000DE TIXR6S          -
tRMD   =  0006D TIXR6S          -
tRND   =  000A0 TIXR6S          -
tROUND =  C01EF TIXR6S          -
tRUN   =  000FE TIXR6S          -
tSDEV  =  0009E TIXR6S          -
tSEMIC =  000F2 TIXR6S          - F2DF6 NZXUTL(00160) Type=0.0 Nibs=2
                                + F72FF NZXFXQ(004E6) Type=0.0 Nibs=2
                                + F735D NZXFXQ(00544) Type=0.0 Nibs=2
                                + F7534 NZXPAR(00037) Type=0.0 Nibs=2
                                + F7556 NZXPAR(00059) Type=0.0 Nibs=2
                                + F7744 NZXPAR(00247) Type=0.0 Nibs=2
                                + F7753 NZXPAR(00256) Type=0.0 Nibs=2
                                + F7894 NZXPAR(00397) Type=0.0 Nibs=2
                                + F7927 NZXPAR(0042A) Type=0.0 Nibs=2
                                + F7D41 NZXDEC(0016E) Type=0.0 Nibs=2
                                + F7E44 NZXDEC(00271) Type=0.0 Nibs=2
                                + F7E5D NZXDEC(0028A) Type=0.0 Nibs=2
tSFLAG =  000FB TIXR6S          -
tSGN   =  000A1 TIXR6S          -
tSHORT =  000CB TIXR6S          -
tSIN   =  00096 TIXR6S          -
tSMALL =  00011 TIXR6S          -
tSQR   =  00092 TIXR6S          -
tSTAT  =  000CE TIXR6S          -
tSTEP  =  000F6 TIXR6S          -
tSTOP  =  000D9 TIXR6S          -
tSTR$  =  000A6 TIXR6S          -
tSUB   =  000C1 TIXR6S          -
tSVAR  =  0002D TIXR6S          -
tTAB   =  000F7 TIXR6S          -
tTAN   =  00098 TIXR6S          -
tTHEN  =  000F4 TIXR6S          -
tTIME  =  0007B TIXR6S          -
tTIME$ =  00095 TIXR6S          -
tTIMER =  000E4 TIXR6S          -
tTO    =  000F3 TIXR6S          -
tTRACE =  000EA TIXR6S          -
tUNF   =  000B0 TIXR6S          -
tUPRC$ =  000AB TIXR6S          -
tUSER  =  000E2 TIXR6S          -
tUSING =  000FD TIXR6S          - F1FA9 SCXENT(00075) Type=0.0 Nibs=2
                                + F754D NZXPAR(00050) Type=0.0 Nibs=2
tVAL   =  000A5 TIXR6S          -
tVARS  =  B01EF TIXR6S          -
tWAIT  =  000D8 TIXR6S          -
tXFN   =  000B3 TIXR6S          -
tXWORD =  000EF TIXR6S          - F1520 NZXBAS(00586) Type=0.0 Nibs=2
                                + F1930 NZXBAS(00996) Type=0.0 Nibs=2
                                + F75F2 NZXPAR(000F5) Type=0.0 Nibs=2
                                + F764C NZXPAR(0014F) Type=0.0 Nibs=2
                                + F765F NZXPAR(00162) Type=0.0 Nibs=2
                                + F767C NZXPAR(0017F) Type=0.0 Nibs=2
                                + F7B4B NZXPAR(0064E) Type=0.0 Nibs=2
                                + F7B77 NZXPAR(0067A) Type=0.0 Nibs=2
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                                          + F7C97 NZ%DEC(000C4) Type=0.0 Nibs=2
                                          + F7CDB NZ%DEC(00108) Type=0.0 Nibs=2
tZ       =  0005A TI%R6S                  -
tZERO    =  C01EF TI%R6S                  -
t^       =  00080 TI%R6S                  -

uALit    =  000F7 TI%R6S                  -
uCPLXC   =  000EE TI%R6S                  - F2627 SC%ENT(006F3) Type=0.0 Nibs=2
uDELIM   =  000F4 TI%R6S                  - F260E SC%ENT(006DA) Type=0.0 Nibs=2
uHKB^    =  000F6 TI%R6S                  - F259E SC%ENT(0066A) Type=0.0 Nibs=2
                                          + F266B SC%ENT(00737) Type=0.0 Nibs=2
uIMXCH   =  000D4 TI%R6S                  -
uIMbck   =  000DC TI%R6S                  -
uIMend   =  000F0 TI%R6S                  - F2609 SC%ENT(006D5) Type=0.0 Nibs=2
uIMsta   =  000DE TI%R6S                  -
uJMPdl   =  000DB TI%R6S                  -
uJMPst   =  000DA TI%R6S                  -
uJMP()   =  000D9 TI%R6S                  -
uLOOPB   =  000D2 TI%R6S                  - F25E1 SC%ENT(006AD) Type=0.0 Nibs=2
uLOOPP   =  000EF TI%R6S                  - F25FF SC%ENT(006CB) Type=0.0 Nibs=2
uLOOPS   =  000D3 TI%R6S                  - F25FA SC%ENT(006C6) Type=0.0 Nibs=2
uMODES   =  0BDB1 TI%R6S                  -
uMULT    =  000D1 TI%R6S                  - F25DC SC%ENT(006A8) Type=0.0 Nibs=2
uNUMEn   =  000FC TI%R6S                  -
uNUMEs   =  000FD TI%R6S                  -
uNUMFn   =  000FA TI%R6S                  -
uNUMFs   =  000FB TI%R6S                  -
uNUMNn   =  000F8 TI%R6S                  -
uNUMNs   =  000F9 TI%R6S                  -
uOPNM-   =  000DF TI%R6S                  -
uOPNNM   =  000D8 TI%R6S                  -
uOPNWM   =  000E0 TI%R6S                  -
uRES12   =  0C994 TI%R6S                  -
uRESD1   =  0E1EE TI%R6S                  -
uRESNX   =  0C9BD TI%R6S                  -
uRESTP   =  000F1 TI%R6S                  - F2604 SC%ENT(006D0) Type=0.0 Nibs=2
uRESXT   =  0C9C1 TI%R6S                  -
uRND>P   =  0C9CF TI%R6S                  -
uSTRPT   =  000D0 TI%R6S                  - F25D7 SC%ENT(006A3) Type=0.0 Nibs=2
uTEST    =  0D435 TI%R6S                  -

vDEVID   =  75048 NZ%SYM                  - F3235 NZ%BIF(0035E) Type=0.0 Nibs=8

xANGLE   =  00006 TI%R6S                  -
xCLOCK   =  00015 TI%R6S                  -
xEXTND   =  00026 TI%R6S                  -
xFLOW    =  00029 TI%R6S                  -
xINTO    =  0002E TI%R6S                  -
xMATH    =  00036 TI%R6S                  -
xNEAR    =  0003C TI%R6S                  -
xNEG     =  0003D TI%R6S                  -
xPCRD    =  0003E TI%R6S                  -
xPOS     =  00042 TI%R6S                  -
xROUND   =  0004C TI%R6S                  -
xVARS    =  0005B TI%R6S                  -
xZERO    =  0001C TI%R6S                  -
xromFF   *  F0095 NZ%TBL(0008D)           -
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Saturn Hex Code Listing

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F0080 - 2C12C120 4610E730 52600F00 ECD10FE1 061E10FD 20CED10F C303DD10 FB4031E1
F00C0 - 0F27061B 10F290B6 A10F3805 6B10FED1 DBA10F28 1D5C10F1 717AC10F CF14FC10

F0100 - FEC02531 0D450874 10D0007B 810DA11C 0810D2C1 75810D1F 02A610DA 212BF00D
F0140 - 1C051E10 D3213782 0C3D1B4B 20D5B1C6 C60D061D FF00D1A0 2DF00DA4 1DC110D9
F0180 - 3135010D 4A1E8720 DCF03831 0D5913D3 10DB025B 3100551F 4820D2B0 72820DBE
F01C0 - 1EE410D1 609A820D AE000000 09010000 00FD0000 000B1435 359474E4 F0B2494E

F0200 - 414E4441 0B2494E4 34D40520 B2494E45 4F42530B 2494E494 F4254052 49445509
F0240 - 34C45414 25E0D34F 4E44525F 4C432D44 54651444 442560B4 45465149 44480B44
F0280 - 54659444 42700449 43505C41 49591B54 E41424C4 5412954E 44554254 1D94E494
F02C0 - 459414C4 D0794E44 52562394 F4427C49 43545219 C4F43414 C4D1DC4F 434B4F45

F0300 - 545525F4 6464013F 4E451BF4 55450555 4531D051 434B4449 425B1705 1434B4A1
F0340 - 70514353 502D0525 94E44554 2581D255 41444444 434B0F25 54144494 E44525A0
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F0400 - 45425F11 FF103401 00484059 4C402C51 10514353 59474E4D 34C8030E E4C8040E
F0440 - 25C8050E 15C8060E 05C8070E B4C8001E D3C71116 54E64602 F46602D2 4CB021EC
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F15C0 - E45854F3 8E133175 B015D61D 3915F292 A218E717 F4B17650 44170908 217C9983

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F5A80 - 117F81D6 8E44C043 5831227B 71D2E6DA 8EFA014B 38EEAD04 2315D086 52220D07
F5AC0 - 4508E721 B4D096B8 08EA8DA6 80179415 7F8168OF ED610B72 41119135 17FD215D

F5B00 - 31CF8F64 1A011BDA 80DE8128 0C18E809 D08112E0 83140E4D 8F4F411C 7B21E243
F5B40 - 1D0B608A C50B2473 208EEE8D 80D18900 062CA7CB 8D0B2411 C72F0865 44CE7A50
F5B80 - 10C4837B 987780D6 8EFBF045 28A8DC8E 1AB05828 80218EE1 CA8985D8 960D208E
F5BC0 - C20B5008 C439CCC4 CE0D58F4 1C8CE63B 11110220 D23101CA 131D015B 333802E8

F5C00 - A6F08FFD D0111A10 96D6B253 088E0DFA 50030E03 8C449E8C 796E7E10 1B109F29
F5C40 - 7C601527 817B4740 0A4F0385 38C9F5ED 28C194F8 CAC2B8CC CAE26741 04008E11
F5C80 - 6E4008C1 90B228CB 2F01F519 F2011BB9 8F201D91 0B71BFDA 8D950118 CC28D73C
F5CC0 - A50075AF 4EE8E2D4 F10A7DCF 5737C005 038E5FEE 4ECA4DAC 980DF891 00893000

F5D00 - 311B816A D28CDF2F 7F7FD215 D373EF48 9730F419 84832308 8E8D3E11 A2614B96
F5D40 - 87217C17 715B6912 E017E17F 17A5FD1C 7AF215D5 20641A72 1A500747 070FE5C1
F5D80 - 881E180D 0896D150 10000000 002030E2 1651F67F 98437040 1201018E B0AE44E7
F5DC0 - 2EE76208 EF5CE151 717F1101 593722F4 1C724E4A B6599853 DB109706 EAFB129D

F5E00 - 7037D795 007F5E4E 7709E460 66D97BCE 0B80F00B 86BE0851 860416CA E86A8084
F5E40 - 05508500 B80F00B8 0CF13517 E15349CA 8B1C4173 A4E59F16 F57D1E8E F82F718E
F5E80 - 4C071AD8 21500692 E7FE8500 978627CC D4D7DB13 58E434D7 E737ED47 B47D069E
F5EC0 - 07E50B1C 3020202E 414D4540 20202023 50245950 55402020 2C454E40 20202024

F5F00 - 41445540 20202024 594D4540 2D0A0FF6 79DDB135 8E5B3D07 1358FE0C 108ECC3D
F5F40 - 137D78E2 39A43D8E 819E7162 42F8AE60 66808EE9 A05318EE E8A7E147 B864E05A
```

```
F5F80 - 78EAD8A4 438FEE01 08FAB251 4908FE21 20968CE8 EF53D137 D7D88E3C 8AD44951
F5FC0 - 1B10A8F3 E32033F5 023A603A D602AB90 0096841D 01FA49F2 15908AA4 18E57FA1

F6000 - 4379A0CA 141791C2 08210380 C1068FEE 0100780D 165FE772 244E8AED 3674F777
F6040 - 26FEF7F0 24CC8AE6 F11B94E6 17D56756 65B011BA 4E10B73B 244A6FEE 11A7B26D
F6080 - ACCCC47E 7E167C36 764BE670 26CC5FE7 1167906A C25CBD72 0D231050 3210D007
F60C0 - DF58F83D B08EBFBB 5018953E 898ED69D B8AB5D8E 502E4CC1 7F8E98C0 17F8EAB0

F6100 - C8E62EB5 33CC4361 018E457E 7D9040C8 AAE4111C C4521017 52149A8A EBE5432B
F6140 - 4C900000 00000001 F0A8F2DB 14576321 F0A8F214 7704F560 D220AF0D A7345BF0
F6180 - BF0A0C1C F137068E EFDA0713 38B62A13 31351517 8ED00C79 5E8DE83B 1400AFB7
F61C0 - 7E4F281E CE7CE4D9 760A10A1 0B8FBD41 08E01AD7 37172A08 0CEAC255 0B468E72

F6200 - 2D8F6A41 08E8E9D8 E132D80D E94E008A AF211B70 84728410 B7A7ED68 E04DA143
F6240 - 174147E9 8B670145 038C59CD 11A8AAE4 94A41715 479547CF 040011A8 AA22CE78
F6280 - 2472247C 3478B040 091A0EB1 654111BD 2AC2A4E1 0BD20311 A10BE603 11A79E3C
F62C0 - E8AAA470 E310A25D A90E217C E34B0D67 9E35F0D6 70E37D70 40011A72 D3784040

F6300 - 091A4B11 A10B0311 B7593CE8 AA297093 608F11B7 F832590A 61D57630 400D912B
F6340 - AC212BDA 7E88AC21 0A8148E3 35E4001F 519F215F 3230300F 6ABA8E91 FD4007DA
F6380 - 8400228E D3804008 C90FD772 38E700D1 B109F215 6716F155 717F1461 6315D317
F63C0 - 38E79BA1 331312B1 5DB17B0C 56F13117 5AF27312 8E60DE79 02AFA77B 84A2AC30

F6400 - 6F2C65A0 B4723B98 8EEC9A24 7732D117 15B3A4D1 C3AC9A46 BCA80DF3 70235055
F6440 - 41401730 91371741 5B913715 99178BAD F1167729 124AF28E 28CEAE27 08166900
F6480 - 9E6134AF 21564161 14EAF51B 939F294E 4215A520 315025A1 2B19650A F2B7681E
F64C0 - 6050A465 60480A46 5C01B129 F24A8A46 59174118 E60CE7A0 1BF281E6 9116E316

F6500 - 3AF015A3 8E419AAF 6AFA8EAC 8A2F90D9 00D58F20 80CFAC6A C3203600 B4D42F30
F6540 - 598562BF 6F6BF5BF 505A05BF 5550B750 42C3086A DFDA2496 A400D7AD 09688014
F6580 - 91711711 B929F215 E516314C 183BF6F6 15C320AF 23103DA3 9F2F202A 30216016
F65C0 - A0149171 18015A01 61149171 140171BF 6BF696E4 D2B1CF0C 6AF8E900 C0313613

F6600 - 71360120 8EE86F15 2710072E F8F43581 77DF1108 EF66F150 71330231 82DED78F
F6640 - AFD718FF D1518DE9 22090DF0 1710D55F 201C194B 511371DD 21371C11 4D17180C
F6680 - F80DFA89 890A0B96 0D55F213 0314D171 A4E5D003 E68C1A8A D2E68C08 8A8C778A
F66C0 - 8C4C8A8C BE3E8CBF 3E25A9A7 A744008A 8267E504 62890941 32182132 4C016D61

F6700 - 7558D203 07220289 4008E7B0 A89121AF 68963B89 8EA59D80 D46221CC 14D1715F
F6740 - 90203167 0B15E008 86062160 15E68161 88A46660 220380D2 88820200 18608618
F6780 - 61811601 5E018008 870200B4 3286C621 3618244F 21564134 94AF0B46 49018724
F67C0 - 02861E08 60F16B7F 1670B15E 00B84186 0E952116 70B15E00 88601116 016E6816

F6800 - 18803840 637F0B16 816E0188 0B012031 20690020 31607D43 400799F4 008E28F9
F6840 - 8810F800 4B828806 0F60380F 02202758 F4008E85 F988B208 0FF5006E 8E786F40
F6880 - 08E83F98 865E52E8 EB94A551 022DA836 B10208EC 84A35800 00A2DA83 A0F76924
F68C0 - 00AF0AC3 797E487A EA814814 BF6F6B47 0D5CE308 9C7DD203 1D02D90F 50AE22F9

F6900 - 6AA09665 0A908148 1400D058 E2D90B32 2FAC2978 6190C700 D68F80FF 81EB46AC
F6940   72003894 0080FF8E C7E9891B 08966066 ADACB80D F8903881 08100D52 F1FBA8F2
F6980 - AF415171 12F0F0AF 11198ODF 89250A7D 207E7016 37AF8018 7CE11321 824F1132
F69C0 - 15F51757 CC053E02 7F204FD5 72162132 A6C4D614 F1717351 40086CAE 770043E2

F6A00 - 00286800 1361B244 F2156413 4A4E018E 3D1D87CC 21321854 D2132AF9 7B60400A
F6A40 - F9BF6BF6 7B4057D0 2037CAF4 1D54A165 132A6C4E 2AE973D0 400A6C4E 1D9F6F67
F6A80 - 0C040086 CAD747F4 3D57C038 0FF26318 116680DF 87CD10B1 6E00B871 01870B01
F6AC0 - 8615C703 850851BF 2BF2BF2B F2BF2136 1B244F21 56413416 115E0181 0B870200

F6B00 - BBF6BF6B F6BF6BF6 80FA5708 71C0890E 00C49018 6240280F A861B086 0C2617F6
F6B40 - 65080FF2 23500004 16F4F263 10120166 87C31081 5E00B870 606C4F84 0615FF2F
```

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F6B80 - 2F2BF226 31012016 687C210B 15E00B87 0505EC84 1642FF2F 2F2BF26E 9F80F021
F6BC0 - 32A416BE F80F0213 2C416CDF AF570000 71360813 220346A0 00CA1321 56780D08

F6C00 - F6890279 11111641 36809136 5ED80FFD 1CD18315 E323A065 B0AE6AE1 473A0653
F6C40 - 2D520320 EF0EF1FE 0EF20EF9 320EFDD5 01A065A0 20A86A81 BED210D1 36071360
F6C80 - 10008744 14451400 28554E44 40068594 4495F340 555E4C40 244BC494 354554E4
F6CC0 - F540555E 44504447 4514C4B4 06445351 4440A445 4444C40C 44544444 50058525

F6D00 - 44950940 5946434B 9405C405 44104057 445C4404 05354434 0048534D 44420F05
F6D40 - D4C41440 F05D4451 400000AF A8E580AA F997A002 FBF20D94 A8FBF6AB 280F0200
F6D80 - 30520A81 A0D15379 80400304 B04B0496 C7117115 3717F100 15370502 268C507C
F6DC0 - E4F00368 00AC214A 311F9621 18E422D4 538EEABB 8E25EC46 2AF22730 815C8752

F6E00 - A4318EBE 3C4A08C1 79A2864A F8EAF0D4 00877D07 834D7555 028A8C48 407B564E
F6E40 - 331A3962 4131E296 23187072 727670F0 67007B91 4007A26D 74113102 96280250
F6E80 - 2D38ED15 C8588ABE E8F6E994 008CC2FC 8E370D40 077358EC 60A11C28 A9E10420
F6EC0 - 84886790 8506E6F8 E8A0A143 D23141D5 8E0A0A13 7E98B6A5 14513511 8155717F

F6F00 - 11C8E030 A15D3725 3400D779 6F400068 E160A153 717F1001 438E7EF9 10417313
F6F40 - 71450703 28022502 754547F7 C954977C 65726245 E78A2460 6F90109A F910A781
F6F80 - 54A32031 82966B27 5F04007F F441B319 29668AD9 CE490219 0AC02802 7215D211
F6FC0 - 2AF8111F 2F2AE621 0D5D331A 296670D2 5F231529 66D07890 4F1608F7 3D47AF06

F7000 - 01071C14 00D231F5 400109AF 910A7974 4C531A39 66F47850 40031309 E190D9CE
F7040 - 56028021 12AF8111 816310E0 E6AB6681 2F2F24C0 C6C60E3A 03F2AB60 3715411A
F7080 - AF511903 AF17A044 05723440 1F1A8895 9AE28023 1E2966E2 75E34B27 D0440205
F70C0 - A04550B3 50447D77 C34D07FE 354F7EE3 AF48EE7C 9D1AFD8A E2B31F10 3AF17993

F7100 - 44271C34 01F1A889 29AE2802 31E29626 079A3AF4 8E93C98E 22E9AF5D 1E57A534
F7140 - 34728348 3F1A8892 9AE72434 937A634E 205A0455 0B650445 A74234B1 7C435FE7
F7180 - B4392DB0 F158F7D3 3D0AE48E BCB9AE53 1F19E16C 8118119E 9BB9696B D2AEDF5A
F71C0 - 350E3D03 AF17AC24 E2712343 2AE88158 1596D317 EA242176 D256E4CD 0370D297

F7200 - D6025029 6DEE8158 1554F8E0 0FC5008E 34FC533A F237E455 C4C47220 31F75003
F7240 - 7C4F4F40 57D0031F 956031F3 0297520D 20172324 D020312E 962606E3 114A1613
F7280 - 14C96260 6470783F 4007E7F4 505E5722 174F1453 312E9668 27F1276E 18E35DC4
F72C0 - 00CD4E02 190D7020 5C028027 3F1D1133 8E620C13 38E3A0CA FDF2F2AE 66C50312

F7300 - F966217E BE400D23 1F552431 58966717 18178718 E5ECC400 6C6F3138 96660D20
F7340 - 379817B8 172518EC FCC40014 A06312F9 66200741 51617350 70617721 8E49CC40
F7380 - 031309E1 90D9CE56 0280210A 1378EB6F B1371098 E5EFB12A 669C2502 10AAF912
F73C0 - A0313706 1371F698 F215D307 135AF98C 18FBAF21 08867708 A8332F30 87E20AF4

F7400 - 1004F02F 3027F100 40333020 2DA1188A A4003D02 502850AC A8E72B9A F5AC6785
F7440 - 04337FA0 5E087032 74704C18 40AE8815 815A4E94 E4DAA054 17950AA0 A2C86050
F7480 - AF1942E0 811811B4 651FB240 18C7CAC8 E10FB8FE 3F8007DF 06DB068E ACA98E01
F74C0 - FB8C3FDB 8C3C998C 2FAC07DA 07DE068E 2CEB8FB0 F808E1EE B8CE0CC8 CD6997F3

F7500 - 6317E966 366CA47E 9471308D 4A5307F8 472208F8 26304501 71312F71 85858849
F7540 - 8DB32307 5F531DF9 62D0312F 96240073 14F74556 3B527605 17756AF6 3594A554
F7580 - 97644175 7BC25808 C74FB831 80246121 7C958E13 905D07D0 572B44D0 626577A4
F75C0 - 53E6AF02 764F07B6 17EB50E7 D31E2D30 0763566D F7355AF6 35FEFF52 976F17EC

F7600 - 47E847E5 4205CA78 94311F64 A47DF485 884A6893 7EF47C95 AF637840 594C4976
F7640 - A21775BB 7745FEFF 62420007 0C47435F EFF42E00 00208D53 03018503 7715FEFF
F7680 - 62900006 2EF1857E A485880B 7B207BBF 70E35F17 59431389 66A07C05 6204258C
F76C0 - E0EB6654 70707990 5BF86816 70514A57 8F757172 4154F1C1 14B9627F 5E37C147

F7700 - 724869A2 70C4AF63 554F4C49 76611757 1A4AEE25 7DA37AF3 75305798 4A037353
F7740 - 20312F71 73791342 1312F966 90706356 0754364C 37A8D400 7054AEE1 33101133
```

```
F7780 - AC281481 4B461711 4B716D5C E80DF0D8 108100D5 7FA46A4E 80DFA961 08D08E61
F77C0 - 4F4E5110 ACA80DF1 19809135 AF684A84 98489695 08582F36 534D4449 72513874

F7800 - 41445149 76808598 5AAC680D F7CB26C0 31811191 35027362 311F7382 7422870E
F7840 - 08737086 A4003795 275D2027 92246065 4120314C 7F422F30 A74B1453 10431A39
F7880 - 62D231E2 96602171 332E2F7B 222F3067 A8147094 CF662F01 7184A7B0 37382313
F78C0 - 89667125 86AC0207 8E164D06 6C031589 66A576D1 7B617B71 46E31829 662274C2

F7900 - 73517361 4EC31922 49663C20 742231A3 96651312 F7E81762 17631486 6B607BD1
F7940 - 7F417F01 7F114A28 315057C7 0C114B72 B155B1C1 14B17131 029623A7 F2120314
F7980 - C76312F3 087F904F 0948A076 A1685F21 0D007371 82111403 84A66008 5A8488FE
F79C0 - 7A205B18 78606DCB 77412031 1F7D0003 77317C90 4606F217 73131E29 622231A3

F7A00 - 96650171 79AE4B08 312162BB 667B706E 6BEF84A0 37DF020A C07BD050 087100A4
F7A40 - CA4E4007 3701717F B04EE031 3710B135 8D9DF307 CEF873B0 11B13559 08704003
F7A80 - 26027B00 74DF873B 10313713 58E79491 3613410A 0111A134 8E794913 501AEE8D
F7AC0 - BEC208DD FC20AFA8 D51D20AF A8D62450 773011B1 3713510B 7C6F873B 011B1355

F7B00 - 90870400 3268CEB9 B14B8096 F301FFC6 F2143131 03203102 1C117114 B9627F01
F7B40 - 8DB39407 840FEFF6 29000060 7A1857B0 B84A74CC 4606FAF6 99F7C10F EFF32900
F7B80 - 00671A18 584A8586 D2E8DA2C 2075FF0E 2101ED00 0067DF79 AA8FE7A2 0460702F
F7BC0 - 6A5F312E 62FE8D8B F3035943 5027DEE1 4B700357 17BB177E 25011717 ED153E7F

F7C00 - 6268507C D2572779 173C2171 9669078B 15BE79A1 14B8D054 507B326A DF3794A5
F7C40 - 54022718 1798E8F9 57507082 4C014B8D 30350171 7D617102 63EF77C0 310E962B
F7C80 - 0311E966 4E671215 B5AF635F EFF52976 728498F9 91507822 171962D0 1C172117
F7CC0 - EA1679F7 D0259017 1698F690 F31FE966 C01757DD 15607400 6A6F3394 F46ACD7B

F7D00 - C066A173 C064DE37 840594C4 2778BD6D 8F70A114 B72107D2 05BF7B40 54F6F1F3
F7D40 - 12F96600 722133B3 0274AF17 114B0374 81480027 35D17114 B8EC0195 FE7350AE
F7D80 - E03311F9 66007ED0 77415A07 E3060FF7 E20AEE03 31A37910 17114B31 38966421
F7DC0 - 8117131A 261FC732 F310263F F31C26BE F3158966 F2315277 DF78707C E0506318

F7E00 - 274CF756 0319278B FAEE5643 14C96642 17114BD6 A664C017 1798C5DE 7AA040C5
F7E40 - B1312F96 6E018131 E2DA59D7 610312F9 62400331 A37B5F17 18022950 3F34F4E4
F7E80 - 4525F4C4 022F764C 74405901 7160CD60 4D8F2915 014F80D1 0C2045E6 64D77008
F7EC0 - D1055039 94E44525 0229610C 14B311F9 62000131 2F962000 10000000 00000000

F7F00 - 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
F7F40 - 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
F7F80 - 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
F7FC0 - 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00007F00

/SLOAD:  End of Saturn Loader Execution
```

```
           *
           *        N   N  ZZZZZ    &    RRRR    SSS   TTTTT
           *        N   N      Z   & &   R   R  S   S    T
           *        NN  N     Z    & &   R   R  S        T
           *        N N N    Z      &    RRRR    SSS     T
           *        N  NN   Z      & & & R R        S    T
           *        N   N  Z       &  &  R   R  S   S    T
           *        N   N  ZZZZZ    && & R   R   SSS     T
           *
           *
                    TITLE  Rom start (header) <840301.1402>
F0000               ABS    #F0000        TIXHP6 address (fixed)
F0000      =ROMSTT
F0000               BSS    #8-((*)-(ROMSTT))  8 nibble rom ID
F0008               END
```

```
=ROMSTT  Abs  983040 #F0000 -     13     14
```

```
Input Parameters

  Source file name is NZ&RST::MS

  Listing file name is NZ/RST:TI:ML::-1

  Object file name is NZXRST:TI:MS::-1

                                                111111
                              0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
     1                     TITLE  Lexical Analyzer Tables--ID=FF
     2               *  This file was generated on Thu Mar  1, 1984   2:03 pm
     3               *  File Header
     4 00000 8405          NIBASC \HPILROM \       File Name
           94C4
           25F4
           D402
     5 00010 0000          CON(4) =fLEX            File Type
     6 00014 00            NIBHEX 00               Flags
     7 00016 0021          NIBHEX 0021             Time
     8 0001A 1030          NIBHEX 103048           Date
           48
     9 00020 0000          REL(5) =ChainE          File Length
           0
    10               *
    11 00025 FF            NIBHEX FF               Id
    12 00027 10            CON(2)   1              Lowest Token
    13 00029 62            CON(2)  38              Highest Token
    14 0002B 0000          NIBHEX 00000            End of lex table chain
           0
    15               *
    16               *  Speed Table
    17 00030 0             NIBHEX 0                 Speed table exists
    18 00031 000           CON(3)    0                A
    19 00034 F00           CON(3)   15                B
    20 00037 450           CON(3)   84                C
    21 0003A 270           CON(3)  114                D
    22 0003D 2B0           CON(3)  178                E
    23 00040 C12           CON(3) (TxTbEn)-(TxTbSt)  F
    24 00043 C12           CON(3) (TxTbEn)-(TxTbSt)  G
    25 00046 C12           CON(3) (TxTbEn)-(TxTbSt)  H
    26 00049 EC0           CON(3)  206                I
    27 0004C C12           CON(3) (TxTbEn)-(TxTbSt)  J
    28 0004F C12           CON(3) (TxTbEn)-(TxTbSt)  K
    29 00052 1F0           CON(3)  241                L
    30 00055 C12           CON(3) (TxTbEn)-(TxTbSt)  M
    31 00058 C12           CON(3) (TxTbEn)-(TxTbSt)  N
    32 0005B A11           CON(3)  282                O
    33 0005E 931           CON(3)  313                P
    34 00061 C12           CON(3) (TxTbEn)-(TxTbSt)  Q
    35 00064 171           CON(3)  369                R
    36 00067 3D1           CON(3)  467                S
    37 0006A B02           CON(3)  523                T
    38 0006D C12           CON(3) (TxTbEn)-(TxTbSt)  U
    39 00070 C12           CON(3) (TxTbEn)-(TxTbSt)  V
    40 00073 C12           CON(3) (TxTbEn)-(TxTbSt)  W
    41 00076 C12           CON(3) (TxTbEn)-(TxTbSt)  X
    42 00079 C12           CON(3) (TxTbEn)-(TxTbSt)  Y
    43 0007C C12           CON(3) (TxTbEn)-(TxTbSt)  Z
    44 0007F 0             NIBHEX 0               Speed table exists
    45 00080 4610          CON(4) (TxTbSt)+1-(*)  Offset to text table
    46 00084 0000          REL(4) =PILMSG      Offset to message table
    47 00088 0000          REL(5) =PILPOL         Offset to poll handler
           0
```

```
                           STITLE M a i n   T a b l e
                    *  Main Table
 0008D              =xromFF
                    *
 0008D F00                 CON(3)   15        01  BINAND ( <int.exp> , <int.exp>
 00090 0000                REL(5) =BINAND
       0
 00095 F                   NIBHEX F
                    *
 00096 E10                 CON(3)   30        02  BINCMP ( <int.exp> )
 00099 0000                REL(5) =BINCMP
       0
 0009E F                   NIBHEX F
                    *
 0009F D20                 CON(3)   45        03  BINEOR ( <int.exp> , <int.exp>
 000A2 0000                REL(5) =BINEOR
       0
 000A7 F                   NIBHEX F
                    *
 000A8 C30                 CON(3)   60        04  BINIOR ( <int.exp> , <int.exp>
 000AB 0000                REL(5) =BINIOR
       0
 000B0 F                   NIBHEX F
                    *
 000B1 B40                 CON(3)   75        05  BIT ( <int.exp> , <bit positio
 000B4 0000                REL(5) =BIT
       0
 000B9 F                   NIBHEX F
                    *
 000BA 270                 CON(3)  114        06  A=DEVADDR(<device spec>)(Retur
 000BD 0000                REL(5) =FIND
       0
 000C2 F                   NIBHEX F
                    *
 000C3 290                 CON(3)  146        07  A$=DEVID$(<device spec>)
 000C6 0000                REL(5) =DEVID
       0
 000CB F                   NIBHEX F
                    *
 000CC 380                 CON(3)  131        08  A=DEVAID(<device spec>)
 000CF 0000                REL(5) =DEVTYP
       0
 000D4 F                   NIBHEX F
                    *
 000D5 ED1                 CON(3)  478        09  SPOLL ( <device spec> )
 000D8 0000                REL(5) =SPOLL
       0
 000DD F                   NIBHEX F
                    *
 000DE 281                 CON(3)  386        0A  READINTR {read interrupt cause
 000E1 0000                REL(5) =READIN
       0
 000E6 F                   NIBHEX F
                    *
 000E7 171                 CON(3)  369        0B  READDDC {read last D.D. comman
```

```
  93 000EA 0000         REL(5) =READDC
           0
  94 000EF F            NIBHEX F
  95              *
  96 000F0 CF1          CON(3)  508          0C  STATUS [( <loop #> )]
  97 000F3 0000         REL(5) =STATUS
           0
  98 000F8 F            NIBHEX F
  99              *
 100 000F9 EC0          CON(3)  206          0D  INITIALIZE [<volume>]<dev spec
 101 000FC 0000         REL(5) =INITXQ
           0
 102 00101 D            NIBHEX D
 103              *
 104 00102 450          CON(3)   84          0E  CLEAR LOOP[;<loop>] | <device
 105 00105 0000         REL(5) =CLEAR
           0
 106 0010A D            NIBHEX D
 107              *
 108 0010B 000          CON(3)    0          0F  ASSIGN IO
 109 0010E 0000         REL(5) =ASGNIO
           0
 110 00113 D            NIBHEX D
 111              *
 112 00114 A11          CON(3)  282          10  OFF IO
 113 00117 0000         REL(5) =OFFIO
           0
 114 0011C D            NIBHEX D
 115              *
 116 0011D 2C1          CON(3)  450          11  RESTORE IO
 117 00120 0000         REL(5) =RESTIO
           0
 118 00125 D            NIBHEX D
 119              *
 120 00126 1F0          CON(3)  241          12  LIST IO
 121 00129 0000         REL(5) =LISTIO
           0
 122 0012E D            NIBHEX D
 123              *
 124 0012F A21          CON(3)  298          13  OUTPUT <dev spec> [USING] <lis
 125 00132 0000         REL(5) =OUTPUT
           0
 126 00137 D            NIBHEX D
 127              *
 128 00138 1C0          CON(3)  193          14  ENTER <dev spec> [USING] <list
 129 0013B 0000         REL(5) =ENTER
           0
 130 00140 D            NIBHEX D
 131              *
 132 00141 321          CON(3)  291          15  ON INTR GOSUB/GOTO <line #>|<l
 133 00144 0000         REL(5) =ONINTx
           0
 134 00149 C            NIBHEX C
 135              *
 136 0014A 3D1          CON(3)  467          16  SEND [;<loop>] {<Frame>}+
137 0014D 0000        REL(5) =SEND
          0
138 00152 D           NIBHEX D
139             *
140 00153 5B1         CON(3)  437           17  RESET HPIL
141 00156 0000        REL(5) =RESET
          0
142 0015B D           NIBHEX D
143             *
144 0015C 061         CON(3)  352           18  PRINTER IS code
145 0015F 0000        REL(5) =PRNTIS
          0
146 00164 D           NIBHEX D
147             *
148 00165 1A0         CON(3)  161           19  DISPLAY IS code
149 00168 0000        REL(5) =DISPIS
          0
150 0016D D           NIBHEX D
151             *
152 0016E A41         CON(3)  330           1A  PACK <Device specifier> code
153 00171 0000        REL(5) =PACK
          0
154 00176 D           NIBHEX D
155             *
156 00177 931         CON(3)  313           1B  PACKDIR <Device specifier> cod
157 0017A 0000        REL(5) =PACKD
          0
158 0017F D           NIBHEX D
159             *
160 00180 4A1         CON(3)  420           1C  REQUEST [<loop #>;]<num|str ex
161 00183 0000        REL(5) =REQST
          0
162 00188 D           NIBHEX D
163             *
164 00189 CF0         CON(3)  252           1D  LOCAL [<dev.spec|loop #>],[<de
165 0018C 0000        REL(5) =LOCAL
          0
166 00191 D           NIBHEX D
167             *
168 00192 591         CON(3)  405           1E  REMOTE [<dev.spec>..] | [ LOOP
169 00195 0000        REL(5) =REMOTE
          0
170 0019A D           NIBHEX D
171             *
172 0019B B02         CON(3)  523           1F  TRIGGER [<dev.spec>..] | [ LOO
173 0019E 0000        REL(5) =TRIGER
          0
174 001A3 D           NIBHEX D
175             *
176 001A4 551         CON(3)  341           20  PASS CONTROL <dev. spec> | LOO
177 001A7 0000        REL(5) =PASS
          0
178 001AC D           NIBHEX D
179             *
180 001AD 2B0         CON(3)  178           21  ENABLE INTR <interrupt mask by
```

```
181 001B0 0000          REL(5) =ENABLE
          0
182 001B5 D             NIBHEX D
183             *
184 001B6 BE1           CON(3)  491              22  STANDBY [ON | OFF] or value
185 001B9 0000          REL(5) =STANBY
          0
186 001BE D             NIBHEX D
187             *
188             =tCNTRL EQU     #23
189 001BF 160           CON(3)   97              23  CONTROL ON|OFF
190 001C2 0000          REL(5) =CONTRL
          0
191 001C7 D             NIBHEX D
192             *
193             =tIO    EQU     #24
194 001C8 AE0           CON(3)  234              24  (See OFF, ASSIGN, and RESTORE)
195 001CB 0000          NIBHEX 00000
          0
196 001D0 0             NIBHEX 0
197             *
198             =tLOCKO EQU     #25
199 001D1 901           CON(3)  265              25  (See LOCAL)
200 001D4 0000          NIBHEX 00000
          0
201 001D9 0             NIBHEX 0
202             *
203             =tINTRR EQU     #26
204 001DA FD0           CON(3)  223              26  (See ON/OFF)
205 001DD 0000          NIBHEX 00000
          0
206 001E2 0             NIBHEX 0
```

```
                         STITLE T e x t   T a b l e
                 *  Text Table
    001E3         TxTbSt                         Text table start
                 *
    001E3 B              NIBHEX B                 ASSIGN IO
    001E4 1435           NIBASC \ASSIGN\
          3594
          74E4
    001F0 F0             NIBHEX F0
                 *
    001F2 B              NIBHEX B                 BINAND ( <int.exp> ,
    001F3 2494           NIBASC \BINAND\
          E414
          E444
    001FF 10             NIBHEX 10
                 *
    00201 B              NIBHEX B                 BINCMP ( <int.exp> )
    00202 2494           NIBASC \BINCMP\
          E434
          D405
    0020E 20             NIBHEX 20
                 *
    00210 B              NIBHEX B                 BINEOR ( <int.exp> ,
    00211 2494           NIBASC \BINEOR\
          E454
          F425
    0021D 30             NIBHEX 30
                 *
    0021F B              NIBHEX B                 BINIOR ( <int.exp> ,
    00220 2494           NIBASC \BINIOR\
          E494
          F425
    0022C 40             NIBHEX 40
                 *
    0022E 5              NIBHEX 5                 BIT ( <int.exp> , <b
    0022F 2494           NIBASC \BIT\
          45
    00235 50             NIBHEX 50
                 *
    00237 9              NIBHEX 9                 CLEAR LOOP[;<loop>]
    00238 34C4           NIBASC \CLEAR\
          5414
          25
    00242 E0             NIBHEX E0
                 *
    00244 D              NIBHEX D                 CONTROL ON|OFF
    00245 34F4           NIBASC \CONTROL\
          E445
          25F4
          C4
    00253 32             NIBHEX 32
                 *
    00255 D              NIBHEX D                 A=DEVADDR(<device sp
    00256 4454           NIBASC \DEVADDR\
          6514
```

```
      4444
      25
00264 60                NIBHEX 60
               *
00266 B                 NIBHEX B                A=DEVAID(<device spe
00267 4454              NIBASC \DEVAID\
      6514
      9444
00273 80                NIBHEX 80
               *
00275 B                 NIBHEX B                A$=DEVID$(<device sp
00276 4454              NIBASC \DEVID$\
      6594
      4442
00282 70                NIBHEX 70
               *
00284 D                 NIBHEX D                DISPLAY IS code
00285 4494              NIBASC \DISPLAY\
      3505
      C414
      95
00293 91                NIBHEX 91
               *
00295 B                 NIBHEX B                ENABLE INTR <interru
00296 54E4              NIBASC \ENABLE\
      1424
      C454
002A2 12                NIBHEX 12
               *
002A4 9                 NIBHEX 9                ENTER <dev spec> [US
002A5 54E4              NIBASC \ENTER\
      4554
      25
002AF 41                NIBHEX 41
               *
002B1 D                 NIBHEX D                INITIALIZE [<volume>
002B2 94E4              NIBASC \INITIAL\
      9445
      9414
      C4
002C0 D0                NIBHEX D0
               *
002C2 7                 NIBHEX 7                (See ON/OFF)
002C3 94E4              NIBASC \INTR\
      4525
002CB 62                NIBHEX 62
               *
002CD 3                 NIBHEX 3                (See OFF, ASSIGN, an
002CE 94F4              NIBASC \IO\
002D2 42                NIBHEX 42
               *
002D4 7                 NIBHEX 7                LIST IO
002D5 C494              NIBASC \LIST\
      3545
002DD 21                NIBHEX 21
```

```
 282                *
 283 002DF 9               NIBHEX 9               LOCAL [<dev.spec|loo
 284 002E0 C4F4            NIBASC \LOCAL\
           3414
           C4
 285 002EA D1              NIBHEX D1
 286                *
 287 002EC D               NIBHEX D               (See LOCAL)
 288 002ED C4F4            NIBASC \LOCKOUT\
           34B4
           F455
           45
 289 002FB 52              NIBHEX 52
 290                *
 291 002FD 5               NIBHEX 5               OFF IO
 292 002FE F464            NIBASC \OFF\
           64
 293 00304 01              NIBHEX 01
 294                *
 295 00306 3               NIBHEX 3               ON INTR GOSUB/GOTO <
 296 00307 F4E4            NIBASC \ON\
 297 0030B 51              NIBHEX 51
 298                *
 299 0030D B               NIBHEX B               OUTPUT <dev spec> [U
 300 0030E F455            NIBASC \OUTPUT\
           4505
           5545
 301 0031A 31              NIBHEX 31
 302                *
 303 0031C D               NIBHEX D               PACKDIR <Device spec
 304 0031D 0514            NIBASC \PACKDIR\
           34B4
           4494
           25
 305 0032B B1              NIBHEX B1
 306                *
 307 0032D 7               NIBHEX 7               PACK <Device specifi
 308 0032E 0514            NIBASC \PACK\
           34B4
 309 00336 A1              NIBHEX A1
 310                *
 311 00338 7               NIBHEX 7               PASS CONTROL <dev. s
 312 00339 0514            NIBASC \PASS\
           3535
 313 00341 02              NIBHEX 02
 314                *
 315 00343 D               NIBHEX D               PRINTER IS code
 316 00344 0525            NIBASC \PRINTER\
           94E4
           4554
           25
 317 00352 81              NIBHEX 81
 318                *
 319 00354 D               NIBHEX D               READDDC {read last D
 320 00355 2554            NIBASC `READDDC\
          1444
          4444
          34
 321 00363 B0            NIBHEX B0
 322            *
 323 00365 F             NIBHEX F             READINTR {read inter
 324 00366 2554          NIBASC \READINTR\
           1444
           94E4
           4525
 325 00376 A0            NIBHEX A0
 326            *
 327 00378 B             NIBHEX B             REMOTE [<dev.spec>..
 328 00379 2554          NIBASC \REMOTE\
           D4F4
           4554
 329 00385 E1            NIBHEX E1
 330            *
 331 00387 D             NIBHEX D             REQUEST [<loop #>;]<
 332 00388 2554          NIBASC \REQUEST\
           1555
           5435
           45
 333 00396 C1            NIBHEX C1
 334            *
 335 00398 9             NIBHEX 9             RESET HPIL
 336 00399 2554          NIBASC \RESET\
           3554
           45
 337 003A3 71            NIBHEX 71
 338            *
 339 003A5 D             NIBHEX D             RESTORE IO
 340 003A6 2554          NIBASC \RESTORE\
           3545
           F425
           54
 341 003B4 11            NIBHEX 11
 342            *
 343 003B6 7             NIBHEX 7             SEND [;<loop>] {<Fra
 344 003B7 3554          NIBASC \SEND\
           E444
 345 003BF 61            NIBHEX 61
 346            *
 347 003C1 9             NIBHEX 9             SPOLL ( <device spec
 348 003C2 3505          NIBASC \SPOLL\
           F4C4
           C4
 349 003CC 90            NIBHEX 90
 350            *
 351 003CE D             NIBHEX D             STANDBY [ON | OFF] o
 352 003CF 3545          NIBASC \STANDBY\
           14E4
           4424
           95
 353 003DD 22            NIBHEX 22
```

```
354                 *
355 003DF B                NIBHEX B              STATUS [( <loop #> )
356 003E0 3545             NIBASC \STATUS\
          1445
          5535
357 003EC C0               NIBHEX C0
358                 *
359 003EE D                NIBHEX D              TRIGGER [<dev.spec>.
360 003EF 4525             NIBASC \TRIGGER\
          9474
          7454
          25
361 003FD F1               NIBHEX F1
362 003FF 1FF   TxTbEn NIBHEX 1FF             Text termination
363 00402                  END
```

```
 ASGNIO  Ext                 -   109
 BINAND  Ext                 -    53
 BINCMP  Ext                 -    57
 BINEOR  Ext                 -    61
 BINIOR  Ext                 -    65
 BIT     Ext                 -    69
 CLEAR   Ext                 -   105
 CONTRL  Ext                 -   190
 ChainE  Ext                 -     9
 DEVID   Ext                 -    77
 DEVTYP  Ext                 -    81
 DISPIS  Ext                 -   149
 ENABLE  Ext                 -   181
 ENTER   Ext                 -   129
 FIND    Ext                 -    73
 INITXQ  Ext                 -   101
 LISTIO  Ext                 -   121
 LOCAL   Ext                 -   165
 OFFIO   Ext                 -   113
 ONINTx  Ext                 -   133
 OUTPUT  Ext                 -   125
 PACK    Ext                 -   153
 PACKD   Ext                 -   157
 PASS    Ext                 -   177
 PILMSG  Ext                 -    46
 PILPOL  Ext                 -    47
 PRNTIS  Ext                 -   145
 READDC  Ext                 -    93
 READIN  Ext                 -    89
 REMOTE  Ext                 -   169
 REQST   Ext                 -   161
 RESET   Ext                 -   141
 RESTIO  Ext                 -   117
 SEND    Ext                 -   137
 SPOLL   Ext                 -    85
 STANBY  Ext                 -   185
 STATUS  Ext                 -    97
 TRIGER  Ext                 -   173
 TxTbEn  Rel    1023 #0003FF -   362     23     24     25     27     28     30     31
                                  34     38     39     40     41     42     43
 TxTbSt  Rel     483 #0001E3 -   209     23     24     25     27     28     30     31
                                  34     38     39     40     41     42     43     45
 fLEX    Ext                 -     5
=tCNTRL  Abs      35 #000023 -   188
=tINTRR  Abs      38 #000026 -   203
=tIO     Abs      36 #000024 -   193
=tLOCKO  Abs      37 #000025 -   198
=xromFF  Rel     141 #00008D -    50
```

```
Input Parameters

  Source file name is NZ&TBL::MS

  Listing file name is NZ/TBL:TI:ML::-1

  Object file name is NZXTBL:TI:MS::-1

                                          111111
                                0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                *
                *       N   N  ZZZZZ   &      EEEEE  RRRR   RRRR
                *       N   N      Z  & &     E      R   R  R   R
                *       NN  N     Z   & &     E      R   R  R   R
                *       N N N    Z     &      EEEE   RRRR   RRRR
                *       N  NN   Z     & & &   E      R R    R R
                *       N   N  Z      &  &    E      R  R   R  R
                *       N   N  ZZZZZ   && &   EEEEE  R   R  R   R
                *
                *
                * Date of last update <830929.1738>
                *
                * HPIL uses error numbers in the range 0-63 (0-3F Hex)
                * (Error numbers between 64 and (end) are building blocks)
                *
00000 10                CON(2)   1       Min message #
00002 34                CON(2)  67       Max message #
                *
                =eHPIL  EQU    00               (TITLE for my errors)
00004 01                CON(2)  16
00006 00                CON(2) 00               Message number 00
00008 4                 CON(1)   4
00009 8405              NIBASC \HPIL \
      94C4
      02
00013 C                 CON(1)  12
                *
                * Errors 1-15 are parse errors
                *
                *
                =eNOASN EQU    01               ASSIGN IO Needed
00014 51                CON(2)  21
00016 10                CON(2) 01               Message number 01
00018 5                 CON(1)   5
00019 1435              NIBASC \ASSIGN\
      3594
      74E4
00025 D                 CON(1)  13
00026 34                CON(2) =eION
00028 C                 CON(1)  12
                *
                =eXCESS EQU    03               Excess chars
00029 80                CON(2)   8
0002B 30                CON(2) 03               Message number 03
0002D E                 CON(1)  14
0002E 00                CON(2) =eEXCHR
00030 C                 CON(1)  12
                *
                =eMSPAr EQU    04               Missing parameter(s)
00031 80                CON(2)   8
00033 40                CON(2) 04               Message number 04
00035 E                 CON(1)  14
00036 00                CON(2) =eMSPAR
00038 C                 CON(1)  12
                *
```

```
                 =eILPAr EQU    05             Illegal parameter(s)
00039 80                 CON(2)  8
0003B 50                 CON(2) 05             Message number 05
0003D E                  CON(1)  14
0003E 00                 CON(2) =eILPAR
00040 C                  CON(1)  12
                 *
                 =eILEXp EQU    06             Illegal expression
00041 80                 CON(2)  8
00043 60                 CON(2) 06             Message number 06
00045 E                  CON(1)  14
00046 00                 CON(2) =eILEXP
00048 C                  CON(1)  12
                 *
                 =eSYNTx EQU    07             Syntax Error
00049 80                 CON(2)  8
0004B 70                 CON(2) 07             Message number 07
0004D E                  CON(1)  14
0004E 00                 CON(2) =eSYNTX
00050 C                  CON(1)  12
                 *
                 * Errors 8-15 are reserved
                 *
                 * Errors 16-31 are tape errors
                 *
                 *
                 =efPROT EQU    16             File Protect
00051 80                 CON(2)  8
00053 01                 CON(2) 16             Message number 16
00055 E                  CON(1)  14
00056 00                 CON(2) =eFPROT
00058 C                  CON(1)  12
                 *
                 =eEOTAP EQU    17             End of medium
00059 71                 CON(2)  23
0005B 11                 CON(2) 17             Message number 17
0005D 6                  CON(1)  6
0005E 54E6               NIBASC \End Of \
      4602
      F466
      02
0006C D                  CON(1)  13
0006D 24                 CON(2) =eMEDIA
0006F C                  CON(1)  12
                 =eINVAL EQU    18            Invalid medium
                 *
                 =eSTALL EQU    18             Tape stall-Invalid medium
00070 B0                 CON(2)  11
00072 21                 CON(2) 18             Message number 18
00074 E                  CON(1)  14
00075 00                 CON(2) =eINVLD
00077 D                  CON(1)  13
00078 24                 CON(2) =eMEDIA
0007A C                  CON(1)  12
                 *
```

```
                =eNOLIF EQU    19           Not LIF-Invalid medium
00078 80                CON(2)   8
0007D 31                CON(2) 19           Message number 19
0007F D                 CON(1)  13
00080 21                CON(2) =eINVAL
00082 C                 CON(1)  12
                *
                =eNOTAP EQU    20           No medium
00083 F0                CON(2)  15
00085 41                CON(2) 20           Message number 20
00087 2                 CON(1)   2
00088 E4F6              NIBASC \No \
      02
0008E D                 CON(1)  13
0008F 24                CON(2) =eMEDIA
00091 C                 CON(1)  12
                *
                =eNFILE EQU    22           File not found
00092 80                CON(2)   8
00094 61                CON(2) 22           Message number 22
00096 E                 CON(1)  14
00097 00                CON(2) =eFnFND
00099 C                 CON(1)  12
                *
                =eNEWTA EQU    23           New medium-Invalid medium
0009A 80                CON(2)   8
0009C 71                CON(2) 23           Message number 23
0009E D                 CON(1)  13
0009F 21                CON(2) =eINVAL
000A1 C                 CON(1)  12
                *
                =eBLANK EQU    24           No data -Invalid medium
000A2 80                CON(2)   8
000A4 81                CON(2) 24           Message number 24
000A6 D                 CON(1)  13
000A7 21                CON(2) =eINVAL
000A9 C                 CON(1)  12
                *
                =eRECRD EQU    25           Record #-Invalid medium
000AA 80                CON(2)   8
000AC 91                CON(2) 25           Message number 25
000AE D                 CON(1)  13
000AF 21                CON(2) =eINVAL
000B1 C                 CON(1)  12
                *
                =eCHSUM EQU    26           Checksum-Invalid medium
000B2 80                CON(2)   8
000B4 A1                CON(2) 26           Message number 26
000B6 D                 CON(1)  13
000B7 21                CON(2) =eINVAL
000B9 C                 CON(1)  12
                *
                =eTSIZE EQU    28           Size of file
000BA 91                CON(2)  25
000BC C1                CON(2) 28           Message number 28
```

```
000BE 7                CON(1)   7
000BF 3596             NIBASC \Size of \
      A756
      02F6
      6602
000CF E                CON(1)  14
000D0 00               CON(2) =eFILE
000D2 C                CON(1)  12
              *
              =eEFILE EQU    30             File exists
000D3 80               CON(2)   8
000D5 E1               CON(2) 30            Message number 30
000D7 E                CON(1)  14
000D8 00               CON(2) =eFEXST
000DA C                CON(1)  12
              *
              =eDIRFL EQU    31             Directory full
000DB 32               CON(2)  35
000DD F1               CON(2) 31            Message number 31
000DF B                CON(1)  11
000E0 D                CON(1)  13
000E1 4496             NIBASC \Director\
      2756
      3647
      F627
000F1 9702             NIBASC \y Full\
      6457
      C6C6
000FD C                CON(1)  12
              *
              * Errors 32-47 are HPIL Errors
              *
              =eNOFND EQU    32            Device not found
              *
              =eTERM  EQU    32             (Terminator match)
000FE 80               CON(2)   8
00100 02               CON(2) 32            Message number 32
00102 E                CON(1)  14
00103 00               CON(2) =eDVCNF
00105 C                CON(1)  12
              *
              =eNORDY EQU    34             Device not ready
00106 B1               CON(2)  27
00108 22               CON(2) 34            Message number 34
0010A D                CON(1)  13
0010B 14               CON(2) =eDEVIC
0010D 8                CON(1)   8
0010E E4F6             NIBASC \Not Read\
      4702
      2556
      1646
0011E 97               NIBASC \y\
00120 C                CON(1)  12
              *
              =eLTIMO EQU    35             Loop broken
```

```
00121 C1              CON(2)  28
00123 32              CON(2) 35              Message number 35
00125 A               CON(1)  10
00126 C4F6            NIBASC \Loop Bro\
      F607
      0224
      27F6
00136 B656            NIBASC \ken\
      E6
0013C C               CON(1)  12
            *
            =eFLOST EQU    36                Frame Error
0013D 31              CON(2)  19
0013F 42              CON(2) 36              Message number 36
00141 D               CON(1)  13
00142 04              CON(2) =eFRAME
00144 4               CON(1)   4
00145 5427            NIBASC \Error\
      27F6
      27
0014F C               CON(1)  12
            *
            =eOVRUN EQU    37                Frame Overrun
00150 80              CON(2)   8
00152 52              CON(2) 37              Message number 37
00154 D               CON(1)  13
00155 42              CON(2) =eFLOST
00157 C               CON(1)  12
            *
            =eLPERR EQU    38                Frame Changed
00158 80              CON(2)   8
0015A 62              CON(2) 38              Message number 38
0015C D               CON(1)  13
0015D 42              CON(2) =eFLOST
0015F C               CON(1)  12
            *
            =eUNEXP EQU    39                Unexpected Frame
00160 F1              CON(2)  31
00162 72              CON(2) 39              Message number 39
00164 A               CON(1)  10
00165 55E6            NIBASC \Unexpect\
      5687
      0756
      3647
00175 5646            NIBASC \ed \
      02
0017B D               CON(1)  13
0017C 04              CON(2) =eFRAME
0017E C               CON(1)  12
            *
            =eXXXXX EQU    40                Frame Lost
0017F 80              CON(2)   8
00181 82              CON(2) 40              Message number 40
00183 D               CON(1)  13
00184 42              CON(2) =eFLOST
```

```
00186 C                CON(1)  12
                 *
                 =eBADMD EQU    41        Invalid Mode
00187 11               CON(2)  17
00189 92               CON(2) 41          Message number 41
0018B E                CON(1)  14
0018C 00               CON(2) =eINVLD
0018E 3                CON(1)   3
0018F D4F6             NIBASC \Mode\
      4656
00197 C                CON(1)  12
                 *
                 =eFRTOI EQU    42        Frame Timeout (SCI)
00198 80               CON(2)   8
0019A A2               CON(2) 42          Message number 42
0019C D                CON(1)  13
0019D 32               CON(2) =eLTIMO
0019F C                CON(1)  12
                 *
                 =eFRTOL EQU    43        Frame Timeout (Loop)
001A0 80               CON(2)   8
001A2 B2               CON(2) 43          Message number 43
001A4 D                CON(1)  13
001A5 32               CON(2) =eLTIMO
001A7 C                CON(1)  12
                 *
                 =eSYSer EQU    44        System Error (Bad cur addr)
001A8 80               CON(2)   8
001AA C2               CON(2) 44          Message number 44
001AC E                CON(1)  14
001AD 00               CON(2) =eMMCOR
001AF C                CON(1)  12
                 *
                 =eTESTF EQU    45        Selftest failed
001B0 72               CON(2)  39
001B2 D2               CON(2) 45          Message number 45
001B4 B                CON(1)  11
001B5 F                CON(1)  15
001B6 3556             NIBASC \Self-tes\
      C666
      D247
      5637
001C6 4702             NIBASC \t failed\
      6616
      96C6
      5646
001D6 C                CON(1)  12
                 *
                 =eDTYPE EQU    47        Device type
001D7 11               CON(2)  17
001D9 F2               CON(2) 47          Message number 47
001DB D                CON(1)  13
001DC 14               CON(2) =eDEVIC
001DE 3                CON(1)   3
001DF 4597             NIBASC \Type\
      0756
001E7 C                CON(1)  12
              *
              * Errors 48-50 are unused
              *
              *
              * Error 51 is reserved
              *
              *
              =eABORT  EQU     52              Aborted operation
001E8 41               CON(2)  20
001EA 43               CON(2) 52               Message number 52
001EC 6                CON(1)   6
001ED 1426             NIBASC \Aborted\
      F627
      4756
      46
001FB C                CON(1)  12
              *
              =eDSPEC  EQU     53              Invalid device spec
001FC 41               CON(2)  20
001FE 53               CON(2) 53               Message number 53
00200 E                CON(1)  14
00201 00               CON(2) =eINVLD
00203 D                CON(1)  13
00204 14               CON(2) =eDEVIC
00206 3                CON(1)   3
00207 3507             NIBASC \Spec\
      5636
0020F C                CON(1)  12
              *
              =eNNUMR  EQU     54              Not numeric
00210 80               CON(2)   8
00212 63               CON(2) 54               Message number 54
00214 E                CON(1)  14
00215 00               CON(2) =eDATTY
00217 C                CON(1)  12
              *
              =eRANGE  EQU     56              Invalid Arg
00218 80               CON(2)   8
0021A 83               CON(2) 56               Message number 56
0021C E                CON(1)  14
0021D 00               CON(2) =eIVARG
0021F C                CON(1)  12
              *
              =eNMBOX  EQU     57              No loop
00220 41               CON(2)  20
00222 93               CON(2) 57               Message number 57
00224 6                CON(1)   6
00225 E4F6             NIBASC \No Loop\
      02C4
      F6F6
      07
00233 C                CON(1)  12
              *
```

```
                 =eNORAM EQU    59              Insufficient memory
00234 80                 CON(2)  8
00236 B3                 CON(2) 59              Message number 59
00238 E                  CON(1)  14
00239 00                 CON(2) =eMEM
0023B C                  CON(1)  12
                 *
                 =eOFFED EQU    60              RESTORE IO Needed
0023C 71                 CON(2)  23
0023E C3                 CON(2) 60              Message number 60
00240 6                  CON(1)   6
00241 2554               NIBASC \RESTORE\
      3545
      F425
      54
0024F D                  CON(1)  13
00250 34                 CON(2) =eION
00252 C                  CON(1)  12
                 *
                 * Errors 61-63 are reserved
                 *
                 * Error messages 64-end are building blocks
                 *
                 *
                 =eFRAME EQU    64              "Message" Building block
00253 61                 CON(2)  22
00255 04                 CON(2) 64              Message number 64
00257 7                  CON(1)   7
00258 D456               NIBASC \Message \
      3737
      1676
      5602
00268 C                  CON(1)  12
                 *
                 =eDEVIC EQU    65              "Device " building block
00269 41                 CON(2)  20
0026B 14                 CON(2) 65              Message number 65
0026D 6                  CON(1)   6
0026E 4456               NIBASC \Device \
      6796
      3656
      02
0027C C                  CON(1)  12
                 *
                 =eMEDIA EQU    66              "Medium" building block
0027D 21                 CON(2)  18
0027F 24                 CON(2) 66              Message number 66
00281 5                  CON(1)   5
00282 D456               NIBASC \Medium\
      4696
      57D6
0028E C                  CON(1)  12
                 *
                 =eION   EQU    67              " IO Needed" building block
0028F A1                 CON(2)  26
```

```
00291 34         CON(2) 67          Message number 67
00293 9          CON(1)   9
00294 0294       NIBASC \ IO Need\
      F402
      E456
      5646
002A4 5646       NIBASC \ed\
002A8 C          CON(1)  12
            *
002A9 FF         NIBHEX FF         Table terminator
002AB            END
```

```
=eABORT  Abs      52 #00034 -   303
=eBADMD  Abs      41 #00029 -   249
=eBLANK  Abs      24 #00018 -   134
=eCHSUM  Abs      26 #0001A -   148
 eDATTY  Ext                -   325
=eDEVIC  Abs      65 #00041 -   370     195     292     316
=eDIRFL  Abs      31 #0001F -   171
=eDSPEC  Abs      53 #00035 -   310
=eDTYPE  Abs      47 #0002F -   288
 eDVCNF  Ext                -   188
=eEFILE  Abs      30 #0001E -   164
=eEOTAP  Abs      17 #00011 -    85
 eEXCHR  Ext                -    42
 eFEXST  Ext                -   168
 eFILE   Ext                -   161
=eFLOST  Abs      36 #00024 -   209     222     229     246
 eFPROT  Ext                -    82
=eFRAME  Abs      64 #00040 -   363     213     239
=eFRTOI  Abs      42 #0002A -   258
=eFRTOL  Abs      43 #0002B -   265
 eFnFND  Ext                -   124
=eHPIL   Abs       0 #00000 -    19
 eILEXP  Ext                -    63
=eILEXp  Abs       6 #00006 -    59
 eILPAR  Ext                -    66
=eILPAr  Abs       5 #00005 -    62
=eINVAL  Abs      18 #00012 -    93     108     131     138     145     152
 eINVLD  Ext                -    99     253     314
=eION    Abs      67 #00043 -   384      35     355
 eIVARG  Ext                -   332
=eLPERR  Abs      38 #00026 -   225
=eLTIMO  Abs      35 #00023 -   201     262     269
=eMEDIA  Abs      66 #00042 -   377      91     101     117
 eMEM    Ext                -   346
 eMMCOR  Ext                -   276
 eMSPAR  Ext                -    49
=eMSPAr  Abs       4 #00004 -    45
=eNEWTA  Abs      23 #00017 -   127
=eNFILE  Abs      22 #00016 -   120
=eNMBOX  Abs      57 #00039 -   335
=eNNUMR  Abs      54 #00036 -   321
=eNOASN  Abs       1 #00001 -    29
=eNOFND  Abs      32 #00020 -   182
=eNOLIF  Abs      19 #00013 -   104
=eNORAM  Abs      59 #0003B -   342
=eNORDY  Abs      34 #00022 -   191
=eNOTAP  Abs      20 #00014 -   111
=eOFFED  Abs      60 #0003C -   349
=eOVRUN  Abs      37 #00025 -   218
=eRANGE  Abs      56 #00038 -   328
=eRECRD  Abs      25 #00019 -   141
=eSTALL  Abs      18 #00012 -    95
 eSYNTX  Ext                -    70
=eSYNTx  Abs       7 #00007 -    66
=eSYSer  Abs      44 #0002C -   272
```

```
=eTERM    Abs      32 #00020 -    184
=eTESTF   Abs      45 #0002D -    279
=eTSIZE   Abs      28 #0001C -    165
=eUNEXP   Abs      39 #00027 -    232
=eXCESS   Abs       3 #00003 -     38
=eXXXXX   Abs      40 #00028 -    242
=efPROT   Abs      16 #00010 -     78
```

```
Input Parameters

  Source file name is NZ&ERR::MS

  Listing file name is NZ/ERR:TI:ML::-1

  Object file name is NZ%ERR:TI:MS::-1

                                              111111
                                    0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
            *
            *       N   N  ZZZZZ   &     DDDD   III  RRRR
            *       N   N      Z  & &     D  D   I   R   R
            *       NN  N     Z   & &     D  D   I   R   R
            *       N N N    Z     &      D  D   I   RRRR
            *       N  NN   Z     & & &   D  D   I   R R
            *       N   N  Z      &  &    D  D   I   R  R
            *       N   N  ZZZZZ   && &  DDDD   III  R   R
            *
            *
                    TITLE  DIRECTORY SECTION <840301.1344>
F06B5               ABS    #F06B5        TIZHP6 address (fixed)
            **************************************************************
            **************************************************************
            **
            ** Name:        PILPOL - Poll handler for HPIL ROM (calls others)
            **
            ** Category:    PILUTL
            **
            ** Purpose:
            **      Handle the POLL entry (check if this is a poll I
            **      respond to...if so, jump to the poll handler for that
            **      specific poll
            **
            ** Entry:
            **      B[A] is the poll number
            **
            ** Exit:
            **      If not handled:
            **        XM=1, carry clear
            **      If handled successfully:
            **        XM=0, carry clear
            **      If error during handling:
            **        Carry set
            **
            ** Calls:       None
            **
            ** Uses.......
            **  Inclusive: B[A],C[A]
            **
            ** Stk lvls:    1 (internal GOSUB){Specific handlers may be more}
            **
            ** History:
            **
            **    Date     Programmer              Modification
            **   --------  ----------   ------------------------------
            **   09/26/83     NZ        Added documentation
            **
            **************************************************************
            **************************************************************
F06B5 20    =PILPOL P=     0
F06B7 D2           C=0     A
F06B9 31E1         LC(2)  ((TEND)-(TSTART))/5  Number of table entries
F06BD 04           SETHEX             Just to be SURE
F06BF 8B5          ?B<C    A
```

```
F06C2 60         GOYES  POLCH1        Check if ROM entry point
F06C4 6EB0       GOTO   POLCHR        ROM entry point
           *
           * Now compute the offset to the Poll handler
           *
F06C8 7690 POLCH1 GOSUB POLCH2        Set RSTK=TSTART (to get address)
           *
           * This is the jump table
           *
F06CC      TSTART
F06CC 0000       REL(5) =hVER$        #00 VER$
      0
F06D1 0000       REL(5) =DEVSPp       #01 Device parse
      0
F06D6 0000       REL(5) =PILDC        #02 File decompile
      0
F06DB 4B00       REL(5) =RTNSXM       #03 Device execute
      0
F06E0 0000       REL(5) =FILSPp       #04 File spec parse
      0
F06E5 0000       REL(5) =FILSPx       #05 File spec XEQ
      0
F06EA 0000       REL(5) =hCAT         #06 CAT
      0
F06EF 0000       REL(5) =hCAT$        #07 CAT$
      0
F06F4 0000       REL(5) =hCOPYx       #08 COPY execute
      0
F06F9 0000       REL(5) =hCREAT       #09 Create XEQ
      0
F06FE 0000       REL(5) =hDIDST       #0A Device ID store (HPIL)
      0
F0703 0000       REL(5) =hFPROT       #0B Private/Secure/Unsecure
      0
F0708 7800       REL(5) =RTNSXM       #0C LIST (File not in mainframe)
      0
F070D 2800       REL(5) =RTNSXM       #0D MERGE (File not in mainframe)
      0
F0712 0000       REL(5) =hPRTCL       #0E Print class
      0
F0717 0000       REL(5) =PRTIS        #0F Print (part 1)
      0
F071C 0000       REL(5) =hPURGE       #10 PURGE
      0
F0721 0000       REL(5) =hRENAM       #11 ReNAME
      0
F0726 0000       REL(5) =hENTER       #12 Enter
      0
F072B 4600       REL(5) =RTNSXM       #13 HPIL poll 2
      0
F0730 F500       REL(5) =RTNSXM       #14 HPIL poll 3
      0
F0735 A500       REL(5) =RTNSXM       #15 HPIL poll 4
      0
F073A 5500       REL(5) =RTNSXM       #16 HPIL poll 5
```

```
            0
 F073F 0000          REL(5) =hFINDF       #17 Find file
            0
 F0744 0000          REL(5) =hRDCBF       #18 Read current record to file bufr
            0
 F0749 0000          REL(5) =hRDNBF       #19 Write bufr out & read next recor
            0
 F074E 0000          REL(5) =hWRCBF       #1A Write file bufr to current recor
            0
 F0753 0000          REL(5) =hKYDF        #1B Build key defn
            0
 F0758 7300          REL(5) =RTNSXM       #1C WTKY - waiting for key in KEYRD
            0
 F075D 0000          REL(5) =ENTUSG       #1D IMAGE execution starts
            0
                *
                * End of polls handled by HPIL ROM
                *
 F0762          TEND
                *
                * REMAINING CODE FOR TABLE LOOKUP
                *
 F0762 07       POLCH2  C=RSTK
 F0764 C9               C=B+C  A
 F0766 C5               B=B+B  A
 F0768 C5               B=B+B  A                B*4
 F076A C9               C=B+C  A                C[A] is now address of jump address
                *
 F076C D5               B=C    A                Save address in B[A] for offset
 F076E 137              CD1EX                   D1 @ address, D1 value in C[A]
 F0771 06               RSTK=C                  Push D1 value (to allow restore)
 F0773 147              C=DAT1 A                Read offset to actual address
 F0776 C1               B=C+B  A                B[A] is address of specific handler
 F0778 07               C=RSTK                  Restore D1 from RSTK...
 F077A 135              D1=C                    ...to D1
 F077D D9               C=B    A                Copy address to C[A]...
 F077F 06               RSTK=C                  ...Push address onto stack...
 F0781 03               RTNCC                   ...and jump to the routine
                *-
                *-
                *
                * Check for system polls (#F0 through #FF)
                *
 F0783 BED      POLCHR  B=-B-1 B                Ones complement of poll # in B[A]
 F0786 3190             LC(2)  ((TEND2)-(TSTAR2))/5  Load # of ROM entries
 F078A 8B5              ?B<C   A                In the range HPIL knows?
 F078D 40               GOYES  POLCH3           Yes...compute specific handler addr
 F078F 00       RTNSXM  RTNSXM                  No...return, carry clear, XM=1
                *-
                *-
 F0791 7DCF     POLCH3  GOSUB  POLCH2           Same driver, given the table addr
                *
                * This is the table for system polls
                *
 F0795          TSTAR2
```

```
F0795 0000         REL(5) =PILCST       #FF CLDST Cold start address
         0
F079A 0000         REL(5) =PILWNK       #FE DSWNK Deep sleep wakeup-no key
         0
F079F 0000         REL(5) =PILWKP       #FD DSWKY Deep sleep wakeup
         0
F07A4 0000         REL(5) =PILPOF       #FC PWROF Power off
         0
F07A9 0000         REL(5) =PILCNF       #FB CONFG Configuration
         0
F07AE 0000         REL(5) =PILMLP       #FA MNLP Main loop
         0
F07B3 0000         REL(5) =PILSRQ       #F9 SREQ Service request
         0
F07B8 0000         REL(5) =hEXCPT       #F8 Excpt Exception check after stmt
         0
F07BD 0000         REL(5) =hZERPG       #F7 ZERPG The Math stack is collapse
         0
              *
              * End of polls handled by HPIL ROM
              *
F07C2         TEND2
F07C2                  END
```

```
 DEVSPp  Ext                   -    67
 ENTUSG  Ext                   -    95
 FILSPp  Ext                   -    70
 FILSPx  Ext                   -    71
 PILCNF  Ext                   -   140
 PILCST  Ext                   -   136
 PILDC   Ext                   -    68
 PILMLP  Ext                   -   141
 PILPOF  Ext                   -   139
*PILPOL  Abs  984757 #F06B5 -    51
 PILSRQ  Ext                   -   142
 PILWKP  Ext                   -   138
 PILWNK  Ext                   -   137
 POLCH1  Abs  984776 #F06C8 -    61     56
 POLCH2  Abs  984930 #F0762 -   103     61    131
 POLCH3  Abs  984977 #F0791 -   131    127
 POLCHR  Abs  984963 #F0783     124     57
 PRTIS   Ext                   -    81
 RTNSKM  Abs  984975 #F078F -   128     69     78     79     85     86     87     88
                                 94
 TEND    Abs  984930 #F0762      99     53
 TEND2   Abs  985026 #F07C2     148    125
 TSTAR2  Abs  984981 #F0795 -   135    125
 TSTART  Abs  984780 #F06CC -    65     53
 hCAT    Ext                   -    72
 hCAT$   Ext                   -    73
 hCOPYx  Ext                   -    74
 hCREAT  Ext                   -    75
 hDIDST  Ext                   -    76
 hENTER  Ext                   -    84
 hEXCPT  Ext                   -   143
 hFINDF  Ext                   -    89
 hFPROT  Ext                   -    77
 hKYDF   Ext                   -    93
 hPRTCL  Ext                   -    80
 hPURGE  Ext                   -    82
 hRDCBF  Ext                   -    90
 hRDNBF  Ext                   -    91
 hRENAM  Ext                   -    83
 hVER$   Ext                   -    66
 hWRCBF  Ext                   -    92
 hZERPG  Ext                   -   144
```

```
Input Parameters

  Source file name is NZ&DIR::MS

  Listing file name is NZ/DIR:TI:ML::-1

  Object file name is NZXDIR:TI:MS::-1

                                          111111
                                0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
               *
               *
               *     N   N  ZZZZZ   &      GGG   PPPP   RRRR
               *     N   N      Z  & &    G   G  P   P  R   R
               *     NN  N     Z   & &    G      P   P  R   R
               *     N N N    Z     &     G GGG  PPPP   RRRR
               *     N  NN   Z     & & &  G   G  P      R R
               *     N   N  Z      &  &   G   G  P      R  R
               *     N   N  ZZZZZ   && &   GGG   P      R   R
               *
               *
                     TITLE  GENERAL ROUTINES <840301.1351>
F07C2                ABS    #F07C2        TIXHP6 address (fixed)
               ************************************************************
               ************************************************************
               **
               ** Name:        FRAME+ - Evaluate an HPIL message, return type
               ** Name:        FRAME- - Evaluate a message, return type (not 3dat
               **
               ** Category:    PILUTL
               **
               ** Purpose:
               **      Parses a frame
               **
               ** Entry:
               **      C[6:0] contains the input frame from GET
               **      ST[3:0] contains the HPIL handshake nibble
               **
               **      FRAME+: C[S] is the status nibble from I/O processor
               **
               ** Exit:
               **      Frame type in P:                                MNEMONIC:
               **              0: ACKNOWLEDGE                          (pACK  )
               **              1: CURRENT PIL STATE                    (pSTATE)
               **              2: DIAGNOSTIC (TEST RESULTS)            (pDIAGR)
               **              3: DIAGNOSTIC (LOCATION CONTENTS)       (pDIAGL)
               **              4: ADDRESS                              (pADDR )
               **              5: IFC RECEIVED (NOT SYS CONTROLLER)    (pIFC  )
               **              6: EOT RECEIVED                         (pEOT  )
               **              7: CONVERSATION HALTED (COUNT, NOT L)   (pHALTD)
               **              8: TERMINATOR MATCH                     (pTERM )
               **              9: ETE REVEIVED                         (pETE  )
               **             10: UNRECOGNIZED TYPE                    (pUTYPE)
               **             11: DATA/END FRAME                       (pDATA )
               **             12: COMMAND RECEIVED                     (pCMD  )
               **             13: READY FRAME                          (pRDY  )
               **             14: IDY FRAME                            (pIDY  )
               **             15: THREE BYTE DATA TRANSFER             (p3DATA)
               **     If illegal frame or error, sets carry; else clears it
               **
               ** Calls:       None
               **
               ** Uses.......
               **  Inclusive: C[S],P (C[S] only for FRAME+)
               **
```

```
            ** Stk lvls:  0
            **
            ** History:
            **
            **   Date     Programmer            Modification
            **  --------  ----------  ---------------------------------
            **  09/22/83     NZ       Updated documentation again
            **  01/03/83     NZ       Updated documentation
            **
            ***************************************************************
            ***************************************************************
F07C2 A46   =FRAME+ C=C+C  S          If carry, 3 byte data transfer
F07C5 80FF          CPEX   15
F07C9 560           GONC   FRAME0     No carry...not 3 byte data
            *
            * Three byte data transfer!
            *
F07CC 20            P=     =p3DATA
F07CE 03            RTNCC
            *-
            *-
F07D0       =FRAME-
F07D0 0B    FRAME0  CSTEX             Put the frame into status bits
F07D2 86B           ?ST=0  11         Is the MSB clear?
F07D5 41            GOYES  FR0XXX     Yes!
            *
            * (1XXX XXXX XXXX) is data class
            *
            * (10XX XXXX XXXX) is DATA or END
            * (1100 XXXX XXXX) is COMMAND received
            * (1101 XXXX XXXX) is READY received
            * (111X XXXX XXXX) is IDY received
            *
F07D7 86A   FR1XXX  ?ST=0  10         Is bit 10 clear?
F07DA 20            GOYES  FR11XX     Yes...DATA or END
            *
            * Carry clear:
            *   (11XX XXXX XXXX) is COMMAND, READY, or IDY
            * Carry set:
            *   (10XX XXXX XXXX) is DATA or END
            *
F07DC 0B    FR11XX  CSTEX             Swap frame back into C[X]
F07DE 80D2          P=C    2          P is now the type!
F07E2 575           GONC   FREND      Go if COMMAND, READY, or IDY
            *FR10XX
            *
            * (10XX XXXX XXXX) is DATA or END
            *
F07E5 20            P=     =pDATA     Data/End
F07E7 03            RTNCC
            *-
            *-
F07E9       FR0XXX
            *
            * (0XXX XXXX XXXX) is status, diagnostic, or address
```

```
                *
                * (0000 XXXX XXXX) is status message
                * (0001 XXXX XXXX) is current state
                * (001X XXXX XXXX) is diagnostic
                * (01SS SSSP PPPP) is address
                *
F07E9 86A               ?ST=0  10          Is it an address?
F07EC 80                GOYES  FR00XX      No!
F07EE 20                P=     =pADDR      Address
F07F0 0B                CSTEX
F07F2 03                RTNCC
                *-
                *-
F07F4           FR00XX
                *
                * (00XX XXXX XXXX) is either status or diagnostic class
                *
                * (0000 XXXX XXXX) is status message
                * (0001 XXXX XXXX) is current state
                * (001X XXXX XXXX) is diagnostic
                *
F07F4 0B                CSTEX
F07F6 80D2              P=C    2
F07FA 880               ?P#    0
F07FD D3                GOYES  FREND       Current state or diagnostic
                *
                * (0000 ZZZZ XXXX) is status message if Z=0, else error
                *
F07FF 21                P=     1
F0801 90E               ?C#0   P
F0804 34                GOYES  FRERR       Error!
F0806 0B                CSTEX
F0808 873               ?ST=1  3
F080B A3                GOYES  FRERRS      Unrecognized frame!
                *
                * (0000 0000 0XXX) is a status message...
                *
F080D 0B                CSTEX
F080F 80D0              P=C    0           Decode it!
F0813 890               ?P=    =pACK
F0816 42                GOYES  FREND       NOP (Acknowledge)
F0818 883               ?P#    3           Is it ETE?
F081B 60                GOYES  FR00-3      No...
F081D 20                P=     =pETE       Yes...report it!
F081F 03                RTNCC
                *-
                *-
F0821 882       FR00-3  ?P#    2           Is it now an EOT?
F0824 60                GOYES  FR00-2      No...check further!
F0826 20                P=     =pEOT       Yes...
F0828 03                RTNCC
                *-
                *-
F082A 884       FR00-2  ?P#    4           Conversation halted?
F082D 60                GOYES  FR00-1      No...check further
```

```
F082F 20              P=     =pHALTD
F0831 03              RTNCC
             *-
             *-
F0833 881    FR00-1   ?P#    1               IFC received?
F0836 60              GOYES  FR00-0          Check further
F0838 20              P=     =pIFC           Yes...set P to value!
F083A 03     FREND    RTNCC
             *-
             *-
F083C 885    FR00-0   ?P#    5               Terminator match?
F083F 80              GOYES  FRERR           No...error!
F0841 20              P=     =pTERM
F0843 03              RTNCC
             *-
             *-
F0845 0B     FRERRS   CSTEX                  Status back in ST, frame in C[X]
F0847 20     FRERR    P=     =pUTYPE         This means unrecognized frame
F0849 02              RTNSC
             *****************************************************************
             *****************************************************************
             **
             ** Name:        END - Clean up the loop
             ** Name:        ENDST - Clean up the loop, exit through NXTSTM
             ** Name:        ENDFN - Clean up the loop, preserve C[W] in R0
             ** Name:        UTLEND - Unaddress talkers&listeners, clean up
             **
             ** Category:    PILUTL
             **
             ** Purpose:
             **      Clean up after accessing a loop
             **
             ** Entry:
             **      MBOX^ points to the mailbox used by this routine
             **
             ** Exit:
             **      Carry clear:
             **        D0 at last mailbox used before call
             **        ENDST: Jumps to NXTSTM
             **        ENDFN: Restores value of C[W] (saved at entry)
             **        UTLEND: First unaddress talkers/listeners, then END
             **      Carry set:
             **        Error (P, C[0] are error code)
             **
             ** Calls:  END:GETMBX
             **        ENDST:END
             **       UTLEND:UNT,UNLPUT
             **        ENDFN:UTLEND
             **
             ** Uses.......
             **  Inclusive: C[W],D0,P,ST[3:0]
             **
             ** Stk lvls:    END: 0 <GETMBX>
             ** Stk lvls:    ENDST: 1 (END)
             ** Stk lvls:    UTLEND: 1 (UNT)(UNLPUT)<END>
```

```
                 ** Stk lvls:   ENDFN: 2 (UTLEND)
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **  --------   ----------   --------------------------------
                 **  09/22/83       NZ       Updated documentation again
                 **  01/03/83       NZ       Updated documentation
                 **
                 ***************************************************************
                 ***************************************************************
 F084B 7820 =ENDST  GOSUB  END
 F084F 8C00         GOLONG =nXISTM        Next basic statement!
       00
                 *-
                 *-
 F0855 108  =ENDFN  R0=C                  Save value of C in R0!
 F0858 7500         GOSUB  UTLEND
 F085C 118          C=R0
 F085F 01           RTN                   (Preserve carry!)
                 *-
                 *-
 F0861 7210 =UTLEND GOSUB  Getmbx         Get the mailbox address
 F0865 8E00         GOSUBL =UNT           Unaddress talkers
       00
 F086B 400          RTNC
 F086E 7E84         GOSUB  UNLPUT         Unaddress listeners
 F0872 821          XM=0                  Clear XM flag (for statements)
 F0875 01           RTN
                 *-
                 *-
 F0877      =END
 F0877 8C00 Getmbx  GOLONG =GETMBX        Return, D0 @ mailbox
       00
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:         START - Set up entry conditions for the loop
                 ** Name:         START+ - Set up loop information (loop # in C[S])
                 ** Name:         START- - Set up loop (loop # in C[S], sReadd=1)
                 **
                 ** Category:     PILUTL
                 **
                 ** Purpose:
                 **       Set up the loop, given the device specifier
                 **
                 ** Entry:
                 **      D[3:0] contains the device address (if known).
                 **          If the address is not known, D[B]=#1F/3F/5F/7F/9F
                 **             #1F: (DevTyp) B[X] is the accessory ID
                 **             #3F: (DevID)  B[W] is the device ID
                 **             #5F: (VolLbl) B[W] is the volume label
                 **             #7F: (Null)   B[W] is "don't care"
                 **             #9F: (Loop)   B[W] is "don't care"
                 **              D[2] is the sequence number for #1F and #3F
```

```
**      If D[X] is an address, bits 8 and 9 are the mailbox #
**      If D[X] is not an address, D[3] is the mailbox #
**
** Exit:
**      Carry clear:
**        Device address in D[X] (+mailbox*1024)
**        D[S] is 0 if address given, 1 if device type,
**          2 if device ID, 3 if volume label, 4 if NULL,
**          5 if LOOP
**        Sets D0 to the HPIL mailbox
**        ST(sReadd) set if loop was readdressed, else clear
**      Carry set:
**        Error (P, C[0] are error code)
**
** Calls:       SETLP,FNDCH-,GETDev,PUTGF-,PUTE,GETERR,GETST,
**              SFLAG?,RESTRT,GETMBX,SWAP01,I/OFND
**
** Uses.......
**  Exclusive:       C[W],D[15   ],        D0,P,ST[4  ]
**  Inclusive: A[W],C[W],D[15:13],D[5:0],D0,P,ST[4:0]
**
** Stk lvls:    3 (RESTRT)(FNDCH-)<GADDR>
**
** Algorithm:
**      START: Derive loop # from D[X] (into C[S])      (SETLP)
**      START+:Set flag (sReadd) to not force readdressing
**      START-:Find mailbox, check for reset, OFFED   (FNDCH-)
**             Check if controller...if so, goto STARTn
**             Check if NULL, LOOP, or zero (if not, error)
**             goto START3
**             ----
**    (Controller)
**      STARTn:
**             If force readdressing (sReadd=1)
**               then send IFC to power up the loop
**               else send power up the loop message (NOP frame)
**      STARTS:Check if error powering up the loop     (GETERR)
**      START!:Get I/O processor status bits
**             If sReadd=1 then goto START2
**             If loop is unconfigured (sUNCNF)
**               then
**                 If (supress readdress)=1 then goto START2
**                 Set all internal addresses=unknown (RESTRT)
**                 Set D0 to mailbox address          (GETMBX)
**             goto START3
**             ----
**    (Readdressing the loop)
**      START2:
**             Set all internal addresses=unknown     (RESTRT)
**             If (extended address flag=0) or
**                (an ASSIGNIO is active)
**               then readdress the loop, primary only
**               else readdress the loop, extended addresses
**             Send readdress message, get result     (PUTGF-)
**             If address not returned by I/O CPU then error
```

```
                **    (Check the device specifier)
                **      START3:If not (find device)
                **               then return (all OK)
                **               else goto GADDR (Get device address)
                **
                ** History:
                **
                **    Date     Programmer            Modification
                **  --------   ----------     ---------------------------------
                **  09/22/83      NZ          Updated documentation
                **  08/02/83      NZ          Added check of =flNZ4 to check if
                **                            readdress the loop automatically
                **  06/03/83      NZ          Removed setting of IDY timeout
                **                            (now done in CHKSET)
                **  06/04/83      NZ          Removed redundant code to set the
                **                            device bit in LOOPST
                **  03/29/83      NZ          Added check of =flEXTD to decide
                **                            whether to use extended addresses
                **  03/15/83      NZ          Changed FNDMB-, CHKSTS to FNDCH-
                **  03/09/83      NZ          Changed code to call CHKSTS
                **  03/08/83      NZ          Changed call to FNDMBX to FNDMB-
                **  01/03/83      NZ          Updated documentation
                **
                ****************************************************************
                ****************************************************************
 F087D          =START
                *
                * First set C[S] to be the mailbox #, minus 1
                *
 F087D 8E00           GOSUBL =SETLP           Set loop # into C[S] from D[A]
       00
                *
 F0883 840      =START+ ST=0   =sReadd        START does NOT force readdress!
                *
                * Set DispOK bit false (Display is NOT set up on loop)
                *
 F0886          =START-
                *
                * Get the mailbox address (search the device table for it)
                * (also clears DispOK and other bits in that nibble)
                *
 F0886 7683           GOSUB  FNDCH-          Do all the above, FNDMBX,CHKSTS
 F088A 400            RTNC
                *
                * Now D0 points to the mailbox
                *
                * Check if I am the controller on this loop
                *
 F088D 7F53           GOSUB  GETDev          Check if I am controller on loop
 F0891 542            GONC   STARTn          I AM controller...continue
                *
                * If device is not "LOOP", "NULL" or zero then error, else
                * continue
                *
 F0894 968            ?D=0   B               Zero?
```

```
F0897 B1              GOYES  STARTd         Yes...OK
F0899 3100            LC(2)  =Null
F089D 963             ?C=D   B              "NULL"?
F08A0 21              GOYES  STARTd         Yes...OK!
F08A2 3100            LC(2)  =Loop
F08A6 963             ?C=D   B              "LOOP"?
F08A9 90              GOYES  STARTd         Yes...OK!
            *
            * Error...I/O CPU is not controller and not LOOP, NULL, or 0
            *
F08AB 300             LC(1)  =eBADMD        Illegal mode (not controller)
F08AE 20              P=     =ePIL
F08B0 02              RTNSC
            *-
            *-
F08B2       STARTd
            *
            * I am in device mode!
            *
F08B2 6AB0            GOTO   START3         Continue following controller
            *-
            *-
            *
            * I am controller...continue
            *
F08B6       STARTn
            *
            * I/O CPU status in C[X]
            *
            * Power up the loop (check if need IFC or just mPULOP)
            *
F08B6 870             ?ST=1  =sReadd        Force readdressing?
F08B9 61              GOYES  STARTN         Yes...power up the loop with IFC
F08BB 3100            LC(2)  =mPULOP        Power up the loop
F08BF 7BB3            GOSUB  PUTGF-         Put it, GET, FRAME+
F08C3 4C1             GOC    STARTS         Error...get the error message
F08C6 890             ?P=    =pSTATE        Status message?
F08C9 71              GOYES  STARTS         Yes...status message
F08CB 64C0            GOTO   START5         No...unexpected frame
            *-
            *-
F08CF 3500  STARTN    LC(6)  =nTAKEI        Take control with IFC
      0000
F08D7 8E00            GOSUBL =PUTE
      00
F08DD 400             RTNC                  Carry if error
            *
            * Status message...check if error
            *
F08E0 7500  STARTS    GOSUB  Geterr         Get error message
F08E4 5A0             GONC   START!         If no carry, loop is UP!
F08E7 02    STARtE    RTNSC                 Error...exit with carry set
            *-
            *-
F08E9 8C00  Geterr    GOLONG =GETERR        (P,C[0] are error, Carry set)
```

```
           00
                *-
                *-
                *
                * Now the loop is powered up!
                *
     F08EF 8E00 START!  GOSUBL =GETST         Get the I/O CPU status again
           00
     F08F5 400          RTNC                  If carry, ERROR!
     F08F8 870  START0  ?ST=1   =sReadd       Force readdressing?
     F08FB 62           GOYES   START2        Yes...do it!
                *
                * Check if loop needs to be readdressed (not done now)
                *
     F08FD 0B           CSTEX                 Put I/O CPU status in ST bits
     F08FF 860          ?ST=0   =sUNCNF       Is the loop unconfigured?
     F0902 20           GOYES   START1        Set/Clear carry...
     F0904 0B   START1  CSTEX                 If carry is set, loop is OK!
     F0906 466          GOC     START3
     F0909 3100         LC(2)   =flNZ4        Check if suppress auto readdress
     F090D 7170         GOSUB   sflag?        Save D[A] in D0;SFLAG?;restore D
     F0911 5F0          GONC    START2        Flag is clear...DO readdress!
     F0914 8E00         GOSUBL  =RESTRT       Restart all devices! (unknown)
           00
     F091A 795F         GOSUB   Getmbx        Flag is set...just get mailbox
     F091E 5E4          GONC    START3        Go always
                *-
                *-
     F0921 8E00 START2  GOSUBL  =RESTRT       Set all devices to be restarted.
           00
     F0927 850          ST=1    =sReadd       Indicate loop was readdressed!
     F092A 3100         LC(2)   =flEXTD       Check if extended addressing
     F092E 7050         GOSUB   sflag?
                *
                * D[A] is the value of D0, which was saved there by SFLAG?
                *
     F0932 3100         LC(2)   (=mAUTOA)+1   Preset primary only!
     F0936 522          GONC    STARTs        If flag is clear, use simple addr
     F0939 8E00         GOSUBL  =SWAP01       Swap D0, D1 to save D1
           00
     F093F 3200         LC(3)   =bPILAI
           0
     F0944 8E00         GOSUBL  =i/OFND       Find the buffer
           00
     F094A 8E00         GOSUBL  =SWAP01       Restore D1 from D0
           00
                *
                * Now carry is SET if assignio buffer found
                *
     F0950 3100 STARTp  LC(2)   =mAUTOA       Loop needs to be reconfigured...
     F0954 540          GONC    STARTs        If no carry, then no assignio
     F0957 E6           C=C+1   A             If carry, then primary only
                *
     F0959 06   STARTs  RSTK=C                Save message on RSTK
     F095B 781F         GOSUB   Getmbx        Get back the mailbox!!!
```

```
F095F 07               C=RSTK                    Restore message
F0961 7913             GOSUB  PUTGF-             Put message, get last addr,decode
F0965 400              RTNC
F0968 880              ?PM    =pADDR             (address frame)
F096B 52               GOYES  START5
F096D AC3    START3    D=0    S                  Set initial value of source flag
F0970 20               P=     0
F0972 310E             LCHEX  E0
F0976 0EFF             C=C!D  A                  Check for address unknown
F097A B66              C=C+1  B                  (address remains in D[3:0])
F097D 461              GOC    GADDR              Go if address unknown
F0980 03               RTNCC                     Address is valid or 0
             *-
             *-
F0982 DF     sflag?    CDEX   A                  Swap flag into D[A], D[A] to C
F0984 134              D0=C                      Save D[A] in D0 (SFLAG? restores)
F0987 DB               C=D    A                  Restore flag from D[A]
F0989 8D00   =sFLAG?   GOVLNG =SFLAG?            Go to SFLAG? now
      000
             *-
             *-
F0990        START5
F0990 6741             GOTO   GADDRe             Unexpected frame error!
             ***************************************************************
             ***************************************************************
             **
             ** Name:        GADDR - Get the address of a device from loop
             **
             ** Category:    PILUTL
             **
             ** Purpose:
             **       Get device address, given search information for the
             **       device
             **
             ** Entry:
             **       D0 points to the HPIL mailbox
             **       D[B] is the search type (#1F,3F,5F,7F,9F)
             **          #1F: (Device type) -B[B] is accessory ID
             **          #3F: (Device ID)   -B[W] is device ID
             **          #5F: (Volume label)-B[W] is the label
             **          #7F: (Null)        -B[W] is "don't care"
             **          #9F: (LOOP)        -B[W] is "don't care"
             **       D[2] is the sequence number
             **       D[3] is the loop number
             **       D[S]=0 (for search type at exit)
             **
             ** Exit:
             **       Carry clear:
             **         HPIL handshake in ST[3:0]
             **         Device address,(mailbox #)*1024 in D[X]
             **         D[S] is search type (1=device type, 2=device ID,
             **           3=volume label,4=NULL,5=LOOP)
             **         D[3] is sequence number (was in D[2] at entry)
             **       Carry set: P, C[S] are error code
             **
```

```
** Calls:      PUTGF+,UNLPUT,PUTC+,GETERR,GETID,PUTGF-,UNT,
**             TSTAT,SEEKA,DDT,TSTATA,READRG,ASRC4,MTYL,DDL
**
** Uses.......
**  Exclusive: A[A],C[W],D[15:14],D[5:0],P
**  Inclusive: A[W],C[W],D[15:13],D[5:0],P,ST[3:0]
**             (If volume label, blankfills B[W],uses B[15:12])
**
** Stk lvls:   3 (GETID)(TSTAT)(SEEKA)
**
** Algorithm:
**      GADDR: if device type is not NULL then goto GADDR0
**             (Type=NULL)
**             set D[S] to DsNull-1
**     GADDRN:set address to zero
**             goto GADDR'
**             ----
**     GADDR0:if device type is not LOOP then goto GADDR1
**             (Type=LOOP)
**             set D[S] to DsLoop-1
**             goto GADDRN (set address=0, goto GADDR')
**             ----
**     GADDR1:if device type is not Acc ID then goto GADDR3
**             (Type=Accessory ID)
**             find that Acc ID (& sequence #)         (PUTGF+)
**             if not found then {Device Not Found}
**    (Device found, address message from I/O CPU in C[X])
**     GADDR':increment D[S] (search type)
**             set D[X]=address + (loop number)*1024 {bits 8&9}
**             set D[3]=sequence number (D[2] entry value)
**             return, all OK
**             ----
**    (Either Volume Label or Device ID)
**     GADDR3:determine length of word in B[W] by searching
**               from B[15] toward B[0], check for first non-
**               zero nibble (all unused nibbles of B[W]=0)
**             set D[14]=length (WP length)
**             if device type is not Device ID then goto GADDR6
**             (Type=Device ID)
**             make a copy of sequence number in D[5]
**             unaddress all listeners on loop        (UNLPUT)
**             reset I/O CPU current address           (PUTC+)
**             check for I/O CPU error (if so, exit)  (GETERR)
**             if loop is unaddressed then {Device Not Found}
**     GADDR4:get Device ID of the current device     (GETID)
**             if no response then goto GADDR5
**             if response matches requested ID (for given length
**               then
**                 decrement sequence # in D[5]
**                 if not right sequence number yet
**                   then goto GADDR5
**                   else
**                     set D[S]=0 (will be incremented twice)
**    GADDR&:          increment D[S]
**                     get current address             (PUTGF-)
```

```
           **                      if not address then {Unexpected Frame}
           **                      goto GADDR'
           **             ----
           **         GADDR5:increment current address             (PUTGF-)
           **                if valid address then goto GADDR4
           **                if end of addresses then {Device Not Found}
           **                  else {Unexpected Message}
           **             ----
           **         GADDR6:if device type <> Volume Label
           **                  then {Unexpected Frame}
           **                (Type=Volume Label)
           **                blankfill requested label (B[11:0])
           **                set tape counter (D[4]) to first drive
           **         GADDRv:find D[4]th tape drive                (PUTGF+)
           **                if not found then {Device Not Found}
           **                check tape status                     (TSTAT)
           **                if status <> all OK and status <> new tape
           **                  then goto GADDm
           **         GADDR7:seek sector zero on the tape          (SEEKA)
           **                if seek error then goto GADDm
           **         GADDR8:read sector zero                        (DDT)
           **                if read error then goto GADDm         (TSTATA)
           **                read 8 bytes from the tape            (READRG)
           **                if tape is not LIF format then goto GADDm
           **                if tape volume label matches requested label
           **                  then
           **                    set search type to 1 (will have 2 added)
           **                    goto GADDR&
           **      (rewind the tape, goto next tape)
           **         GADDm: rewind the current tape           (MTYL)(DDL)
           **                increment tape counter (D[4])
           **                if tape counter is >16 then {Device Not Found}
           **                goto GADDRv
           **
           ** History:
           **
           **    Date      Programmer              Modification
           **  --------    ----------     ----------------------------------
           **  09/22/83       NZ          Updated documentation extensively
           **  02/09/83       NZ          Added LOOP to valid lists
           **  01/03/83       NZ          Updated documentation
           **
           ***************************************************************
           ***************************************************************
F0994 DB   =GADDR  C=D    A           Copy D[2] (sequence #)
           *
           * Decode what type it is
           *
F0996 3100         LC(2)  =Null       Is this a NULL assignment?
F099A 967          ?C#D   B
F099D F0           GOYES  GADDR0      Not NULL...continue
           *
           * NULL assignment!
           *
F099F 2F           P=     15
```

```
F09A1 300              LC(1)  (=DsNull)-1   Code for NULL-1
F09A4 AC7   GADDRN     D=C    S
F09A7 D2               C=0    A             Clear "ADDRESS"
F09A9 503              GONC   GADDR'        Go always (Continue with coding)
            *-
            *-
F09AC 3100  GADDR0     LC(2)  =Loop         Is this LOOP?
F09B0 967              ?C#D   B
F09B3 A0               GOYES  GADDR1        Not LOOP...continue
F09B5 2F               P=     15
F09B7 300              LC(1)  (=DsLoop)-1   Code for LOOP-1
F09BA 59E              GONC   GADDRN        Go always
            *-
            *-
F09BD 3100  GADDR1     LC(2)  =DevTyp       Is this a device type?
F09C1 967              ?C#D   B
F09C4 34               GOYES  GADDR3        No...check further!
            *
            * Accessory ID...search for it!
            *
F09C6 AE9              C=B    B             Type in C[B] for FIND Nth device
F09C9 23               P=     3
F09CB 300              LC(1)  =nFIND1       FIND Nth device, type N
F09CE 70B2             GOSUB  PUTGF+        Put message, get address,decode
F09D2 400              RTNC
F09D5 880              ?P#    =pADDR        Check if address frame
F09D8 B2               GOYES  GADDR2        Not address...error
            *
            * Entry with C[X] = I/O CPU "address" message
            *
F09DA 0B    GADDR'     CSTEX                Clear the opcode bit!
F09DC 84A              ST=0   10
F09DF 0B               CSTEX
            *
            * Now address is in C[X], Seq # in D[2], loop # in D[3]
            *
F09E1 B47              D=D+1  S             Set type flag=flag + 1
F09E4 DF               CDEX   A             Copy address to D[X]
            *
            * Now loop # in C[3], seq # in C[2]
            *
F09E6 F2               CSL    A             Loop in C[4], seq in C[3]
F09E8 80D4             P=C    4
F09EC 80F2             CPEX   2             Loop in C[2], seq in C[3]
F09F0 AE2              C=0    B             Clear lower bits of C[X]
F09F3 A36              C=C+C  X
F09F6 A36              C=C+C  X             Now (loop #)*4 in C[XS]
F09F9 0E3F             C=C!D  X             C[X] is address+loop*1024
F09FD D7               D=C    A             D[X] is address,loop; D[3] is seq
F09FF 20               P=     0
F0A01 03               RTNCC                All done...exit, carry clear
            *-
            *-
F0A03 68A0  GADDR2     GOTO   GADDRn        Device not found
            *-
```

```
                  *-
FOA07             GADDR3
                  *
                  * Determine length of user-supplied string (store in D[14])
                  *
FOA07 20                  P=     0                First time through, P=15
                  *
FOA09 979                 ?B=0   W
FOA0C 90                  GOYES  GADDR8           This SHOULD never happen!!!
                  *
FOA0E 0D          GADDR7  P=P-1
FOA10 909                 ?B=0   P
FOA13 BF                  GOYES  GADDR7           Zero...continue checking
FOA15 AFF         GADDR8  CDEX   W
FOA18 80FE                CPEX   14               Put length in D[14]
FOA1C AFF                 CDEX   W
                  *
                  * Now D[14] is user-supplied length
                  *
FOA1F 20                  P=     0
FOA21 3100                LC(2)  =DevID           Is this a device ID?
FOA25 963                 ?C=D   B
FOA28 60                  GOYES  GADDRd           Yes...device ID
FOA2A 66B0                GOTO   GADDR6           No...check volume label
                  *-
                  *-
                  *
                  * Device ID...search for the device!
                  *
                  * First unaddress all listeners on the loop
                  *
FOA2E 7EC2        GADDRd  GOSUB  UNLPUT
FOA32 400                 RTNC
                  *
                  * Now search the loop, asking each device its device ID
                  *
                  * Set current address to the start of the loop
                  *
FOA35 3100                LC(2)  =mRSTCA          Reset current address to start
FOA39 8E00                GOSUBL =PUTC+
      00
FOA3F 400                 RTNC
                  *
                  * Read error message to clear the error flag (used to decide
                  * when I'm done searching)
                  *
FOA42 73AE                GOSUB  Geterr           Get error #
FOA46 400                 RTNC                    If carry, had an error!
                  *
                  * Status bits are in C[X] now...check if addresses are valid
                  *
FOA49 C6                  C=C+C  A
FOA4B C6                  C=C+C  A
FOA4D A66                 C=C+C  B                Check if loop is unaddressed
FOA50 4B5                 GOC    GADDRn           If so, say "Device Not Found"
```

```
                  *
                  * Addresses ARE valid...continue search
                  *
F0A53 F3                 DSL   A                  Now seq # in D[3], loop in D[4]
F0A55 DB                 C=D   A                  C[3] is seq #
F0A57 80D3               P=C   3                  (Make a copy of seq # in D[5])
F0A5B 80C5               C=P   5                  C[5] is now a copy of the seq #
F0A5F AB2                C=0   X                  Clear the address field
F0A62 25                 P=    5
F0A64 A97                D=C   WP                 Copy back to D[5]
                  *
                  * Loop to check for the device ID!
                  *
F0A67 8E00  GADDR4  GOSUBL =GETID                 Get ID of this device
      00
F0A6D 400                RTNC                     Error (not "NOT READY")
F0A70 94B                ?D=0  S                  ID response?
F0A73 B4                 GOYES GADDR5             No...try next
F0A75 970                ?A=B  W                  Match exactly?
F0A78 E0                 GOYES GADDR-             Match...check for Nth item
F0A7A AFB                C=D   W                  Not match...check user-given len
F0A7D 80DE               P=C   14
F0A81 914                ?A#B  WP
F0A84 A3                 GOYES GADDR5             Not a match...continue
F0A86 25    GADDR-       P=    5                  Decrement copy of seq #
F0A88 A0F                D=D-1 P
F0A8B 523                GONC  GADDR5             Not Nth device...keep looking
F0A8E AC3                D=0   S                  Set find flag=0 (+2 below=dev ID)

                  *
                  * Exact length match, Nth device!
                  *
F0A91 F7                 DSR   A                  Move loop # to D[3], seq to D[2]
                  *
                  * Now D[2] is sequence #, D[3] is loop #
                  *
F0A93 B47   GADDR&       D=D+1 S                  Add 1 to current find flag
F0A96 20                 P=    0
F0A98 3100               LC(2) =mGETCA            Get current address
F0A9C 7ED1               GOSUB PUTGF-
F0AA0 400                RTNC
F0AA3 880                ?P#   =pADDR             Not an address?
F0AA6 23                 GOYES GADDRe             Error...unexpected frame!
                  *
                  * GADDR' adds 1 to flag value!
                  *
F0AA8 613F               GOTO  GADDR'             Common exit code
                  *-
                  *-
F0AAC             GADDRn
                  *
                  * Device not found!
                  *
F0AAC 8E00               GOSUBL =UNT              Unaddress talkers on loop
      00
```

```
FOAB2 400              RTNC
FOAB5 20               P=      0
FOAB7 300              LC(1)   =eNOFND
FOABA 20               P=      =ePIL
FOABC 02               RTNSC                  Device not found!
                *-
                *-
FOABE           GADDR5
                *
                * Not found yet...keep looking
                *
FOABE 20               P=      0
FOAC0 3100             LC(2)   =mINCCA        Increment current address
FOAC4 76B1             GOSUB   PUTGF-
FOAC8 400              RTNC                   Error
FOACB 880              ?P#     =pADDR         Address?
FOACE 50               GOYES   GADDRf         No...check frame further
FOAD0 569              GONC    GADDR4         Yes...poll the device for ID
                *-
                *-
FOAD3 890       GADDRf ?P=     =pSTATE        Current state (error message)?
FOAD6 6D               GOYES   GADDRn         Yes...end of table (not found)
                *
                * Error...other than "NOT FOUND"
                *
FOAD8           GADDRu                        Unknown device type...?
FOAD8 20        GADDRe P=      0
FOADA 300              LC(1)   =eUNEXP
FOADD 20               P=      =ePIL
FOADF 02               RTNSC
                *-
                *-
FOAE1           GADDR6
                *
                * Volume label?
                *
FOAE1 3100             LC(2)   =VolLbl        Check if volume label
FOAE5 967              ?C#D    B
FOAE8 0F               GOYES   GADDRu         Unknown command
                *
                * Volume label!!!
                *
                * Find the 1st through 16th tapes, check the volume label
                *
                * First blank-fill the volume label!!!
                * D[14] is first non-zero character in B...
                *
FOAEA AD8              C=D     M              Get length from D[14] to C[14]
FOAED 3B02             LCASC   \      \       Blank-fill the volume label!
      0202
      0202
      02
FOAFB 80DE             P=C     14
FOAFF A99              C=B     WP
FOB02 AF5              B=C     W              Leave B[11:0] blank-filled
```

```
                   *
                   * D[4] is the current sequence # we are on!
                   *
F0B05 24                   P=     4
F0B07 A83                  D=0    P                  Start with 1st device
F0B0A A83                  D=0    X                  Clear address of tape for TSTAT
F0B0D 20           GADDRv  P=     0
F0B0F 3300                 LC(4)  (=mFINDD)+#10 Find the Nth (Acc ID=16) drive
      00
F0B15 F7                   DSR    A
F0B17 F7                   DSR    A
F0B19 AAB                  C=D    XS                 Copy N from D[4]
F0B1C F3                   DSL    A                  Restore D[4]
F0B1E F3                   DSL    A                  Restore D[4]
F0B20 7E51                 GOSUB  PUTGF+             Find Nth device, type #10
F0B24 400                  RTNC                      Return if error, else check addr
F0B27 880                  ?P#    =pADDR             Not address?
F0B2A 9A                   GOYES  GADDRf             No...either "NOT FOUND" or error!
                   *
                   * Now current address is a tape device
                   *
F0B2C 8E00                 GOSUBL =TSTAT             Check tape status first
      00
F0B32 571                  GONC   GADDR7             OK...seek record zero
                   *
                   * Check if "NEW TAPE" or other error!
                   *
F0B35 880                  ?P#    =eTAPE
F0B38 00                   RTNYES                    Not a tape error!
F0B3A 80F0                 CPEX   0
F0B3E 880                  ?P#    =eNEWTA            New tape?
F0B41 20                   GOYES  GADDR+
F0B43 80F0         GADDR+  CPEX   0                  Carry if NOT new tape
F0B47 4B5                  GOC    GADDrn             Next item!
F0B4A D0           GADDR7  A=0    A
F0B4C 8E00                 GOSUBL =SEEKA             Seek record zero
      00
F0B52 590                  GONC   GADDR8             OK!
F0B55 890          GADDr-  ?P=    =eTAPE             Tape error?
F0B58 B4                   GOYES  GADDrn             Tape error...goto next item
F0B5A 02                   RTNSC
                   *-
                   *-
F0B5C 22           GADDR8  P=     2
F0B5E 8E00                 GOSUBL =DDT               Read record zero
      00
F0B64 400                  RTNC
F0B67 8E00                 GOSUBL =TSTATA            Check status
      00
F0B6D 47E                  GOC    GADDr-             Not OK
F0B70 3500                 LC(6)  (=nSDA)+8          Send 8 bytes
      0000
F0B78 8E00                 GOSUBL =READRG            Read register (A[W])
      00
F0B7E 400                  RTNC
```

```
                *
                * D[S] is # characters in A[W] (rest is zero)
                * (don't even check count...if less than 8 for any reason,
                * will not match blankfilled volume label)
                *
                * Now A[3:0] is LIF ID (#8000), A[15:4] is volume label
                *
F0B81 3308            LC(4)  #0080          LIF ID, byte-reversed
      00
F0B87 23              P=     3
F0B89 916             ?A#C   WP
F0B8C 71              GOYES  GADDm          Tape not LIF...continue search
                *
                * This is an LIF tape...do the labels match???
                *
F0B8E 7D83            GOSUB  ASRC4          Shift to A[11:0]
F0B92 2B              P=     11
F0B94 914             ?A#B   WP
F0B97 C0              GOYES  GADDm          Label differs...try next!
                *
                * This volume label matches...found the device!
                *
F0B99 AC3             D=0    S
F0B9C B47             D=D+1  S              Set find flag=1(+2) for vol label
F0B9F 63FE            GOTO   GADDR&         Get address, return!
                *-
                *-
F0BA3 7171 GADDm      GOSUB  MTYL
F0BA7 400             RTNC
F0BAA 20              P=     =Rewind        Rewind the tape
F0BAC 8E00            GOSUBL =DDL
      00
F0BB2 400             RTNC
F0BB5 24              P=     4
F0BB7 B07             D=D+1  P              Increment tape counter
F0BBA 460             GOC    GADDR9         If carry, have searched 16 drives
F0BBD 6F4F            GOTO   GADDRv         Continue volume label search
                *-
                *-
F0BC1           GADDR9
                *
                * Device "NOT FOUND"
                *
F0BC1 6AEE            GOTO   GADDRn         Device not found!
                *************************************************************
                *************************************************************
                **
                ** Name:        ATNCHK - Check if ATTN key has been hit twice
                **
                ** Category:    PILUTL
                **
                ** Purpose:
                **      Check if ATNFLG has been decremented to "E" or less
                **
                ** Entry:
                 **      None
                 **
                 ** Exit:
                 **      Carry set: ATTN hit twice
                 **      Carry clear: ATTN hit 0 or 1 times
                 **
                 ** Calls:       None
                 **
                 ** Uses.......
                 **  Inclusive: C[S],P (P only if carry set)
                 **
                 ** Stk lvls:    1 (Internal push)
                 **
                 ** History:
                 **
                 **    Date     Programmer               Modification
                 **  --------   ----------    ---------------------------------
                 **  02/08/83       NZ        Wrote routine
                 **
                 **************************************************************
                 **************************************************************
 F0BC5 860       =ATNCHK ?ST=0  =Attn
 F0BC8 62                GOYES  ATNCHc          Not aborting! (RTNCC)
                 *
                 * Attn set...check if ATNFLG true
                 *
 F0BCA 06                RSTK=C                 Save C[A] on RSTK
 F0BCC 136               CD0EX                  Save D0 in C[A]
 F0BCF 1B00              D0=(5) =ATNFLG
       000
 F0BD6 1564              C=DAT0 S
 F0BDA 134               D0=C                   Restore D0
 F0BDD 07                C=RSTK                 Restore C[A]
 F0BDF 94A               ?C=0   S
 F0BE2 C0                GOYES  ATNCHc          Not abort...(RTNCC)
 F0BE4 B46               C=C+1  S               Check if "F"
 F0BE7 460               GOC    ATNCHc          Yes...not abort (RTNCC)
 F0BEA 20                P=     =eABORT         No...ABORT!
 F0BEC 02                RTNSC
                 *-
                 *-
 F0BEE 03        ATNCHc  RTNCC
                 **************************************************************
                 **************************************************************
                 **
                 ** Name:        GETDev - Get device status bit from LOOPST
                 **
                 ** Category:    PILUTL
                 **
                 ** Purpose:
                 **      Indicate whether the last call to CHKSTS found I/O CPU
                 **      in device or controller mode
                 **
                 ** Entry:
                 **      None
```

```
                **
                ** Exit:
                **      LOOPST in ST[3:0]
                **      Carry set if device, clear if controller
                **
                ** Calls:      None
                **
                ** Uses.......
                **  Inclusive: ST[3:0]
                **
                ** Stk lvls:   1 (internal push)
                **
                ** History:
                **
                **   Date     Programmer           Modification
                ** --------   ----------   -------------------------------
                **  03/17/83     NZ        Added code to save C[A] on RSTK
                **  02/02/83     NZ        Added documentation
                **
                *************************************************************
                *************************************************************
F0BF0 06        =GETDev RSTK=C             Save C[A] on RSTK
F0BF2 136              CDOEX               Save D0 in C[A]
F0BF5 1B00             D0=(5) =LOOPST
      000
F0BFC 0B               CSTEX
F0BFE 15E0             C=DAT0 1            Read status into C[0]
F0C02 0B               CSTEX
F0C04 134              D0=C                Restore D0
F0C07 07               C=RSTK              Restore C[A]
F0C09 870              ?ST=1  (=Device)-8  (Device is set up for XS read)
F0C0C 00               RTNYES              Carry set if device
F0C0E 03               RTNCC               Carry clear if not device
                *************************************************************
                *************************************************************
                **
                ** Name:        CHKSTS - Check I/O CPU status, errors, etc
                ** Name:        FNDCHK - Find a mailbox, CHKSTS
                ** Name:        FNDCH- - Check OFFED, Find a mailbox, CHKSTS
                **
                ** Category:    EXCUTL
                **
                ** Purpose:
                **      Check that the status is OK for messages (ie NOT in
                **      manual mode), clear the error bit in I/O CPU, set/clear
                **      bit for device/controller
                **
                ** Entry:
                **      FNDCH-:C[S] is mailbox desired
                **      FNDCHK:C[S] is mailbox desired
                **      CHKSTS:D0 points to mailbox
                **
                ** Exit:
                **      Carry clear:
                **        P=0, C[X] is I/O CPU status
```

```
                  **         CHKSTS:D0 unchanged
                  **         FNDCH-,FNDCHK:D0 points to mailbox
                  **        Carry set: error (P, C[0] are the error #)
                  **
                  ** Calls:       GETHS2,CHKSET,GETERR,GETST,GETMBX
                  **
                  ** Uses.......
                  **  Exclusive:       C[X],P
                  **  Inclusive: A[W],C[W],P,ST[3:0], bit(Device) of LOOPST
                  **
                  ** Stk lvls:   2 (GETST)(GETERR)(CHKSET)(pushed status;GETMBX)
                  **
                  ** History:
                  **
                  **    Date     Programmer               Modification
                  **  --------   ----------    ---------------------------------
                  **  09/22/83       NZ        Updated documentation
                  **  03/09/83       NZ        Wrote code and documentation
                  **
                  ***************************************************************
                  ***************************************************************
F0C10 8E00  =FNDCH- GOSUBL =FNDMB-         Find the mailbox, check it
      00
F0C16 5D0           GONC   CHKSTS          If no error, continue
F0C19 02            RTNSC
                  *-
                  *-
F0C1B 8E00  =FNDCHK GOSUBL =FNDMBX         Find the mailbox first
      00
F0C21 400           RTNC                   Error (not found)
F0C24       =CHKSTS
F0C24 8E00          GOSUBL =GETHS2
      00
F0C2A 870           ?ST=1  =sMANUL         Manual mode?
F0C2D 64            GOYES  CHKST+          Yes..Illegal mode (not auto mode)
F0C2F 8E00          GOSUBL =CHKSET         Check if RESET: if so, initialize
      00
F0C35 400           RTNC                   Error during initialize!
F0C38 7DAC          GOSUB  Geterr          Get Genstone status! (&clear err)
F0C3C 5B0           GONC   CHKST.          If no carry, all is fine
F0C3F 8E00          GOSUBL =GETST          If carry, get status bits
      00
F0C45 400           RTNC                   Error!
F0C48 0B    CHKST.  CSTEX                  Put C[X] in the status bits
            *
            * Now check if I am the controller
            *
F0C4A 870           ?ST=1  =sCONTR         Am I the controller on loop?
F0C4D D2            GOYES  CHKSTn          Yes...done
            *
            * I am in device mode...set the Device bit of LOOPST
            *
F0C4F 0B            CSTEX                  Restore status bits,PILST-->C[X]
F0C51 06            RSTK=C                 Save PILST on RSTK
F0C53 1B00          D0=(5) =LOOPST         Set =Device bit in LOOPST
```

```
           000
     F0C5A 1562          C=DAT0 XS
     F0C5E 0B            CSTEX
     F0C60 850           ST=1   =Device        Set Device Status bit
     F0C63 0B            CSTEX
     F0C65 1542          DAT0=C XS             Write it out to LOOPST
     F0C69 7A0C          GOSUB  Getmbx         Get D0 back at mailbox
     F0C6D 07            C=RSTK                Restore PILST from RSTK
     F0C6F 03            RTNCC                 Return, status in C[X]
                  *-
                  *-
                  *
                  * Error...I/O CPU is in manual mode!
                  *
     F0C71 0B     CMKSTe CSTEX
     F0C73 300    CMKST+ LC(1)  =eBADMD         Illegal mode (not controller)
     F0C76 20            P=     =ePIL
     F0C78 02            RTNSC
                  *-
                  *-
     F0C7A 0B     CMKSTn CSTEX                  Restore status bits
     F0C7C 03            RTNCC
                  ****************************************************************
                  ****************************************************************
                  **
                  ** Name:          PUTGF- - CSL A,CSL A, call PUTC, GET, FRAME+
                  ** Name:          PUTGF+ - call PUTC, GET, FRAME+
                  ** Name:          PUTGF  - check carry, call GET, FRAME+
                  **
                  ** Category:      LOCAL
                  **
                  ** Purpose:
                  **      Save code by grouping commonly called subroutines
                  **
                  ** Entry:
                  **      D0 points to mailbox
                  **      PUTGF-:C[B] is the message to send
                  **      PUTGF+:C[3:0] is the message to send
                  **      PUTGF: Carry set if previous error
                  **
                  ** Exit:
                  **      D0 unchanged
                  **      Carry clear: P is frame type, C[X] is frame
                  **      Carry set: Error (P, C[0] are error code)
                  **
                  ** Calls:         PUTC,GET,<FRAME+>
                  **
                  ** Uses.......
                  **  Inclusive: C[W],P,ST[3:0]
                  **
                  ** Stk lvls:      1 (PUTC)(GET)
                  **
                  ** History:
                  **
                  **    Date     Programmer                  Modification
```

```
                 **  --------    ----------     --------------------------------
                 **  09/22/83       NZ          Updated documentation
                 **  02/28/83       NZ          Added PUTGF- entry point
                 **  12/05/82       NZ          Added routine and documentation
                 **
                 ***************************************************************
                 ***************************************************************
FOC7E F2         =PUTGF- CSL   A
FOC80 F2                 CSL   A
FOC82 7470       =PUTGF+ GOSUB Putc             Put the message...
FOC86 400        =PUTGF  RTNC
FOC89 7580               GOSUB Get              ...Get the response...
FOC8D 400                RTNC
FOC90 613B               GOTO  FRAME+           Exit through FRAME+!
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:        GTYPE - Get the device type (Acc id) from loop
                 **
                 ** Category:    PILI/O
                 **
                 ** Purpose:
                 **      Get the accessory id of a device (address in D[X])
                 **
                 ** Entry:
                 **      DO points to the HPIL mailbox
                 **      D[X] contains the address of the device to be checked
                 **
                 ** Exit:
                 **      Carry clear:
                 **        P=0
                 **        Device type in A[B] (if 2 byte response, A[3:2] is
                 **          first byte received, A[B] is second)
                 **        If device does not respond to Acc ID, A[A]=0
                 **      Carry set: error (P, C[0] are error code)
                 **
                 ** Calls:       YTML,PUTE,PUTGF
                 **
                 ** Uses.......
                 **  Exclusive: A[A],C[W],P
                 **  Inclusive: A[A],C[W],P,ST[3:0]
                 **
                 ** Stk lvls:   2 (YTML)(PUTGF)
                 **
                 ** History:
                 **
                 **    Date     Programmer             Modification
                 **  --------   ----------     --------------------------------
                 **  09/22/83       NZ         Updated documentation
                 **  05/17/83       NZ         Rewrote to fix early EOT error
                 **  01/03/83       NZ         Updated documentation
                 **
                 ***************************************************************
                 ***************************************************************
FOC94 7890       =GTYPE  GOSUB YTML            YOU TALK, ME LISTEN
```

```
F0C98 400          RTNC                   RETURN IF ERROR (CARRY SET)
F0C9B D0           A=0    A               Clear value of acc id first
F0C9D 3500         LC(6)  (=mSAI)+#2      LIMIT OF TWO BYTES
      0000
F0CA5 8E00         GOSUBL =PUTE           START ACCESSORY POLL
      00
F0CAB 770F GTYPE-  GOSUB  PUTGF           Do a GET, FRAME+
F0CAF 400          RTNC                   If carry, error
           *
           * Now P is frame type
           *
F0CB2 880          ?P#    =pDATA          Is this a data byte?
F0CB5 51           GOYES  GTYPE2          No...check if EOT
F0CB7 8AC          ?A#0   A
F0CBA 20           GOYES  GTYPE0          Set carry if A#0 before this byte
F0CBC F0   GTYPE0  ASL    A
F0CBE F0           ASL    A               Save any previous data in A[3:2]
F0CC0 AEA          A=C    B               Copy data byte to A[B]
F0CC3 57E          GONC   GTYPE-          If no carry (A=0) then get next
F0CC6 20   GTYPE1  P=     0               Reset P=0
F0CC8 03           RTNCC                  Done...return!
           *-
           *-
F0CCA 890  GTYPE2  ?P=    =pEOT           Is this an EOT frame?
F0CCD 9F           GOYES  GTYPE1          Yes...done
F0CCF 890          ?P=    =pSTATE         Is this an error message?
F0CD2 C0           GOYES  GTYPE4          Yes...must mean error!
F0CD4 20           P=     =eUNEXP         No...unexpected frame
F0CD6 80C0 GTYPE3  C=P    0               Put the error message into C[0]
F0CDA 20           P=     =ePIL
F0CDC 02           RTNSC
           *-
           *-
F0CDE 80D4 GTYPE4  P=C    4               Read error code
F0CE2 880          ?P#    =eNORDY         Is it other than "NOT READY"?
F0CE5 1F           GOYES  GTYPE3
F0CE7 5ED          GONC   GTYPE1          Return, clear carry, P=0
           ***************************************************************
           ***************************************************************
           **
           ** Name:        ULYL - Unaddress listeners, address D[X] as Listen
           ** Name:        LISTEN - Address D[X] as listener
           **
           ** Category:    PILUTL
           **
           ** Purpose:
           **      Unaddress all listeners, address D[X] as listener
           **
           ** Entry:
           **      Desired listener address in D[X]
           **      D0 points to mailbox
           **
           ** Exit:
           **      Carry clear: OK, P=0
           **      Carry set: error (P=error #)
```

```
                 **
                 ** Calls:      PUTC
                 **
                 ** Uses.......
                 **  Inclusive: C[W],P,ST[3:0]
                 **
                 ** Stk lvls:   1 (PUTC)
                 **
                 ** History:
                 **
                 **   Date      Programmer              Modification
                 **  --------   ----------   ---------------------------------
                 **  01/03/83      NZ        Updated documentation
                 **
                 *************************************************************
                 *************************************************************
 F0CEA 7210 =ULYL   GOSUB  UNLPUT
 F0CEE 400          RTNC
 F0CF1 3300 =LISTEN LC(4)  =mADDRL       Address ( ) as listener
       00
 F0CF7 AB8  PUTC=D  C=D    X             Fill in ( )
 F0CFA 8C00 Putc    GOLONG =PUTC         Carry indicates return status
       00
                 *-
                 *-
 F0D00 20   =UNLPUT P=     0
 F0D02 3300         LC(4)  =mUNL         Unaddress all listeners
       00
 F0D08 61FF         GOTO   Putc
                 *-
                 *-
 F0D0C 8C00 =Putd   GOLONG =PUTD
       00
                 *-
                 *-
 F0D12 8C00 Get     GOLONG =GET
       00
                 *************************************************************
                 *************************************************************
                 **
                 ** Name:       MTYL - Unaddress listeners, me talk, D[X] listen
                 ** Name:       MTYLL- Address me as talker, D[X] as listener
                 **
                 ** Category:   PILUTL
                 **
                 ** Purpose:
                 **      Address me as talker, D[X] as listener
                 **
                 ** Entry:
                 **     D[X] is the address of the device to be listener
                 **     D0 points to mailbox
                 **
                 ** Exit:
                 **      Carry clear: OK, P=0
                 **      Carry set: error (P=error code)
```

```
                  **
                  ** Calls:      UNLPUT,LISTEN,<PUTC>
                  **
                  ** Uses.......
                  **  Inclusive: C[W],P,ST[3:0]
                  **
                  ** Stk lvls:   1 (UNLPUT)(LISTEN)
                  **
                  ** History:
                  **
                  **   Date      Programmer            Modification
                  **  --------   ----------    ------------------------------
                  **  01/03/83      NZ         Updated documentation
                  **
                  ***************************************************************
                  ***************************************************************
     F0D18 74EF =MTYL    GOSUB  UNLPUT         Unaddress all listeners
     F0D1C 400           RTNC                  RETURN IF ERROR (CARRY SET)
     F0D1F 7ECF =MTYLL   GOSUB  LISTEN         Address D[X] as listener
     F0D23 400           RTNC                  RETURN IF ERROR (CARRY SET)
     F0D26 3300 =MTYLC   LC(4)  (=nADDRM)+#4   / ADDRESS ME AS TALKER
           00
     F0D2C 6DCF          GOTO   Putc           \   (carry=status)
                  ***************************************************************
                  ***************************************************************
                  **
                  ** Name:       YTML - "You" (D[X]) talk, "me" listen
                  **
                  ** Category:   PILUTL
                  **
                  ** Purpose:
                  **      Address D[X] as talker, me as listener
                  **
                  ** Entry:
                  **      D0 points to mailbox
                  **      D[X] contains the address of the device to be talker
                  **
                  ** Exit:
                  **      Carry clear: P=0
                  **      Carry set: Error # in P
                  **
                  ** Calls:      UNLPUT,PUTC,<PUTC=D>
                  **
                  ** Uses.......
                  **  Inclusive: C[W],P,ST[3:0]
                  **
                  ** Stk lvls:   1 (UNLPUT)(PUTC)
                  **
                  ** History:
                  **
                  **   Date      Programmer            Modification
                  **  --------   ----------    ------------------------------
                  **  01/03/83      NZ         Updated documentation
                  **
                  ***************************************************************
                  ***************************************************************
F0D30 7CCF =YTML    GOSUB  UNLPUT          Unaddress all listeners
F0D34 400           RTNC                   Return if error (carry set)
F0D37 3300 =YTMLL   LC(4)  (=mADDRM)+#2    Address me as listener
      00
F0D3D 79BF          GOSUB  Putc
F0D41 400           RTNC                   Return if error (carry set)
F0D44 3300 =TALK    LC(4)  =mADDRT
      00
F0D4A 6CAF          GOTO   PUTC=D          Address D[X] as talker
                  ***************************************************************
                  ***************************************************************
                  **
                  ** Name:        PRMSGA - Output message from C (uses A)
                  **
                  ** Category:    PILI/O
                  **
                  ** Purpose:
                  **      Output message from C (ASCII) (use A[W] to store it)
                  **
                  ** Entry:
                  **      C[W] has an ASCII string, C[B] is the first character
                  **      Message is terminated by a #00 character
                  **      D0 points to mailbox
                  **
                  ** Exit:
                  **      Carry clear: OK, P=0
                  **      Carry set: error (P,C[0] are error code)
                  **
                  ** Calls:       PUTD
                  **
                  ** Uses.......
                  **  Inclusive: A[W],C[W],ST[3:0]
                  **
                  ** Stk lvls:    1 (PUTD)
                  **
                  ** Algorithm:
                  **      PRMSGA:Copy C[W] to A[W]
                  **      PRMSG1:shift A[W] right twice (next char in A[B] now)
                  **             output the character in C[B]           (PUTD)
                  **             if next character (A[B]) <> #00 then goto PRMSG1
                  **             return
                  **
                  ** History:
                  **
                  **    Date      Programmer            Modification
                  **  --------    ----------   -------------------------------
                  **  01/03/83       NZ        Updated documentation
                  **
                  ***************************************************************
                  ***************************************************************
F0D4E AFA  =PRMSGA A=C    W              First byte is still in C[B]
F0D51 BF4  PRMSG1  ASR    W              Get next char into A[B]
F0D54 BF4          ASR    W
F0D57 71BF         GOSUB  Putd           Output the character
```

```
F005B 400          RTNC                     Return if error (carry set)
F005E D6           C=A    A                 Get next byte
F0060 96E          ?C#0   B                 Is this the end (NULL byte)?
F0063 EE           GOYES  PRMSG1            No...output it!
F0065 01           RTN                      Yes...return, carry clear
            ***************************************************************
            ***************************************************************
            **
            ** Name:      DTOH - Convert from decimal to HEX
            **
            ** Category:  PILUTL
            **
            ** Purpose:
            **      Convert value in A[A] from decimal to hex
            **
            ** Entry:
            **      A[A] contains the BCD value
            **      A[S] contains the sign of the value (for exit only)
            **
            ** Exit:
            **      Hex value in C[A], sign in C[S] (copied from A[S])
            **      P=0, carry clear
            **
            ** Calls:     None
            **
            ** Uses.......
            **  Inclusive: A[A],B[A],C[A],P
            **
            ** Stk lvls:  0
            **
            ** History:
            **
            **   Date     Programmer              Modification
            **  --------  ----------  --------------------------------
            **  01/03/83     NZ       Updated documentation
            **
            ***************************************************************
            ***************************************************************
F0067 04    =DTOH  SETHEX
F0069 20           P=     0
F006B 3401         LC(5)  10000
      720
F0072 D1           B=0    A
F0074 24           P=     4
F0076 908   DTOH0  ?A=0   P
F0079 A0           GOYES  DTOH1
F007B C1           B=B+C  A
F007D A0C          A=A-1  P
F0080 55F          GONC   DTOH0            Go always
            *-
            *-
F0083 0D    DTOH1  P=P-1
F0085 136          CD0EX                   Use D0 to set value!
F0088 883          ?P#    3
F008B B0           GOYES  DTOH2
```

```
F008D 1A8E         D0=(4) 1000
      30
F0093 591          GONC   DTOH4         Go always
            *-
            *-
F0096 882  DTOH2   ?P#    2
F0099 B0           GOYES  DTOH3
F009B 1A46         D0=(4) 100
      00
F00A1 5B0          GONC   DTOH4         Go always
            *-
            *-
F00A4 881  DTOH3   ?P#    1
F00A7 60           GOYES  DTOH4
F00A9 19A0         D0=(2) 10
            *
F00AD 136  DTOH4   CD0EX
F00B0 55C          GONC   DTOH0         If carry clear, not done yet
            *
            * Done! (P=0, carry set)
            *
F00B3 09           C=B    A
F00B5 C2           C=C+A  A             Now HEX result in C[A]!
F00B7 AC6          C=A    S             (Copy sign from A[S])
F00BA 03           RTNCC
            *************************************************************
            *************************************************************
            **
            ** Name:        HTOD - Convert C[B] value from hex to decimal
            **
            ** Category:    PILUTL
            **
            ** Purpose:
            **      Convert C[B] from hex into decimal, use only B,C,P
            **
            ** Entry:
            **      C[B] contains a HEX value
            **
            ** Exit:
            **      Decimal value in B[X]
            **      Decimal mode set!
            **      Carry set, P=3
            **
            ** Calls:       None
            **
            ** Uses.......
            **  Inclusive: B[A],C[A],P
            **
            ** Stk lvls:    0
            **
            ** History:
            **
            **    Date     Programmer           Modification
            **  --------   ----------   --------------------------------
            **  01/03/83      NZ        Updated documentation
```

```
                 **
                 ****************************************************************
                 ****************************************************************
 F0DBC D1        *HTOD    B=0    A             Clear destination register
 F0DBE F2                 CSL    A
 F0DC0 F2                 CSL    A             Save digits in C[3:2]
 F0DC2 20                 P=     0
 F0DC4 05                 SETDEC
                 *
                 * Loop for the case of A-F
                 *
 F0DC6 A2E       HTOD1    C=C-1  XS            Is the least sig. digit zero?
 F0DC9 470                GOC    HTOD2         Yes...next digit
 F0DCC E5                 B=B+1  A             No...increment result
 F0DCE 57F                GONC   HTOD1         Go always
                 *-
                 *-
 F0DD1 3261      HTOD2    LCHEX  016           Now the digit value is 16(DEC)
       0
 F0DD6 23                 P=     3             Point to the other digit
 F0DD8 A0E       HTOD3    C=C-1  P             Is the digit zero yet?
 F0DDB 400                RTNC                 Yes...done!
 F0DDE A31                B=B+C  X             No...add another 16!
 F0DE1 56F                GONC   HTOD3         Go always
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:      HTODX - Convert A[W] from HEX to decimal
                 **
                 ** Category:  PILUTL
                 **
                 ** Purpose:
                 **      Convert A[W] from HEX to DECIMAL
                 **
                 ** Entry:
                 **      A[W] contains the HEX value
                 **
                 ** Exit:
                 **      Carry clear: Decimal value in B[W], P=0
                 **      Carry set: Error (range error) (P=Error #)
                 **
                 ** Calls:     None
                 **
                 ** Uses.......
                 **  Inclusive: A[W],B[W],C[W],P
                 **
                 ** Stk lvls:  0
                 **
                 ** History:
                 **
                 **   Date     Programmer           Modification
                 **  --------  ----------    ------------------------------
                 **  01/03/83     NZ         Updated documentation
                 **
                 ****************************************************************
                 ****************************************************************
      F0DE4 AF1  =HTODX  B=0    W
      F0DE7 AF2          C=0    W
      F0DEA 20           P=     0
      F0DEC 301          LC(1)  1
      F0DEF 05           SETDEC
      F0DF1 A0C  HTODX1  A=A-1  P             Is this digit zero yet?
      F0DF4 480          GOC    HTODX2        Yes...continue with next!
      F0DF7 A71          B=B+C  W             No...add HEX place value to B[W]
      F0DFA 56F          GONC   HTODX1        Go always!
                 *-
                 *-
      F0DFD A80  HTODX2  A=0    P             Clear digit when done with it!
      F0E00 97C          ?A#0   W             Done with whole word?
      F0E03 60           GOYES  HTODX3        No...continue
                 *
                 * Carry clear if fall through
                 *
      F0E05 04   HTODXr  SETHEX               Done...return in HEX mode!
      F0E07 01           RTN                  (Carry is result)
                 *-
                 *-
      F0E09 0C   HTODX3  P=P+1                Go to next digit
      F0E0B 411          GOC    HTODX4        Error!
      F0E0E A76          C=C+C  W             Do a multiply by 16 in DEC mode
      F0E11 A76          C=C+C  W
      F0E14 A76          C=C+C  W
      F0E17 A76          C=C+C  W
      F0E1A 56D          GONC   HTODX1
      F0E1D 20   HTODX4  P=     =eRANGE       Range error (Overflow)
      F0E1F 45E          GOC    HTODXr        Go always
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:        A-MULT - Multiply A[A] by C[A], result in A[9:0]
                 **
                 ** Category:    MTHUTL
                 **
                 ** Purpose:     Multiply 20-bit hex integers
                 **
                 ** Entry:
                 **       A[A], C[A] are the operands
                 **       If HEXMODE, does HEX multiply; if DECMODE, DECIMAL mult
                 **
                 ** Exit:
                 **       P has been preserved
                 **       A[9:0] = product
                 **       Carry set
                 **
                 ** Uses.......
                 **  Inclusive: A[W],B[W],C[W]
                 **
                 ** Stk lvls:   0
                 **
                 **     Date      Programmer                  Modification
                 **  --------    ----------    --------------------------------
                 **  09/22/83       NZ         Updated documentation
                 **  12/06/82       NZ         Changed result to A[9:0]
                 **  01/01/00       SA         Wrote original (mainframe)
                 **
                 ***************************************************************
                 ***************************************************************
 F0E22 AF1   =A-MULT B=0    W
 F0E25 DC            ABEX   A              B[A] is multiplicand, B[15:5]=0
 F0E27 AF0           A=0    W              Clear result register
 F0E2A 8AA           ?C=0   A              Zero multiplier?
 F0E2D 00            RTNYES                Yes...return, carry set
 F0E2F 80FE          CPEX   14             Save P in C[14]
 F0E33 20            P=     0
 F0E35 570           GONC   M-STRT         Go always
                 *-
                 *-
 F0E38 0C     NXTDGT P=P+1                 Go to next digit
 F0E3A BF1           BSL    W              Shift multiplicand left one digit
 F0E3D B8A    M-STRT ?C=0   P              Zero digit?
 F0E40 57F           GONC   NXTDGT         Yes...go to next digit
                 *
 F0E43 A70    ADCYCL A=A+B  W              ADD MULTIPLICAND TO RESULT
 F0E46 431           GOC    OVFLOW         ***This will NEVER happen!***
 F0E49 B06           C=C+1  P              Increment digit
 F0E4C 56F           GONC   ADCYCL         No carry=not done...repeat ADCYCL
 F0E4F 8AE           ?C#0   A              More digits remaining?
 F0E52 6E            GOYES  NXTDGT         Yes...go to next digit
 F0E54 80DE          P=C    14             No...restore P from C[14]
 F0E58 02            RTNSC                 Return with carry set...OK
                 *-
                 *-
 F0E5A AF0    OVFLOW A=0    W              ***This code will never be used***
 F0E5D A7C           A=A-1  W              ***      .          .           ***
 F0E60 80DE          P=C    14             ***           .                 ***
 F0E64 03            RTNCC                 ***      .          .           ***
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:       UCRANG - Convert to upper case, check if [A-Z]
                 ** Name:       CONVUC - Convert to upper case
                 ** Name:       RANGE - Check if in given range
                 ** Name:       RANGEN - Check if in [0-9]
                 ** Name:       RANGEA - Check if in [A-Z]
                 **
                 ** Category:   PILUTL
                 **
                 ** Purpose:
                 **       A[B] is item to work with:
                 **       UCRANG: Determine if letter, convert to upper case
                 **       CONVUC: Convert to upper case (if lower case)
                 **       RANGE:  Determine if in specified range of characters
                 **       RANGEN: Check if in [0-9]
                 **       RANGEA: Check if in [A-Z]
                 **
```

```
                ** Entry:
                **      A[B] contains the character to be checked
                **      P=0, HEXMODE
                **
                ** Exit:
                **      P=0
                **      Carry set if not in range
                **      Carry clear if in range
                **
                ** Calls:(UCRANG):            RANGEA,<CONVUC>
                ** Calls:(CONVUC):            RANGE
                ** Calls:(RANGE):             None
                **
                ** Uses.......
                **  Inclusive: C[A] (CONVUC also changes A[B] if in [a-z]
                **
                ** Stk lvls (UCRANG):         1 (RANGEA)<CONVUC>
                ** Stk lvls (CONVUC):         1 (RANGE)
                ** Stk lvls (RANGE):          0
                **
                ** History:
                **
                **    Date     Programmer              Modification
                **  --------   ----------    ---------------------------------
                **  01/03/83       NZ        Updated documentation
                **
                **************************************************************
                **************************************************************
F0E66 7910      =UCRANG GOSUB  RANGEA        Check if in [A-Z]
F0E6A 500               RTNNC                If carry clear, Done!
                *
                * Fall through to convert to upper case
                *
F0E6D 3316      =CONVUC LCASC  \za\
      A7
F0E73 7C10              GOSUB  RANGE
F0E77 400               RTNC
F0E7A 3102              LCHEX  20
F0E7E B6A               A=A-C  B
F0E81 03                RTNCC
                *_
                *_
F0E83 3314      =RANGEA LCASC  \ZA\
      A5
F0E89 6900              GOTO   RANGE
                *_
                *_
F0E8D 3303      =RANGEN LCASC  \90\
      93
F0E93 9E2       =RANGE  ?A<C   B
F0E96 00                RTNYES
F0E98 F6                CSR    A
F0E9A B86               CSR    X
F0E9D B62               C=C-A  B
F0EA0 01                RTN
```

```
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:        GETALR - Get data into A[W] from @D1,left>right
                 **
                 ** Category:    PILUTL
                 **
                 ** Purpose:
                 **      Read data from @ D1 into A[W], from A[15:14] to A[B]
                 **
                 ** Entry:
                 **      D1 points to the data in RAM
                 **      P is a count of bytes to be read into A[W]
                 **      Bytes are to be entered with the last byte in A[B]
                 **
                 ** Exit:
                 **      "P" data bytes in A[W]
                 **      P=0
                 **
                 ** Calls:       None
                 **
                 ** Uses.......
                 **  Inclusive: A[W],C[B],D1,P
                 **
                 ** Stk lvls:    0
                 **
                 ** History:
                 **
                 **    Date     Programmer               Modification
                 **  --------   ----------   --------------------------------
                 **  01/03/83      NZ        Updated documentation
                 **
                 ****************************************************************
                 ****************************************************************
F0EA2 14F        =GETALR C=DAT1 B
F0EA5 171               D1=D1+ 2
F0EA8 BF0        =ALRNOG ASL    W
F0EAB BF0               ASL    W
F0EAE AEA               A=C    B
F0EB1 0D                P=P-1
F0EB3 880               ?P#    0
F0EB6 CE                GOYES  GETALR
F0EB8 01                RTN
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:        PUTARL - Put data from A[W] (Right to left)
                 ** Name:        PUTALR - Put data from A[W] (Left to right)
                 **
                 ** Category:    PILUTL
                 **
                 ** Purpose:
                 **      Output data from A[W] to the HPIL loop
                 **
                 ** Entry:
```

```
                **      D0 points to mailbox
                **      I am talker on loop
                **      P is a count of bytes to be output from A[W]
                **      PUTARL outputs bytes starting with A[B]
                **      PUTALR outputs bytes starting with A[15:14]
                **
                ** Exit:
                **      Carry clear: P=0, all OK
                **      Carry set: error (P, C[0] are error code)
                **
                ** Calls:       PUTD
                **
                ** Uses.......
                **  Exclusive: A[W],C[A],P
                **  Inclusive: A[W],C[W],P,ST[3:0]
                **
                ** Stk lvls:    1 (PUTD)
                **
                ** History:
                **
                **    Date      Programmer              Modification
                **  --------    ----------    ----------------------------------
                **  01/03/83       NZ         Updated documentation
                **
                ***************************************************************
                ***************************************************************
 F0EBA D6       =PUTARL C=A     A
 F0EBC 814              ASRC
 F0EBF 814              ASRC
                *
                * Put A[W] from right to left, no shift
                *
 F0EC2 764E     =ARLNOS GOSUB   Putd
 F0EC6 400              RTNC                    Return if error (carry set)
 F0EC9 0D               P=P-1
 F0ECB 880              ?P#     0
 F0ECE CE               GOYES   PUTARL
 F0ED0 01               RTN                     Done!
                *_
                *_
 F0ED2 810      =PUTALR ASLC
 F0ED5 810              ASLC
 F0ED8 D6               C=A     A
                *
                * Put A[W] from left to right, no shift
                *
 F0EDA 7E2E     =ALRNOS GOSUB   Putd
 F0EDE 400              RTNC                    Return if error (carry set)
 F0EE1 0D               P=P-1
 F0EE3 880              ?P#     0
 F0EE6 CE               GOYES   PUTALR
 F0EE8 01               RTN                     Done!
                ***************************************************************
                ***************************************************************
                **
```

```
               ** Name:        PUTDX - Output multiple data bytes (P is count)
               **
               ** Category:    PILI/O
               **
               ** Purpose:
               **      Output data to the loop: first the contents of C[B],
               **      then P-1 zero bytes
               **
               ** Entry:
               **      DO points to mailbox
               **      I am talker
               **      P contains the total number of bytes to send
               **
               ** Exit:
               **      P=0
               **      Carry set if error (P is error #)
               **
               ** Calls:       PUTD
               **
               ** Uses.......
               **  Exclusive: C[A],P
               **  Inclusive: C[W],P,ST[3:0]
               **
               ** Stk lvls:    1 (PUTD)
               **
               ** History:
               **
               **    Date     Programmer            Modification
               **  --------   ----------   ---------------------------------
               **  01/03/83      NZ        Updated documentation
               **
               ************************************************************
               ************************************************************
F0EEA 7E1E     =PUTDX  GOSUB  Putd
F0EEE D2               C=0    A
F0EF0 400              RTNC                Return if error (carry set)
F0EF3 0D               P=P-1
F0EF5 880              ?P#    0
F0EF8 2F               GOYES  PUTDX
F0EFA 01               RTN                 Done!
               ************************************************************
               ************************************************************
               **
               ** Name:        ASLCn - Shift the A register n nibbles LEFT
               ** Name:        ASRCn - Shift the A register n nibbles RIGHT
               **
               ** Category:    PILUTL
               **
               ** Purpose:
               **      Shift the A register by a given number of nibbles
               **
               ** Entry:
               **      None
               **
               ** Exit:
                 **      A[W] is rotated the given # of nibbles
                 **
                 ** Calls:      None
                 **
                 ** Uses.......
                 **  Inclusive: A[W] (shifted as per instructions)
                 **
                 ** Stk lvls:   0
                 **
                 ** NOTE: Does not alter P or carry!!!
                 **
                 ** History:
                 **
                 **    Date     Programmer               Modification
                 **  --------   ----------   ----------------------------------
                 **  01/03/83      NZ        Updated documentation
                 **
                 *************************************************************
                 *************************************************************
 F0EFC           =ASRC8
 F0EFC 810       =ASLC8  ASLC
 F0EFF           =ASRC9
 F0EFF 810       =ASLC7  ASLC
 F0F02           =ASRC10
 F0F02 810       =ASLC6  ASLC
 F0F05           =ASRC11
 F0F05 810       =ASLC5  ASLC
 F0F08           =ASRC12
 F0F08 810       =ASLC4  ASLC
 F0F0B           =ASRC13
 F0F0B 810       =ASLC3  ASLC
 F0F0E           =ASRC14
 F0F0E 810       =ASLC2  ASLC
 F0F11           =ASRC15
 F0F11 810       =ASLC1  ASLC
 F0F14 01                RTN
                 *-
                 *-
 F0F16           =ASRC7
 F0F16 814       =ASLC9  ASRC
 F0F19           =ASRC6
 F0F19 814       =ASLC10 ASRC
 F0F1C           =ASRC5
 F0F1C 814       =ASLC11 ASRC
 F0F1F           =ASRC4
 F0F1F 814       =ASLC12 ASRC
 F0F22           =ASRC3
 F0F22 814       =ASLC13 ASRC
 F0F25           =ASRC2
 F0F25 814       =ASLC14 ASRC
 F0F28           =ASRC1
 F0F28 814       =ASLC15 ASRC
 F0F2B 01                RTN
                 *************************************************************
                 *************************************************************
```

```
          **
          ** Name:       CSLCn - Shift C[W] the given # of nibbles LEFT
          ** Name:       CSRCn - Shift C[W] the given # of nibbles RIGHT
          **
          ** Category:   PILUTL
          **
          ** Purpose:
          **     Shift the C register by a given number of nibbles
          **
          ** Entry:
          **     None
          **
          ** Exit:
          **     C[W] is rotated the given # of nibbles
          **
          ** Calls:      None
          **
          ** Uses.......
          **  Inclusive: C[W] (rotated as per instructions)
          **
          ** Stk lvls:   0
          **
          ** NOTE: Does not alter P or carry!!!
          **
          ** History:
          **
          **   Date     Programmer              Modification
          **  --------  ----------  ---------------------------------
          **  01/03/83     NZ       Updated documentation
          **
          ***************************************************************
          ***************************************************************
F0F2D     =CSRC8
F0F2D 812 =CSLC8  CSLC
F0F30     =CSRC9
F0F30 812 =CSLC7  CSLC
F0F33     =CSRC10
F0F33 812 =CSLC6  CSLC
F0F36     =CSRC11
F0F36 812 =CSLC5  CSLC
F0F39     =CSRC12
F0F39 812 =CSLC4  CSLC
F0F3C     =CSRC13
F0F3C 812 =CSLC3  CSLC
F0F3F     =CSRC14
F0F3F 812 =CSLC2  CSLC
F0F42     =CSRC15
F0F42 812 =CSLC1  CSLC
F0F45 01          RTN
          *-
          *-
F0F47     =CSRC7
F0F47 816 =CSLC9  CSRC
F0F4A     =CSRC6
F0F4A 816 =CSLC10 CSRC
```

```
F0F4D        =CSRC5
F0F4D 816    =CSLC11 CSRC
F0F50        =CSRC4
F0F50 816    =CSLC12 CSRC
F0F53        =CSRC3
F0F53 816    =CSLC13 CSRC
F0F56        =CSRC2
F0F56 816    =CSLC14 CSRC
F0F59        =CSRC1
F0F59 816    =CSLC15 CSRC
F0F5C 01             RTN
             **************************************************************
             **************************************************************
             **
             ** Name:         BLANKC - Load C[W] with 8 blanks
             **
             ** Category:     GENUTL
             **
             ** Purpose:
             **         Load 8 blanks into C[W]
             **
             ** Entry:
             **         None
             **
             ** Exit:
             **         P=0, C[W]="        "
             **         Carry unchanged!!!
             **
             ** Calls:        None
             **
             ** Uses.......
             **   Inclusive: C[W],P
             **
             ** Stk lvls:     None
             **
             ** History:
             **
             **     Date      Programmer               Modification
             **   --------    ----------    ---------------------------------
             **   12/06/82       NZ         Added routine and documentation
             **
             **************************************************************
             **************************************************************
F0F5E 20     =BLANKC P=      0
F0F60 3F02           LCASC  \        \
      0202
      0202
      0202
      02
F0F72 01             RTN
             **************************************************************
             **************************************************************
             **
             ** Name:         D1=AVE,D1=AVS,D1@AVE,D1@AVS - Set D1 to pointer
             **
```

```
                ** Category:   PTRUTIL
                **
                ** Purpose:
                **      Set D1 either at AVMEME/AVMEMS or (AVMEME)/(AVMEMS)
                **
                ** Entry:
                **      None
                **
                ** Exit:
                **      D1 @ pointer, carry unchanged
                **      (D1@xxx:C[A]=pointer address)
                **
                ** Calls:      None
                **
                ** Uses.......
                **  Inclusive: C[A],D1
                **
                ** Stk lvls:   0 (D1@xxx uses 1 stack level)
                **
                ** NOTE: Does not change P or carry!
                **
                ** History:
                **
                **    Date     Programmer              Modification
                **  --------   ----------   ----------------------------------
                **  02/07/83      NZ        Changed D1=C to CD1EX (Exit cond)
                **  01/12/83      NZ        Added documentation
                **
                ****************************************************************
                ****************************************************************
F0F74 1F00 =D1=AVE D1=(5) =AVMEME
      000
F0F7B 01           RTN
                *-
                *-
F0F7D 1F00 =D1=AVS D1=(5) =AVMEMS
      000
F0F84 01           RTN
                *-
                *-
F0F86 7AEF =D1@AVE GOSUB  D1=AVE
F0F8A 147  =ReadD1 C=DAT1 A
F0F8D 137          CD1EX                    Leave pointer address in C[A]
F0F90 01           RTN
                *-
                *-
F0F92 77EF =D1@AVS GOSUB  D1=AVS
F0F96 63FF         GOTO   ReadD1
F0F9A              END
```

```
=A-MULT  Abs  986658 #F0E22 -  1661
 ADCYCL  Abs  986691 #F0E43 -  1676  1679
=ALRNOG  Abs  986792 #F0EA8 -  1797
=ALRNOS  Abs  986842 #F0EDA -  1862
=ARLNOS  Abs  986818 #F0EC2 -  1848
=ASLC1   Abs  986897 #F0F11 -  1960
=ASLC10  Abs  986905 #F0F19 -  1967
=ASLC11  Abs  986908 #F0F1C -  1969
=ASLC12  Abs  986911 #F0F1F -  1971
=ASLC13  Abs  986914 #F0F22 -  1973
=ASLC14  Abs  986917 #F0F25 -  1975
=ASLC15  Abs  986920 #F0F28 -  1977
=ASLC2   Abs  986894 #F0F0E -  1958
=ASLC3   Abs  986891 #F0F0B -  1956
=ASLC4   Abs  986888 #F0F08 -  1954
=ASLC5   Abs  986885 #F0F05 -  1952
=ASLC6   Abs  986882 #F0F02 -  1950
=ASLC7   Abs  986879 #F0EFF -  1948
=ASLC8   Abs  986876 #F0EFC -  1946
=ASLC9   Abs  986902 #F0F16 -  1965
=ASRC1   Abs  986920 #F0F28 -  1976
=ASRC10  Abs  986882 #F0F02 -  1949
=ASRC11  Abs  986885 #F0F05 -  1951
=ASRC12  Abs  986888 #F0F08 -  1953
=ASRC13  Abs  986891 #F0F0B -  1955
=ASRC14  Abs  986894 #F0F0E -  1957
=ASRC15  Abs  986897 #F0F11 -  1959
=ASRC2   Abs  986917 #F0F25 -  1974
=ASRC3   Abs  986914 #F0F22 -  1972
=ASRC4   Abs  986911 #F0F1F -  1970   922
=ASRC5   Abs  986908 #F0F1C -  1968
=ASRC6   Abs  986905 #F0F19 -  1966
=ASRC7   Abs  986902 #F0F16 -  1964
=ASRC8   Abs  986876 #F0EFC -  1945
=ASRC9   Abs  986879 #F0EFF -  1947
=ATNCHK  Abs  986053 #F0BC5 -   982
 ATNCHc  Abs  986094 #F0BEE -  1001   983   994   996
 ATNFLG  Ext                -   989
 AVMEME  Ext                -  2117
 AVMEMS  Ext                -  2121
 Attn    Ext                -   982
=BLANKC  Abs  986974 #F0F5E -  2079
 CHKSET  Ext                -  1101
 CHKST+  Abs  986227 #F0C73 -  1133  1100
 CHKST.  Abs  986184 #F0C48 -  1107  1104
=CHKSTS  Abs  986148 #F0C24 -  1097  1091
 CHKSTe  Abs  986225 #F0C71 -  1132
 CHKSTn  Abs  986234 #F0C7A -  1138  1112
=CONVUC  Abs  986733 #F0E6D -  1742
=CSLC1   Abs  986946 #F0F42 -  2028
=CSLC10  Abs  986954 #F0F4A -  2035
=CSLC11  Abs  986957 #F0F4D -  2037
=CSLC12  Abs  986960 #F0F50 -  2039
=CSLC13  Abs  986963 #F0F53 -  2041
=CSLC14  Abs  986966 #F0F56 -  2043
```

```
=CSLC15   Abs   986969 #F0F59 -  2045
=CSLC2    Abs   986943 #F0F3F -  2026
=CSLC3    Abs   986940 #F0F3C -  2024
=CSLC4    Abs   986937 #F0F39 -  2022
=CSLC5    Abs   986934 #F0F36 -  2020
=CSLC6    Abs   986931 #F0F33 -  2018
=CSLC7    Abs   986928 #F0F30 -  2016
=CSLC8    Abs   986925 #F0F2D -  2014
=CSLC9    Abs   986951 #F0F47 -  2033
=CSRC1    Abs   986969 #F0F59 -  2044
=CSRC10   Abs   986931 #F0F33 -  2017
=CSRC11   Abs   986934 #F0F36 -  2019
=CSRC12   Abs   986937 #F0F39 -  2021
=CSRC13   Abs   986940 #F0F3C -  2023
=CSRC14   Abs   986943 #F0F3F -  2025
=CSRC15   Abs   986946 #F0F42 -  2027
=CSRC2    Abs   986966 #F0F56 -  2042
=CSRC3    Abs   986963 #F0F53 -  2040
=CSRC4    Abs   986960 #F0F50 -  2038
=CSRC5    Abs   986957 #F0F4D -  2036
=CSRC6    Abs   986954 #F0F4A -  2034
=CSRC7    Abs   986951 #F0F47 -  2032
=CSRC8    Abs   986925 #F0F2D -  2013
=CSRC9    Abs   986928 #F0F30 -  2015
=D1=AVE   Abs   986996 #F0F74 -  2117  2125
=D1=AVS   Abs   987005 #F0F7D -  2121  2131
=D1@AVE   Abs   987014 #F0F86 -  2125
=D1@AVS   Abs   987026 #F0F92 -  2131
 DDL      Ext                 -   937
 DDT      Ext                 -   901
=DTOH     Abs   986471 #F0D67 -  1476
 DTOH0    Abs   986486 #F0D76 -  1481  1485  1507
 DTOH1    Abs   986499 #F0D83 -  1488  1482
 DTOH2    Abs   986518 #F0D96 -  1496  1491
 DTOH3    Abs   986532 #F0DA4 -  1502  1497
 DTOH4    Abs   986541 #F0DAD -  1506  1493  1499  1503
 DevID    Ext                 -   721
 DevTyp   Ext                 -   660
 Device   Ext                 -  1044  1121
 DsLoop   Ext                 -   656
 DsNull   Ext                 -   646
=END      Abs   985207 #F0877 -   250   232
=ENDFN    Abs   985173 #F0855 -   236
=ENDST    Abs   985163 #F084B -   232
=FNDCH-   Abs   986128 #F0C10 -  1090   368
=FNDCHK   Abs   986139 #F0C1B -  1095
 FNDMB-   Ext                 -  1090
 FNDMBX   Ext                 -  1095
 FR00-0   Abs   985148 #F083C -   176   171
 FR00-1   Abs   985139 #F0833 -   170   165
 FR00-2   Abs   985130 #F082A -   164   159
 FR00-3   Abs   985121 #F0821 -   158   153
 FR00XX   Abs   985076 #F07F4 -   124   118
 FR0XXX   Abs   985065 #F07E9 -   108    80
 FR11XX   Abs   985052 #F07DC -    97    90
 FR1XXX  Abs  985047 #F07D7 -    89
=FRAME+  Abs  985026 #F07C2 -    67  1186
=FRAME-  Abs  985040 #F07D0 -    77
 FRAME0  Abs  985040 #F07D0 -    78    69
 FREND   Abs  985146 #F083A -   173    99   135   151
 FRERR   Abs  985159 #F0847 -   183   141   177
 FRERRS  Abs  985157 #F0845 -   182   144
=GADDR   Abs  985492 #F0994 -   635   492
 GADDR$  Abs  985621 #F0A15 -   714   709
 GADDR&  Abs  985747 #F0A93 -   790   931
 GADDR'  Abs  985562 #F09DA -   676   649   800
 GADDR+  Abs  985923 #F0B43 -   890   889
 GADDR-  Abs  985734 #F0A86 -   778   773
 GADDR0  Abs  985516 #F09AC -   652   641
 GADDR1  Abs  985533 #F09BD -   660   654
 GADDR2  Abs  985603 #F0A03 -   699   672
 GADDR3  Abs  985607 #F0A07 -   702   662
 GADDR4  Abs  985703 #F0A67 -   768   825
 GADDR5  Abs  985790 #F0ABE -   815   771   777   780
 GADDR6  Abs  985825 #F0AE1 -   840   724
 GADDR7  Abs  985930 #F0B4A -   892   881
 GADDR8  Abs  985948 #F0B5C -   900   894
 GADDR9  Abs  986049 #F0BC1 -   945   941
 GADDR?  Abs  985614 #F0A0E -   711   713
 GADDRN  Abs  985508 #F09A4 -   647   657
 GADDRd  Abs  985646 #F0A2E -   732   723
 GADDRe  Abs  985816 #F0AD8 -   834   503   796
 GADDRf  Abs  985811 #F0AD3 -   828   824   876
 GADDRn  Abs  985772 #F0AAC -   803   699   754   829   949
 GADDRu  Abs  985816 #F0AD8 -   833   846
 GADDRv  Abs  985869 #F0B0D -   866   942
 GADDr-  Abs  985941 #F0B55 -   895   904
 GADDrn  Abs  986019 #F0BA3 -   934   891   896   918   925
 GET     Ext                -  1312
=GETALR  Abs  986786 #F0EA2 -  1795  1802
=GETDev  Abs  986096 #F0BF0 -  1036   375
 GETERR  Ext                -   434
 GETHS2  Ext                -  1098
 GETID   Ext                -   768
 GETMBX  Ext                -   251
 GETST   Ext                -   440  1105
=GTYPE   Abs  986260 #F0C94 -  1227
 GTYPE-  Abs  986283 #F0CAB -  1232  1244
 GTYPE0  Abs  986300 #F0CBC -  1241  1240
 GTYPE1  Abs  986310 #F0CC6 -  1245  1250  1262
 GTYPE2  Abs  986314 #F0CCA -  1249  1238
 GTYPE3  Abs  986326 #F0CD6 -  1254  1261
 GTYPE4  Abs  986334 #F0CDE -  1259  1252
 Get     Abs  986386 #F0D12 -  1312  1184
 Geterr  Abs  985321 #F08E9 -   434   429   746  1103
 Getmbx  Abs  985207 #F0877 -   251   242   456   481  1124
=HTOD    Abs  986556 #F0DBC -  1548
 HTOD1   Abs  986566 #F0DC6 -  1556  1559
 HTOD2   Abs  986577 #F0DD1 -  1562  1557
 HTOD3   Abs  986584 #F0DD8 -  1564  1567
```

```
=HTODX    Abs  986596 #F0DE4 -  1600
 HTODX1   Abs  986609 #F0DF1 -  1605  1608  1627
 HTODX2   Abs  986621 #F0DFD -  1611  1606
 HTODX3   Abs  986633 #F0E09 -  1621  1613
 HTODX4   Abs  986653 #F0E1D -  1628  1622
 HTODXr   Abs  986629 #F0E05 -  1617  1629
=LISTEN   Abs  986353 #F0CF1 -  1299  1349
 LOOPST   Ext                -  1038  1118
 Loop     Ext                -   386   652
 M-STRT   Abs  986685 #F0E3D -  1673  1668
=MTYL     Abs  986392 #F0D18 -  1347   934
=MTYLC    Abs  986406 #F0D26 -  1351
=MTYLL    Abs  986399 #F0D1F -  1349
 NXTDGT   Abs  986680 #F0E38 -  1671  1674  1681
 Null     Ext                -   383   639
 OVFLOW   Abs  986714 #F0E5A -  1686  1677
 PRMSG1   Abs  986449 #F0D51 -  1435  1441
=PRMSGA   Abs  986446 #F0D4E -  1434
=PUTALR   Abs  986834 #F0ED2 -  1856  1866
=PUTARL   Abs  986810 #F0EBA -  1842  1852
 PUTC     Ext                -  1301
 PUTC+    Ext                -   740
 PUTC=D   Abs  986359 #F0CF7 -  1300  1392
 PUTD     Ext                -  1309
=PUTDX    Abs  986858 #F0EEA -  1904  1909
 PUTE     Ext                -   424  1231
=PUTGF    Abs  986246 #F0C86 -  1183  1232
=PUTGF+   Abs  986242 #F0C82 -  1182   669   873
=PUTGF-   Abs  986238 #F0C7E -  1180   416   483   793   821
 Putc     Abs  986362 #F0CFA -  1301  1182  1306  1352  1389
=Putd     Abs  986380 #F0D0C -  1309  1437  1848  1862  1904
=RANGE    Abs  986771 #F0E93 -  1755  1743  1751
=RANGEA   Abs  986755 #F0E83 -  1750  1737
=RANGEN   Abs  986765 #F0E8D -  1754
 READRG   Ext                -   906
 RESTRT   Ext                -   455   460
=ReadD1   Abs  987018 #F0F8A -  2126  2132
 Rewind   Ext                -   936
 SEEKA    Ext                -   893
 SETLP    Ext                -   357
 SFLAG?   Ext                -   499
=START    Abs  985213 #F087D -   353
 START!   Abs  985327 #F08EF -   440   430
 START#   Abs  985295 #F08CF -   423   414
=START+   Abs  985219 #F0883 -   359
=START-   Abs  985222 #F0886 -   363
 START0   Abs  985336 #F08F8 -   442
 START1   Abs  985348 #F0904 -   450   449
 START2   Abs  985377 #F0921 -   460   443   454
 START3   Abs  985453 #F096D -   487   401   451   457
 START5   Abs  985488 #F0990 -   502   420   486
 STARTS   Abs  985312 #F08E0 -   429   417   419
 STARTd   Abs  985266 #F08B2 -   397   382   385   388
 STARTn   Abs  985270 #F08B6 -   407   376
 STARTp   Abs  985424 #F0950 -   476
 STARTs  Abs  985433 #F0959 -   480   468   477
 STARtE  Abs  985319 #F08E7 -   431
 SWAP01  Ext                -   469   472
=TALK    Abs  986436 #F0D44 -  1391
 TSTAT   Ext                -   880
 TSTATA  Ext                -   903
=UCRANG  Abs  986726 #F0E66 -  1737
=ULYL    Abs  986346 #F0CEA -  1297
=UNLPUT  Abs  986368 #F0D00 -  1304   245   732  1297  1347  1386
 UNT     Ext                -   243   807
=UTLEND  Abs  985185 #F0861 -   242   237
 VolLbl  Ext                -   844
=YTML    Abs  986416 #F0D30 -  1386  1227
=YTMLL   Abs  986423 #F0D37 -  1388
 bPILAI  Ext                -   470
 eABORT  Ext                -   997
 eBADMD  Ext                -   392  1133
 eNEWTA  Ext                -   888
 eNOFND  Ext                -   810
 eNORDY  Ext                -  1260
 ePIL    Ext                -   393   811   836  1134  1255
 eRANGE  Ext                -  1628
 eTAPE   Ext                -   885   895
 eUNEXP  Ext                -   835  1253
 f1EXTD  Ext                -   462
 f1NZ4   Ext                -   452
 i/OFND  Ext                -   471
 mADDRL  Ext                -  1299
 mADDRM  Ext                -  1351  1388
 mADDRT  Ext                -  1391
 mAUTOA  Ext                -   467   476
 mFIND1  Ext                -   668
 mFINDD  Ext                -   867
 mGETCA  Ext                -   792
 mINCCA  Ext                -   820
 mPULOP  Ext                -   415
 mRSTCA  Ext                -   739
 mSAI    Ext                -  1230
 mSDA    Ext                -   905
 mTAKEI  Ext                -   423
 mUNL    Ext                -  1305
 nXTSTM  Ext                -   233
 p3DATA  Ext                -    73
 pACK    Ext                -   150
 pADDR   Ext                -   119   485   671   795   823   875
 pDATA   Ext                -   104  1237
 pEOT    Ext                -   160  1249
 pETE    Ext                -   154
 pHALTD  Ext                -   166
 pIFC    Ext                -   172
 pSTATE  Ext                -   418   828  1251
 pTERM   Ext                -   178
 pUTYPE  Ext                -   183
 sCONTR  Ext                -  1111
=sFLAG?  Abs  985481 #F0989 -   499
```

```
 sMANUL  Ext                -  1099
 sReadd  Ext                -   359   413   442   461
 sUNCNF  Ext                -   448
 sflag?  Abs   985474 #F0982 -   496   453   463
```

```
Input Parameters

  Source file name is NZ&GPR::MS

  Listing file name is NZ/GPR:TI:ML::-1

  Object file name is NZ%GPR:TI:MS::-1

                                          111111
                                0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
              *
              *       N   N  ZZZZZ   &     BBBB     A     SSS
              *       N   N     Z  & &     B   B   A A   S   S
              *       NN  N    Z   & &     B   B  A   A  S
              *       N N N   Z     &      BBBB   A   A   SSS
              *       N  NN  Z     & & &   B   B  AAAAA      S
              *       N   N Z     &   &    B   B  A   A  S   S
              *       N   N ZZZZZ  && &    BBBB   A   A   SSS
              *
              *
                      TITLE  BASIC ROUTINES <840301.1323>
   F0F9A              ABS    #F0F9A        TIXHP6 address (fixed)
              ***************************************************************
              ***************************************************************
              **
              ** Name:        PRTIS - Poll handler for the PRINT statement
              ** Name:        PRTIS+ - Poll handler for pPRTCL (D1 @ address)
              ** Name:        PRTISc - Address device as listener (D1 @ addr)
              **
              ** Category:    POLL
              **
              ** Purpose:
              **      Handle pPRTIS/pPRTCL/... (address device as listener,
              **      me as talker, load address of routine to send data)
              **
              ** Entry:
              **      P=0, HEXMODE
              **      PRTIS+,PRTISc:
              **              D1 points to the 7 nib device assignment
              **              FUNCD1 contains the value to return in D1
              **
              ** Exit:
              **      Carry clear
              **      If XM=0, A[A] is the address of the PRINT handler
              **      If XM=1, Did NOT handle the poll
              **      PRTIS+,PRTICc: D1 restored from FUNCD1
              **
              ** Calls:       TSAVD1,CHKASN,TRESD1,START,ULYL,MTYL
              **
              ** Uses.......
              **  Inclusive: A,B,C,D[15:13,5:0],D0,P,FUNCD0[2:0],FUNCD1
              **
              ** Stk lvls:    4 (START)
              **
              ** NOTE: Does not alter D1 or status bits
              **
              ** History:
              **
              **    Date      Programmer              Modification
              **  --------    ----------     ---------------------------------
              **  11/29/83       NZ          Updated documentation
              **  07/21/83       NZ          Removed check for mass storage
              **                             device (not correct as it is)
              **  06/23/83       NZ          Changed call to CHKMSD to inline
              **                             code (only reference to CHKMSD)
```

```
                 **  02/23/83      JM          Added A[S] flag for MeTalk status
                 **  02/17/83      NZ          Removed multiple devices
                 **  02/03/83      NZ          Changed MeTalk from 4 to 9 (START
                 **                              destroys ST4)
                 **  01/20/83      JM          Added MeTalk status, send MTA
                 **  12/15/82      NZ          Updated documentation
                 **
                 **************************************************************
                 **************************************************************
                 SaveIt  EQU    6              Need to save this one after start
                 MeTalk  EQU    9              Address me as talker
                 *
 F0F9A AC0       =PRTISc A=0    S              Entry for CLEAR, clear A[S] so My
 F0F9D 6610              GOTO   PRTISe         Talk Adr is not sent out
                 *-
                 *-
 F0FA1 8E00      =PRTIS  GOSUBL =TSAVD1        Save D1 in FUNCD1
       00
 F0FA7 1F00              D1=(5) =IS-PRT
       000
 F0FAE AC0       =PRTIS+ A=0    S              Set status to address me to talk
 F0FB1 A4C               A=A-1  S              A[S]=F
 F0FB4 15F6      PRTISe  C=DAT1 7
 F0FB8 DA                A=C    A              Save low 3 nibs in A[A]
 F0FBA 8E00              GOSUBL =CHKASN
       00
 F0FC0 5F3               GONC   PRTIS2         This is assigned...do it
                 *
                 * If carry, check if this is "NULL" or "LOOP"
                 *
 F0FC3 96C               ?A#0   B
 F0FC6 03                GOYES  PRTIS1         If A[B]<>0, NOT "NULL"...exit
                 *
                 * A[B]=0...either "NULL" or "LOOP"
                 *
 F0FC8 B24               A=A+1  XS             Check if "NULL"
 F0FCB 543               GONC   PRTIS2         If no carry, this is "LOOP"
                 *
                 * This is "NULL"
                 *
 F0FCE 7700              GOSUB  PRTIS-         Get my address
 F0FD2 5000              REL(5) =PREXT         (Address of part 3 handler)
       0
                 *
                 * Following is the part 2&3 handler for "NULL" (Doesn't use
                 * anything, just clears carry)
                 *
 F0FD7 03        =PREXT  RTNCC
                 *-
                 *-
 F0FD9 07        PRTIS-  C=RSTK                Pop my address back
 F0FDB 137               CD1EX
 F0FDE 174               D1=D1+ 5              Skip the REL(5)
 F0FE1 133               AD1EX                 Leave address in A[A]
                 *
```

```
                * Carry is CLEAR from the D1=D1+ 5 above...TRESD1 doesn't
                * affect the carry
                *
FOFE4 8C00 Tresd1  GOLONG =TRESD1        Restore D1, return "handled"
      00
                *-
                *-
                *
                * Not assigned or error...return, carry clear, XM=1
                *
FOFEA 1B00 PRTIS0  D0=(5) =FUNCD0
      000
FOFF1 146          C=DAT0 A
FOFF4 0A           ST=C                  Restore status bits from FUNCD0
FOFF6 7AEF PRTIS1  GOSUB  Tresd1         Restore D1 from FUNCD1
FOFFA 21           P=     1
FOFFC 0D           P=P-1                 Clear carry, P=0
FOFFE 00           RTNSXM                Return, not handled
                *-
                *-
F1000 1B00 PRTIS2  D0=(5) =FUNCD0        Save status bits in FUNCD0
      000
F1007 0B           CSTEX
F1009 15C2         DAT0=C 3
F100D 0B           CSTEX
F100F 846          ST=0   SaveIt         Initially say don't save it
F1012 859          ST=1   MeTalk         Set up MeTalk status bit...
F1015 B44          A=A+1  S              ...MeTalk = 1 if A[S]=F
F1018 450          GOC    PRTIS,         ...MeTalk = 0 if A[S]=0
F101B 849          ST=0   MeTalk
F101E D7   PRTIS,  D=C    A              Put device specifier in D[A]
F1020 94A          ?C=0   S              Did CHKASN say to find it?
F1023 50           GOYES  PRTIS"         No...don't need to save it
F1025 856          ST=1   SaveIt         Yes...need to save address
F1028 7000 PRTIS"  GOSUB  =START         Set up the device
F102C 4DB          GOC    PRTIS0         Error...can't handle the poll
                *
                * Now address listener, make me talker (conditionally)
                *
F102F 96B          ?D=0   B              Is this "LOOP"?
F1032 61           GOYES  PRTS01         Yes...don't change addressing
F1034 879          ?ST=1  MeTalk         Should I be addressed as talker?
F1037 A0           GOYES  PRTIS@         Yes...set it up
F1039 7000         GOSUB  =ULYL          No...send UNL, LAD n
F103D 6700         GOTO   PRTS00         (Check errors at PRTS00)
                *-
                *-
F1041 7616 PRTIS@  GOSUB  Mtyl           Address device as listener
F1045 44A  PRTS00  GOC    PRTIS0         HPIL error...don't handle it
F1048 866  PRTS01  ?ST=0  SaveIt         Do I need to write it out?
F104B 90           GOYES  PRTIS4         No...continue
F104D ABB          C=D    X              Yes...copy address from D[X]
F1050 15D2         DAT1=C 3              Write out the device address @ D1
F1054 729F PRTIS4  GOSUB  PRTIS0         Restore caller's status, D1 (XM=1)
F1058 821          XM=0                  Clear XM
```

```
                *
    F105B 7000          GOSUB  PRTIS5          Get my current address...
    F105F 07    PRTIS5  C=RSTK                 ...pop it off...
    F1061 DA            A=C    A               ...move it to A[A]...
    F1063 3402          LC(5)  (PRASCI)-(PRTIS5)  ...Offset of part 2 routine
          000
    F106A CA            A=A+C  A               (Address of part 2 routine in A)
    F106C 03            RTNCC                  Done, handled
                *-
                *-
    F106E AF2   PREND2  C=0    W
    F1071 7CE5          GOSUB  Saveit          Deallocate any buffers
    F1075 583           GONC   PREND3          Go always
                *-
                *-
    F1078 0             CON(1) =FIXSPC         2 nibbles available here
    F1079               BSS    2-1
                *************************************************************
                *************************************************************
                **
                ** Name:        PRASCI - Send ASCII characters to the loop
                **
                ** Category:    PILI/O
                **
                ** Purpose:
                **      Send the ASCII characters to the loop (already set up)
                **
                ** Entry:
                **      MBOX^ points to the desired mailbox
                **      A[A] contains the length of the string in bytes
                **      D[A] is the start address of the string
                **
                ** Exit:
                **      If loop error, jumps to ERRORX
                **      P=0
                **      D1 positioned following last character sent
                **
                ** Calls:       GETMBX,WRITIT,TSAVDO,TRESDO,<ERRORX>
                **
                ** Uses.......
                **  Inclusive: A[A],C,D1,P,FUNCDO,ST[8,3:0]
                **
                ** Stk lvls:    3 (pushed DO;WRITIT)(pushed DO;TRESDO)
                **
                ** History:
                **
                **    Date      Programmer              Modification
                **  --------    ----------    ---------------------------------
                **  01/27/84       NZ         Moved PRASER to pack 9 nibbles
                **  12/15/82       NZ         Updated documentation
                **  01/27/83       NZ         Modified entry, exit save method,
                **                            added exit condition on D1
                **
                *************************************************************
                *************************************************************
```

```
F107A D300          REL(5) =PREND       Address of the final part
      0
F107F 09     =PRASCI C=ST
F1081 136           CD0EX               ST into D0, D0 value into C[A]
F1084 7116          GOSUB  Tsavd0       Save status in FUNCD0
F1088 06            RSTK=C              Save D0 on RSTK
F108A 8E00          GOSUBL =GETMBX      Get the mailbox address
      00
F1090 DB            C=D    A
F1092 135           D1=C                Set D1 to the start of the buffer
             *
             * Now D1-->buffer, A[A] is length in bytes, D0-->mailbox
             * Loop is addressed (Talker and Listener(s))
             *
F1095 840           ST=0   =LoopOK      Do not abort with one ATTN hit
F1098 8E00          GOSUBL =WRITIT      Transfer the data to the loop
      00
F109E 435           GOC    PRASER       Error if carry set
F10A1 7AF5          GOSUB  Tresd0       Get status back to D0
F10A5 07            C=RSTK              Get old D0 from RSTK
F10A7 136           CD0EX               Now D0 restored, ST in C[X]
F10AA 0A            ST=C                Restore the status bits
F10AC 01            RTN
             *-
             *-
F10AE 8E00 PREND3   GOSUBL =UTLEND      Unaddress all talkers, listeners
      00
F10B4 03   PREND4   RTNCC
             *-
             *-
F10B6 0             CON(1) =FIXSPC      1 nibble available here
             ****************************************************************
             ****************************************************************
             **
             ** Name:        PREND - Clean up the loop after PRINT/OUTPUT
             **
             ** Category:    LOCAL
             **
             ** Purpose:
             **      Clean up the loop after a PRINT/OUTPUT sequence
             **
             ** Entry:
             **      Device(s) are addressed as listener(s)
             **      MBOX^ points to the mailbox used
             **
             ** Exit:
             **      D0 points to the mailbox used
             **      Carry clear (P may be non-zero)
             **
             ** Calls:      D1=SR0,SAVEIT,UTLEND
             **
             ** Uses.......
             **  Inclusive: A,B,C,D,R2,R3,D0,D1,P,ST[3:0]
             **
             ** Stk lvls:   4 (UTLEND)(SAVEIT)
```

```
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **  --------   ----------    --------------------------------
                 **  01/27/84      NZ         Rewrote to fix bug with PRINT not
                 **                           unaddressing the loop (checked
                 **                           LOOP by looking at STMTR1')
                 **  11/29/83      NZ         Updated documentation
                 **  12/15/82      NZ         Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
 F10B7           =PREND
                 *
                 * If device code equals OUTPTt, then need to deallocate the
                 * buffer!
                 *
 F10B7 7CC5              GOSUB  D1=SR0          Device code
 F10BB 14F               C=DAT1 B               Read in 1 nib
 F10BE 80D0              P=C    0               Copy device code to P
 F10C2 1D00              D1=(2) (=STMTR1)+2     Point to device spec
 F10C6 880               ?P#    =PRINTt         Is this PRINT?
 F10C9 80                GOYES  PREND1          No...D1 is OK
 F10CB 1E00              D1=(4) =IS-PRT         Yes...look at IS-PRT
       00
 F10D1 14F       PREND1  C=DAT1 B
 F10D4 96A               ?C=0   B               NULL or LOOP?
 F10D7 DD                GOYES  PREND4          Yes...exit cleanly
                 *
 F10D9 880               ?P#    =OUTPTt         If OUTPUT, deallocate any buffers
 F10DC 2D                GOYES  PREND3          Not output...Unaddress talk,listen
 F10DE 6F8F              GOTO   PREND2          Could be GONC, but leaves a nib
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:        OUTPUT - Execute the OUTPUT statement
                 **
                 ** Category:    STEXEC
                 **
                 ** Purpose:
                 **       Send output to the specified device(s)
                 **
                 ** Entry:
                 **       D0 at tokenized device specifier
                 **
                 ** Exit:
                 **       Through mainframe PRINT*
                 **
                 ** Calls:       GETDID,SAVEIT,TRESD0,<PRINT*>,<ERRORX>
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,D,R0-R4,D0,D1,P,FUNCxx,STMTD1[3:0],STMTR1,
                 **             ST[11:0],all RAM that EXPEXC is permitted to use
                 **
```

```
                  ** Stk lvls:   7 (GETDID)
                  **
                  ** History:
                  **
                  **    Date     Programmer             Modification
                  **  --------   ----------   ---------------------------------
                  **  11/29/83       NZ        Updated documentation
                  **  03/15/83       NZ        Replaced GETMUL with GETDID
                  **  12/15/82       NZ        Wrote code and documentation
                  **
                  ***************************************************************
                  ***************************************************************
 F10E2 0000               REL(5) =OUTPd         OUTPUT decompile
       0
 F10E7 0000               REL(5) =OUTPp         OUTPUT parse
       0
 F10EC 8E00 =OUTPUT GOSUBL =GETDID          Get device specifier
       00
 F10F2 414  PRASER  GOC    OUTPer           Error with device or loop
 F10F5 1F00         D1=(5) (=STMTR1)+2      (This is where I save the 7 nibs)
       000
 F10FC AF0          A=0    W                Clear position, length
 F10FF 159A         DAT1=A 11               (STMTR1)+9 is position, width
 F1103 7A55         GOSUB  Saveit           Save the source @ D1
 F1107 7495         GOSUB  TreadO           Restore the PC (saved by GETDID)
 F110B 1F00         D1=(5) =EOLLEN          Point to EOL length, EOL string
       000
 F1112 15F6         C=DAT1 7                Read EOLLEN, EOL string
 F1116 1E00         D1=(4) (=STMTRO)+11     Position to CKINFO location
       00
 F111C 15D6         DAT1=C 7                Write it out EOL info out
 F1120 1CB          D1=D1- 12               Position to MLFFLG
                  *****
                  *
                  *       LC(2)  (=OUTPTt)*16+#F Set MLFFLG="F", type=OUTPTt
 F1123 31F          NIBHEX 31F
 F1126 0            CON(1) =OUTPTt
                  *
                  *****
 F1127 14D          DAT1=C B                Write the info out to MLFFLG
                  *
                  * Now have written the info needed for the hPRTCL handler to
                  * do its job
                  *
 F112A 161          DO=DO+ 2                Skip the t@ used to stop GETDID
 F112D 8D00         GOVLNG =PRINT*          Now continue with PRINT handler
       000
                  *-
                  *-
 F1134 60D4 OUTPer  GOTO   Errorx
                  ***************************************************************
                  ***************************************************************
                  **
                  ** Name:          PRNTIS - Reassign HPIL PRINT device
                  ** Name:          DISPIS - Reassign HPIL DISPLAY device
```

```
                 **
                 ** Category:   STEXEC
                 **
                 ** Purpose:
                 **      PRNTIS executes the PRINTER IS statement, and DISPIS
                 **      executes the DISPLAY IS statement.
                 **
                 ** Entry:
                 **      D0 points to the device specifier
                 **
                 ** Exit:
                 **      Exits through ENDST if no error, ERRORX if error
                 **
                 ** Calls:      D1=DST,SAVED0,GETDID,RESTD0,SWAP01,SAVEIT,
                 **             D1=DSX,PILCNF,<ENDST>,<ERRORX>
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,D,R0-R4,D0,D1,P,FUNCxx,STMTD0,STMTD1,
                 **             ST[11:0],all RAM that EXPEXC is permitted to use
                 **
                 ** Stk lvls:   7 (GETDID)
                 **
                 ** History:
                 **
                 **   Date     Programmer               Modification
                 **  --------  ----------   ---------------------------------
                 **  01/06/84     NZ        Changed order of DISPIS to set up
                 **                         to search AFTER calling GETDID
                 **  11/29/83     NZ        Updated documentation and added
                 **                         PRNT00 as an external entry point
                 **  05/17/83     NZ        Corrected mod of 5/4/83 to error
                 **                         for bad device spec
                 **  05/04/83     NZ        Modified return from GETDID to
                 **                         match new exit conditions of same
                 **  03/18/83     NZ        Used STMTD0 instead of STMTD1 to
                 **                         save address through GETDID
                 **  02/18/83     NZ        Added call to PILCNF for DISPIS
                 **  12/15/82     NZ        Updated documentation
                 **
                 ***************************************************************
                 ***************************************************************
F1138 0000             REL(5) =PRNTSd       "PRINTER IS" DECOMPILE
      0
F113D 0000             REL(5) =PRNTSp       "PRINTER IS" PARSE
      0
F1142            =DISPIS
F1142 3400             LC(5)  =IS-DSP
      000
                 *
                 * Following statement is a "Go always" because the LEX table
                 * entry for DISPIS is earlier in memory than DISPIS, hence
                 * the calculation of the execution address leaves carry clear
                 *
F1149 512              GONC   PRNT00        Go always
                 *-
```

```
418                  *-
419 F114C 15D0 DISPI+  DAT1=C 1           Write out the bits
420 F1150 8E00         GOSUBL =PILCNF     Set up DSPCNX if needed
          00
421 F1156 69E4 PRNT50  GOTO   Endst       Clean up, goto next statement
422                  *-
423                  *-
424 F115A 0000         REL(5) =PRNTSd     "PRINTER IS" decompile
          0
425 F115F 0000         REL(5) =PRNTSp     "PRINTER IS" parse
          0
426 F1164 3400 =PRNTIS LC(5)  =IS-PRT
          000
427 F116B 136  =PRNT00 CD0EX              Save PC in C[A],put address in D0
428 F116E 8E00         GOSUBL =SAVED0     Save location in STMTD0
          00
429 F1174 136          CD0EX              Restore PC from C[A]
430 F1177 8E00         GOSUBL =GETDID     Get device specifier
          00
431                  *
432                  * Following two routines do not change carry
433                  *
434 F117D 8E00         GOSUBL =RESTD0     Now D0 @ intended location
          00
435 F1183 8E00         GOSUBL =SWAP01     Swap D0, D1
          00
436                  *
437                  * Now D1 is at the destination
438                  *
439 F1189 551          GONC   PRNT45      No error...save it in RAM
440                  *
441                  * Check for *, "" (Address=0, carry set)
442                  *
443 F118C 8AF          ?D#0   A
444 F118F A5           GOYES  PRNTER      Not a valid device spec
445 F1191 880          ?P#    =eDSPEC     Is it "", *, or "*"?
446 F1194 55           GOYES  PRNTER      No...error
447                  *
448                  * Device is "*"...undo it
449                  *
450 F1196 AF2          C=0    W
451 F1199 A7E          C=C-1  W
452 F119C AC2          C=0    S           Indicate "fits" in 7 nibs
453 F119F 7EB4 PRNT45  GOSUB  Saveit      Save source @ D1
454                  *
455                  * Check if this is DISPLAY IS
456                  *
457 F11A3 133          AD1EX
458 F11A6 3400         LC(5)  =IS-DSP
          000
459 F11AD 8A6          ?A#C   A           Is it DISPLAY?
460 F11B0 6A           GOYES  PRNT50      No...exit
461 F11B2 8E00         GOSUBL =D1=DSX     Yes...point to DSPCNX (address)
          00
462 F11B8 D2           C=0    A
```

```
F11BA 145            DAT1=C A            Clear DISCHX for case of "*"
F11BD 8E00           GOSUBL =D1=DST      Point to DSPSET
      00
F11C3 307            LC(1)  7            Printr,Wallby,LoopOK=1; DispOK=0
F11C6 658F           GOTO   DISPI+       Go always (reset DSPCHX, clean up)
                *-
                *-
F11CA 0              CON(1) =FIXSPC      1 nibble available here
F11CB                BSS    1-1
                **************************************************************
                **************************************************************
                **
                ** Name:        PACKD - Pack the directory of a mass storage dev
                **
                ** Category:    STEXEC
                **
                ** Purpose:
                **      Pack a mass storage device directory
                **
                ** Entry:
                **      D0 points to the device specifier
                **
                ** Exit:
                **      Through NXTSTM or ERRORX
                **
                ** Calls:       PDIR,ENDTAP,<NXTSTM>,<ERRORX>
                **
                ** Uses.......
                **  Inclusive: All CPU registers, all RAM EXPEXC is permitted
                **             to use, STMTD0[3:0],STMTR1
                **
                ** Stk lvls:    7 (PDIR)
                **
                ** History:
                **
                **   Date      Programmer            Modification
                **  --------   ----------   ---------------------------------
                **  12/21/83       NZ       Moved call to GETDID to PACKD to
                **                          fix a stack level problem (PDIR)
                **  11/29/83       NZ       Updated documentation
                **
                **************************************************************
                **************************************************************
F11CB 0000           REL(5) =PACKd       PACK decompile
      0
F11D0 0000           REL(5) =PACKp       PACK parse
      0
F11D5 8E00 =PACKD    GOSUBL =GETDID      Get the device specifer
      00
F11DB 7E00           GOSUB  PDIR         Pack the directory
F11DF 490            GOC    PRNTER       Error during pack
F11E2 6302           GOTO   PACK90       ENDTAP, NXTSTM
                *-
                *-
F11E6 0              CON(1) =FIXSPC      3 nibbles available here
```

```
F11E7                BSS    3-1
                *-
                *-
                *
                * Error detected
                *
F11E9 6B14 PRNTER  GOTO   Errorx         If error, don't change IS-xxx
                ***************************************************************
                ***************************************************************
                **
                ** Name:        PDIR - Pack a directory (assembly language call)
                **
                ** Category:    LOCAL
                **
                ** Purpose:
                **      Pack a mass storage device directory
                **
                ** Entry:
                **      Exit conditions from GETDID
                **
                ** Exit:
                **      Carry clear: (successful pack)
                **        P=0
                **        D0 points to the HPIL mailbox
                **        D[X] is the address of the mass storage device
                **        R0 is the information returned in B[W] from GDIRST
                **        R1 is the information returned in D[W] from GDIRST
                **      Carry set: (error occurred)
                **        P,C[0] are the error code
                **
                ** Calls:       CHKMAS,GDIRST,GETDR",CSRC4,NXTENT,CSRC5,CSLC5,
                **              PDIRBF,CSLC4,PBF->C,GETDR+,F->SCR,CSLC3,
                **      PBF->C:SEEKA,DDT,ULYL,DDL,TSTAT,<DDT>
                **      -----
                **      PDIRBF:MTYL,DDL,CSLC4,PUTD,<PUTDR">
                **
                ** Uses.......
                **  Inclusive: A-D,R0-R4,D0,D1,P,ST[11:0]
                **
                ** Stk lvls:   4 (GDIRST)
                **
                ** PDIR:Set up the loop (START)
                **      Check for mass storage device
                **      Get directory information (GDIRST)
                **      (PTRC is current directory entry)
                **       (PTRC is B[3:0])
                **      (PTRD is where next non-purged directory entry goes)
                **       (PTRD is B[15:12])
                **    1:Seek correct record & read directory entry
                **    2:IF (physical end of directory) THEN GOTO 8..:
                **      IF (logical end of directory) THEN GOTO 8:
                **      Increment PTRC
                **      IF (PTRC crossed record boundary) THEN
                **         Decrement record count (D[8:5])
                **      IF (entry is purged) THEN GOTO 3:
```

```
                **      Write entry at PTRD (Buffer 1)
                **      Increment PTRD
                **      IF (PTRD not at start of record) THEN GOTO 3:
                **      Write out buffer 1 contents to tape
                **      GOTO 1:
                **      --
                **    3:Read directory entry
                **      GOTO 2:
                **      --
                **    8:Write out EOD marker (if not at physical EOD)
                **    9:RETURN
                **
                ** History:
                **
                **    Date     Programmer              Modification
                **  --------   ----------     ---------------------------------
                **  12/21/83       NZ         Removed call to GETDID to fix a
                **                            bug (stack levels)
                **  05/25/83       NZ         Added mass storage check in PDIR
                **  01/06/83       NZ         Rewrote algorithm, documented it
                **  12/15/82       NZ         Updated documentation
                **
                ***************************************************************
                ***************************************************************
 F11ED 400      =PDIR   RTNC                  Error with device specifier
 F11F0 8E00             GOSUBL =CHKMAS        Check for mass storage
       00
 F11F6 400              RTNC                  Not mass storage...error
 F11F9 23               P=     3
 F11FB 304              LC(1)  4              This is Acc ID=16 (for MOVEFL)
 F11FE A87              D=C    P
 F1201 8E00             GOSUBL =GDIRST        Get the directory start info
       00
 F1207 400              RTNC
 F120A AF9              C=B    W
 F120D 108              R0=C                  Save B[W] in R0 for PACK
 F1210 AFB              C=D    W
 F1213 109              R1=C                  Save D[W] in R1 for PACK
 F1216 8E00     PDIR10  GOSUBL =GETDR"        Get the entry from B[3:0]
       00
 F121C 400              RTNC                  Error
 F121F 90D      PDIR20  ?B#0   P              New record?
 F1222 31               GOYES  PDIR22         No...continue
                *
                * New record...check for end of directory
                *
                PhyEOD  EQU    0
 F1224 850              ST=1   PhyEOD         Physical End Of Directory
 F1227 AFB              C=D    W
 F122A 7F44             GOSUB  Csrc4
 F122E F6               CSR    A              Now C[3:0] is count, C[4]=0
 F1230 8AA              ?C=0   A              Is the record count zero?
 F1233 A7               GOYES  PDIR90         Yes...physical EOD
 F1235 840      PDIR22  ST=0   PhyEOD         No...not physical EOD.
 F1238 173              D1=D1+ 4              Move to TYPE
```

```
621 F123B 15F3          C=DAT1 4            Read in file type
622               *
623               * Check for end of directory (FFFF)
624               *
625 F123F E6            C=C+1  A
626 F1241 F2            CSL    A            Now C[4:1] is type+1, C[0]=0
627 F1243 8AA           ?C=0   A            Is this logical EOD?
628 F1246 76            GOYES  PDIR90       Yes...done
629 F1248 DD            BCEX   A            No
630 F124A 8E00          GOSUBL =NXTENT      Increment directory pointer
          00
631 F1250 DD            BCEX   A            (Carry if new record)
632 F1252 521           GONC   PDIR24       Not new record...continue
633               *
634               * New record...need to decrement record count in D[8:5]
635               *
636 F1255 AFF           CDEX   W
637 F1258 7E14          GOSUB  Csrc5
638 F125C CE            C=C-1  A            C[3:0] is always >0...use C[A]
639 F125E 7114          GOSUB  Cslc5
640 F1262 AFF           CDEX   W            Replace the count, restore C[A]
641 F1265 F6     PDIR24 CSR    A            Type + 1 in C[3:0], C[4]=0
642 F1267 CE            C=C-1  A            Type in C[A]
643 F1269 8AA           ?C=0   A            Is this a purged entry?
644 F126C F2            GOYES  PDIR30       Yes...read next entry @ PIRC
645               *
646               * Non-purged entry...put directory entry into buffer 1 of tape
647               *
648 F126E 7190          GOSUB  PDIRBF       Write (SCRTCH) to B[12]th entry
649 F1272 400           RTNC
650 F1275 AF9           C=B    W
651 F1278 7AF3          GOSUB  Cslc4        Get the address of buffer 1
652 F127C D5            B=C    A            Save pointer in B[A] for now
653 F127E 8E00          GOSUBL =NXTENT
          00
654 F1284 75F3          GOSUB  Csrc4        Rotate back to C[15:12]
655 F1288 AFD           BCEX   W            Now C[A] is entry, B is restored
656 F128B 5F0           GONC   PDIR30       Not a new record...continue
657               *
658               * This is a new record...write buffer 1 @ recprd C[3:1]
659               *
660 F128E F6            CSR    A            Record # in C[X] now
661 F1290 7240          GOSUB  PBF->C       Write buffer 1 to @C[X]
662 F1294 400           RTNC                Error
663 F1297 6E7F          GOTO   PDIR10       No error...go reread the record
664               *-
665               *-
666               *
667               * Wrote a new entry into buffer 1, but didn't fill buffer 1
668               *
669 F129B D4     PDIR30 A=B    A
670 F129D 814           ASRC                A[S] is byte pointer div 32
671 F12A0 8E00          GOSUBL =GETDR+      Get next directory entry
          00
672 F12A6 400           RTNC                Error
```

```
F12A9 657F          GOTO   PDIR20        No error...process the entry
               *-
               *-
               *
               * Reached end of directory...check whether physical or logical
               *
F12AD 860    PDIR90 ?ST=0  PhyEOD        Physical EOD?
F12B0 21            GOYES  PDIR92        No...continue
F12B2 AF9           C=B    W             Yes...check if room for a new EOD
F12B5 7D83          GOSUB  Calc4         Get PIRD into C[3:0]
F12B9 E9            C=C-B  A             Now C[3:0] is PIRC-PIRD
F12BB F2            CSL    A             Now C[A]=0 iff PIRC=PIRD
F12BD 8AA           ?C=0   A             Is there space for an EOD mark?
F12C0 F0            GOYES  PDIR95        No...exit
F12C2        PDIR92
               *
               * Write an end of directory mark in buffer 1
               *
F12C2 8E00          GOSUBL =F->SCR       Put "FFF"s in SCRTCH[63:0]
      00
F12C8 7730          GOSUB  PDIRBF        Put SCRTCH @ PIRD
F12CC 400           RTNC                 Error
F12CF AF9    PDIR95 C=B    W
F12D2 7000          GOSUB  =CSLC3        C[X] is PIRD record # now
               *
               * Fall into PBF->C
               *
               * PBF->C writes the record in buffer 1 at the record number
               * in C[X] on the mass storage device
               *
F12D6 D0     PBF->C A=0    A
F12D8 ABA           A=C    X
F12DB 8E00          GOSUBL =SEEKA        Go to that record
      00
F12E1 400           RTNC
F12E4 20            P=     =Xchgl        Exchange buffers (talker)
F12E6 7310          GOSUB  Ddt
F12EA 7000          GOSUB  =ULYL         Address tape as listener
F12EE 20            P=     =CloseR       Close record (write buffer 0 out)
F12F0 7973          GOSUB  Ddl
F12F4 7D53          GOSUB  Tstat         Check tape status
F12F8 400           RTNC
F12FB 20     DdtXgl P=     =Xchgl        Exchange buffers back (talker)
F12FD 8C00   Ddt    GOLONG =DDT          Exit through DDT
      00
               *-
               *-
F1303 7453   PDIRBF GOSUB  Mtyl          Address device as listener
F1307 400           RTNC                 Error
F130A 20            P=     =SetBP        Set byte pointer
F130C 7D63          GOSUB  Ddl
F1310 400           RTNC                 Error
F1313 AF9           C=B    W
F1316 7C53          GOSUB  Calc4
F131A F2            CSL    A
```

```
F131C C6              C=C+C  A            C[B] is the byte pointer value
F131E 7000            GOSUB  =Putd
F1322 400             RTNC
F1325 20              P=     =Write1      Write to buffer 1 of the device
F1327 8C00            GOLONG =PUTDR"      Put out the directory entry.
      00
                *
                *
                *
                * Bug fix for pack (too many RSTK levels)
                *
F132D 8E00 PACKfx  GOSUBL =GETDID
      00
F1333 76BE            GOSUB  PDIR
F1337 6210            GOTO   PACK00
                *
                *
F133B 0               CON(1) =FIXSPC       1 nibble available here
                ***************************************************************
                ***************************************************************
                **
                ** Name:       PACK - Pack an HPIL mass storage device
                **
                ** Category:   STEXEC
                **
                ** Purpose:
                **      Pack an HPIL mass storage device
                **
                ** Entry:
                **      D0 @ device spec
                **      P=0
                **
                ** Exit:
                **      Through NXTSTM...
                **
                ** Calls:      PDIR,GETDR",GT2BYT,GETZER,ASRC4,CSLC5,CSLC2,
                **             PT2BYT,PUTDRW,TSTAT,MOVEFL,NXTFN+,NXTFN ,GETDIR,
                **             ENDTAP,ASLC4,CSRC5,<NXTSTM>,<ERRORX>
                **
                ** Uses.......
                **  Inclusive: All CPU registers, STMTD0[3:0],STMTR1,TOKEN,
                **             all RAM that EXPEXC is permitted to use
                **
                ** Stk lvls:   7 (PDIR)
                **
                ** Algorithm:
                **      GOSUB GETDID
                **      GOSUB PDIR
                **      Recall directory info from R0,R1
                **      Read and get directory entry
                **      If end of directory THEN GOTO 9:
                **    2: If file data area pointer <> PTRF THEN
                **         Copy file down, update directory
                **         Update file destination, read next entry
                **         GOTO 2
```

```
                 **      Get next directory entry
                 **      IF NOT end of directory THEN GOTO 2:
                 **    9:(end of directory)
                 **      Exit
                 **
                 ** History:
                 **
                 **    Date      Programmer            Modification
                 **    -------   ----------    ----- ----- ---------- ------
                 **  12/21/83       NZ         Changed call to PDIR to add a call
                 **                            to GETDID (RSTK level bug)
                 **  01/10/83       NZ         Rewrote routine and documentation
                 **
                 ******************************************************************
                 ******************************************************************
F133C 0000               REL(5) =PACKd
      0
F1341 0000               REL(5) =PACKp
      0
F1346 66CF =PACK         GOTO   PACKfx          Pack the directory first
F134A 493  PACK00        GOC    PACKeR          (error during directory pack)
F134D 118                C=R0                   Recall info from GDIRST
F1350 AF5                B=C    W
                 *
                 * Now B,R0[3:0] is PTRC...pointer to directory entry,
                 *     B,R0[7:4] is PTRF...pointer to data area
                 *
F1353 8E00 PACK10        GOSUBL =GETDR"         Get that directory entry
      00
F1359 4A2  PACK20        GOC    PACKeR          Error!
                 *
                 * Check for logical end of directory
                 *
F135C 173                D1=D1+ 4               Skip to type...
F135F 7F90               GOSUB  Gt2byt          Read 2 bytes...
F1363 E6                 C=C+1  A               ...add 1 (if EOD, #0000)
F1365 F2                 CSL    A               If EOD, 00000!
F1367 8AE                ?C#0   A               EOD?
F136A 60                 GOYES  PACK30          No...continue
F136C 6970               GOTO   PACK90          Yes...done with the tape
                 *
                 *
F1370            PACK30
                 *
                 * Now D1 is positioned at the directory start address
                 *
F1370 7170               GOSUB  GETZER          Read 2 bytes of zero, 2 of start
F1374 4F0                GOC    PACKeR          Error...out of range
                 *
                 * Now C[3:0] is the last 2 bytes of start
                 *
F1377 AF4                A=B    W
F137A 7000               GOSUB  =ASRC4          Now PTRF in A[3:0], A[4]=0
F137E D5                 B=C    A               Copy start to B[A]
F1380 7160               GOSUB  GETZER          Read 2 bytes of zero, 2 of size
```

```
F1384 4F4  PACKeR GOC    PACKer        Error...out of range
                  *
                  * Now C[A] is size of file in sectors
                  *
F1387 8A0         ?A=B   A             Is the file already in place?
F138A E4          GOYES  PACK40        Yes...continue
                  *
                  * Need to move the file data
                  *
F138C 73E2        GOSUB  Calc6
F1390 D6          C=A    A             C[A] is dest, C[9:6] is length
F1392 108         R3=C
                  *
                  * A[A],R3[A] is dest, B[A] is source, R3[9:6] is length,
                  * R2[A] is the source address, R1[A] is dest address
                  *
F1395 1CB         D1=D1  12            Back up to middle of start addr
F1398 D6          C=A    A
F139A 7000        GOSUB  =CSLC2
F139E 8E00        GOSUBL =P12BYT       Write 2 bytes @ D1
      00
                  *
                  * Now update the directory entry in the directory
                  *
F13A4 118         C=R0
F13A7 816         CSRC
F13AA AD2         C=0    M             Now C[S] is entry, C[X] is addr
F13AD 8E00        GOSUBL =PUTDRN       Write the entry to the device
      00
F13B3 402         GOC    PACKer        Error
F13B6 7B42        GOSUB  Tstat         Check status
F13BA 491         GOC    PACKer        Error
F13BD 119         C=R1
F13C0 10A         R2=C                 Copy address to R1,R2 for MOVEFL
                  *
                  * A,C,D and R4 are available to MOVEFL...
                  *
F13C3 8E00        GOSUBL =MOVEFL       Move file
      00
F13C9 400         GOC    PACKer        Error
                  *
                  * Nxtent does not return if an error occurs
                  *
F13CC 7810        GOSUB  Nxtent        Go to next entry...
F13D0 62AF        GOTO   PACK10          ..and continue loop if return
                  *
                  *
F13D4 6032 PACKer GOTO   Errorx
                  *
                  *
F13D8      PACK40
                  *
                  * This entry is OK where it is now
                  *
                  * A[A] is P1RF, C[A] is file length
```

```
                 *
F13D8 7A30               GOSUB  Nxten-         Increment to next entry
F13DC 8E00               GOSUBL =GETDIR        Read the next directory entry
      00
F13E2 667F               GOTO   PACK20         Check error @ PACK20
                 *-
                 *-
                 *
                 * If here, reached end of directory
                 *
F13E6 8E00 PACK90 GOSUBL =ENDTAP       Clean the device up (rewind, etc)
      00
F13EC 47E                GOC    PACKer         Error
F13EF 6093               GOTO   nXTSTM         No error...exit
                 *-
                 *-
F13F3 D2    =GETZER C=0    A
F13F5 7900               GOSUB  Gt2byt
F13F9 8AA                ?C=0   A
F13FC 60                 GOYES  Gt2byt
F13FE 20                 P=     =eRANGE
F1400 02                 RTNSC
                 *-
                 *-
F1402 8C00 Gt2byt GOLONG =GT2BYT
      00
                 *-
                 *-
F1408 110  Nxten+ A=R0
F140B 7000               GOSUB  =ASRC4         Get file start address
F140F 11B                C=R3
F1412 7462               GOSUB  Csrc5          Get length of file into C[A]
F1416 23   Nxten- P=     3
F1418 A1A                A=A+C  WP             Add length to start of file
F141B 20                 P=     =eRANGE
F141D 46B                GOC    PACKer         Error if carry
F1420 7000               GOSUB  =ASLC4         Return to proper location
F1424 D6                 C=A    A
F1426 8E00               GOSUBL =NXTENT
      00
F142C DA                 A=C    A
F142E 100                R0=A
F1431 AF8                B=A    W              Copy to B[W] too
F1434 500                RTNNC                 If no carry, same entry
F1437 119                C=R1
F143A 7C32               GOSUB  Csrc5
F143E CE                 C=C-1  A              Decrement counter
F1440 7F22               GOSUB  Cslc5
F1444 109                R1=C
F1447 4E9                GOC    PACK90         If carry set, EOD (RSTK=garbage)
F144A 03                 RTNCC                 Not at EOD yet...continue
                 *************************************************************
                 *************************************************************
                 **
                 ** Name:        INITXQ - Execute the INITIALIZE statement
```

```
                  **
                  ** Category:   STEXEC
                  **
                  ** Purpose:
                  **      Initialize the specified mass storage device's medium
                  **
                  ** Entry:
                  **      D0 points to the device specifier
                  **
                  ** Exit:
                  **      If error, exits through ERRORX;
                  **      If no error, exits through ENDST
                  **
                  ** Calls:      GETPIL,SAVE2C,TRESD0,SAVED1,SAVE1A,GETHEX,RESTD1,
                  **             REST2C,ASRC4,REST1A,START,CHKMAS,FORMAT,<ENDST>,
                  **             <ERRORX>
                  **
                  ** Uses.......
                  **  Inclusive: All CPU registers, STMTD1,STMTRx,FUNCxx,ST[11:0],
                  **             all RAM EXPEXC is permitted to use,SCRTCH[63:0]
                  **
                  ** Stk lvls:   7 (GETPIL)
                  **
                  ** History:
                  **
                  **   Date      Programmer               Modification
                  **   --------  ----------   ---------------------------------
                  **   11/29/83     NZ        Updated documentation
                  **   12/15/82     NZ        Updated documentation
                  **
                  *************************************************************
                  *************************************************************
F144C 0000              REL(5) =INITd        INITIALIZE decompile
      0
F1451 0000              REL(5) =INITp        INITIALIZE parse
      0
F1456             =INITXQ
                  *
                  * Get the file specifier (volume label, device spec)
                  *
F1456 8E00              GOSUBL =GETPIL
      00
F145C 4F4               GOC    INITXF        Error
                  *
                  * Now B[W] is the device type or word, D[X] is device address,
                  * R0 is the volume label, C[6:0] is the recall word from SETUP
                  *
F145F 7E12              GOSUB  Save2c        Save recall word in STMTR1
F1463 7832              GOSUB  Tresd0        Get PC from FUNCD0 (from GETPIL)
F1467 20                P=     0
F1469 3100              LC(2)  =tCOMMA
F146D 14A               A=DAT0 B
F1470 962               ?A=C   B             # entries specified?
F1473 51                GOYES  INITX0        Yes...skip the comma first
                  *
```

```
                   * Number of entries not specified...use default length
                   *
    F1475 110            A=R0                    Length field is R0[15:12]
    F1478 2C             P=     12               Clear nibbles 12-15
    F147A A80   INITLP   A=0    P
    F147D 0C             P=P+1
    F147F 5AF            GONC   INITLP
    F1482 100            R0=A                    Put new vol label, length into R0
    F1485 426            GOC    INITX1           Go always
                   *-
                   *-
                   *
                   * Found a comma (number of entries specified)
                   *
    F1488 161   INITX0   D0=D0+ 2                Skip the comma
    F148B DB             C=D    A                Save D[A] in STMTD1
    F148D 135            D1=C
    F1490 8E00           GOSUBL =SAVED1          Save device address in STMTD1
          00
    F1496 118            C=R0
    F1499 74E1           GOSUB  Save2c           Save volume label in STMTR1
    F149D AF4            A=B    W
    F14A0 8E00           GOSUBL =SAVE1A          Save device word in STMTR0
          00
    F14A6 8E00           GOSUBL =GETHEX          Get # of entries (4 nibs max)
          00
    F14AC 4C5   INITXF   GOC    INITXE           Error in expression evaluation
                   *
    F14AF 20             P=     =eRANGE          Check if valid range
    F14B1 8A8            ?A=0   A                Is the value zero?
    F14B4 8F             GOYES  INITXF           Yes...error
    F14B6 8E00           GOSUBL =RESTD1          Restore device address to D[A]
          00
    F14BC 137            CD1EX
    F14BF D7             D=C    A
    F14C1 8E00           GOSUBL =REST2C          Restore volume label to R0
          00
    F14C7 108            R0=C
    F14CA 7000           GOSUB  =ASRC4           Rotate value into A[15:12]
    F14CE AF8            B=A    W                Save value in B[15:12] for now
    F14D1 8E00           GOSUBL =REST1A          Restore device word to A[W]
          00
                   *
                   * Now A[W] is device word, B[15:12] is # of entries, R0 is vol
                   * label, D[A] is device address
                   *
                   * Combine volume label and # of entries in R0
                   *
    F14D7 120            AR0EX
    F14DA 2B             P=     11
    F14DC A9C            ABEX   WP               Volume label in B[11:0]
    F14DF AFC            ABEX   W                Volume label, # entries in A
    F14E2 120            AR0EX                   Volume label->R0, device word->A
    F14E5 AF8            B=A    W                Device word back in B[W]
                   *
```

```
F14E8 8E00 INITX1  GOSUBL =START         Set up the loop, find the device
      00
F14EE 4A1          GOC    INITXE         Error
F14F1 8E00         GOSUBL =CHKMAS        Check if mass storage (must be!)
      00
F14F7 411          GOC    INITXE         Error
                   *
                   * It is mass storage...OK to continue
                   *
F14FA 8E00         GOSUBL =FORMAT        Format the medium, initialize fields
      00
F1500 480          GOC    INITXE         Error
F1503 6C31         GOTO   Endst          No error...clean up, exit
                   *-
                   *-
                   *
                   * Following line is never referenced!(?)
                   *
F1507 20   INITX2  P=     =eDTYPE        Device type error
F1509 6BF0 INITXE  GOTO   Errorx
           ************************************************************
           ************************************************************
           **
           ** Name:        LOCAL - Execute the LOCAL [LOCKOUT] statement
           **
           ** Category:    STEXEC
           **
           ** Purpose:
           **      LOCAL statement sends a NRE to entire loop, or a GTL
           **      frame to devices specified.  LOCAL LOCKOUT sends
           **      a LLO frame to loop specified.
           **
           ** Entry:
           **      D0 points to the token following LOCAL
           **
           ** Exit:
           **      Through CLEARc
           **
           ** Calls:       <CLEARc>
           **
           ** Uses.......
           **  Inclusive: Same as CLEARc
           **
           ** Stk lvls:   Same as CLEARc
           **
           ** History:
           **
           **    Date     Programmer            Modification
           **  --------   ----------   --------------------------------
           **  01/25/83      JH        Added Routine
           **
           ************************************************************
           ************************************************************
F150D 0000         REL(5) =LOCALd
      0
```

```
1085 F1512 0000          REL(5) =LOCALp
           0
1086 F1517      =LOCAL
1087            *
1088            *  Is the next token LOCKOUT?
1089            *
1090 F1517 AFA           A=C    W             (Copy high nibs for compare)
1091 F151A 15A5          A=DAT0 6             Read next token
1092            *****
1093            *
1094            *        LC(6)  (=tLOCKO)~(=LEXPIL)~(=tXWORD)
1095 F151E 35            NIBHEX 35            LC(6)
1096 F1520 00            CON(2) =tXWORD       ...
1097 F1522 00            CON(2) =LEXPIL       ..
1098 F1524 00            CON(2) =tLOCKO       .
1099            *
1100            *****
1101 F1526 976           ?A#C   W             LOCAL LOCKOUT statement?
1102 F1529 D1            GOYES  LCL10         No...execute LOCAL statement
1103 F152B 7161          GOSUB  D1=SD0        Yes...set up LLO frame
1104 F152F 3411          LC(5)  #11~#11       Set C[3:0] to value of LLO frame
           110
1105 F1536 145           DAT1=C A             Save frame in STMTD0
1106 F1539 165           D0=D0+ 6             Skip the LOCKOUT token
1107 F153C 8E00          GOSUBL =CKLOP#       Get the loop # to C[S]
           00
1108 F1542 6F50          GOTO   CLEAR1        Continue with loop
1109            *-
1110            *-
1111 F1546 3410 LCL10    LC(5)  #93~#01       Set C[3:0] to NRE and GTL frames
           390
1112 F154D 6E30          GOTO   CLEARc        Execution same as CLEAR
1113            ***************************************************************
1114            ***************************************************************
1115            **
1116            ** Name:         TRIGGER - Execute the TRIGGER statement
1117            **
1118            ** Category:     STEXEC
1119            **
1120            ** Purpose:
1121            **       Sends a GET to entire loop, or devices specified
1122            **       are addressed to listen and then GET is sent.
1123            **
1124            ** Entry:
1125            **       D0 points to the token following TRIGGER
1126            **
1127            ** Exit:
1128            **       Through CLEARc
1129            **
1130            ** Calls:        Same as CLEARc
1131            **
1132            ** Uses.......
1133            **  Inclusive: Same as CLEARc
1134            **
1135            ** Stk lvls:   Same as CLEARc
```

```
                 **
                 ** History:
                 **
                 **    Date     Programmer               Modification
                 **  --------   ----------    ---------------------------------
                 **  01/25/83       JH        Added routine
                 **
                 ****************************************************************
                 ****************************************************************
F1551 0000              REL(5) =TRIGd
      0
F1556 0000              REL(5) =TRIGp
      0
F155B            =TRIGER                          Set C[3:0] to values of GET and
F155B 3480              LC(5)  #08~#08            GET frame
      800
F1562 6920              GOTO   CLEARc             Execute same as CLEAR
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:       REMOTE - Execute the REMOTE statement
                 **
                 ** Category:   STEXEC
                 **
                 ** Purpose:
                 **      Sends an UNL, RFC, REN, RFC, then addresses the device
                 **      specified, if any, as listener
                 **
                 ** Entry:
                 **      D0 points to the token following REMOTE
                 **
                 ** Exit:
                 **      Through CLEARc
                 **
                 ** Calls:      Same as CLEARc
                 **
                 ** Uses.......
                 **  Inclusive: Same as CLEARc
                 **
                 ** Stk lvls:   Same as CLEARc
                 **
                 ** History:
                 **
                 **    Date     Programmer               Modification
                 **  --------   ----------    ---------------------------------
                 **  03/19/83       NZ        Rewrote routine and documentation
                 **  01/26/83       JH        Added routine
                 **
                 ****************************************************************
                 ****************************************************************
F1566 0000              REL(5) =REMOTd
      0
F156B 0000              REL(5) =REMOTp
      0
F1570 3429       =REMOTE LC(5)  #F9292            Set the REMOTE flag, REN~REN
```

```
           29F
     F1577 6410          GOTO   CLEARc
                  ***************************************************************
                  ***************************************************************
                  **
                  ** Name:       CLEAR - Execute the CLEAR statement
                  ** Name:       CLEARc - Execute a loop statement
                  **
                  ** Category:   STEXEC
                  **
                  ** Purpose:
                  **      Execute the CLEAR statement (also TRIGGER, LOCAL,
                  **      REMOTE)
                  **
                  ** Entry:
                  **      D0 points to the device specifier
                  **      CLEARc: C[3:0] is the 2 frames, C[4] is REMOTE flag-
                  **       "F" means REMOTE, "0" means other
                  **
                  ** Exit:
                  **      Through ENDST if no error, through ERRORX if error
                  **
                  ** Calls:      D1=SR0,FNDCH-,GETDID,CKmode,UNLPUT,PUTC,PRTISc,
                  **             SAVEIT,D1=SD0,GETMBX,<ENDST>,<ERRORX>
                  **
                  ** Uses.......
                  **  Inclusive: All CPU registers, STMTDx,STMTR1,FUNCxx,ST[11:0],
                  **             all RAM EXPEXC is permitted to use
                  **
                  ** Stk lvls:   7 (GETDID)
                  **
                  ** History:
                  **
                  **    Date      Programmer             Modification
                  **   --------   ----------    ------------------------------
                  **   04/05/83      NZ         Moved controller check to include
                  **                            case of device spec given
                  **   03/19/83      NZ         Rewrote routine and documentation
                  **
                  ***************************************************************
                  ***************************************************************
     F157B 0000          REL(5) =CLEARd
           0
     F1580 0000          REL(5) =CLEARp
           0
     F1585 3440 =CLEAR   LC(5)  #14~#04      DCL ~ SDC frames (high nib=0)
           410
     F158C 7001 CLEARc   GOSUB  D1=SD0       Save C[3:0] in STMTD0 (frames)
     F1590 145           DAT1=C A
     F1593 14A           A=DAT0 B            Check if there is a device spec
     F1596 3100          LC(2)  =tCOMMA      (tCOMMA means no device spec)
     F159A 966           ?A#C   B
     F159D 22            GOYES  CLEAR.       No device spec...use LOOP
     F159F AC2           C=0    S            Use loop 0 if none given
     F15A2      CLEAR1
```

```
1237 F15A2 AC7            D=C    S            Save mailbox # for later...
1238 F15A5 8E00           GOSUBL =FNDCH-      Find that mailbox
           00
1239 F15AB 495            GOC    Errorx       Error if carry
1240 F15AE 813            DSLC                Mailbox # to D[0]
1241 F15B1 F3             DSL    A
1242 F15B3 F3             DSL    A            Mailbox # to D[2]
1243 F15B5 C7             D=D+D  A
1244 F15B7 C7             D=D+D  A            (Mailbox #)*16 to D[2]
1245 F15B9 DB             C=D    A            Device = :LOOP:#
1246 F15BB 6C00           GOTO   CLEAR+       (Carry not sure)
1247                *-
1248                *-
1249 F15BF          CLEAR.
1250                *
1251                * Device spec follows...get it
1252                *
1253 F15BF 8E00           GOSUBL =GETDID      Get device spec, don't check MS
           00
1254 F15C5 4F3            GOC    Errorx       Error
1255 F15C8 8E00 CLEAR+    GOSUBL =CKmode      Controller check (exits to error)
           00
1256 F15CE 75B0           GOSUB  D1=SRO       Save device spec in STMTRO
1257 F15D2 15D6           DAT1=C 7            (Write it out)
1258 F15D6 1D00           D1=(2) (=STMTDO)+2  Check if REMOTE
1259 F15DA 15F2           C=DAT1 3            Read frame, flag (C[XS] is flag)
1260 F15DE 92A            ?C=0   XS           Is it REMOTE?
1261 F15E1 21             GOYES  CLEAR1       No...continue
1262                *
1263                * This is the REMOTE statement
1264                *
1265 F15E3 8E00           GOSUBL =UNLPUT      Send the UNL command
           00
1266 F15E9 4B1            GOC    Errorx       Error if carry
1267 F15EC 7650           GOSUB  CLEARs       Send the frame @ D1
1268 F15F0 441            GOC    Errorx       Error if carry
1269 F15F3 7090 CLEAR1    GOSUB  D1=SRO       Set D1 @ STMTRO (device spec)
1270 F15F7 821            XM=0                Clear XM to detect error - PRTISc
1271 F15FA 7C99           GOSUB  PRTISc       Address the device as listener
1272 F15FE 831            ?XM=0               OK?
1273 F1601 A0             GOYES  CLEAR2       Yes...continue
1274                *
1275                * Error detected by PRTISc...must be loop error!?
1276                *
1277 F1603 20             P=     =eABORT      Set eABORT to check it in ERRORX
1278 F1605 8C00 Errorx    GOLONG =ERRORX
           00
1279                *-
1280                *-
1281 F160B          CLEAR2
1282                *
1283                * Now release any I/O buffers created by GETDID
1284                *
1285 F160B 7870           GOSUB  D1=SRO
1286 F160F 147            C=DAT1 A            Read the device spec for below
```

```
F1612 06              RSTK=C               Save device spec on stack
F1614 AF2             C=0     W
F1617 7640            GOSUB   Saveit       SAVEIT will release any buffers
F161B 07              C=RSTK               Pop device spec...
F161D DA              A=C     A            ...and put in A[A]
F161F 7D60            GOSUB   D1=SDO       Set D1 @ STMTDO
F1623 147             C=DAT1  A
F1626 C6              C=C+C   A            Check if REMOTE (Carry if so)
F1628 471             GOC     CLEAR4       REMOTE...exit
F162B 8E00            GOSUBL  =GETMBX      Get the mailbox address back
      00
                *
                * A[A] contains the device spec, D1 @ STMTDO
                *
F1631 96C             ?A#0    B            Was the device LOOP?
F1634 50              GOYES   CLEAR3       No...REAL device
F1636 171             D1=D1+  2            Yes...use the LOOP spec
F1639 7900 CLEAR3     GOSUB   CLEARs       Send the command
F163D 47C             GOC     Errorx       Error if carry
F1640      CLEAR4
F1640 8C00 Endst      GOLONG  =ENDST       Done
      00
                *-
                *-
F1646 3300 CLEARs     LC(4)   =mCMDf       Send the command frame...
      00
F164C 14F             C=DAT1  B            ...from @ D1
F164F 8C00 Putc       GOLONG  =PUTC
      00
                *-
                *-
F1655 8C00 Tstat      GOLONG  =TSTAT
      00
                *-
                *-
F165B 8C00 Mtyl       GOLONG  =MTYL
      00
                *-
                *-
F1661 8C00 Saveit     GOLONG  =SAVEIT
      00
                *-
                *-
F1667 8C00 Nxtchr     GOLONG  =NXTCHR
      00
                *-
                *-
F166D 8C00 Ddl        GOLONG  =DDL
      00
                *-
                *-
F1673 812  Cslc5      CSLC                 Fall into CSLC4
F1676 6000 Cslc4      GOTO    =CSLC4
                *-
                *-
```

```
F167A 816  Csrc5   CSRC                    Fall into CSRC4!
F167D 6000 Csrc4   GOTO   =CSRC4
                *-
                *-
F1681 8C00 Save2c  GOLONG =SAVE2C
      00
                *-
                *-
F1687 1F00 =D1=SR0 D1=(5) =STMTR0
      000
F168E 01           RTN
                *-
                *-
F1690 1F00 =D1=SD0 D1=(5) =STMTD0
      000
F1697 01           RTN
                *-
                *-
F1699 8C00 Tsavd0  GOLONG =TSAVD0
      00
                *-
                *-
F169F 8C00 Tresd0  GOLONG =TRESD0
      00
           **************************************************************
           **************************************************************
           **
           ** Name:        STANBY - Execute the STANDBY statement
           **
           ** Category:    STEXEC
           **
           ** Purpose:
           **      Execute the standby statement
           **
           ** Entry:
           **      D0 points to the first parameter
           **
           ** Exit:
           **      Through NXTSTM if no error, ERRORX if error
           **
           ** Calls:       GLOOPM,SAVE2C,STANsb,REST2C,IDIV,FNDCHK,PUTC,
           **              PUTE,<NXTSTM>
           **
           **      STANsb:EXPEXC,POP1N,FLTDM
           **
           ** Uses.......
           **  Inclusive: All CPU registers,STMTR1,FUNCxx,ST[11:0],all
           **             RAM that EXPEXC is permitted to use
           **
           ** Stk lvls:    7 (GLOOPM)
           **
           ** History:
           **
           **   Date      Programmer              Modification
           ** --------    -- -------    ----------------------------
```

```
                ** 05/18/83       NZ          Changed # of IDY timeouts (+1)...
                **                            due to user misunderstanding
                ** 03/21/83       NZ          Changed CHECKC to inline code
                ** 02/25/83       NZ          Wrote, added documentation
                **
                *************************************************************
                *************************************************************
F16A5 0000             REL(5) =STANDd         Standby decompile
      0
F16AA 0000             REL(5) =STANDp         Standby parse
      0
F16AF 8E00 =STANBY GOSUBL =GLOOP#             Get loop # to C[S]
      00
F16B5 AC7              D=C    S               Save in D[S]
F16B8 14A              A=DAT0 B               Read next token
F16BB 3100             LC(2)  =tOFF           Check if "STANDBY OFF"
F16BF 962              ?A=C   B               Is it "OFF"?
F16C2 11               GOYES  STAN10          Yes...set up the values
F16C4 3100             LC(2)  =tON            Check if "ON"
F16C8 966              ?A#C   B               Is it "ON"?
F16CB 02               GOYES  STAN20          No...must be numeric values
                *
                * This is "STANDBY ON"
                *
F16CD D3               D=0    A               Set frame timeout=0
F16CF 6480             GOTO   STAN40
                *-
                *-
F16D3           STAN10
                *
                * This is "STANDBY OFF"
                *
F16D3 3400             LC(5)  =Timout         Frame timeout value
      000
F16DA D7               D=C    A               Put in D[A]
F16DC 3100             LC(2)  =#Timeo         # of IDY timeouts
F16E0 D5               B=C    A               Put in B[B]
F16E2 417              GOC    STAN40          Go always
                *-
                *-
F16E5 20        STANra P=     =eRANGE         Arg out of range
F16E7 6D1F      STANer GOTO   Errorx          Error
                *-
                *-
F16EB           STAN20
                *
                * This is STANDBY <expr> [,<expr>]
                *
                * Evaluate the frame timeout after saving loop #
                *
F16EB ACB              C=D    S               Recall loop # to C[S]
F16EE 7F8F             GOSUB  Save2c          Save in STMTR1[S]
F16F2 7790             GOSUB  STANsb          Manipulate frame timeout
F16F6 40F              GOC    STANer          Error if carry
F16F9 8E00             GOSUBL =REST2C         Restore loop # to C[S]
```

```
           00
                 *
                 * A[A] is now the timeout value
                 *
     F16FF D6           C=A    A
     F1701 D7           D=C    A          Put timeout value in D[A]
     F1703 D1           B=0    A          Clear B[B] (# of IDY timeouts)
     F1705 E5           B=B+1  A          (# of IDY timeouts: 0=infinity)
     F1707 767F         GOSUB  Save2c     Timeout in STMTR1,loop # in [S]
     F170B 14A          A=DAT0 B
     F170E 3100         LC(2)  =tCOMMA
     F1712 966          ?A#C   B          Is there a comma?
     F1715 F3           GOYES  STAN40     No...use default (same as first)
     F1717 161          D0=D0+ 2          Comma...skip it
                 *
                 * Read the IDY timeout value
                 *
     F171A 17F          D1=D1+ 16         Remove the first entry from stack
                 *
                 * Now evaluate IDY timeout
                 *
     F171D 7C60         GOSUB  STANeb     Evaluate expr, massage it
     F1721 45C   STANeR GOC    STANer     Error
                 *
                 * A[A] is now the IDY timeout
                 *
     F1724 D6           C=A    A
     F1726 D7           D=C    A          Set D[A] to IDY timeout
     F1728 8E00         GOSUBL =REST2C    Restore frame timeout to C[A]
           00
     F172E AC7          D=C    S          Restore loop #
     F1731 AF0          A=0    W
     F1734 DA           A=C    A          A[W] is now frame timeout
     F1736 AF2          C=0    W
     F1739 DB           C=D    A          C[W] is now IDY timeout
     F173B 8F00         GOSBVL =IDIV
           000
                 *
                 * Now A[W] is quotient, B,C[W] are remainder
                 *
     F1742 97A          ?C=0   W
     F1745 50           GOYES  STAN30     Exact multiple...OK
     F1747 B74          A=A+1  W          Remainder...round up
     F174A D8    STAN30 B=A    A          Copy count to B[B]
     F174C AE0          A=0    B          Check if too many IDY timeouts
     F174F 97C          ?A#0   W          In range?
     F1752 39           GOYES  STANra     No...range error
     F1754 20    STAN40 P=     0
                 *
                 * Now D[A] is timeout value, B[B] is # IDY timeouts, D[S] is
                 * loop #
                 *
     F1756 ACB          C=D    S
     F1759 7386         GOSUB  Fndchk     Find the mailbox (C[S]=loop #)
     F175D 43C          GOC    STANeR     Error...not found or man mode
```

```
F1760 3300          LC(4)  =mSETIC       Set number of IDY timeouts...
      00
F1766 AE9           C=B    B             ...to B[B]
F1769 72EE          GOSUB  Putc
F176D 43B           GOC    STANeR        Error...abort
F1770 25            P=     5
F1772 300           LC(1)  =mSTO5        Set frame timeout...
F1775 DB            C=D    A             ...to D[A]
F1777 8E00          GOSUBL =PUTE
      00
F177D 43A           GOC    STANeR        Error...abort
F1780 8D00 =nXTSTM GOVLNG =NXTSTM        Done
      000
           *-
           *-
F1787 8C00 Pop1n    GOLONG =POP1N
      00
           *-
           *-
F178D 8E00 STANsb   GOSUBL =eXPEXC       Evaluate the expression
      00
F1793 70FF          GOSUB  Pop1n         Pop it off the stack
F1797 400           RTNC                 Error
           *
           * Multiply by 1000 (convert to millisecs)
           *
F179A 3230          LC(3)  3             10^3 is 1000
      0
F179F 05            SETDEC
F17A1 A3A           A=A+C  X             Can't be shortened to A field
F17A4 D6            C=A    A             Check if still negative...
F17A6 A36           C=C+C  X
F17A9 04            SETHEX
F17AB 401           GOC    STANsr        Range error if carry
F17AE 7B77          GOSUB  FLTDH         Convert to HEX
F17B2 590           GONC   STANsr        Out of range or data type
F17B5 8A8           ?A=0   A             Zero is NOT valid for timeout
F17B8 40            GOYES  STANsr
F17BA 03            RTNCC                Good data...return
           *-
           *-
F17BC 20   STANsr   P=     =eRANGE       Out of range
F17BE 02            RTNSC
           ************************************************************
           ************************************************************
           **
           ** Name:       LISTIO - Execute the LIST IO statement
           **
           ** Category:   STEXEC
           **
           ** Purpose:
           **      LIST IO user statement: list the devices in the ASSIGN
           **      IO table (if none, error)
           **
           ** Entry:
                  **      P=0
                  **
                  ** Exit:
                  **      Through NXTSTM if no error, through ERRORX if error
                  **
                  ** Calls:       I/OFND,HTOD,D1=SDO,BLANKC,WRTASC,BF2DSP,ASLC2,
                  **              ASRC2,<NXTSTM>,<ERRORX>
                  **
                  ** Uses.......
                  **  Inclusive: A-D,R3,ST[11:0],STMTxx,FUNCxx
                  **
                  ** Stk lvls:   5 (BF2DSP)
                  **
                  ** History:
                  **
                  **    Date     Programmer               Modification
                  **  --------   ----------    ---------------------------------
                  **  01/16/84       NZ        Fixed device # count to count in
                  **                           DECIMAL, not HEX!
                  **  12/15/82       NZ        Updated documentation
                  **
                  **************************************************************
                  **************************************************************
F17C0 300         LISTnb  LC(1)  =eNOASN        "ASSIGN IO Needed"
F17C3 20                  P=     =ePARSE        (parse message)
F17C5 6F3E                GOTO   Errorx
                  *-
                  *-
F17C9 0000                REL(5) =OFFIOd        IO decompile
      0
F17CE 0000                REL(5) =IOp           IO parse
      0
F17D3             =LISTIO
F17D3 3200                LC(3)  =bPILAI        Assign IO buffer
      0
F17D8 8E00                GOSUBL =i/OFND
      00
F17DE 51E                 GONC   LISTnb         No buffer...error
F17E1 AF2                 C=0    W              Clear nibs 14 & 15
F17E4 137                 CD1EX
F17E7 134                 D0=C
F17EA 135                 D1=C
F17ED 108                 R3=C                  Save buffer pointer in R3
                  *
                  * Now D0,D1 point to the ASSIGN IO buffer
                  *
                  * First figure out how many devices ARE assigned
                  *
F17F0 D1                  B=0    A              B[A] is the device count
F17F2 E5          LIST10  B=B+1  A              increment count
F17F4 147                 C=DAT1 A              Read this entry
F17F7 173                 D1=D1+ 4
F17FA 96E                 ?C#0   B              Is this entry null?
F17FD 5F                  GOYES  LIST10         No...continue
                  *
```

```
                 * Now B[X] is the device count
                 *
F17FF CD                B=B-1  A          Back off last count (the null)
F1801 D9                C=B    A          Copy count to C[X]
F1803 8E00              GOSUBL =HTOD      Convert to decimal
      00
F1809 04                SETHEX            Now B[B] is the decimal value
F180B 718E              GOSUB  D1=SD0     Use STMTDx,FUNCxx to write it
F180F 8E00              GOSUBL =BLANKC    Set C[W]="              "
      00
F1815 15D5              DAT1=C 6          Write out 3 blanks
F1819 21                P=     1          Two digits (B[B])
F181B AC3               D=0    S          CLEAR the sign for WRTASC
F181E 8E00              GOSUBL =WRTASC    WRiTe ASCii
      00
F1824 171               D1=D1+ 2          Leave a blank after the number
F1827 20                P=     0
F1829 3F44              LCASC  \s(eciveD\    "Device(s"
      5667
      9636
      5682
      37
F1838 1557              DAT1=C W
F183F 17F               D1=D1+ 16
F1842 3F92              LCASC  \ngissa )\    ") assign"
      0216
      3737
      9676
      E6
F1854 1557              DAT1=C W
F1858 17F               D1=D1+ 16
                 *      LC(10) #FF0A0D*(#10000)+\de\ "ed"&Cr&Lf&chr$(255)
F185B 39                NIBHEX 39
F185D 5646              NIBASC \ed\
F1861 D0A0              NIBHEX D0A0FF
      FF
                 *
F1867 15D9              DAT1=C 10
F186B 1D00              D1=(2) =STMTD0
F186F 8F00              GOSBVL =BF2DSP       Send to display, ignore width
      000
                 *
                 * Now have sent the header
                 *
                 * Send out lines until reach a zero byte
                 *
F1876 3F44       LIST20 LCASC  \# eciveD\    "Device #"
      5667
      9636
      5602
      32
F1888 1F00              D1=(5) =FUNCR0
      000
F188F 1557              DAT1=C W
F1893 17F               D1=D1+ 16
```

```
F1896 3302          LCASC  \ \
      02
F189C 15D3          DAT1=C 4            Write blanks out to initialize
F18A0 113           A=R3                Get buffer address, counter
F18A3 8E00          GOSUBL =ASLC5
      00
F18A9 05            SETDEC              Increment in DECIMAL mode
F18AB E4            A=A+1  A            Increment A[B]
F18AD 04            SETHEX              Return to HEX mode
F18AF D8            B=A    A            Copy to B[B]
F18B1 8E00          GOSUBL =ASRC5
      00
F18B7 130           D0=A                Set D0 @ buffer
F18BA 163           D0=D0+ 4
F18BD 132           AD0EX               D0 @ entry, A[A] @ next entry
F18C0 103           R3=A                Store new count in R3
F18C3 21            P=     1            Write B[B]
F18C5 AC3           D=0    S            Sign is positive
F18C8 8E00          GOSUBL =WRTASC      Write ASCII @ D1
      00
F18CE 20            P=     0
F18D0 35D3          LCASC  \:'=\        "=':"
      72A3
F18D8 15D5          DAT1=C 6
F18DC 175           D1=D1+ 6
              *
              * Now read the 2 letters, put them in RAM, display them
              *
F18DF 146           C=DAT0 A            Read the 2 bytes of name
F18E2 96A           ?C=0   B            Zero byte?
F18E5 83            GOYES  LIST50       Yes...done with list
F18E7 145           DAT1=C A            No...write the bytes out
F18EA 171           D1=D1+ 2
F18ED F6            CSR    A            Check if second char was null
F18EF F6            CSR    A            Now second char in C[B], C[4:2]=0
F18F1 96E           ?C#0   B            Was the second char null?
F18F4 90            GOYES  LIST30       No...continue
F18F6 3102          LCASC  \ \
F18FA 14D           DAT1=C B            Yes...replace with a blank
F18FD 171     LIST30 D1=D1+ 2           Now D1 @ end of string
              *****
              *
              *     LC(8)  #FF0A0D*256+\'\  "'"&Cr&Lf&CHR$(255)
F1900 37            NIBHEX 37
F1902 72D0          NIBHEX 72D0A0FF
      A0FF
              *
              *****
F190A 15D7          DAT1=C 8            Write it out
F190E 1D00          D1=(2) =FUNCR0      Point back to start...
F1912 8F00          GOSBVL =BF2DSP      ...and send to the display
      000
F1919 6C5F          GOTO   LIST20       Loop back (not done yet)
              *-
              *-
```

```
F191D           LIST50
                *
                * Done with LIST IO
                *
F191D 626E              GOTO   nXTSTM
                ****************************************************************
                ****************************************************************
                **
                ** Name:        OFFIO - Execute the OFF IO statement
                **
                ** Category:    STEXEC
                **
                ** Purpose:
                **      Execute the "OFF IO" statement
                **
                ** Entry:
                **      Hexmode, P=0
                **
                ** Exit:
                **      Through NXTSTM
                **
                ** Calls:       D1=DST,<NXTSTM>
                **
                ** Uses.......
                **  Inclusive: A[B],C[A],D0,D1
                **
                ** Stk lvls:    0
                **
                ** History:
                **
                **    Date     Programmer            Modification
                **  --------   ----------   --------------------------------
                **  12/15/82      NZ        Updated documentation
                **
                ****************************************************************
                ****************************************************************
F1921 0000              REL(5) =OFFIOd       Deconpile "IO"
      0
F1926 0000              REL(5) =OFFIOp       Parse OFF IO/INTR
      0
F192B 14A  =OFFIO  A=DAT0 B                  Read the first token to check
F192E 3100              LC(2)  =tXWORD         for IO vs INTR
F1932 966               ?A#C   B             Is it INTR?
F1935 11                GOYES  OFFIO1        No...must be OFF IO
                *
                * It is OFF INTR; clear the ONINTR address
                *
F1937 1F00              D1=(5) =ONINTR
      000
F193E D2                C=0    A
F1940 145               DAT1=C A
F1943 502               GONC   OFFIO2        Go always
                *-
                *-
F1946 1F00 OFFIO1  D1=(5) =LOOPST
```

```
           000
     F194D 1572          C=DAT1 XS
     F1951 0B            CSTEX
     F1953 850           ST=1   =Offed        Loop is OFFED by the user
     F1956 0B            CSTEX
     F1958 1552          DAT1=C XS            Write it back out
                  *
     F195C 8E00          GOSUBL =D1=DST
           00
     F1962 1572          C=DAT1 XS
     F1966 0B            CSTEX
     F1968 840           ST=0   =LoopOK       Loop is NOT ok
     F196B 0B            CSTEX
     F196D 1552          DAT1=C XS
     F1971 6E0E OFFIO2   GOTO   nXTSTM        Exit through NXTSTM
                  ************************************************************
                  ************************************************************
                  **
                  ** Name:        RESTIO - Execute the RESTORE IO statement
                  ** Name:        REST10 - RESTORE IO, loop # in C[S]
                  **
                  ** Category:    STEXEC
                  **
                  ** Purpose:
                  **      Execute the RESTORE IO statement...undo the effects
                  **      of an OFF IO and reinitialize the specified loop
                  **
                  ** Entry:
                  **      HEXMODE, P=0
                  **
                  ** Exit:
                  **      Through ENDST if no error, through ERRORX if error
                  **
                  ** Calls:       CKLOP#,D1=DST,START-,RESTRT,PILCNF,<ENDST>,
                  **              <ERRORX>
                  **
                  ** Uses.......
                  **  Inclusive: All CPU registers,ST[11:0],FUNCxx,all RAM that
                  **              EXPEXC is permitted to use
                  **
                  ** Stk lvls:    7 (CKLOP#)
                  **
                  ** History:
                  **
                  **   Date      Programmer            Modification
                  **  --------   ----------   --------------------------------
                  **  08/12/83      NZ        Reordered code between RESTIO and
                  **                          (former) REST10 to allow REST10
                  **                          to clear the OFFED flag
                  **  08/05/83      NZ        Changed to take a loop number
                  **  12/15/82      NZ        Updated documentation
                  **
                  ************************************************************
                  ************************************************************
     F1975 0000          REL(5) =RESTd
```

```
      0
F197A 0000          REL(5) =RESTp
      0
F197F 8E00 =RESTIO GOSUBL =CKLOP#        Get loop number, if any
      00
           *
           * C[S] is the loop number
           *
           * (Entry for ASSIGN IO "" and CONTROL ON)
           *
F1985 1F00 =RESTIO D1=(5) =LOOPST
      000
F198C D2            C=0    A             Clear all bits in nibble
F198E 15D0          DAT1=C 1             Loop is no longer offed
           *
           * Set the loop OK flag for the display device
           *
F1992 8E00          GOSUBL =D1=DST
      00
F1998 1572          C=DAT1 XS
F199C 0B            CSTEX
F199E 850           ST=1   =LoopOK       Set the loop "OK"
F19A1 0B            CSTEX
F19A3 1552          DAT1=C XS            Write it back out to RAM
           *
           * Now readdress loop (loop # still in C[S])
           *
F19A7 850           ST=1   =sReadd       Force readdressing
F19AA D3            D=0    A             Set device = NULL
           *
           * With device=null, START- will not error out if that loop
           * is currently in device mode, but will just return
           *
F19AC 8E00          GOSUBL =START-       Readdress the loop if controller
      00
F19B2 4C0           GOC    Rester        Error during START
F19B5 8E00          GOSUBL =PILCNF       Restore OFFED devices, set DSPCHX
      00
F19BB 648C          GOTO   Endst         Done...exit
           *-
           *-
F19BF 654C Rester  GOTO   Errorx        Error jump
           **************************************************************
           **************************************************************
           **
           ** Name:        ASGNIO - Execute the ASSIGN IO statement
           **
           ** Category:    STEXEC
           **
           ** Purpose:
           **      Execute the ASSIGN IO statement (undo all DISPLAY IS
           **      and PRINTER IS assignments, allocate/deallocate the
           **      assign io device buffer
           **
           ** Entry:
                 **      DO points to the device specifier list
                 **      P=0, HEXMODE
                 **
                 ** Exit:
                 **      Through ENDST if no error, ERRORX if error
                 **
                 ** Calls:       GETSTR,TSAVDO,TSAVD1,NXTCHR,I/ODAL,D1=DSP,I/OALL,
                 **              START-,TRESDO,TSWAD1,UCRANG,ASRC2,CATCH+,BAKCHR,
                 **              ASLC2,<REST1O>,<BSERR>,<ENDST>
                 **
                 ** Uses.......
                 **  Inclusive: All CPU registers,ST[11:0],STMTDO,STMTR1,FUNCxx,
                 **              all RAM EXPEXC is permitted to use
                 **
                 ** Stk lvls:    7 (GETSTR)
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **  --------   ----------    --------------------------------
                 **  11/30/83       NZ        Updated documentation
                 **  12/21/82       NZ        Added documentation
                 **
                 ************************************************************
                 ************************************************************
F19C3 0000               REL(5) =ASGNd
      0
F19C8 0000               REL(5) =ASGNp
      0
F19CD            =ASGNIO
                 *
                 * Get the string from program memory
                 *
F19CD 8E00               GOSUBL =GETSTR
      00
                 *
                 * GETSTR returns two cases:
                 *    1) (Literal expression): ST(=sSTK)=0, DO at start of data
                 *    2) (String expression): ST(=sSTK)=1, D1 at start of data,
                 *                            D[A] past end of data
                 *
                 * If ST(=sSTK)=0, then this is ASSIGN IO *
                 *
F19D3 860                ?ST=0  =sSTK        Reading from stack?
F19D6 81                 GOYES  ASGN00       No...ASSIGN IO *
                 *
                 * Reading from stack (ASSIGN IO "????")
                 *
F19D8 7DBC               GOSUB  Tsavd0       Save DO (to restore after I/OALL)
F19DC 8E00               GOSUBL =TSAVD1      Save D1
      00
F19E2 DB                 C=D    A
F19E4 108                RO=C                Save end (if string) in RO
                 *
                 * The exit conditions of GETSTR match those needed be NXTCHR!
```

```
                *
F19E7 7C7C              GOSUB  Nxtchr          Check if this is a "*"
F19EB 5D0               GONC   ASGN04          No error...exit
                *
                * ASSIGNIO "" = deallocate the ASSIGNIO buffer
                *
F19EE 7631      ASGN00  GOSUB  ASGNda          Deallocate,
F19F2 AC2               C=0    S                  (loop 1!)
F19F5 6F8F              GOTO   REST10             exit through restore
                *-
                *-
F19F9           ASGN04
F19F9 31A2              LCASC  \*\
F19FD 962               ?A=C   B
F1A00 EE                GOYES  ASGN00
                *
                * Not "*"...Unassign all devices
                *
                * (ASSIGN IO "device list")
                *
F1A02 8E00              GOSUBL =D1=DSP
      00
F1A08 AF2               C=0    W               C[W]="000...000"
F1A0B A7E               C=C-1  W               C[W]="FFF...FFF"
F1A0E 15DD              DAT1=C 14              Clear IS-DSP, IS-PRT
F1A12 17D               D1=D1+ 14
F1A15 15DD              DAT1=C 14              Clear IS-INP, IS-PLT
                *
                * Now create the I/O buffer for the ASSIGN words
                *
F1A19 D2                C=0    A
                *
                * Leave 1 byte @ end (terminates LISTIO)
                *
F1A1B 31A7              LC(2)  30*2*2+1*2      30 entries of 2 bytes, 2 nib/byte
F1A1F D5                B=C    A               Size in B[A]
F1A21 3200              LC(3)  =bPILAI         Assign IO
      0
F1A26 8F00              GOSBVL =I/OALL         I/O ALlocate routine
      000
F1A2D 490               GOC    ASGN05          OK
F1A30 8D00      =bSERR  GOVLNG =BSERR          Error (mem)
      000
                *-
                *-
                *
                * The I/O buffer is allocated, D1 is the start of the buffer
                *
                * Initialize the buffer to all zero
                *
F1A37 137       ASGN05  CD1EX                  Get D1 value into D0...
F1A3A 135               D1=C                   ...restore D1
F1A3D 134               D0=C                   Use D0 for clear loop
F1A40 AF2               C=0    W
F1A43 28                P=     16-(120/15)     (30*2*2 = 120)
```

```
F1A45 15CE ASGN10  DAT0=C 15
F1A49 16E          D0=D0+ 15
F1A4C 0C           P=P+1
F1A4E 56F          GONC   ASGN10        Loop back if not done yet
F1A51 14C          DAT0=C B             Clear out terminator byte
                *
                * Now D1 points to the buffer area, A[A] is length
                * FUNCD0 contains the program pointer
                *
                * Set OFFED flag = 0 (ASSIGN IO eliminates OFF IO)
                *
F1A54 1B00         D0=(5) =LOOPST
      000
F1A5B D2           C=0    A
F1A5D 1542         DAT0=C XS            No longer OFFED, no devices set up
                *
                * Now readdress the loop (Primary only), use last address as
                * a device count
                *
F1A61 AC2          C=0    S             Always loop 1 for ASSIGN IO
                *
                * Since D[A] is the end of the string and could look like
                * a request to search for the device to START-, set D[0] to
                * 1 (which always looks like an address, no search).  This also
                * ensures that the HP-71 is the controller on loop 1.
                *
F1A64 BF3          DSL    W
F1A67 E7           D=D+1  A             D[0] is now "1"
F1A69 850          ST=1   =sReadd       Force readdressing
F1A6C 8E00         GOSUBL =START-       Set it up (first mailbox)
      00
F1A72 560          GONC   ASGN15        Found it, controller...ok
F1A75 6E90         GOTO   ASGNeR        Not found or not controller...error
                *-
                *-
                *
                * If start returns with no carry, then last message in MBOX is
                * the address message from readdressing the loop
                *
F1A79 BF7  ASGN15  DSR    W             First restore D[A]
F1A7C 169          D0=D0+ 10            Position to the message in mailbox
F1A7F 14E          C=DAT0 B             Read address
F1A82 189          D0=D0- 10            Restore D0
                *
                * Now C[B] is the last address
                *
F1A85 D5           B=C    A             Save count in B[B]
F1A87 CD           B=B-1  A             Decrement for zero-based loop
                *
F1A89 721C         GOSUB  TresD0        Restore D0
F1A8D 8E00         GOSUBL =TSWAD1       Restore D1, save buffer pointer
      00
F1A93 118          C=R0
F1A96 D7           D=C    A             Restore end of string pointer
                *
```

```
                  * Now D1 is restored, buffer pointer is in FUNCD1
                  *
                  * Loop to get ASSIGN words, copy to assign buffer
                  *
F1A98 7BCB ASGN20 GOSUB  Nxtchr         Get first character
F1A9C 560         GONC   ASGN30         Have NOT reached end of string
F1A9F 60A8 ASGN25 GOTO   Endst          Reached end (Done)
                  *-
                  *-
F1AA3 8E00 ASGN30 GOSUBL =UCRANG        Check if a letter (convert to UC)
      00
F1AA9 5B1         GONC   ASGN40         Now in [A-Z]...continue
F1AAC 31A3        LCASC  \:\            Not in [A-Z]...check if ":"
F1AB0 966         ?A#C   B              Is it a ":"?
F1AB3 F5          GOYES  ASGNER         No...bad character error
F1AB5 7EAB        GOSUB  Nxtchr         Get next character
F1AB9 485         GOC    ASGNER         End of list after ":"...error
F1ABC 8E00        GOSUBL =UCRANG        Check if a letter (convert to UC)
      00
F1AC2 4F4         GOC    ASGNER         Not in [A-Z]...error
                  *
                  * Letter...save in A[15:14]
                  *
F1AC5 8E00 ASGN40 GOSUBL =ASRC2
      00
F1ACB 7898        GOSUB  Nxtchr         Read next character
F1ACF 411         GOC    ASGN45         End of string...single letter word
F1AD2 8E00        GOSUBL =cATCH+        Check if letter or digit
      00
F1AD8 4A0         GOC    ASGN50         Letter or digit...OK
F1ADB 8E00        GOSUBL =BAKCHR        Back up unconditionally
      00
F1AE1 D0   ASGN45 A=0    A              Clear A[B] (single letter word)
                  *
                  * Valid word...save it in buffer
                  *
F1AE3 8E00 ASGN50 GOSUBL =TSWAD1        Swap D1 with buffer pointer
      00
F1AE9 8E00        GOSUBL =ASLC2         Rotate word back to A[3:0]
      00
F1AEF 1593        DAT1=A 4              Write the word out to the buffer
F1AF3 173         D1=D1+ 4              Increment pointer
F1AF6 8E00        GOSUBL =TSWAD1        Swap D1 back
      00
                  *
                  * Ready for next character
                  *
F1AFC 776B        GOSUB  Nxtchr
F1B00 4E9         GOC    ASGN25         No next character (done)
F1B03 31C2        LCASC  \,\            Got a character...check it
F1B07 966         ?A#C   B              Is it a comma?
F1B0A 80          GOYES  ASGNER         No...error
F1B0C A6D         B=B-1  B              Yes...devices left to get words?
F1B0F 588         GONC   ASGN20         Yes...continue on
                  *
```

```
                 * Fall through to error (too many words)
                 *
F1B12 20    ASGNER  P=     =eDSPEC       Invalid Device Spec
F1B14 80C1  ASGNeR  C=P    1             Save P in C[1]
F1B18 06            RSTK=C               Save error (in C[B]) on RSTK
F1B1A 7A00          GOSUB  ASGNda        Deallocate assignio buffer
F1B1E 07            C=RSTK               Restore error from RSTK
F1B20 80D1          P=C    1             Restore P from C[1]
F1B24 60EA          GOTO   Errorx        Error exit
                 *_
                 *_
F1B28 20    ASGNda  P=     0             Deallocate the ASSIGN buffer
F1B2A 3200          LC(3)  =bPILAI
      0
F1B2F 8D00 =I/odal GOVLNG =I/ODAL
      000
            ****************************************************************
            ****************************************************************
            **
            ** Name:        DEVID - Return the device ID of the device
            **
            ** Category:    FNEXEC
            **
            ** Purpose:
            **      Return the device ID of the device indicated by the
            **      device specifier passed as a parameter
            **
            ** Entry:
            **      P=0
            **      D1 points to the stack
            **      D0 points to the PC
            **
            ** Exit:
            **      P=0
            **      D1 points to the  stack (Device ID string)
            **      Returns through FNRTN1
            **      If device not found/doesn't respond, null string
            **      If bad device spec, error
            **
            ** Calls:       DEVPAR,GETID+,ENDFN,TRESDO,<FNRTN1>,<ERRORX>
            **
            ** Uses.......
            **  Inclusive: A,B,C,D,R0-R3,D1,P,FUNCD0,FUNCD1,MLFFLG,ST[7,4:0]
            **
            ** Stk lvls:    4 (DEVPAR)
            **
            ** History:
            **
            **   Date       Programmer              Modification
            **  --------    ----------    --------------------------------
            **  09/07/83       NZ         Packed at DEVID3
            **  12/21/82       NZ         Updated documentation
            **
            ****************************************************************
            ****************************************************************
```

```
F1B36 C11           NIBHEX C11          One parameter, string or numeric
F1B39 7841 =DEVID   GOSUB  DEVPAR       Get parameter
F1B3D 485           GOC    DEVIDe       Error
                *
                * Now D[A] is address of the device
                *
                * If D[A]=0, then not found...return null string
                *
F1B40 AC3           D=0    S            D[S] = length of ID in characters
F1B43 8AB           ?D=0   A            Found?
F1B46 B0            GOYES  DEVID1       No...null ID
                *
                * Get the device ID of the device
                *
F1B48 8E00          GOSUBL =GETID+      Get Device ID of device
      00
                *
                * GETID returns with the ID in A[W]. The length in characters
                * is in D[S]. A[B] is the first character of the ID.
                *
F1B4E 474           GOC    DEVIDe       Error if carry
F1B51           DEVID1
                *
                * Now D1 @ stack-16, D[S] is length of ID in nibbles, A[W] is
                * device ID of the device
                *
F1B51 ACB           C=D    S
F1B54 80DF          P=C    15           P is length in characters
F1B58 17F           D1=D1+ 16           Point to top of stack (first item)
F1B5B 890   DEVID2  ?P=    0            Is length zero yet?
F1B5E 31            GOYES  DEVID3       Yes...done writing ID to stack
F1B60 1C1           D1=D1- 2            No...write another byte
F1B63 149           DAT1=A B
F1B66 BF4           ASR    W
F1B69 BF4           ASR    W            Set up next data item
F1B6C 0D            P=P-1
F1B6E 5CE           GONC   DEVID2       Go always (P was not zero)
                *_
                *_
F1B71           DEVID3
                *
                * Now write out the string header
                *
F1B71 A46           C=C+C  S            Convert to number of nibbles
F1B74 80DF          P=C    15           Now P is number of nibbles
F1B78 AF2           C=0    W            Clear C[W] for string header
F1B7B 80F2          CPEX   2            String length in C[2], P=0
                *
                * If carry, then length=8...increment C[3] (C[M])
                *
F1B7F 550           GONC   DEVID4
F1B82 B56           C=C+1  M            C[3]=1
F1B85 A0E   DEVID4  C=C-1  P            C[0]="F" (string header)
F1B88 8E00          GOSUBL =ENDFN       Clean up loop (C saved in R0)
      00
```

```
F1B8E 7D0B         GOSUB  Tread0        Restore D0 value (PC)
F1B92 6CF1         GOTO   Fnrtn1        Return, C[W] is string header
           *-
           *-
F1B96 6E6A DEVIDe  GOTO   Errorx        Error
           **************************************************************
           **************************************************************
           **
           ** Name:       SPOLL - Execute the SPOLL function
           **
           ** Category:   FNEXEC
           **
           ** Purpose:
           **      SPOLL is a function which returns the status of the
           **      device specified by either an address or a string
           **      device specifier.
           **
           ** Entry:
           **      P=0
           **      D0 points to PC
           **      D1 points to the top of the stack (device spec)
           **
           ** Exit:
           **      P=0
           **      Numeric value on stack (D1 points to top of stack),
           **        value = -1 if device not found or no response
           **        (the numeric value is the decimal equivalent of the
           **          first 4 bytes of device status...because more than
           **          four bytes may lose accuracy in the conversion to
           **          decimal; 2^(8*5) is about 1.1E+12, which would lose
           **          a small amount of precision in the FIRST byte.
           **          The first byte is SPOLL(x) mod 256, etc
           **      Returns through FNRTN4
           **      If error, exits through ERRORX
           **
           ** Calls:      DEVPAR,YTML,READRG,<DEVTYx>,<ERRORX>
           **
           ** Uses.......
           **  Inclusive: A,B,C,D,R0-R3,D1,P,FUNCD0,FUNCD1,MLFFLG,ST[7,4:0]
           **
           ** Stk lvls:   4 (DEVPAR)
           **
           **
           ** History:
           **
           **    Date     Programmer             Modification
           **  --------   ----------   --------------------------------
           **  03/15/83       NZ       Removed extra START call @ SPOL10
           **  02/25/83       NZ       Modified to change order of bytes
           **  02/24/83       SC       Wrote routine
           **
           **************************************************************
           **************************************************************
F1B9A C11          NIBHEX C11           1 parameter, either numeric/string
F1B9D 74E0 =SPOLL  GOSUB  DEVPAR        Process device specifier
```

```
F1BA1 4D3          GOC    FINDer         Error
              *
              * D[X] is the device address (D[X]=0 if not found)
              *
F1BA4 93F          ?D#0   X              Was the device found?
F1BA7 60           GOYES  SPOL10         Yes...continue
              *
              * If device not found, return -1
              *
F1BA9 65C0    SPOL05  GOTO   DEVTY5
              *-
              *-
F1BAD 8E00    SPOL10  GOSUBL =YTML       Make the device as a talker
      00
F1BB3 4B2          GOC    FINDer         Error
              *
              * Only the first 4 bytes are returned, but READRG expects 8
              *
F1BB6 3500         LC(6)  (=mSST)+#8     Send ready frame SST, count=8
      0000
F1BBE 8E00         GOSUBL =READRG        Read into A[W]
      00
F1BC4 4A1          GOC    FINDer         Error
F1BC7 94B          ?D=0   S              Any response?
F1BCA FD           GOYES  SPOL05         No...return -1
F1BCC AF2          C=0    W              Clear high 4 bytes
F1BCF 27           P=     7
F1BD1 A96          C=A    WP             Return only first 4 bytes
F1BD4 6680         GOTO   DEVTYx         Convert to floating number, exit
              ***************************************************************
              ***************************************************************
              **
              ** Name:        FIND - Execute the DEVADDR function
              **
              ** Category:    FNEXEC
              **
              ** Purpose:
              **      FIND is a function which returns the address of the
              **      device specified by either an address (trival case) or
              **      a string device specifier
              **
              ** Entry:
              **      P=0
              **      D0 points to the PC
              **      D1 points to the stack (device specifier on stack)
              **
              ** Exit:
              **      P=0
              **      Numeric expression on stack (D1 points to the address)
              **         (-1=not found, else address)
              **      Returns through FNRTN4
              **      If error, exits through ERRORX
              **
              ** Calls:       DEVPAR,HTOD,CSLC12,<DEVTY4>,<DEVTY5>,<ERRORX>
              **
```

```
                  ** Uses.......
                  **  Inclusive: A,B,C,D,R0-R3,D1,P,FUNCD0,FUNCD1,MLFFLG,ST[7,4:0]
                  **
                  ** Stk lvls:   4 (DEVPAR)
                  **
                  ** History:
                  **
                  **   Date     Programmer              Modification
                  **  --------  ----------   ---------------------------------
                  **  12/21/82      NZ       Updated documentation
                  **
                  ************************************************************
                  ************************************************************
F1BD8 C11                NIBHEX C11          One argument, string or numeric
F1BDB 76A0  =FIND        GOSUB  DEVPAR       Evaluate the device specifier
F1BDF 455   FINDer       GOC    FINDER       Error
                  *
                  * Convert D[X] to a floating number address
                  *
F1BE2 D2                 C=0    A
F1BE4 20                 P=     0
F1BE6 31F1               LC(2)  #1F          Get primary address
F1BEA 0EF7               C=C&D  A
F1BEE 8E00               GOSUBL =HTOD        Convert to decimal (in B[X])
      00
F1BF4 D4                 A=B    A            Save in A[X]
                  *
                  * Now A[X] is the primary address value
                  *
F1BF6 20                 P=     0
F1BF8 320E               LC(3)  #3E0         Mask for secondary address
      3
F1BFD 0EF7               C=C&D  A            C[X] is secondary * 32
F1C01 BB6                CSR    X            Cannot be CSR A:need C[XS]=xxx0(2)
F1C04 81E                CSRB                C[B] is secondary address
F1C07 8E00               GOSUBL =HTOD        Convert to decimal
      00
                  *
                  * Now DECIMAL mode, B[X] is secondary address, A[X] is primary
                  *
F1C0D 04                 SETHEX
F1C0F 20                 P=     0            HTOD leaves P non-zero
F1C11 AF2                C=0    W
F1C14 D6                 C=A    A            Copy A[B] (A[4:2]=0)
F1C16 F2                 CSL    A
F1C18 F2                 CSL    A
F1C1A AE9                C=B    B            Now C[3:2] is primary, [B] is sec
F1C1D 8E00               GOSUBL =CSLC12      Rotate into C[15:12]
      00
                  *
                  * If C[S] is non-zero, shift RIGHT 1 nibble, add 1 to exponent
                  * (address is >= 10)
                  *
F1C23 94A                ?C=0   S
F1C26 70                 GOYES  FIND10
```

```
F1C28 BF6           CSR    W               (Exponent, low mantissa = 0)
F1C2B E6            C=C+1  A               C[X]=1
F1C2D         FIND10
              *
              * Now C[W] is value, D1 points to the stack
              *
F1C2D 97E           ?C#0   W               Is it zero? (not found)
F1C30 13            GOYES  DEVTY4          No...value is OK
F1C32 5C3           GONC   DEVTY5          Yes...return -1 (not found)
              *-
              *-
F1C35 6FC9 FINDER   GOTO   Errorx          Error
              ****************************************************************
              ****************************************************************
              **
              ** Name:        DEVTYP - Execute the DEVAID function
              **
              ** Category:    FNEXEC
              **
              ** Purpose:
              **      DEVTYP returns the accessory ID of the device indicated
              **      by the device specifier
              **
              ** Entry:
              **      P=0
              **      D1 points to the stack (device specifier on the stack)
              **      D0 points to the PC
              **
              ** Exit:
              **      P=0
              **      Numeric expression for accessory ID (-1 if no response)
              **      Returns through FNRTN4
              **      Exits through ERRORX if error
              **
              ** Calls:       DEVPAR,GTYPE,FLOAT!,ENDFN,TRESD0,<FNRTN4>,<ERRORX>
              **
              ** Uses.......
              **  Inclusive: A,B,C,D,R0-R3,D1,P,FUNCD0,FUNCD1,MLFFLG,ST[7,4:0]
              **
              ** Stk lvls:    4 (DEVPAR)
              **
              ** History:
              **
              **    Date     Programmer                Modification
              **  --------   ----------    -------------------------------
              **  05/17/83       NZ        Changed return from GTYPE
              **  12/21/82       NZ        Added documentation
              **
              ****************************************************************
              ****************************************************************
F1C39 C11           NIBHEX C11             One parameter, string or numeric
F1C3C 7540 =DEVTYP GOSUB  DEVPAR           Get device parameter
F1C40 404           GOC    DEVTYe          Error
              *
              * Now D0 points to the mailbox, D[X] is the address
```

```
                *
F1C43 8A8               ?D=0    A               Was the device found?
F1C46 92                GOYES   DEVTY5          No...return -1
F1C48 8E00              GOSUBL  =GTYPE          Get device type for the device
      00
F1C4E 423               GOC     DEVTYe          Error...exit
F1C51 8A8               ?A=0    A               Was it "NO RESPONSE"?
F1C54 B1                GOYES   DEVTY5          Yes...return -1
F1C56 AF2               C=0     W
F1C59 D6                C=A     A               Copy all info returned from GTYPE
F1C5B 8E00 DEVTYx       GOSUBL  =FLOAT!         Convert to floating point #
      00
F1C61 8E00 DEVTY4       GOSUBL  =ENDFN          Clean up the loop
      00
F1C67 743A              GOSUB   Tresd0          Restore D0
F1C6B 6F02              GOTO    Fnrtn4          Return the value
                *-
                *-
F1C6F 7300 DEVTY5       GOSUB   LOAD-1          Load a -1 into C[W]
F1C73 5DE               GONC    DEVTY4          Go always
                *-
                *-
F1C76 AF2  LOAD-1       C=0     W
F1C79 2E                P=      14
F1C7B 3119              LCHEX   91              This is -1
F1C7F 03                RTNCC
                *-
                *-
F1C81 6389 DEVTYe       GOTO    Errorx          Error
                **************************************************************
                **************************************************************
                **
                ** Name:        DEVPAR - Parse a device specifier on the stack
                ** Name:        DEVPR$ - Parse a string device spec on stack
                **
                ** Category:    PILUTL
                **
                ** Purpose:
                **      Decode a device parameter (for functions which accept
                **      one parameter, either string or numeric, for device
                **      specifier)
                **
                ** Entry:
                **      P=0
                **      HEXMODE
                **      DEVPAR:
                **         D1 points to the parameter on stack
                **      DEVPR$:
                **         D1 points to string header (String is reversed)
                **         ST(sSTK)=1
                **
                ** Exit:
                **      FUNCD0 contains the calling routine's D0 value
                **      Carry clear: OK...D[X] is address (0 if not found)
                **              D1 set up for 1 numeric parameter return
                **              DO points to the mailbox
                **        Carry set: Error...P, C[0] set up for ERRORX
                **
                ** Calls:       TSAVDO,POP1N,GADRRM,REVPOP,<DEVPR$>
                **        DEVPR$:TSAVD1,GETDIX,TRESD1
                **
                ** Uses.......
                **  Inclusive: A,B,C,D,RO-R3,D1,P,FUNCDO,FUNCD1,MLFFLG,ST[7,4:0]
                **
                ** Stk lvls:    3 (GETDIX - two levels saved in RO)
                **
                ** History:
                **
                **   Date       Programmer              Modification
                **  --------    ----------    --------------------------------
                **  01/06/84       NZ         Made setting of MLFFLG a GOSUB so
                **                            code can be shared by READxxxx and
                **                            STATUS; moved call to the routine
                **                            so that DEVPR$ also sets MLFFLG
                **  03/16/83       NZ         Changed error return from GETDIX
                **  03/15/83       NZ         Added second stack level save for
                **                            call to GETDIX
                **  12/21/82       NZ         Updated documentation
                **
                *************************************************************
                *************************************************************
F1C85           =DEVPAR
F1C85 1537            A=DAT1 W                Read in the item from the stack
F1C89 850             ST=1   =sSTK            GADDRM needs this if not a string
F1C8C B04             A=A+1  P
F1C8F A64             A=A+A  B                Clear bit for string array
F1C92 968             ?A=0   B                Is this a string?
F1C95 F2              GOYES  DEVP10           Yes...string device spec
                *
                * Not string...check for legal input
                *
F1C97 7EF9            GOSUB  Tsavd0           Save DO in FUNCDO (exit condition)
F1C9B 78EA            GOSUB  Pop1n            Pop one numeric item into A[W]
                *
                * Now A[W] is the numeric item
                *
F1C9F 8E00            GOSUBL =GADRRM          Get address from RAM (use A[W])
      00
F1CA5 D7              D=C    A                Put address into D[A]
                *
                * If carry clear, C[X] is address else error
                *
F1CA7 6060            GOTO   DEVP20           Check error, continue, C[A] is addr
                *-
                *-
F1CAB 0               CON(1) =FIXSPC          3 nibbles available here
F1CAC                 BSS    3-1
                *-
                *-
                *
```

```
             * Set the MLFFLG to "F" (Sets A[A] to D0 value, C[0] to "F")
             *
F1CAE 132    MLFG=F  AD0EX                  Save D0 in A[A]
F1CB1 1B00           D0=(5) =MLFFLG
      000
F1CB8 30F            LC(1)  #F              Set C[0]="F"
F1CBB 15C0           DAT0=C 1               Write it out
F1CBF 130            D0=A                   Restore D0 from A[A]
F1CC2 01             RTN
             *_
             *_
F1CC4        DEVP10
             *
             * String item...set it up, call GETDIX with ST(sSTK)=1
             *
F1CC4 8F00           GOSBVL =REVPOP         Reverse the string, POP it
      000
F1CCB 137    =DEVPR$ CD1EX
F1CCE D7             D=C    A               D points to start of string
F1CD0 C2             C=C+A  A               C[A] points to end of string
F1CD2 135            D1=C                   Now D1, C[A] at end of string
F1CD5 1CF            D1=D1- 16              Point to where numeric should go
F1CD8 8E00           GOSUBL =TSAVD1         Save in FUNCD1
      00
F1CDE DF             CDEX   A               D[A] at end of string,C[A] at start
F1CE0 135            D1=C                   Set D1 to the start of string
             *
             * Now D[A], D1 are set up for a call to GETDIX (Later entry
             * into GETDID)
             *
F1CE3 07             C=RSTK
F1CE5 7A89           GOSUB  Calc5
F1CE9 07             C=RSTK
F1CEB 108            R0=C                   Save 2 RSTK levels in R0
             *
             * GETDIX saves D0 in FUNCD0...
             *
F1CEE 8E00           GOSUBL =GETDIX         Get device address (in D[X])
      00
             *
F1CF4 128            CR0EX                  Save C[W] in R0...
F1CF7 06             RSTK=C                 Restore first level...
F1CF9 7D79           GOSUB  Carc5
F1CFD 06             RSTK=C                 Restore second level
F1CFF 118            C=R0                   Restore C[A] value
             *
             * Now restore D1 value for exit, then check error
             *
F1D02 8ECD           GOSUBL Tresd1          D1 @ next item on stack
      2F
             *
             * D1 is now where next item goes, C[A] is address,B[W] is type
             *
             * If carry, had an error (GETDIX did START)
             *
```

```
F1D08 461  DEVP20 GOC    DEVP25         Go if error
F1D0B 7F9F        GOSUB  MLFG=F         Set MLFFLG to "F"
F1D0F 8E00        GOSUBL =START         (START for DEVP20 entry)
      00
F1D15 490  DEVP23 GOC    DEVP25         Error...check what it is
F1D18 96F         ?D#0   B              Is this a valid device spec?
F1D1B 41          GOYES  DEVPcc         Yes...return, carry clear
                  *
                  * (Test at DEVP25 will be true, hence RTNSC...packing technique)
                  *
F1D1D 20          P=     =eDSPEC        No...Invalid Device Spec
                  *
                  * Error...check if "NOT FOUND" or something else
                  *
F1D1F 880  DEVP25 ?P#    =ePIL          PIL error?
F1D22 00          RTNYES                No...some other error
F1D24 80F0        CPEX   0
F1D28 880         ?P#    =eNOFND        NOT FOUND?
F1D2B 60          GOYES  DEVP30         (Set carry if not found)
                  *
                  * Error was "Device not Found"...set D[A]=0, continue
                  *
F1D2D D3          D=0    A
F1D2F 03   DEVPcc RTNCC
                  *_
                  *_
F1D31 80F0 DEVP30 CPEX   0              Restore C[0],P
F1D35 02          RTNSC                 Set carry = error
                  *_
                  *_
F1D37 0           CON(1) =FIXSPC        1 nibble available here
F1D38             BSS    1-1
                  ***************************************************************
                  ***************************************************************
                  **
                  ** Name:        READIN - Execute the READ INTR function
                  **
                  ** Category:    FNEXEC
                  **
                  ** Purpose:
                  **      Read the interrupt cause byte for the specified loop
                  **      and return the value as a decimal number
                  **
                  ** Entry:
                  **     P=0
                  **     D1 points to the stack
                  **     C[S]=number of parameters supplied by user
                  **     If C[S]=1 then top of stack contains a numeric value
                  **
                  ** Exit:
                  **      Numeric result on top of stack
                  **      D1 at top of stack
                  **      P=0
                  **      Returns through FNRTN4
                  **
```

```
                 ** Calls:      GETLPs,PUTGF-,LOAD-1,FLOAT',TRESDO,<FNRTN1>
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,D,R0,D1,P,FUNCD0,ST[5,3:0]
                 **
                 ** Stk lvls:   3 (GETLPs)
                 **
                 ** History:
                 **
                 **   Date     Programmer             Modification
                 **  --------  ----------   --------------------------------
                 **  12/01/83      NZ        Updated documentation
                 **  08/03/83      NZ        Added optional loop # (sharing
                 **                          code with STATUS)
                 **  05/20/83      NZ        Changed to save message in B[A]
                 **                          instead of A[A] thru FNDMB-
                 **  02/28/83      NZ        Changed to use TSAVDO & TRESDO
                 **                          instead of SAVEDO & RESTDO
                 **                          Reworked routine to reduce code
                 **  02/07/83      SC        Wrote routine
                 **
                 ***************************************************************
                 ***************************************************************
F1D38 20    R&CVEu  P=     0
F1D3A 300           LC(1)  =eUNEXP       Unexpected frame
F1D3D 20            P=     =ePIL
F1D3F 65C8 R&CVER   GOTO   Errorx
                 *-
                 *-
F1D43 801           NIBHEX 801           Zero or one numeric parameter
F1D46 7060 =READIN  GOSUB  GETLPs        Get (optional) loop # from stack
F1D4A 44F           GOC    R&CVER        Error with loop
F1D4D 3100          LC(2)  =mREADI
F1D51 845           ST=0   5
F1D54 8E00 RD&CVT   GOSUBL =PUTGF-       Read the byte from mailbox
      00
F1D5A 44E           GOC    R&CVER
F1D5D 880           ?P#    =pDIAGL       Contents of location?
F1D60 8D            GOYES  R&CVEu        No...unexpected frame
F1D62 20            P=     0
F1D64 DA            A=C    A             Yes...save in A[B]
F1D66 865           ?ST=0  5             Read interrupt cause?
F1D69 61            GOYES  FCNRT1        Yes...return all 8 bits
                 *
                 * READDDC...if zero, return -1, else return top 6 bits
                 *
F1D6B 96C           ?A#0   B             Any DDCs received?
F1D6E 90            GOYES  R&CV10        Yes...return 6 bits
F1D70 720F Fnrtn-   GOSUB  LOAD-1        No...return -1
F1D74 561           GONC   Fnrtn.        Go always
                 *-
                 *-
F1D77 31F3 R&CV10   LCHEX  3F            Only 6 bits for DDC
F1D7B 0EF6          A=A&C  A
F1D7F AF2  FCNRT1   C=0    W
```

```
F1D82 AE6           C=A    B             Copy A[B] for conversion
F1D85 8E00          GOSUBL =FLOAT!
      00
F1D88 7019 Fnrtn.   GOSUB  Tresd0        Restore PC from FUNCDO
F1D8F 8D00 Fnrtn1   GOVLNG =FNRTN1       Exit with memory check
      000
           **************************************************************
           **************************************************************
           **
           ** Name:        READDC - Execute the READDDC functino
           **
           ** Category:    FNEXEC
           **
           ** Purpose:
           **      Return the last device dependent command received (low
           **      6 bits of the DDT or DDL frame) as a decimal number
           **
           ** Entry:
           **      D1 points to the stack
           **      C[S] is the number of parameters passed to the function
           **      If C[S]=1, there is a numeric expression on top of stack
           **      P=0
           **
           ** Exit:
           **      D1 points to the top of the stack
           **      P=0
           **      Returns through FNRTN1
           **
           ** Calls:       GETLPs,<RD&CVT>
           **
           ** Uses.......
           **  Inclusive:  A,B,C,D,R0,D1,P,FUNCD0,ST[5,3:0]
           **
           ** Stk lvls:    3 (GETLPs)
           **
           ** History:
           **
           **    Date      Programmer              Modification
           **   --------   ----------   --------------------------------
           **   08/03/83      NZ        Modified to take a loop #
           **   02/28/83      NZ        Updated documentation
           **   02/07/83      SC        Wrote routine
           **
           **************************************************************
           **************************************************************
F1D96 801           NIBHEX 801           Zero or one numeric parameter
F1D99 7D00 =READDC  GOSUB  GETLPs        Get (optional) loop # from stack
F1D9D 41A           GOC    R&CVER        Error with loop specifier
F1DA0 3100          LC(2)  =mREADC       Read last ddc
F1DA4 855           ST=1   5
F1DA7 5CA           GONC   RD&CVT        Go always
           **************************************************************
           **************************************************************
           **
           ** Name:        GETLPs - Get (optional) loop #, check status
```

```
                 **
                 ** Category:    PILUTL
                 **
                 ** Purpose:
                 **      Check if a loop number was passed to a function; if
                 **      so, get that mailbox, else get first mailbox.
                 **      Check the status of the mailbox (reset?, etc)
                 **
                 ** Entry:
                 **      P=0
                 **      D1 points to the top of the stack
                 **      C[S] is the parameter count (0 or 1)
                 **      If C[S]=1, there is a numeric value on top of the stack
                 **
                 ** Exit:
                 **      Carry clear:
                 **        P=0
                 **        D0 points to the mailbox
                 **        Mailbox status in C[X]
                 **        D1 at (new) top of stack (loop number is popped off)
                 **        FUNCD0 contains the caller's D0
                 **      Carry set:
                 **        Error (P, C[0] are the error code)
                 **
                 ** Calls:       TSAVD0,POP1N,GHEXB+,<FNDCHK>
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,D,R0,D0,D1,P,FUNCD0,ST[3:0]
                 **
                 ** Stk lvls:    2 (TSAVD0)(GHEXB+)(<FNDCHK>)
                 **
                 ** History:
                 **
                 **   Date     Programmer              Modification
                 **  --------  ----------   ---------------------------------
                 **  12/01/83      NZ       Added documentation
                 **
                 ************************************************************
                 ************************************************************
 F1DAA 700F =GETLPs GOSUB  MLFG=F          Set MLFFLG to indicate loop changed
 F1DAE 77E8        GOSUB  Tsavd0          Save PC in FUNCD0
 F1DB2 94A         ?C=0   S               Loop number specified?
 F1DB5 B2          GOYES  Fndchk          No...use default (=first loop)
 F1DB7 7CC9        GOSUB  Pop1n           Yes...get value from stack
 F1DBB 4A2         GOC    GETLPe          If complex number, error
 F1DBE 8E00        GOSUBL =GHEXB+         Convert value into HEX byte
       00
 F1DC4 432         GOC    ErrorX          Error
                 *
                 * B[B] is now the value of the expression (B[4:2]=0)
                 *
 F1DC7 D2          C=0    A
 F1DC9 302         LC(1)  2               Max of 3 loops (0,1, or 2)
 F1DCC DD          BCEX   A               Loop number in C[A]
 F1DCE 20          P=     =eRANGE
```

```
F1DD0 CE              C=C-1  A              Convert user input to base zero
F1DD2 451             GOC    ErrorX
F1DD5 8B5             ?B<C   A              Is the loop number less than 2?
F1DD8 01              GOYES  ErrorX         No...error
F1DDA 816             CSRC                  C[S] is now loop number
F1DDD 17F             D1=D1+ 16             Pop the numeric field off the stack
F1DE0 8C00 Fndchk     GOLONG =FNDCHK        Find the mailbox (P can be non-0)
      00
           *-
           *-
F1DE6 20   GETLPe P=     =eNNUMR            Not numeric data
F1DE8 6C18 ErrorX GOTO   Errorx
           **************************************************************
           **************************************************************
           **
           ** Name:        STATUS - Execute the STATUS function
           **
           ** Category:    FNEXEC
           **
           ** Purpose:
           **      Return mailbox status as a numeric value
           **
           ** Entry:
           **      P=0
           **      D1 points to the top of the stack
           **      C[S]=Number of parameters passed to this function
           **      If C[S]=1, there is a numeric value on top of the stack
           **
           ** Exit:
           **      P=0
           **      D1 points to the top of the stack
           **      Numeric value for STATUS on top of the stack
           **      Returns through FNRTN1
           **
           ** Calls:       GETLPs,GETHSS,<FCNRT1>,<FNRTN->
           **
           ** Uses.......
           **  Inclusive: A,B,C,D,R0,D1,P,FUNCD0,ST[11:0]
           **
           ** Stk lvls:    3 (GETLPs)
           **
           ** History:
           **
           **   Date       Programmer             Modification
           **  --------    ----------     ---------------------------------
           **  12/01/83       NZ          Updated documentation
           **  08/03/83       NZ          Changed first part to a subroutine
           **                             to do multiple loop READINTR/DDC
           **  06/16/83       NZ          Changed -1 return to pack code
           **  03/09/83       NZ          Changed where PC is saved to RAM
           **  03/07/83       NZ          Fixed bug with mailbox not found,
           **                             added call to GETERR to clear
           **                             error bit in mailbox
           **  02/28/83       NZ          Added check for insufficient mem,
           **                             mailbox out of range, packed,
           **                                     updated documentation
           **  02/08/83      SC                   Wrote routine
           **
           ***************************************************************
           ***************************************************************
F1DEC 801          NIBHEX 801
F1DEF 77BF =STATUS GOSUB  GETLPs                  Get loop number, check status
           *
           * If carry clear, C[X] is the I/O CPU status
           *
F1DF3 5B0          GONC   STAT10                  All OK...continue STATUS execution
F1DF6 880          ?P#    =eNMBOX                 Is error "No mailbox"?
F1DF9 FE           GOYES  ErrorX                  No...error exit
F1DFB 647F         GOTO   Fnrtn-                  Yes...return -1, restore PC, exit
           *-
           *-
           sStanb  EQU    7
           sLA     EQU    6
           sCA     EQU    5
           sTA     EQU    4
           sSRQR   EQU    3
           sEar    EQU    2
           sRemot  EQU    1
           sLLout  EQU    0
           *
F1DFF 08   STAT10  CLRST                          Initially clear all status bits
F1E01 F2           CSL    A
F1E03 F2           CSL    A                       C[4:2] is the loop status now
F1E05 C6           C=C+C  A                       Bit 11: Local Lockout
F1E07 550          GONC   STAT21                  Clear
F1E0A 850          ST=1   sLLout                  Set Local Lockout bit
F1E0D C6   STAT21  C=C+C  A                       Bit 10: Remote
F1E0F 550          GONC   STAT22                  Clear
F1E12 851          ST=1   sRemot                  Set Remote bit
F1E15 C6   STAT22  C=C+C  A                       Bit 9: Manual mode       (ignored)
F1E17 C6           C=C+C  A                       Bit 8: Data available    (ignored)
F1E19 C6           C=C+C  A                       Bit 7: Controller Standby
F1E1B 550          GONC   STAT23                  Clear
F1E1E 857          ST=1   sStanb                  Set Controller Standby bit
F1E21 C6   STAT23  C=C+C  A                       Bit 6: EAR enabled
F1E23 550          GONC   STAT24                  Clear
F1E26 852          ST=1   sEar                    Set EAR enabled bit
F1E29 C6   STAT24  C=C+C  A                       Bit 5: Configured        (ignored)
F1E2B C6           C=C+C  A                       Bit 4: Interrupt pending(ignored)
F1E2D C6           C=C+C  A                       Bit 3: System Controller(ignored)
F1E2F C6           C=C+C  A                       Bit 2: Talker Active
F1E31 550          GONC   STAT25                  Clear
F1E34 854          ST=1   sTA                     Set Talker Active bit
F1E37 C6   STAT25  C=C+C  A                       Bit 1: Listener
F1E39 550          GONC   STAT26                  Clear
F1E3C 856          ST=1   sLA                     Set Listener bit
F1E3F C6   STAT26  C=C+C  A                       Bit 0: Controller Active
F1E41 550          GONC   STAT27                  Clear
F1E44 855          ST=1   sCA                     Set Controller Active bit
F1E47 0B   STAT27  CSTEX                          C[B] is now the byte for STATUS
```

```
F1E49 DA            A=C     A             Put STATUS into A[B]
F1E4B 8E00          GOSUBL  =GETHSS       Get handshake nibble from mailbox
      00
F1E51 860           ?ST=0   =hsLPRQ       SRQ received on loop?
F1E54 A0            GOYES   STAT30        No...leave the bit clear
F1E56 3180          LC(2)   2^sSRQR       Yes...set the SRQR bit
F1E5A 0EFE          A=A!C   A
F1E5E 602F STAT30   GOTO    FCNRT1        Restore PC, convert to float&exit
           ******************************************************************
           ******************************************************************
           **
           ** Name:       BINAND - Execute the BINAND function
           ** Name:       BINIOR - Execute the BINIOR function
           ** Name:       BINEOR - Execute the BINEOR function
           ** Name:       BINCMP - Execute the BINCMP function
           ** Name:       BIT    - Execute the BIT function
           **
           ** Category:   FNEXEC
           **
           ** Purpose:
           **      Binary functions:
           **        BINAND: Return the binary AND of two numbers
           **        BINIOR: Return the binary inclusive OR of two numbers
           **        BINEOR: Return the binary exclusive OR of two numbers
           **        BINCMP: Return the binary complement of a number
           **        BIT: Return the value of a specific bit in a number
           **
           ** Entry:
           **      P=0
           **      D1 points to the top of the stack
           **      Two values on top of the stack (only one for BINCMP)
           **
           ** Exit:
           **      P=0
           **      Returns through FNRTN4
           **
           ** Calls:      POP2DH,POP1N(BINCMP),FLOAT!,<FNRTN4>,<ERRORX>
           **
           ** Uses.......
           **  Inclusive: A,B,C,D,D1,P,R0
           **
           ** Stk lvls:   3 (POP2DH)
           **
           ** History:
           **
           **   Date     Programmer            Modification
           **  --------  ----------   --------------------------------
           **  03/01/83     NZ        Changed to always return non-
           **                         negative value
           **  02/28/83     NZ        Changed FLTRTN to do processing
           **                         here
           **  02/08/83     SC        Wrote routines
           **
           ******************************************************************
           ******************************************************************
```

```
2878 F1E62 8822         NIBHEX 8822
2879 F1E66 7D80 =BINAND GOSUB  POP2DH         Pop 2 values
2880 F1E6A 0EF6         A=A&C  A
2881 F1E6E        FLTRTN
2882              *
2883              * Following instruction is not needed any more (overlooked on
2884              * 3/1/83 change)
2885              *
2886 F1E6E D3           D=0    A              If D[A]=0, then sign is positive
2887              *
2888 F1E70 AF2          C=0    W
2889 F1E73 D6           C=A    A
2890 F1E75 8E00         GOSUBL =FLOAT!        Convert to floating decimal
           00
2891 F1E7B 8D00 Fnrtn4  GOVLNG =FNRTN4
           000
2892              ****************************************************************
2893 F1E82 8822         NIBHEX 8822
2894 F1E86 7D60 =BINIOR GOSUB  POP2DH         Pop 2 numbers
2895 F1E8A 0EFE         A=A!C  A              Do an inclusive OR on them
2896 F1E8E 6FDF         GOTO   FLTRTN         Finish up
2897              ****************************************************************
2898 F1E92 8822         NIBHEX 8822
2899 F1E96 7D50 =BINEOR GOSUB  POP2DH         Pop 2 numbers
2900              *
2901              * A EOR C = (A and (not C)) or ((not A) and C)
2902              *
2903 F1E9A D8           B=A    A              Save A in B
2904 F1E9C FE           C=-C-1 A              C = not C
2905 F1E9E 0EF6         A=A&C  A              A = (A and (not C)
2906 F1EA2 DC           ABEX   A              B = (A and (not C), restore A
2907 F1EA4 FC           A=-A-1 A              A = not A
2908 F1EA6 DB           C=D    A              Restore C from D (POP2DH)
2909 F1EA8 0EF6         A=A&C  A              A = ((not A) and C)
2910 F1EAC 0EF8         A=A!B  A              A = A EOR C
2911 F1EB0 6DBF         GOTO   FLTRTN         Finish up
2912              ****************************************************************
2913 F1EB4 811          NIBHEX 811
2914 F1EB7 7CC8 =BINCMP GOSUB  Pop1n          Pop 1 number
2915 F1EBB 474          GOC    badtyp         (complex...error)
2916 F1EBE 7B60         GOSUB  FLTDH          Convert to HEX
2917 F1EC2 564          GONC   badinp         (range error)
2918 F1EC5 FC           A=-A-1 A              Do 1's complement
2919 F1EC7 66AF Fltrtn  GOTO   FLTRTN         Finish up
2920              ****************************************************************
2921 F1ECB 8822         NIBHEX 8822
2922 F1ECF 7420 =BIT    GOSUB  POP2DH
2923              *
2924              * C[A] is the value to check
2925              * A[A] is the bit position to check in value
2926              *
2927 F1ED3 D1           B=0    A
2928 F1ED5 E5           B=B+1  A              Use B[A] as the mask register
2929 F1ED7 CC   BIT10   A=A-1  A              Decrement bit count
2930 F1ED9 4D0          GOC    BIT20          Done making the mask
```

```
F1EDC C5            B=B+B  A               Double the mask
F1EDE 58F           GONC   BIT10           Go unless bit # too big
              *
              * If here, bit # was too big
              *
F1EE1 20            P=     =eRANGE
F1EE3 640F          GOTO   ErrorX
              *-
              *-
F1EE7 0EF5 BIT20    C=C&B  A               Check if bit in that spot is set
F1EEB D0            A=0    A
F1EED 8AA           ?C=0   A
F1EF0 7D            GOYES  Fltrtn          Return zero if C[A]=0
F1EF2 E4            A=A+1  A
F1EF4 52D           GONC   Fltrtn          Go always
              ***************************************************************
              ***************************************************************
              **
              ** Name:        POP2DH - Pop 2 numeric items, convert to HEX
              **
              ** Category:    LOCAL
              **
              ** Purpose:
              **      Pop two numbers off the stack and convert them to hex
              **
              ** Entry:
              **      P=0
              **      D1 points to the top of the stack
              **      Two numbers on the top of the stack
              **
              ** Exit:
              **      A[A] is the first number on the stack
              **      C[A] and D[A] are the second number on the stack
              **      Exits through ERRORX with eNNUMR if complex number,
              **        eRANGE if not in [0...2^20-1]
              **      Carry clear
              **
              ** Calls:       POP2N,FLTDH,<ERRORX>
              **
              ** Uses.......
              **  Inclusive: A,B,C,D,D1,P
              **
              ** Stk lvls:    2 (POP2N)
              **
              ** History:
              **
              **    Date      Programmer            Modification
              **  --------    ----------     --------------------------------
              **  03/01/83       NZ          Added check for FLTDH error
              **  02/09/83       SC          Wrote routine
              **
              ***************************************************************
              ***************************************************************
F1EF7 8F00 POP2DH  GOSBVL =POP2N           Pop 2 numbers
      000
```

```
F1EFE 04                SETHEX
F1F00 500               GONC    POP2D1          Go if no complex values
                *
F1F03 20        badtyp  P=      =eNNUMR         Error...not numeric
F1F05 62EE      POP2ER  GOTO    ErrorX
                *-
                *-
F1F09 20        badinp  P=      =eRANGE         Out of range error
F1F0B 59F               GONC    POP2ER          Go always
                *-
                *-
                *
                * C[W] is the first number on stack
                * A[W] is the second number on stack
                *
F1F0E AFF       POP2D1  CDEX    W               D=first number
F1F11 7810              GOSUB   fLTDH           Convert second number to HEX
F1F15 53F               GONC    badinp          Out of range or negative
F1F18 AFE               ACEX    W
F1F1B AFF               CDEX    W               D=second number, C=first number
F1F1E AFE               ACEX    W               A=first number
F1F21 7800              GOSUB   fLTDH           Convert first number to HEX
F1F25 53E               GONC    badinp          Out of range or negative
F1F28 AFB               C=D     W               C,D=second number,A=first number
F1F2B 03                RTNCC
                *-
                *-
F1F2D 8D00      =fLTDH  GOVLNG =FLTDH
      000
F1F34                   END
```

```
 #Timeo   Ext                  -  1414
 ASGN00   Abs   989678 #F19EE  -  1881   1865   1889
 ASGN04   Abs   989689 #F19F9  -  1886   1877
 ASGN05   Abs   989751 #F1A37  -  1921   1912
 ASGN10   Abs   989765 #F1A45  -  1926   1929
 ASGN15   Abs   989817 #F1A79  -  1963   1955
 ASGN20   Abs   989848 #F1A98  -  1982   2023
 ASGN25   Abs   989855 #F1A9F  -  1984   2018
 ASGN30   Abs   989859 #F1AA3  -  1987   1983
 ASGN40   Abs   989893 #F1AC5  -  1999   1988
 ASGN45   Abs   989921 #F1AE1  -  2005   2001
 ASGN50   Abs   989923 #F1AE3  -  2009   2003
 ASGNER   Abs   989970 #F1B12  -  2027   1991   1993   1995   2021
=ASGNIO   Abs   989645 #F19CD  -  1851
 ASGNd    Ext                  -  1849
 ASGNda   Abs   989992 #F1B28  -  2036   1881   2030
 ASGNeR   Abs   989972 #F1B14  -  2028   1956
 ASGNp    Ext                  -  1850
 ASLC2    Ext                  -  2010
 ASLC4    Ext                  -   915
 ASLC5    Ext                  -  1626
 ASRC2    Ext                  -  1999
 ASRC4    Ext                  -   827    908   1018
 ASRC5    Ext                  -  1631
 BAKCHR   Ext                  -  2004
 BF2DSP   Ext                  -  1613   1667
=BINAND   Abs   990822 #F1E66  -  2879
=BINCMP   Abs   990903 #F1EB7  -  2914
=BINEOR   Abs   990870 #F1E96  -  2899
=BINIOR   Abs   990854 #F1E86  -  2894
=BIT      Abs   990927 #F1ECF  -  2922
 BIT10    Abs   990935 #F1ED7  -  2929   2932
 BIT20    Abs   990951 #F1EE7  -  2940   2930
 BLANKC   Ext                  -  1593
 BSERR    Ext                  -  1913
 CHKASN   Ext                  -    78
 CHKMAS   Ext                  -   594   1036
 CKLOP#   Ext                  -  1107   1777
 CKmode   Ext                  -  1255
=CLEAR    Abs   988549 #F1585  -  1228
 CLEAR+   Abs   988616 #F15C8  -  1255   1246
 CLEAR.   Abs   988607 #F15BF  -  1249   1234
 CLEAR1   Abs   988659 #F15F3  -  1269   1261
 CLEAR2   Abs   988683 #F160B  -  1281   1273
 CLEAR3   Abs   988729 #F1639  -  1303   1301
 CLEAR4   Abs   988736 #F1640  -  1305   1295
 CLEARc   Abs   988556 #F158C  -  1229   1112   1149   1186
 CLEARd   Ext                  -  1226
 CLEARl   Abs   988578 #F15A2  -  1236   1108
 CLEARp   Ext                  -  1227
 CLEARs   Abs   988742 #F1646  -  1309   1267   1303
 CSLC12   Ext                  -  2282
 CSLC2    Ext                  -   848
 CSLC3    Ext                  -   695
 CSLC4    Ext                  -  1330
 CSRC4   Ext                  -  1334
 CloseR  Ext                  -   709
 Cslc4   Abs  988790 #F1676 -  1330   651   682   723
 Cslc5   Abs  988787 #F1673 -  1329   639   839   925  2478
 Csrc4   Abs  988797 #F167D -  1334   615   654
 Csrc5   Abs  988794 #F167A -  1333   637   910   923  2488
 D1=DSP  Ext                  -  1895
 D1=DST  Ext                  -   464  1729  1789
 D1=DSX  Ext                  -   461
=D1=SDO  Abs  988816 #F1690 -  1344  1103  1229  1292  1592
=D1=SRO  Abs  988807 #F1687 -  1340   282  1256  1269  1285
 DDL     Ext                  -  1326
 DDT     Ext                  -   714
=DEVID   Abs  990009 #F1B39 -  2079
 DEVID1  Abs  990033 #F1B51 -  2098  2088
 DEVID2  Abs  990043 #F1B5B -  2106  2113
 DEVID3  Abs  990065 #F1B71 -  2116  2107
 DEVID4  Abs  990085 #F1B85 -  2129  2127
 DEVIDe  Abs  990102 #F1B96 -  2135  2080  2097
 DEVP10  Abs  990404 #F1CC4 -  2460  2428
 DEVP20  Abs  990472 #F1D08 -  2500  2442
 DEVP23  Abs  990485 #F1D15 -  2503
 DEVP25  Abs  990495 #F1D1F -  2513  2500  2503
 DEVP30  Abs  990513 #F1D31 -  2525  2517
=DEVPAR  Abs  990341 #F1C85 -  2422  2079  2185  2252  2340
=DEVPR$  Abs  990411 #F1CCB -  2465
 DEVPcc  Abs  990511 #F1D2F -  2522  2505
 DEVTY4  Abs  990305 #F1C61 -  2354  2296  2360
 DEVTY5  Abs  990319 #F1C6F -  2359  2195  2297  2346  2350
=DEVTYP  Abs  990268 #F1C3C -  2340
 DEVTYe  Abs  990337 #F1C81 -  2369  2341  2348
 DEVTYx  Abs  990299 #F1C5B -  2353  2211
 DISPI+  Abs  987468 #F114C -   419   466
=DISPIS  Abs  987458 #F1142 -   409
 Ddl     Abs  988781 #F166D -  1326   710   720
 Ddt     Abs  987901 #F12FD -   714   707
 DdtXgT  Abs  987899 #F12FB -   713
 ENDFN   Ext                  -  2130  2354
 ENDST   Ext                  -  1306
 ENDTAP  Ext                  -   891
 EOLLEN  Ext                  -   339
 ERRORX  Ext                  -  1278
 Endst   Abs  988736 #F1640 -  1306   421  1043  1807  1984
 ErrorX  Abs  990696 #F1DE8 -  2725  2707  2716  2718  2781  2937  2989
 Errorx  Abs  988677 #F1605 -  1278   360   520   874  1050  1239  1254  1266
                               1268  1304  1420  1560  1810  2033  2135  2300
                               2369  2580  2725
 F->SCR  Ext                  -   691
 FCWRT1  Abs  990591 #F1D7F -  2607  2595  2830
=FIND    Abs  990171 #F1BDB -  2252
 FIND10  Abs  990253 #F1C2D -  2291  2288
 FINDER  Abs  990261 #F1C35 -  2300  2253
 FINDer  Abs  990175 #F1BDF -  2253  2186  2199  2205
 FIXSPC  Ext                  -   173   239   469   513   740  2445  2529
 FLOAT'  Ext                  -  2353  2609  2890
 FLTDM    Ext                    -  3012
 FLTRTN   Abs   990830 #F1E6E -  2881  2896  2911  2919
 FNDCH-   Ext                    -  1238
 FNDCHK   Ext                    -  2721
 FNRTN1   Ext                    -  2611
 FNRTN4   Ext                    -  2891
 FORMAT   Ext                    -  1041
 FUNCDO   Ext                    -   116   125
 FUNCRO   Ext                    -  1620  1666
 Fltrtn   Abs   990919 #F1EC7 -  2919  2943  2945
 Fndchk   Abs   990688 #F1DE0 -  2721  1484  2703
 Fnrtn-   Abs   990576 #F1D70 -  2601  2782
 Fnrtn.   Abs   990603 #F1D8B -  2610  2602
 Fnrtn1   Abs   990607 #F1D8F -  2611  2132
 Fnrtn4   Abs   990843 #F1E7B -  2891  2356
 GADRRM   Ext                    -  2437
 GDIRST   Ext                    -   599
 GETDID   Ext                    -   332   430   507   735  1253
 GETDIR   Ext                    -   884
 GETDIX   Ext                    -  2484
 GETDR"   Ext                    -   605   803
 GETDR+   Ext                    -   671
 GETHEX   Ext                    -  1007
 GETHSS   Ext                    -  2825
 GETID+   Ext                    -  2092
 GETLPe   Abs   990694 #F1DE6 -  2724  2705
*GETLPs   Abs   990634 #F1DAA -  2700  2584  2652  2775
 GETMBX   Ext                    -   218  1296
 GETPIL   Ext                    -   971
 GETSTR   Ext                    -  1855
*GETZER   Abs   988147 #F13F3 -   896   821   829
 GHEXB+   Ext                    -  2706
 GLOOPM   Ext                    -  1392
 GT2BYT   Ext                    -   904
 GTYPE    Ext                    -  2347
 Gt2byt   Abs   988162 #F1402 -   904   809   897   899
 HTOD     Ext                    -  1590  2261  2271
 I/OALL   Ext                    -  1911
 I/ODAL   Ext                    -  2038
*I/odal   Abs   989999 #F1B2F -  2038
 IDIV     Ext                    -  1467
 INITLP   Abs   988282 #F147A -   989   991
 INITXO   Abs   988296 #F1488 -   999   983
 INITX1   Abs   988392 #F14E8 -  1034   993
 INITX2   Abs   988423 #F1507 -  1049
 INITXE   Abs   988425 #F1509 -  1050  1008  1035  1037  1042
 INITXF   Abs   988332 #F14AC -  1008   972  1012
*INITXQ   Abs   988246 #F1456 -   967
 INITd    Ext                    -   965
 INITp    Ext                    -   966
 IOp      Ext                    -  1564
 IS-DSP   Ext                    -   410   458
 IS-PRT   Ext                    -    73   288   426
 LCL10    Abs   988486 #F1546 -  1111  1102
 LEXPIL   Ext                    -  1097
 LIST10   Abs   989170 #F17F2 -  1580  1584
 LIST20   Abs   989302 #F1876 -  1619  1668
 LIST30   Abs   989437 #F18FD -  1657  1654
 LIST50   Abs   989469 #F191D -  1671  1648
=LISTIO   Abs   989139 #F17D3 -  1565
 LISTnb   Abs   989120 #F17C0 -  1558  1568
 LOAD-1   Abs   990326 #F1C76 -  2363  2359  2601
=LOCAL    Abs   988439 #F1517 -  1086
 LOCALd   Ext                 -  1084
 LOCALp   Ext                 -  1085
 LOOPST   Ext                 -  1722  1783  1937
 LoopOK   Ext                 -   225  1732  1792
 MLFFLG   Ext                 -  2453
 MLFG=F   Abs   990382 #F1CAE -  2452  2501  2700
 MOVEFL   Ext                 -   865
 MTYL     Ext                 -  1317
 MeTalk   Abs        9 #00009 -    66   130   133   145
 Mtyl     Abs   988763 #F165B -  1317   151   717
 NXTCHR   Ext                 -  1323
 NXTENT   Ext                 -   630   653   917
 NXTSTM   Ext                 -  1495
 Nxtchr   Abs   988775 #F1667 -  1323  1876  1982  1992  2000  2017
 Nxten+   Abs   988168 #F1408 -   907   870
 Nxten-   Abs   988182 #F1416 -   911   883
=OFFIO    Abs   989483 #F192B -  1709
 OFFIO1   Abs   989510 #F1946 -  1722  1712
 OFFIO2   Abs   989553 #F1971 -  1735  1719
 OFFIOd   Ext                 -  1563  1707
 OFFIOp   Ext                 -  1708
 ONINTR   Ext                 -  1716
 OUTPTt   Ext                 -   293   348
=OUTPUT   Abs   987372 #F10EC -   332
 OUTPd    Ext                 -   330
 OUTPer   Abs   987444 #F1134 -   360   333
 OUTPp    Ext                 -   331
 Offed    Ext                 -  1725
=PACK     Abs   987974 #F1346 -   795
 PACK00   Abs   987978 #F134A -   796   737
 PACK10   Abs   987987 #F1353 -   803   871
 PACK20   Abs   987993 #F1359 -   804   885
 PACK30   Abs   988016 #F1370 -   817   813
 PACK40   Abs   988120 #F13D8 -   877   835
 PACK90   Abs   988134 #F13E6 -   891   510   814   927
=PACKD    Abs   987605 #F11D5 -   507
 PACKd    Ext                 -   505   793
 PACKeR   Abs   988036 #F1384 -   830   796   804   822
 PACKer   Abs   988116 #F13D4 -   874   830   857   859   866   892   914
 PACKfx   Abs   987949 #F132D -   735   795
 PACKp    Ext                 -   506   794
 PBF->C   Abs   987862 #F12D6 -   702   661
=PDIR     Abs   987629 #F11ED -   593   508   736
 PDIR10   Abs   987670 #F1216 -   605   663
 PDIR20   Abs   987679 #F121F -   607   673
 PDIR22   Abs   987701 #F1235 -   619   608
 PDIR24   Abs   987749 #F1265 -   641   632
 PDIR30  Abs  987803 #F129B -   669   644   656
 PDIR90  Abs  987821 #F12AD -   679   618   628
 PDIR92  Abs  987842 #F12C2 -   687   680
 PDIR95  Abs  987855 #F12CF -   694   686
 PDIRBF  Abs  987907 #F1303 -   717   648   692
 PILCNF  Ext                -   420  1806
 POP1N   Ext                -  1498
 POP2D1  Abs  990990 #F1F0E -  3000  2986
 POP2DN  Abs  990967 #F1EF7 -  2984  2879  2894  2899  2922
 POP2ER  Abs  990981 #F1F05 -  2989  2993
 POP2N   Ext                -  2984
=PRASCI  Abs  987263 #F107F -   214   163
 PRASER  Abs  987378 #F10F2 -   333   227
=PREND   Abs  987319 #F10B7 -   277   213
 PREND1  Abs  987345 #F10D1 -   289   287
 PREND2  Abs  987246 #F106E -   168   295
 PREND3  Abs  987310 #F10AE -   235   170   294
 PREND4  Abs  987316 #F10B4 -   236   291
=PREXT   Abs  987095 #F0FD7 -    99    94
 PRINT*  Ext                -   357
 PRINTt  Ext                -   286
=PRNT00  Abs  987499 #F116B -   427   416
 PRNT45  Abs  987551 #F119F -   453   439
 PRNT50  Abs  987478 #F1156 -   421   460
 PRNTER  Abs  987625 #F11E9 -   520   444   446   509
=PRNTIS  Abs  987492 #F1164 -   426
 PRNTSd  Ext                -   407   424
 PRNTSp  Ext                -   408   425
=PRTIS   Abs  987041 #F0FA1 -    72
 PRTIS"  Abs  987176 #F1028 -   138   136
=PRTIS+  Abs  987054 #F0FAE -    74
 PRTIS,  Abs  987166 #F101E -   134   132
 PRTIS-  Abs  987097 #F0FD9 -   102    93
 PRTIS0  Abs  987114 #F0FEA -   116   139   152   157
 PRTIS1  Abs  987126 #F0FF6 -   119    84
 PRTIS2  Abs  987136 #F1000 -   125    79    89
 PRTIS4  Abs  987220 #F1054 -   157   154
 PRTIS5  Abs  987231 #F105F -   161   160   163
 PRTIS@  Abs  987201 #F1041 -   151   146
=PRTISc  Abs  987034 #F0F9A -    68  1271
 PRTISe  Abs  987060 #F0FB4 -    76    69
 PRTS00  Abs  987205 #F1045 -   152   148
 PRTS01  Abs  987208 #F1048 -   153   144
 PT2BYT  Ext                -   849
 PUTC    Ext                -  1311
 PUTDR"  Ext                -   729
 PUTDR#  Ext                -   856
 PUTE    Ext                -  1493
 PUTGF-  Ext                -  2588
 PhyEOD  Abs       0 #00000 -   612   613   619   679
 Pop1n   Abs  989063 #F1787 -  1498  1502  2433  2704  2914
 Putc    Abs  988751 #F164F -  1311  1488
 Putd    Ext                -   726
 R&CV10  Abs  990583 #F1D77 -  2605  2600
 R&CVER  Abs  990527 #F1D3F -  2580  2585  2589  2653
 R&CVEu  Abs  990520 #F1D38 -  2577  2591
 RD&CVT  Abs  990548 #F1D54 -  2588  2656
=READDC  Abs  990617 #F1D99 -  2652
=READIN  Abs  990534 #F1D46 -  2584
 READRG  Ext               -  2204
=REMOTE  Abs  988528 #F1570 -  1185
 REMOTd  Ext               -  1183
 REMOTp  Ext               -  1184
=REST10  Abs  989573 #F1985 -  1783  1883
 REST1A  Ext               -  1020
 REST2C  Ext               -  1016  1433  1461
 RESTD0  Ext               -   434
 RESTD1  Ext               -  1013
=RESTIO  Abs  989567 #F197F -  1777
 RESTd   Ext               -  1775
 RESTp   Ext               -  1776
 REVPOP  Ext               -  2464
 Rester  Abs  989631 #F19BF -  1810  1805
 SAVE1A  Ext               -  1006
 SAVE2C  Ext               -  1337
 SAVED0  Ext               -   428
 SAVED1  Ext               -  1002
 SAVEIT  Ext               -  1320
 SEEKA   Ext               -   704
 SPOL05  Abs  990121 #F1BA9 -  2195  2207
 SPOL10  Abs  990125 #F1BAD -  2198  2191
=SPOLL   Abs  990109 #F1B9D -  2185
 STAN10  Abs  988883 #F16D3 -  1408  1397
 STAN20  Abs  988907 #F16EB -  1423  1400
 STAN30  Abs  989002 #F174A -  1474  1472
 STAN40  Abs  989012 #F1754 -  1478  1405  1416  1445
=STANBY  Abs  988847 #F16AF -  1392
 STANDd  Ext               -  1390
 STANDp  Ext               -  1391
 STANeR  Abs  988961 #F1721 -  1455  1485  1489  1494
 STANer  Abs  988903 #F16E7 -  1420  1432  1455
 STANra  Abs  988901 #F16E5 -  1419  1477
 STANsb  Abs  989069 #F178D -  1501  1431  1454
 STANsr  Abs  989116 #F17BC -  1521  1513  1515  1517
 START   Ext               -   138  1034  2502
 START-  Ext               -  1804  1954
 STAT10  Abs  990719 #F1DFF -  2794  2779
 STAT21  Abs  990733 #F1E0D -  2800  2798
 STAT22  Abs  990741 #F1E15 -  2803  2801
 STAT23  Abs  990753 #F1E21 -  2808  2806
 STAT24  Abs  990761 #F1E29 -  2811  2809
 STAT25  Abs  990775 #F1E37 -  2817  2815
 STAT26  Abs  990783 #F1E3F -  2820  2818
 STAT27  Abs  990791 #F1E47 -  2823  2821
 STAT30  Abs  990814 #F1E5E -  2830  2827
=STATUS  Abs  990703 #F1DEF -  2775
 STMTD0  Ext               -  1258  1344  1612
 STMTR0  Ext               -   341  1340
 STMTR1  Ext               -   285   334
 SWAP01  Ext               -   435
 Save2c  Abs  988801 #F1681 -  1337   977  1004  1430  1441
 SaveIt  Abs       6 #00006 -    65   129   137   153
 Saveit  Abs  988769 #F1661 -  1320   169   337   453  1289
 SetBP   Ext                -   719
 TRESD0  Ext                -  1351
 TRESD1  Ext                -   110
=TRIGER  Abs  988507 #F155B -  1147
 TRIGd   Ext                -  1145
 TRIGp   Ext                -  1146
 TSAVD0  Ext                -  1348
 TSAVD1  Ext                -    72  1870  2470
 TSTAT   Ext                -  1314
 TSWAD1  Ext                -  1974  2009  2013
 Timout  Ext                -  1412
 Tresd0  Abs  988831 #F169F -  1351   228   338   978  1973  2131  2355  2610
 Tresd1  Abs  987108 #F0FE4 -   110   119  2494
 Tsavd0  Abs  988825 #F1699 -  1348   216  1869  2432  2701
 Tstat   Abs  988757 #F1655 -  1314   711   858
 UCRANG  Ext                -  1987  1994
 ULYL    Ext                -   147   708
 UNLPUT  Ext                -  1265
 UTLEND  Ext                -   235
 WRITIT  Ext                -   226
 WRTASC  Ext                -  1597  1638
 Write1  Ext                -   728
 XchgI   Ext                -   706   713
 YTML    Ext                -  2198
 bPILAI  Ext                -  1566  1910  2037
=bSERR   Abs  989744 #F1A30 -  1913
 badinp  Abs  990985 #F1F09 -  2992  2917  3002  3007
 badtyp  Abs  990979 #F1F03 -  2988  2915
 cATCH+  Ext                -  2002
 eABORT  Ext                -  1277
 eDSPEC  Ext                -   445  2027  2509
 eDTYPE  Ext                -  1049
 eNMBOX  Ext                -  2780
 eNNUMR  Ext                -  2724  2988
 eNOASN  Ext                -  1558
 eNOFND  Ext                -  2516
 ePARSE  Ext                -  1559
 ePIL    Ext                -  2513  2579
 eRANGE  Ext                -   900   913  1010  1419  1521  2714  2936  2992
 eUNEXP  Ext                -  2578
 eXPEXC  Ext                -  1501
=fLTDH   Abs  991021 #F1F2D -  3012  1514  2916  3001  3006
 hsLPRQ  Ext                -  2826
 i/OFND  Ext                -  1567
 nCMDf   Ext                -  1309
 nREADC  Ext                -  2654
 nREADI  Ext                -  2586
 nSETIC  Ext                -  1486
 nSST    Ext                -  2203
 nSTO@5  Ext                -  1491
=nXTSTM  Abs  989056 #F1780 -  1495   893  1675  1735
 pDIAGL  Ext                -  2590
 sCA     Abs       5 #00005 -  2787  2822
 sEar    Abs       2 #00002 -  2790  2810
 sLA     Abs       6 #00006 -  2786  2819
 sLLout  Abs       0 #00000 -  2792  2799
 sReadd  Ext                -  1798  1953
 sRemot  Abs       1 #00001 -  2791  2802
 sSRQR   Abs       3 #00003 -  2789  2828
 sSTK    Ext                -  1864  2424
 sStanb  Abs       7 #00007 -  2785  2807
 sTA     Abs       4 #00004 -  2788  2816
 tCOMMA  Ext                -   980  1232  1443
 tLOCKO  Ext                -  1098
 tOFF    Ext                -  1395
 tON     Ext                -  1398
 tXWORD  Ext                -  1096  1710
```

```
Input Parameters

  Source file name is NZ&BAS::MS

  Listing file name is NZ/BAS:TI:ML::-1

  Object file name is NZ%BAS:TI:MS::-1

                                          111111
                                0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                *       SSS    CCC    &     EEEEE  N   N  TTTTT
                *      S   S  C   C  & &    E      N   N    T
                *      S      C       & &   E      NN  N    T
                *       SSS   C        &    EEEE   N N N    T
                *          S  C      & & &  E      N  NN    T
                *      S   S  C   C  & &    E      N   N    T
                *       SSS    CCC    && &  EEEEE  N   N    T
                *
                       TITLE  ENTER Execution <840301.1406>
F1F34                  ABS    #F1F34        TIXHP6 address (fixed)
                *
                Array  EQU    1
                String EQU    2
                Cmplex EQU    3
                Endfrm EQU    3
                MltItm EQU    4
                Memerr EQU    4
                BytCnt EQU    5
                KorM   EQU    5
                Sign   EQU    6
                Trash  EQU    6
                ChrTrp EQU    7
                **************************************************************
                **************************************************************
                **
                ** Name:       hENTER - Poll handler for the pENTER poll
                **
                ** Category:   POLL
                **
                ** Type:       POLL
                **
                ** Purpose:
                **      To read data from HP-IL and put it on math stack
                **
                ** Entry:
                **      B[A] = Poll number.
                **      HEX mode.
                **      P=0.
                **      MTHSTK=FORSTK  (Math stack is collapsed to FORSTK)
                **
                **      R1[A]=HP-IL address (device's location relative to the
                **            controller)
                **
                **      S5 (BytCnt):
                **          1:Read a specified number of characters
                **            A[A] is the number of characters to read
                **          0:Terminate by END frame or terminating char match
                **            A[B] is the terminating character
                **
                **      S6 (Trash):
                **          1:Ignore the data which is read
                **          0:Save the data which is read on the stack
                **
                **      S7 (ChrTrp):
                **          1:Detect a special character in incoming data
                **                R2[B] is the character to be detected
                **                If R2[3:2]=00, ignore the character;
                **                otherwise replace the character with R2[3:2]
                **              0:No special character processing
                **
                **          If system flag -23 is set:
                **            Terminate by ETO, terminating character is ignored
                **
                **            If S5 (BytCnt)=0, S6 (Trash)=0, and S-R0-3[0]>2 (the
                **              destination is a string), then S-R1-1[3:0] and R3[A]
                **              are the maximum number of chars to read before
                **              interrupting the conversation with an NRD.
                **              R3[S] must not be "F". (R3[4]=0)
                **
                **            If S5 (BytCnt)=1 or S6 (Trash)=1, then flag -23 has
                **              no effect other than to terminate on an ETO instead
                **              of the terminator character.
                **
                **            If { S-R0-3[0]<=2 (not string dest) and S5 (BytCnt)=0 }
                **              or { in device mode (not controller) },
                **              then flag -23 has no effect (it is ignored).
                **
                **
                ** Exit:
                **          HEX mode.
                **          XM=0.
                **          Carry clear:
                **            AVMEME points to the last character read
                **            FORSTK points to first char read + 2
                **            Number of chars read = ((FORSTK) - (AVMEME))/2
                **            S4 (Memerr)=0
                **          Carry set:
                **            S4 (Memerr)=1: Insufficient memory (Need to load eMEM)
                **            S4 (Memerr)=0: C[3:0] is the error code
                **
                ** Calls:       D1=AVE,RDST01,<ERROR>,<AVE=D1>
                **
                ** Uses:
                **  Inclusive: A-D,D0,D1,P,R1,R2,ST[5:0]
                **
                ** Stk Lvls:    5 (RDST01)
                **
                ** History:
                **
                **     Date     Programmer              Modification
                **   --------   ----------     ---------------------------------
                **   12/13/83       NZ         Updated documentation
                **   07/26/83       SC         Wrote routine
                **
                ****************************************************************
                ****************************************************************
    F1F34 11A   =hENTER C=R2                   Get special char (for ChrTrp=1)
    F1F37 D5           B=C     A               Place in B[B], B[3:2]
    F1F39 7317         GOSUB   D1mstk          Set D1 to the top of the math stack
    F1F3D 70C3         GOSUB   RDST01          Read the characters...
```

```
F1F41 580          GONC   pENTR1        ...No error (leave AVMEME at stack)
F1F44 8C00         GOLONG =ERROR        Error (set up C[3:0])
      00
                *-
                *-
F1F4A 6072 pENTR1  GOTO   aVE=D1        Carry clear, AVMEME updated
           ***************************************************************
           ***************************************************************
           **
           ** Name:        ENTER - Execute the ENTER statement
           **
           ** Category:    STEXEC
           **
           ** Purpose:
           **      Execute the ENTER statement to read data from the loop
           **
           ** Entry:
           **      D0 points to the device specifier
           **      P=0
           **
           ** Exit:
           **      Through either NXTSTM or BSERR
           **
           ** Calls:       GETDID,DEVADR,SAVEIT,TRESD0,CHKEOL,NXTDST,RED-LF,
           **              STRPcr,CS=TYP,STRHED,REV$,D1MSTK,GETNUM,STOSUB,
           **              FSTK-7,AVE=D1,RESTD0,NXTDS+,<NXTSTM>,<USING>,
           **              <ERRORX>,<getEOL>
           **
           ** Uses.......
           **  Inclusive: A,B,C,D,R0-R4,D0,D1,P,STMTxx,ST[11:0],FUNCxx,
           **              All RAM EXPEXC is permitted to use
           **
           ** Stk lvls:    7 (GETDID)(STOSUB)
           **
           ** History:
           **
           **    Date     Programmer             Modification
           **  --------   ----------    ---------------------------------
           **  12/20/83      NZ         Packed 3 places to get room for
           **                           bug fix in GETNUM (locations are
           **                           marked with a "+" in col. 29)
           **  12/15/83      NZ         Added documentation
           **  04/01/82      SC         Wrote routine
           **
           ***************************************************************
           ***************************************************************
F1F4E 0000         REL(5) =OUTPd
      0
F1F53 0000         REL(5) =ENTERp
      0
F1F58 8E00 =ENTER  GOSUBL =GETDID       Get Device specifier
      00
F1F5E 431          GOC    ENTREX        Error...P,C[0] are error code
           *
           * D0 points to the mailbox, FUNCD0 contains the PC value
```

```
                   *
F1F61 96F                  ?D#0    B            Is the address non-zero?
F1F64 D2                   GOYES   GETD10       Yes...valid address
F1F66 2F                   P=      15           No...check for LOOP (not NULL)
F1F68 300                  LC(1)   =DsLoop
F1F6B 943                  ?C=D    S            Is this "LOOP"?
F1F6E 02                   GOYES   GETD09       Yes...accept it
F1F70 20                   P=      =eDSPEC      No...must be "NULL"
F1F72 8C00 ENTREX          GOLONG  =ERRORX      Error exit for P, C[0]=error code
      00
                   *_
                   *_
F1F78 49F   RTNCHK         GOC     ENTREX       If carry, detected an error
                   *
                   * Delete the buffer (if any) created by SAVEIT before finishing
                   *
F1F7B 7342  ENTdel         GOSUB   DEVADR       Set D1 to the device specifier
F1F7F AF2                  C=0     W            Replace it with zero (no device)
F1F82 8E00                 GOSUBL  =SAVEIT      SAVEIT deletes any old buffer
      00
F1F88 8C00  ENTRTN         GOLONG  =nXTSTM      Finished!
      00
                   *_
                   *_
F1F8E AC2   GETD09         C=0     S            This is LOOP...don't make a buffer
F1F91 7D22  GETD10         GOSUB   DEVADR       Set (MTHSTK) = (FORSTK) - 7
F1F95 8E00                 GOSUBL  =SAVEIT      Save device specifier on MTHSTK
      00
F1F9B 8E00                 GOSUBL  =TRESDO      Restore PC (saved by GETDID)
      00
F1FA1 161                  D0=D0+  2            Skip the t@ used to terminate spec
F1FA4 14A                  A=DAT0  B
F1FA7 3100                 LC(2)   =tUSING
F1FAB 966                  ?A#C    B            Is this ENTER ... USING?
F1FAE 51                   GOYES   ENT120       No...continue with ENTER
F1FB0 1F00                 D1=(5)  =MLFFLG      Yes...zero MLFFLG, device to prevent
      000
F1FB7 D2                   C=0     A            .CKINFO from doing anything bad when
F1FB9 14D                  DAT1=C  B            .USING calls it
F1FBC 8D00                 GOVLNG  =USING
      000
                   *_
                   *_
F1FC3 8F00  ENT120         GOSBVL  =CHKEOL      Are there any variables specified?
      000
F1FCA 460                  GOC     ENT130       Yes...read and store
                   *
                   * ENTER statement has no destination variable:
                   * just skip to end of line and return.
                   *
F1FCD 6517                 GOTO    getEOL
                   *_
                   *_
F1FD1 7C52  ENT130         GOSUB   NXTDST       Set up next destination and loop
F1FD5 55A                  GONC    ENTdel       Reached end of line...done
```

```
F1FD8 7803 ENT150  GOSUB  RED-LF        Read until <Lf>
F1FDC 580          GONC   ENT155        Good read...continue
F1FDF 8C8F         GOLONG REDCer        Error during read...exit with error
      80
                *-
                *-
F1FE5 845  ENT155  ST=0   KorH          This is not USING format "K" or "H"
F1FE8 844  ENT160  ST=0   MltItm        Not multiple items per data line
F1FEB 94C          ?A#0   S             Is flag -23 set?
F1FEE B0           GOYES  ENT180        Yes...keep all characters
                *
F1FF0 873          ?ST=1  Endfrm        Was the last byte an END frame?
F1FF3 60           GOYES  ENT180        If so, don't strip off <CR>
                *
F1FF5 7F36         GOSUB  STRPcr        Strip off trailing <cr> if present
                *
F1FF9 78F1 ENT180  GOSUB  CS=TYP        Returns carry set if numeric type
F1FFD 4A4          GOC    ENT220        Numeric variable...process it
                *
                * Destination is a string variable: make sure not to exceed the
                * maximum string length.
                *
F2000 864          ?ST=0  MltItm        Has another item been processed?
F2003 C1           GOYES  ENT190        No...continue
                *
                * A numeric item has been processed already (strings use up the
                * entire line which has been read).  Processing a numeric item
                * reverses the string on the stack, so we have to reverse it
                * again to get back to original order.
                *
F2005 7046         GOSUB  strhed        Put a header on to reverse the data
F2009 8E00         GOSUBL =rEV$         Reverse the string
      00
F200F 17F          D1=D1+ 16            Skip the header (16 nibbles)
F2012 137          CD1EX                Save D1 in C[A]
F2015 79A1         GOSUB  DEVADR        Set AVMEME back to FORSTK - 7
F2019 135          D1=C                 Restore D1
F201C 171          D1=D1+ 2             Skip the <Cr> that GETNUM added
                *
                * D1 points to the end of the string (lowest address)
                *
F201F 133  ENT190  AD1EX                Save D1 in A[A]
F2022 7A26         GOSUB  D1mstk        Set D1 to AVMEME (=MTHSTK)
F2026 D6           C=A    A             Copy old D1 value to C[A]
F2028 133          AD1EX                Restore D1, set A[A] to AVMEME
F202B EE           C=A-C  A             C[A] is number of nibbles on stack
F202D 7164         GOSUB  A=SLEN        Recall maximum string length
F2031 C4           A=A+A  A             A[A] is the max length in nibbles
F2033 E2           C=C-A  A             Check if the data will fit in string
F2035 4A0          GOC    ENT200        Yes...do the assignment
F2038 133          AD1EX                No...throw away the excess chars
F203B CA           A=A+C  A             (C[A] is the number of extra nibs)
F203D 133          AD1EX
F2040 7506 ENT200  GOSUB  strhed        Put a string header on the data
F2044 6410         GOTO   ENT300        Go do the string assignment
```

```
                *-
                *-
                *
                * Destination is a numeric variable: try to get a number out of
                * the data
                *
F2048 7660 ENT220  GOSUB  GETNUM       Get a number, if possible
F204C 4B8          GOC    ENT150       No number, MltItm; read another line
F204F AF4  ENT250  A=B    W
F2052 1CF          D1=D1- 16
F2055 1517         DAT1=A W            Push number value onto the stack
F2059 865  ENT300  ?ST=0  KorH         Is this ENTER ... USING "K" or "H"?
F205C 60           GOYES  ENT302       No...store and loop back
F205E 6B01         GOTO   STOSUB       Yes...store and return to caller
                *-
                *-
F2062 7401 ENT302  GOSUB  STOSUB       Store the number
F2066 76E5         GOSUB  D1mstk       Set D1 to (MTHSTK)
F206A 7271         GOSUB  FSTK-7       Set D0 to (FORSTK) - 7
F206E 136          CD0EX               C[A] is (FORSTK) - 7
F2071 133          AD1EX               A[A] is (MTHSTK)
F2074 8E00         GOSUBL =RESTD0      Restore D0 from STMTD0
      00
F207A 8BE          ?A>=C  A            Any data left in line?
F207D 51           GOYES  ENT305       No...get next dest, read a line
                *
                * If there is exactly one character left on the stack, it must
                * be the <Cr> GETNUM added to the string.
                *
F207F CE           C=C-1  A
F2081 CE           C=C-1  A            Back up 2 nibbles
F2083 8B2          ?A<C   A            Any data left?
F2086 01           GOYES  ENT310       Yes...set up next dest, GOTO ENT180
F2088 131          D1=A                No...
F208B 171          D1=D1+ 2            ...set D1 to bottom of stack
F208E 7921         GOSUB  aVE=D1       Set AVMEME to bottom of stack
F2092 6E3F ENT305  GOTO   ENT130       Get next destination, read line
                *-
                *-
F2096 7791 ENT310  GOSUB  NXTDST       Get next destination variable
F209A 460          GOC    ENT320       Got another destination...continue
F209D 6DDE         GOTO   ENTdel       No more variables...exit
                *-
                *-
F20A1 7D11 ENT320  GOSUB  DEVADR       Set AVMEME to (FORSTK) - 7
F20A5 135          D1=C                Set D1 @ top of stack (from NXTDST)
F20A8 854          ST=1   MltItm       Set Multi-Item flag
F20AB 845          ST=0   KorH         Not ENTER ... USING "K" or "H"
F20AE 6A4F         GOTO   ENT180       Continue processing line
```

```
                         STITLE Convert string into a number
              ****************************************************************
              ****************************************************************
              **
              ** Name:        GETNUM - Convert data on stack into a number
              **
              ** Category:    LOCAL
              **
              ** Purpose:
              **      Skip over any non-digit chars and convert the ASCII
              **      digits into a floating number
              **
              ** Entry:
              **      P=0
              **      HEXMODE
              **      D1 points to the lowest-addressed character of the data
              **      ST[MltItm]=1:
              **        D1 points to first character of the string
              **      ST[MltItm]=0:
              **        D1 points to last character of the string
              **
              ** Exit:
              **      Carry clear:
              **        B[W] is the floating number value
              **      Carry set:
              **        No digit found and ST[MltItm]=1
              **
              ** Calls:       STRHED,REV$,AVE=D1,RANGEN,NUMSCN,TSAVD1,BLDCON,
              **                   NRMCON,TRESD1
              **
              ** Uses.......
              **  Inclusive: A,B,C,D,R0,R2,D0,D1,P,FUNCD1,ST[6,3,2,1]
              **
              ** Stk lvls:    2 (NUMSCN)(STRHED)(REV$)(TSAVD1)(TRESD1)
              **
              ** History:
              **
              **    Date     Programmer              Modification
              **  --------   ----------     --------------------------------
              **  12/20/83       NZ         Packed, installed bug fix for
              **                            SR #0039-01070(2).  This is the
              **                            bug where ENTER of an underflow
              **                            or an overflow will destroy some
              **                            user flags and traps.  This bug
              **                            exists in version HPIL:1A.
              **  12/15/83       NZ         Updated documentation
              **  03/02/83       SC         Wrote routine
              **
              ****************************************************************
              ****************************************************************
 F20B2 31D0 GETNUM  LCHEX  0D             Add a <Cr> as the last digit...
 F20B6 1C1          D1=D1- 2              (if MltItm is set, it will be the
 F20B9 14D          DAT1=C 8              first digit, but will be skipped)
            *
 F20BC 7985         GOSUB  strhed         Put a string header on data
```

```
                  *
                  * If not the first number of the input string, don't reverse
                  * the string - it already has been reversed the first time thru
                  *
F20C0 874                 ?ST=1  MltItm         Is this the first time through?
F20C3 80                  GOYES  GETN10         No...leave it alone (already done)
F20C5 8E00                GOSUBL =rEV$          Yes...reverse the string
      00
F20CB 171         GETN10  D1=D1+ 2              Skip the first byte of header
F20CE AF2                 C=0    W
F20D1 147                 C=DAT1 A              Read string length in nibbles
F20D4 81E                 CSRB                  C[A] is string length in bytes
F20D7 D5                  B=C    A              B[A] is number of bytes on stack
F20D9 17D                 D1=D1+ 14             Position to first character
F20DC 846                 ST=0   Sign           Initialize the sign
F20DF CD          GETN20  B=B-1  A              Check if string exhausted yet
F20E1 521                 GONC   GETN40         No...check the character
                  *
                  * No digits found in the string.
                  * If ST[MltItm]=0, just return zero.
                  * If ST[MltItm]=1, pop the stack and return with carry set
                  *
F20E4 864                 ?ST=0  MltItm         First number in string?
F20E7 80                  GOYES  GETN30         Yes...return zero
F20E9 7EC0                GOSUB  aVE=D1         No...pop stack, set carry to
F20ED 02                  RTNSC                 indicate need to read more data
                  *_
                  *_
F20EF AF1         GETN30  B=0    W              Set up a  floating number zero
F20F2 03                  RTNCC                 Return, all OK
                  *_
                  *_
F20F4 14B         GETN40  A=DAT1 B              Read the next character
F20F7 8E00                GOSUBL =RANGEN        Is it in [0,9]?
      00
F20FD 502                 GONC   GETN60         Yes...continue
F2100 31E2                LCASC  \.\            No
F2104 962                 ?A=C   B              Is is a decimal point?
F2107 71                  GOYES  GETN60         Yes...consider it a digit
F2109 856                 ST=1   Sign           No...set sign initially negative
F210C 31D2                LCASC  \-\
F2110 962                 ?A=C   B              Is it a minus sign?
F2113 50                  GOYES  GETN50         Yes...leave sign negative
F2115 846                 ST=0   Sign           No...set sign back to positive
F2118 171         GETN50  D1=D1+ 2              Position to next character
F211B 53C                 GONC   GETN20         Go always
                  *_
                  *_
F211E AF1         GETN60  B=0    W              Initialize the number
F2121 841                 ST=0   1              Clear these two statuses for
F2124 842                 ST=0   2                NUMSCN (if not zero, then error)
F2127 118                 C=R0                  Save R0 value...
F212A 10A                 R2=C                  ...in R2
F212D 8F00                GOSBVL =NUMSCN        Scan the string for a number
      000
```

```
 417 F2134 04              SETHEX               (NUMSCN leaves DEC mode)
 418 F2136 8E00            GOSUBL =TSAVD1       Save D1 to save from BLDCON/NRMCON
           00
 419 F213C 8F00            GOSBVL =BLDCON       Convert NUMSCN output to tokenized
           000
 420 F2143 8F00            GOSBVL =NRMCON       Convert tokenized to floating num
           000
 421 F214A 8E00            GOSUBL =TRESD1       Restore D1 from FUNCD1
           00
 422 F2150 11A             C=R2                 Restore R0 from R2
 423 F2153 108             R0=C
 424 F2156 AF8             B=A    W             [S] is garbage here
 425 F2159 AC1             B=0    S             Set the sign positive initially
 426 F215C 866             ?ST=0  Sign          Is the sign positive?
 427 F215F 90              GOYES  GETN80        Yes...done
 428 F2161 05              SETDEC               No...
 429 F2163 A4D             B=B-1  S             Set sign negative
 430 F2166 04              SETHEX
 431 F2168 03      GETN80  RTNCC                Return, got a good string
```

```
                        STITLE Store item into variable
               ****************************************************************
               ****************************************************************
               **
               ** Name:        STOSUB - Subroutine to store into a variable
               **
               ** Category:    LOCAL
               **
               ** Purpose:
               **      Assign the value on the stack to the variable location
               **      indicated by Statement scratch RAM
               **
               ** Entry:
               **      P=0
               **      STMTR0 and STMTR1 set up as by DEST
               **      D1 points to top of stack
               **      R0[A] is the saved D1 value
               **
               ** Exit:
               **      P=0
               **      The item has been popped off the stack
               **      AVMEME is updated to new top of stack
               **      D1 restored from R0[A]
               **
               ** Calls:       AVE=D1,CSLC5,CSRC5,STORE,D1MSTK,POPMTH,<ENTST3>
               **
               ** Uses.......
               **  Inclusive: A,B,C,D,R0[15:5],R1,R2,R3[15:5],R4,D0,D1,P,
               **             RESREG,ST[11:8,5,3,0]
               **
               ** Stk lvls:    6 (STORE)
               **
               ** History:
               **
               **    Date      Programmer               Modification
               **  --------    ----------    -----------------------------------
               **  12/02/83       NZ         Added documentation
               **  04/01/82       SC         Wrote routine
               **
               ****************************************************************
               ****************************************************************
F216A 7D40     STOSUB  GOSUB  aVE=D1          Set stack pointer to D1 value
               *
               * Need to save R0[A] and R3[A] from STORE...use R4[14:10] for
               * R3[A], R4[9:5] for R0[A]
               *
F216E 110              A=R0
F2171 11B              C=R3
F2174 8E00             GOSUBL =CSLC5          R3[A] now in C[9:5]
      00
F217A D6               C=A    A
F217C 8E00             GOSUBL =CSLC5          R0[A] in C[9:5], R3[A] in C[14:10]
      00
F2182 10C              R4=C                   Put it all in R4
F2185 1537             A=DAT1 W               Recall the value from the stack
```

```
F2189 8F00         GOSBVL =STORE        Store it
      000
                *
                * Now restore R0[A] and R3[A] from R4
                *
F2190 11C          C=R4
F2193 8E00         GOSUBL =CSRC5
      00
F2199 108          R0=C
F219C 8E00         GOSUBL =CSRC5
      00
F21A2 10B          R3=C
                *
                * R0 and R3 are now restored...pop the item off the stack
                *
F21A5 77A4 popstk  GOSUB  D1mstk        First set D1 to top of stack
F21A9 8F00         GOSBVL =POPMTH       Pop the item
      000
F21B0 7700         GOSUB  aVE=D1        Set AVMEME to new top of stack
F21B4 AF4          A=B    W             Copy B to A for popstk entry
F21B7 6717         GOTO   ENTST3        Finish it up
                *-
                *-
F21BB 8D00 =aVE=D1 GOVLNG =AVE=D1
      000
```

```
                        STITLE Utility routines
            *****************************************************************
            *****************************************************************
            **
            ** Name:        DEVADR - Collapse MTHSTK, D1 to FORSTK - 7
            **
            ** Category:    LOCAL
            **
            ** Purpose:
            **      Collapse MTHSTK to FORSTK - 7, leave D1 at (MTHSTK)
            **
            ** Entry:
            **      None
            **
            ** Exit:
            **      Carry clear
            **      MTHSTK at (FORSTK) - 7
            **      D1 at (MTHSTK)
            **
            ** Calls:       None
            **
            ** Uses.......
            **  Inclusive: A[A],D1
            **
            ** Stk lvls:    0
            **
            ** History:
            **
            **    Date      Programmer             Modification
            **  --------    ----------    ---------------------------------
            **  12/15/83       NZ         Added documentation
            **  04/01/82       SC         Wrote routine
            **
            *****************************************************************
            *****************************************************************
F21C2 1F00 DEVADR  D1=(5) =FORSTK
      000
F21C9 143          A=DAT1 A             A[A] is FORSTK pointer
F21CC 1C4          D1=D1- 5             D1 points to MTHSTK
            *
            * SET (MTHSTK) = (FORSTK) - 7
            *
F21CF 133          AD1EX                D1 is now (FORSTK)
F21D2 1C6          D1=D1- 7             D1 is (FORSTK) - 7
F21D5 133          AD1EX                A[A] is (FORSTK)-7, D1 is MTHSTK
F21D8 141          DAT1=A A             Write out (FORSTK)-7 to MTHSTK
F21DB 133          AD1EX                D1 is (FORSTK)-7
F21DE 03           RTNCC
            *****************************************************************
            *****************************************************************
            **
            ** Name:        FSTK-7 - Set D0 to (FORSTK) - 7 and read 5 nibs
            **
            ** Category:    LOCAL
            **
```

```
                 ** Purpose:
                 **      Set D0 to (FORSTK) - 7
                 **
                 ** Entry:
                 **      None
                 **
                 ** Exit:
                 **      D0 points to (FORSTK) - 7
                 **      C[A] is the data at D0
                 **      Carry clear
                 **
                 ** Calls:      None
                 **
                 ** Uses.......
                 **  Inclusive: C[A],D0
                 **
                 ** Stk lvls:   0
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **  --------   ----------    --------------------------------
                 **  12/15/83      NZ         Added documentation
                 **  04/01/82      SC         Wrote routine
                 **
                 *************************************************************
                 *************************************************************
F21E0 1800 FSTK-7  D0=(5) =FORSTK
      000
F21E7 146          C=DAT0 A
F21EA 134          D0=C
F21ED 186          D0=D0- 7               D0 is at (FORSTK)-7
F21F0 146          C=DAT0 A               C[A] is (D0)
F21F3 01           RTN                    Carry is clear from D0=D0-7 above
                 *************************************************************
                 *************************************************************
                 **
                 ** Name:       CS=TYP - Check if the destination is numeric
                 **
                 ** Category:   LOCAL
                 **
                 ** Purpose:
                 **      Check if the destination variable is of type numeric
                 **      or not
                 **
                 ** Entry:
                 **      S-R0-3 contains the variable type
                 **
                 ** Exit:
                 **      Carry set if numeric, else clear
                 **
                 ** Calls:      None
                 **
                 ** Uses.......
                 **  Inclusive: C[S],C[A]
```

```
                **
                ** Stk lvls:   0
                **
                ** History:
                **
                **   Date      Programmer               Modification
                ** --------    ----------    ----------------------------------
                **  12/15/83      NZ         Added documentation
                **  04/01/82      SC         Wrote routine
                **
                *************************************************************
                *************************************************************
F21F5 136       CS=TYP  CDOEX                Save DO in C[A]
F21F8 1B00              DO=(5) =S-R0-3
      000
F21FF 1564              C=DATO S
F2203 136               CDOEX                Restore DO from C[A]
F2206 A4E               C=C-1  S
F2209 400               RTNC                 C[S] was 0
F220C A4E               C=C-1  S
F220F 400               RTNC                 C[S] was 1
F2212 A4E               C=C-1  S
F2215 01                RTN                  C[S] was 2 if carry set, else >2
                *************************************************************
                *************************************************************
                **
                ** Name:        AS=FTY - Read and clear image type flag (CHN#SV)
                **
                ** Category:    LOCAL
                **
                ** Purpose:
                **      Read contents of CHN#SV into A[S] and clear CHN#SV
                **
                ** Entry:
                **      None
                **
                ** Exit:
                **      Carry unchanged from entry
                **      A[S] is the old contents of CHN#SV
                **
                ** Calls:       None
                **
                ** Uses.......
                **  Inclusive: A[S],C[S]
                **
                ** Stk lvls:   0
                **
                ** History:
                **
                **   Date      Programmer               Modification
                ** --------    ----------    ----------------------------------
                **  12/15/83      NZ         Added documentation
                **  04/01/82      SC         Wrote routine
                **
                *************************************************************
```

```
 667              ****************************************************************
 668 F2217 1B00 AS=FTY  D0=(5) =CHNNSV
       000
 669 F221E 1524         A=DAT0 S              Read the old value into A[S]
 670 F2222 AC2          C=0    S
 671 F2225 1544         DAT0=C S              Clear CHNNSV (write a zero)
 672 F2229 01           RTN                   Return, carry unchanged
```

```
                             STITLE Get next dest. variable
                      ****************************************************************
                      ****************************************************************
                      **
                      ** Name:         NXTDST - Get the next destination variable
                      **
                      ** Purpose:
                      **      Get next variable from variable list.
                      **      The variable will be created if not yet exist.
                      **
                      ** Entry:
                      **      D0 is the PC
                      **      P=0
                      **
                      ** Exit:
                      **      D0 is the PC
                      **      Carry clear:
                      **        Reached end of variable list
                      **      Carry set:
                      **        Variable on top of stack
                      **        C,D1 point to top of stack (variable has been popped)
                      **        AVMEME=D1
                      **        S2=1 if string variable
                      **          (S-R1-1[3:0]=Maximum string length)
                      **
                      **      Error exit if the variable is an array or complex number
                      **      Error exit if insufficient memory to create new variable
                      **      Error exit if encounter any error on the loop
                      **
                      ** Calls:       RESTD0,CHKEOL,MFLG=0,EXPEXC,NXTVA-,DIMST+,STKVCT,
                      **              D1MSTK,POPMTH,AVE=D1,D1FSTK,CHKASN,START
                      **
                      ** Uses:
                      **  Inclusive: A,B,C,D,R0-R4,D0,D1,STMTD0,STMTR0,STMTR1,FUNCxx,
                      **              ST[11:0],all RAM EXPEXC is permitted to use
                      **
                      ** Stk Lvls:    5 (EXPEXC)
                      **
                      ** History:
                      **
                      **   Date     Programmer               Modification
                      **  --------  ----------    --------------------------------
                      **  12/16/83     NZ         Updated documentation
                      **               SC         Wrote routine
                      **
                      ****************************************************************
                      ****************************************************************
    F222B 0                  CON(1) =FIXSPC       6 nibbles available here
    F222C                    BSS    6-1
                      *_
                      *_
    F2231 8F00        =NXTDST GOSBVL =CHKEOL      Check if EOL yet
          000
    F2238 500                RTNNC                Yes...return with carry clear
                      *
```

```
F223B 161           D0=D0+ 2
F223E 7D80          GOSUB  Mflg=0        Clear MLFFLG so can tell if UDF used
F2242 8E00          GOSUBL =eXPEXC       Evaluate the variable
      00
F2248 8F00 NXTDS-   GOSBVL =NXTVA-       Create it, if needed, and set it up
      000
F224F 8F00          GOSBVL =D1MST+       Set D1 to top of stack,clear ST
      000
F2256 8F00          GOSBVL =STKVCT       Set appropriate status bits
      000
                 *
                 * Do not allow an array or a complex number as the destination
                 *
F225D 873           ?ST=1  Cmplex        Is it complex?
F2260 70            GOYES  BADTYP        Yes...Type error
F2262 861           ?ST=0  Array         Is it array?
F2265 91            GOYES  NXTD10        No...continue
F2267 8D00 BADTYP   GOVLNG =RDATTY       Yes...Data Type error
      000
                 *-
                 *-
F226E 0             CON(1) =FIXSPC       16 nibbles available here
F226F               BSS    16-1
                 *-
                 *-
F227E 7EC3 NXTD10   GOSUB  D1mstk        Reset D1 to top of stack
F2282 8F00          GOSBVL =POPMTH       Pop off the variable value
      000
F2289 7E2F          GOSUB  aVE=D1        Set AVMEME=D1
F228D 7856          GOSUB  D1fstk        Set D1 to (FORSTK)
F2291 1C6           D1=D1- 7             Move to (FORSTK)-7 (Device addr)
F2294 15F6          C=DAT1 7             Read device address & info
F2298 1B00          D0=(5) =MLFFLG       Check if a UDF has been called
      000
F229F 14A           A=DAT0 B
F22A2 908           ?A=0   P             User-defined function?
F22A5 E1            GOYES  NXTD20        No...continue
F22A7 32FF          LCHEX  FFF           Yes...set device address to search
      F
F22AC 8E00          GOSUBL =CHKASN       Figure out how to find the device
      00
F22B2 D7            D=C    A
F22B4 8E00          GOSUBL =START        Find the device
      00
F22BA 407           GOC    ENTRex        Error setting up the device address
F22BD DB            C=D    A
F22BF 1553          DAT1=C X             Write out the (new) device address
                 *
F22C3 7983 NXTD20   GOSUB  D1mstk        Position back to top of stack
F22C7 137           CD1EX                Set C[A]=D1 = top of stack
F22CA 135           D1=C
F22CD 02            RTNSC                Return with carry set...good var
                 *-
                 *-
F22CF 8F00 Mflg=0   GOSBVL =SVTRC        Save pointer for TRACE
```

```
             000
    772 F22D6 8D00          GOVLNG =MFLG=0        Clear multi-UDF flag
             000
```

```
                STITLE Read characters from loop
**************************************************************
**************************************************************
**
** Name:        RED-LF - Read characters from the loop until <Lf>
** Name:        SKP-LF - Read & discard characters from the loop
** Name:        REDC00 - Read characters from the loop until <Lf>
** Name:        REDCHR - Read characters from the loop
** Name:        RDST01 - Read characters from the loop to stack
**
** Category:    LOCAL
**
** Purpose:
**      Read data from the loop onto the stack
**
** Entry:
**      REDCHR,REDC00,RED-LF,SKP-LF only:
**        The 7 nibble device specifier is stored on the bottom
**          (highest address) of the math stack.
**      RDST01 only:
**        R1[6:0] is the 7-nibble device specifier
**
**      (All entries)
**
**      P=0,HEXMODE
**      D1 points to current top of math stack. Data read will
**        be stored on top of stack (last character placed at
**        lowest address)
**
**      Available memory on stack will be checked.
**
**      S5 (BytCnt):
**           1:Read a specified number of characters
**               A[A] is the number of characters to read
**           0:Terminate by END frame or terminating char match
**               A[B] is the terminating character
**
**      S6 (Trash):
**           1:Ignore the data which is read
**           0:Save the data which is read on the stack
**
**      S7 (ChrTrp):
**           1:Detect a special character in incoming data
**               B[B] is the character to be detected
**               If B[3:2]=00, ignore the character;
**               otherwise replace the character with B[3:2]
**           0:No special character processing
**
**      If system flag -23 is set:
**        Terminate by ETO, terminating character is ignored
**
**        If S5 (BytCnt)=0, S6 (Trash)=0, and S-R0-3[0]>2 (the
**          destination is a string), then S-R1-1[3:0] and R3[A]
**          are the maximum number of chars to read before
**          interrupting the conversation with an NRD.
```

```
                  **          R3[S] must not be "F".
                  **          (R3 is for HPIL:1A only, S-R1-1 for all others)
                  **
                  **         If S5 (BytCnt)=1 or S6 (Trash)=1, then flag -23 has
                  **           no effect other than to terminate on an ETO instead
                  **           of the terminator character.
                  **
                  **         If { S5 (BytCnt)=0 and S-R0-3[0]<=2 (not string dest) }
                  **           OR { device mode (not controller) },
                  **           then flag -23 has no effect (it is ignored).
                  **
                  **
                  ** Exit:
                  **       HEX mode.
                  **       XM=0.
                  **       Carry clear:
                  **         D1 points to the last character read
                  **         Number of chars read=(FORSTK)-D1
                  **         S4 (Memerr)=0
                  **         A[S] contains the state of flag -23 (A[S]=0:flag clear)
                  **       Carry set:
                  **         S4 (Memerr)=1: Insufficient memory (Need to load eMEM)
                  **         S4 (Memerr)=0: P,C[0] is the error code
                  **
                  ** Calls:       FSTK-7,SFLAG?,STGART,CHKSTK,GETDev,CLMODE,CS=TYP,
                  **              PUTC,SETTRM,PUTEFC,YTML,PUTE,GETX,FRAME-,CLMOUT
                  **
                  ** Uses:
                  **  Inclusive: A,B[15:14,A],C,D[15:13,5:0],R1,R2,D0,D1,P,ST[7:0]
                  **
                  ** Stk lvls:   4 (START)
                  **
                  ** History:
                  **
                  **    Date      Programmer              Modification
                  **  --------    ----------    ---------------------------------
                  **  01/09/83        NZ        Rewrote character read loop to
                  **                            be faster and shorter
                  **  12/19/83        NZ        Updated documentation
                  **                  SC        Wrote routine
                  **
                  *************************************************************
                  *************************************************************
    F22D0 856     SKP-LF  ST=1    Trash         Read and trash data until <Lf>
    F22E0 6600            GOTO    REDC00
                  *_
                  *_
    F22E4 846     RED-LF  ST=0    Trash         Keep all data that is read
    F22E7 845     REDC00  ST=0    BytCnt        Read and save until <Lf>
    F22EA 847             ST=0    ChrTrp        Don't do special char matching
    F22ED 1B00            D0=(5) =TERCHR
          000
    F22F4 14A             A=DAT0 B              Read the terminator char (<Lf>?)
    F22F7 119     =REDCHR C=R1                  (Preserve the upper nibs of R1)
    F22FA 72EE            GOSUB   FSTK-7        Get device address from stack...
```

```
F22FE 109            R1=C                   ...and save it in R1
F2301 AC0   RDST01   A=0     S              Clear flag -23 indicator nibble
F2304 102            R2=A                   Save character count in R2[A]
            *
            * Save system flag(-23) in R2[S]
            *
F2307 3100           LC(2)   =f1EOT
F230B 8E00           GOSUBL  =sFLAG?        Check if flag -23 is set
      00
F2311 5B0            GONC    RDST05         Not set...leave R2[S]=0
F2314 112            A=R2                   Flag -23 is set...set R2[S]
F2317 B44            A=A+1   S
F231A 102            R2=A                   Save back in R2
F231D 119   RDST05   C=R1                   Recall device address from R1
F2320 D7             D=C     A
F2322 8E00           GOSUBL  =START         Set up the mailbox, D0
      00
F2328 560            GONC    RDST10         No error...continue
F232B 664C  ENTRex   GOTO    ENTREX         Error...exit
            *-
            *-
F232F 73F1  RDST10   GOSUB   CHKSTK         Set R1[A] to # bytes available
F2333 DC             ABEX    A              Swap # bytes to B[A], B[3:0] to A
F2335 122            AR2EX                  Save B[A] in R2, recall R2 to A[S,A]
F2338 7DB5           GOSUB   getdev         Check if in device mode
F233C 462            GOC     RDST15         Yes...continue
F233F 7B81           GOSUB   CLMODE         No...clear all terminate modes
F2343 47E            GOC     ENTRex         (Error)
F2346 948            ?A=0    S              Is flag -23 clear?
F2349 A1             GOYES   RDST15         Yes...continue
F234B 875            ?ST=1   BytCnt         No...is this by count?
F234E 14             GOYES   RDST25         Yes...continue
F2350 876            ?ST=1   Trash          Not by count...keep data?
F2353 83             GOYES   RDST20         No...set count to "FFFFF"
            *
            * Keep data which is read, flag -23 is set, not by count
            *
F2355 7C9E           GOSUB   CS=TYP         Check if numeric destination
F2359 413            GOC     RDST20         Yes...set byte count to "FFFFF"
            *
            * System flag -23 is set, destination is a string variable,
            * read until EOT received or the string is full.
            *
F235C 7231           GOSUB   A=SLEN         Set A[A] to maximum string length
            *                               Use the max string length as count
F2360 855            ST=1    BytCnt         (Go to counting mode)
            *
F2363 875   RDST15   ?ST=1   BytCnt         Is this a read by count?
F2366 92             GOYES   RDST25         Yes...set it up
            *
            * Terminate by character matching; always terminate by an END
            * frame.  Flag -23 should be ignored for this case.
            *
F2368 AC0            A=0     S              Clear flag -23 indicator nibble
F236B 811            BSLC
```

```
F236E 811            BSLC
F2371 AE8            B=A    B              Save the terminator char in B[15:14]
F2374 815            BSRC
F2377 815            BSRC
F237A 3300           LC(4)  (=mSETTM)+12   Set mode to terminate by END frame
      00
F2380 7C51           GOSUB  putc
F2384 46A            GOC    ENTRex         Error
F2387 7181           GOSUB  SETTRM         Set terminate by character match
F238B D0     RDST20  A=0    A              Set byte count to "FFFFF"
F238D CC             A=A-1  A
             *
F238F 96B    RDST25  ?D=0   B              Is the device LOOP?
F2392 80             GOYES  RDST30         Yes...leave addressing as it is
             *
             * All non-controller devices will have D[B]=0!
             *
F2394 8E00           GOSUBL =YTML          No...address the device as talker
      00
F239A 8A8    RDST30  ?A=0   A              Is the byte count zero?
F239D E0             GOYES  RDST35         Yes...goto RDST75 (out of range)
F239F D6             C=A    A              No...start conversation
F23A1 8E00           GOSUBL =hCPY5s        Load either SDA or Set frame count
      00
F23A7 7C41           GOSUB  pute           Send data, count=A[A]
             *
             * Start of main data read loop
             *
F23AB 8A8    RDST35  ?A=0   A              Is the count to zero?
F23AE F7             GOYES  RDST75         Yes...exit
F23B0 8E00           GOSUBL =GETX          No...read next message
      00
F23B6 435            GOC    RDST65         Not data...check frame
F23B9 CC     RDST40  A=A-1  A              Decrement count
F23BB 876            ?ST=1  Trash          Is this data to keep?
F23BE E3             GOYES  RDST55         No...process next byte
F23C0 867            ?ST=0  ChrTrp         Is this special char trapping?
F23C3 42             GOYES  RDST50         No...store it
             *
             * Special character processing
             *
F23C5 122            AR2EX                 Save count in R2, get chars
F23C8 966            ?A#C   B              Is this the special character?
F23CB 61             GOYES  RDST45         No...restore A, R2; continue
F23CD 814            ASRC                  Yes...see what to do
F23D0 814            ASRC
F23D3 AE6            C=A    B              Copy the replace char/delete flag
F23D6 810            ASLC
F23D9 810            ASLC
F23DC 96E            ?C#0   B              Test char to set carry if replace
F23DF 20             GOYES  RDST45         Carry SET to replace,CLEAR to delete
F23E1 122    RDST45  AR2EX                 Restore A, R2
F23E4 521            GONC   RDST52         This was delete...ignore it
F23E7 874    RDST50  ?ST=1  Menerr         Has stack collision occurred?
F23EA 21             GOYES  RDST55         Yes...do next char
```

```
F23EC CD             B=B-1  A          No...check if room for this char
F23EE 451            GOC    RDST60     No room...set memerr
F23F1 1C1            D1=D1- 2          Room...decrement stack pointer
F23F4 14D            DAT1=C B          Write out the character
F23F7 BF6   RDST52   CSR    W          Shift to the next character, if any
F23FA F6             CSR    A
F23FC 0D    RDST55   P=P-1             See if any characters left
F23FE 5AB            GONC   RDST40     Yes...process next char
F2401 49A            GOC    RDST35     Go always...get more chars
            *-
            *-
F2404 854   RDST60   ST=1   Memerr
F2407 44F            GOC    RDST55     Go always
            *-
            *-
F240A       RDST65
            *
            * GETX returned in an error condition:
            * If an ETO was received and flag -23 is clear, send SDA again
            * If an ETO was received and flag -23 is set, finished
            * If matched terminating character, finished
            *
F240A 890            ?P=    =eABORT    Is this an abort?
F240D 62             GOYES  RDST80     Yes...exit immediately
F240F 8E00           GOSUBL =FRAME-    No...check the frame
      00
F2415 880            ?P#    =pEOT      Is this an EOT?
F2418 B0             GOYES  RDST70     No...check more
            *
            * EOT received: check if flag -23 is set (to terminate on EOT).
            * If it is not set, send an SDA to continue the conversation.
            *
F241A 94C            ?A#0   S          Is flag -23 set?
F241D 01             GOYES  RDST75     Yes...exit
F241F 6A7F  RDS30.   GOTO   RDST30     No...send SDA again
            *-
            *-
F2423 880   RDST70   ?P#    =pTERM     Is it terminator character match?
F2426 71             GOYES  RDST85     No...unexpected frame
            *
            * Terminating char was detected.
            * If we are in byte count mode, just keep reading until the
            *  byte count reaches zero.
            *
F2428 875            ?ST=1  BytCnt     Is this a read by byte count?
F242B 4F             GOYES  RDS30.     Yes...keep reading
F242D 20    RDST75   P=     0          No...set P=0, exit
F242F 6330           GOTO   RDST90
            *-
            *-
F2433 D3    RDST80   D=0    A          Don't send UNT
F2435 7180           GOSUB  CLMDUT     Try to clean up the mailbox
F2439 20             P=     =eABORT    (Ignore any error from CLMDUT)
F243B 02             RTNSC             Set eABORT, set carry for error
            *-
```

```
                  *-
F243D 80F0 RDST85  CPEX    0          Save P in C[0] (could be C=P 0)
F2441 D5           B=C     A          Save the error code in B for now
F2443 7370         GOSUB   CLMOUT     Clear mode, untalk (if possible)
F2447 D9           C=B     A          Restore the error code from B
F2449 80D0         P=C     0          Recall P value for error
F244D 880          ?P#     =pSTATE    Is the error code in the mailbox?
F2450 90           GOYES   RDST87     No...set generic error
F2452 80D4         P=C     4          Yes...read the error code
F2456 540          GONC    RDST89     Go always
                  *-
                  *-
F2459 20    RDST87 P=      =eUNEXP    Unexpected frame error
F245B 80F0 RDST89  CPEX    0          Put error code into C[0]
F245F 20           P=      =ePIL      Set P to ePIL error code
F2461 02           RTNSC              Set carry to indicate error exit
                  *-
                  *-
                  *
                  * End of main data entry loop
                  *
                  * The following code is to clean up after normal termination
                  *
F2463 7350 RDST90  GOSUB   CLMOUT     Clear mode and send UNT
F2467 400          RTNC               (Error)
F246A 811          BSLC
F246D 811          BSLC               B[B] is the terminator character
F2470 874          ?ST=1   Memerr     Was there a stack collision?
F2473 00           RTNYES             Yes...insufficient memory
F2475 875          ?ST=1   BytCnt     Is this a read by count?
F2478 51           GOYES   RDST95     Yes...don't strip "terminator" char
F247A 876          ?ST=1   Trash      Is this read but through away?
F247D 01           GOYES   RDST95     Yes...don't look at garbage!
F247F 853          ST=1    Endfrm     Assume an END frame first
F2482 14F          C=DAT1  B          Check the last character
F2485 965          ?B#C    B          Is it the terminator character?
F2488 80           GOYES   RDST99     No...keep the last character
F248A 171          D1=D1+  2          Yes...throw away terminator char
F248D 843   RDST95 ST=0    Endfrm     Last frame is not an END frame
F2490 03    RDST99 RTNCC              Clear carry to indicate all OK
```

```
                     STITLE Utility routines
             ****************************************************************
             ****************************************************************
             **
             ** Name:       A=SLEN - Set A[A] to the string length
             **
             ** Category:   LOCAL
             **
             ** Purpose:
             **      Read the string length from S-R1-1 into A[A]
             **
             ** Entry:
             **      None
             **
             ** Exit:
             **      A[A] is string length (a[4]=0)
             **
             ** Calls:      None
             **
             ** Uses.......
             **  Inclusive: A[A]
             **
             ** Stk lvls:   1 (internal push)
             **
             ** History:
             **
             **    Date     Programmer              Modification
             **  --------   ----------   ---------------------------------
             **  01/12/84       NZ       Wrote routine
             **
             ****************************************************************
             ****************************************************************
F2492 06     A=SLEN  RSTK=C              Save C[A] on RSTK
F2494 137            CD1EX               Save D1 in C[A]
F2497 1F00           D1=(5) =S-R1-1
      000
F249E D0             A=0   A             Clear A[4]
F24A0 15B3           A=DAT1 4            Read string length
F24A4 137            CD1EX               Restore D1
F24A7 07             C=RSTK              Restore C[A]
F24A9 01             RTN                 Return (carry unchanged)
             *-
             *-
F24AB 0              CON(1) =FIXSPC      15 nibbles available here
F24AC                BSS    15-1
             ****************************************************************
             ****************************************************************
             **
             ** Name:       CLMDUT - Clear terminator modes, send UNT
             ** Name:       CLMODE - Clear terminator modes
             **
             ** Category:   LOCAL
             **
             ** Purpose:
             **      Clean up any special terminator modes set up by ENTER,
                  **       set up default modes:
                  **         Controller: No terminator modes enabled
                  **         Device: Terminate on <Lf> or END frame
                  **
                  ** Entry:
                  **       D0 points to the mailbox
                  **       Bit 2 (=Device) of LOOPST indicates whether device or
                  **         controller
                  **
                  ** Exit:
                  **       Carry clear:
                  **         P=0
                  **       Carry set:
                  **         Error (P, C[0] are the error code)
                  **
                  ** Calls:      GETDev,UNT,PUTC
                  **
                  ** Uses.......
                  **  Inclusive: C[W],P,ST[3:0]
                  **
                  ** Stk lvls:   1 (GETDev:-1 level saved in C[A])(UNT)(PUTC)
                  **
                  ** History:
                  **
                  **     Date     Programmer             Modification
                  **   --------   ----------     --------------------------------
                  **   12/19/83       NZ         Added documentation
                  **   04/01/82       SC         Wrote routine
                  **
                  *************************************************************
                  *************************************************************
     F24BA 07     CLMOUT  C=RSTK                 Save 1 RSTK level used by GETDev
     F24BC 7934           GOSUB  getdev          Check if we are in device mode
     F24C0 06             RSTK=C                 Restore the RSTK level
     F24C2 4A3            GOC    TER/LF          If in device mode, set frame count=0
                  *
                  * Controller
                  *
     F24C5 968            ?D=0   B               Is the device LOOP?
     F24C8 60             GOYES  CLMODE          Yes...don't send an UNT
     F24CA 7810           GOSUB  UNT             No...send an UNT
     F24CE 20     =CLMODE P=     0
     F24D0 3300           LC(4)  =mSETTM         Clear terminate on character match
           00
     F24D6 7600           GOSUB  putc
     F24DA 3300           LC(4)  (=mSETTM)+8     Clear terminate on END frame
           00
     F24E0 8C00   putc    GOLONG =PUTC
           00
                  *-
                  *-
     F24E6 20     =UNT    P=     0               Send the UNT frame
     F24E8 3300           LC(4)  =mUNT
           00
     F24EE 61FF           GOTO   putc
```

```
                  *-
                  *-
                  *
                  * C[A] is the frame count
                  *
F24F2 25          putefc  P=      5
F24F4 300                 LC(1)   =mSFC@5         Load "SET FRAME COUNT" opcode
F24F7 8C00        pute    GOLONG  =PUTE
      00
                  ****************************************************************
                  ****************************************************************
                  **
                  ** Name:        TER/LF - Set up to terminate conversation on <Lf>
                  ** Name:        SETTRM - Set up to terminate on character in A[B]
                  **
                  ** Category:    LOCAL
                  **
                  ** Purpose:
                  **      Enable terminate on character match mode, with the
                  **      character to match set to <Lf>
                  **
                  ** Entry:
                  **      D0 points to the mailbox
                  **      SETTRM only: A[B] is the terminating character
                  **
                  ** Exit:
                  **      Carry clear:
                  **        P=0, frame count is zero, terminate on <Lf>
                  **      Carry set:
                  **        P, C[0] are the error code
                  **
                  ** Calls:       PUTEFC,PUTC
                  **
                  ** Uses:
                  **  Inclusive: A[A],C[A],P,ST[3:0]  (A[A] only for TER/LF)
                  **
                  ** Stk lvls: 1 (PUTEFC)(PUTC)
                  **
                  ** History:
                  **
                  **    Date     Programmer             Modification
                  **  --------   ----------    ---------------------------------
                  **  12/19/83       NZ        Updated documentation
                  **                 SC        Wrote routine
                  **
                  ****************************************************************
                  ****************************************************************
F24FD D2          =TER/LF C=0     A               Set frame count to zero
F24FF 7FEF                GOSUB   putefc
F2503 400                 RTNC
F2506 31A0                LCHEX   0A              Set up for <Lf> terminator
F250A DA                  A=C     A
F250C 3300        SETTRM  LC(4)   (=mSETTM)+1     Enable terminator character match
      00
F2512 7ACF                GOSUB   putc
```

```
   1238 F2516 400          RTNC
   1239 F2519 3300         LC(4)  =nSETTC
              00
   1240 F251F AE6          C=A    B            Set terminator character to A[B]
   1241 F2522 6DBF         GOTO   putc
```

```
                         STITLE Check # bytes mem available
                   ***************************************************************
                   ***************************************************************
                   **
                   ** Name:        CHKSTK - Check how many bytes available on stack
                   **
                   ** Category:    LOCAL
                   **
                   ** Purpose:
                   **      Check if the math stack has at least 16 bytes available
                   **      and return the actual number of bytes available
                   **
                   ** Entry:
                   **      D1 points to the top of the math stack
                   **      S6 (Trash)=0: Do the computation
                   **      S6 (Trash)=1: Don't bother with computation...don't care
                   **
                   ** Exit:
                   **      Carry clear:
                   **        OK (enough room for at least 16 bytes)
                   **        R1[A] is number of bytes past 16 that are available
                   **        S4 (Memerr)=0
                   **      Carry set:
                   **        S4 (Memerr)=1
                   **
                   ** Calls:       D1=AVS
                   **
                   ** Uses:
                   **  Inclusive: A[W],C[W],R1[A],ST[4]
                   **
                   ** Stk Lvls:    1 (D1=AVS)
                   **
                   ** History:
                   **
                   **   Date      Programmer               Modification
                   **  --------   ----------     ---------------------------------
                   **  12/19/83      NZ          Updated documentation
                   **                SC          Wrote routine
                   **
                   ***************************************************************
                   ***************************************************************
 F2526 854  CHKSTK  ST=1   Memerr        Assume there is no room left
 F2529 876         ?ST=1   Trash         Check memory available?
 F252C 03           GOYES  CKST10        No...don't care (exit)
 F252E 1CF          D1=D1- 16            Yes...compute available memory,
 F2531 1CF          D1=D1- 16              leaving a 16 byte leeway
 F2534 AF2          C=0    W             (Clear nibble 5 for CSRB)
 F2537 137          CD1EX                Get stack pointer into C[A]
 F253A 8E00         GOSUBL =D1=AVS
       00
 F2540 143          A=DAT1 A             Read AVMEMS into A[A]
 F2543 135          D1=C                 Restore D1 (-32)
 F2546 17F          D1=D1+ 16
 F2549 17F          D1=D1+ 16            Now D1 is restored to entry cond'n
 F254C E2           C=C-A  A             Compute available memory size
```

```
1296 F254E 400           RTNC                   (If carry, less than 16 bytes)
1297 F2551 81E           CSRB                   Convert count to bytes
1298 F2554 111           A=R1                   Preserve upper nibbles of R1
1299 F2557 DA            A=C     A
1300 F2559 101           R1=A                   Write the count to R1[A]
1301 F255C 844   CKST10  ST=0    Memerr         If here, no error
1302 F255F 03            RTNCC
```

```
                     STITLE ENTER USING execution
        ***************************************************************
        * List of external calls and modules:
        *
        *   AVE=D1  n/f                Set AvMemEnd = D1.
        *
        *   COUNTC  MB&USG             Count #symbols in C(A),
        *                                for #input chars.
        *
        *   DCRMNT  MB&USG             Decrement symbol multiplier
        *                                (e.g., "5D")
        *
        *   ENDIMG  MB&USG             Reached end of IMAGE string:
        *                                test for more input fields.
        *
        *   NXTEXP  MB&USG             Fetch next expression. Stores
        *                                some registers first, then
        *                                calls EXPEXC.
        *
        *   RCVOFS  MB&USG             Recover offset: read offset
        *                                from RAM, compute orginal
        *                                address.
        *
        *   TstEnd  MB&USG             Test input list for EOL, @ or "!".
        *
        *   USloop  MB&USG             Computes address for looping back
        *                               to multiplier (e.g., "5D").
        *
        ***************************************************************
```

```
                    EJECT
        **************************************************************
        *
        * Status bits:
        *
        sCOUNT  EQU    BytCnt          For ENTSTR: "Count input chars"
        sTRASH  EQU    Trash           For ENTSTR: "Read but trash chars"
        sIGNOR  EQU    ChrTrp          For ENTSTR: "Ignore special char"
        *
        **************************************************************
        **************************************************************
        *
        *
        *--- Image tokens for building expanded IMAGE.
        ** 1) Tokens not identifying the end of a numeric field.
        **   1a) Tokens not used in backwards search.
        *  uSTRPT       String pointer
        *  uMULT        |D1| Multiplier
        *  uLOOPB       Loop on byte
        *  uLOOPS       Loop on string (12 nibs)
        *  uIMXCH       Strange execution character.
        *
        **   1b) Tokens used in backwards search.
        *  uOPNNM       Open loop without multiplier
        *  uJMP()       Jump over parenthesis loop pointer (9 nibs)
        *  uJMPst       Jump over string pointer (14 nibs)
        *  uJMPdl       Jump over unfilled delimiter (8nibs)
        *  uIMbck       Poll for backward search handler
        *  uIMsta       IMAGE string start (|Dx|-see IMentr)
        *  uOPNM-       Open loop with mult, decremented
        *  uOPNUM       |E0| Open loop with multiplier (ends in 0!)
        *
        *++++++++++++++++++++++++++++++++++++++++++++++++
        *+ EndNum       Any value >= this identifies the    +
        *+              end of a numeric field (used        +
        *+              in execution).                      +
        *++++++++++++++++++++++++++++++++++++++++++++++++
        *
        ** 2) Tokens identifying the end of a numeric field.
        **   2a) Tokens not used in backwards search.
        *  uCPLXC       Complex field closed
        *  uLOOPP       Loop on parentheses (variable #bytes)
        *  uIMend       |F0| IMAGE string end
        *
        **   2b) Tokens used in backwards search.
        *  uRESTP       Restart parse
        *  uDELIM       Delimiter
        **        Tokens delimiting an output/input field.
        *  uHKB^        H,K,B or ^ field
        *  uALit        "A" literal field
        *  uNUMNn       |F8| Numeric, no float chars, no sign*
        *  uNUMNs       |F9| Numeric, no float chars, w/sign*
        *  uNUMFn       |FA| Numeric, w/float chars, no sign*
        *  uNUMFs       |FB| Numeric, w/float chars, w/sign*
        *  uNUMEn       |FC| Numeric, w/Exponent, no sign*
```

```
*  uNUMEs      |FD| Numeric, w/Exponent, w/sign*
*
*  *Note: these numeric delimiters have values that
*         determine the status bit setting in USING execute.
*
****************************************************************
****************************************************************
*
* Register usage:
*    The following registers are used in the ENTER USING
*    execution routines, and must be saved during calls to
*    external routines, such as ENTSTR, STOSUB, EXPEXC
*    and SKP-LF:
*     R0[A] = address of execution symbol
*     R3[A] = program counter
*     S8, S9, S10, S11
*
****************************************************************
```

```
                           EJECT
                  **************************************************************
                  **************************************************************
                  **
                  ** Name:        ENTUSG - Execute the ENTER USING statement
                  **
                  ** Category:    STEXEC
                  **
                  ** Purpose:
                  **      Execute ENTER USING statement.
                  **
                  ** Entry:
                  **      This is a poll handler in response to the pIMXQT poll.
                  **      The only necessary conditions are:
                  **        R0[9-5]= address to begin execution of IMAGE tokens
                  **        RAM set up at AvMemEnd as specified in MB&USG.
                  **
                  ** Exit:
                  **      Through ENDIMG in mainframe (does NOT return from POLL)
                  **
                  ** Calls:       DO=PCA,CSRC5,AS=FTY,MEMBER,FINDA,<ENUFND>,
                  **              <CHRCNT>,<ENT"X">,<ENTstr>,<ENTmlt>,<ENTlpb>,
                  **              <ENT"C">,<ENT"P">,<ENT"H">,<ENT"K">,<ENTlps>,
                  **              <ENTlpp>,<ENTrst>,<ENDend>,<ENTdlm>,<END"B">,
                  **              <ENT"/">,<ENT"R">,<IMerr>
                  **
                  ** Uses:        A-D,R0-R4,D0,D1,STMTDx,FUNCxx,ST[11:0],all
                  **              RAM that EXPEXC is permitted to use
                  **
                  ** Stk lvls:    5 (<ENUFND>)
                  **
                  ** NOTE:
                  **      ENTUSG is the driving routine to execute the IMAGE
                  **      tokens.  Each token has its own execution routine.
                  **
                  ** Detail:
                  **      Call MEMBER and FINDA to execute each token.
                  **
                  ** History:
                  **
                  **   Date     Programmer              Modification
                  **  --------  ----------   ---------------------------------
                  **  01/10/84      NZ       Updated documentation
                  **  01/06/83      MB       Wrote routines.
                  **
                  **************************************************************
                  **************************************************************
 F2561 8F00 =ENTUSG GOSBVL =DO=PCA
       000
 F2568 161          DO=DO+ 2             Step over the line length
 F256B AFA          A=C    W             Set A[15:6]=C[15:6] for test
 F256E 3500         LC(6)  =tENTER
       0000
 F2576 15A5         A=DAT0 6             Read current instruction
 F257A 972          ?A=C   W             Is this ENTER USING?
```

```
F257D 40             GOYES  ENTU00        Yes...process it
F257F 00             RTNSXM               No...return carry clear, XM=1
              *-
              *-
F2581 118   ENTU00   C=R0                 R0[9-5]=execute address.
F2584 8E00           GOSUBL =CSRC5        Execute address to C[A].
      00
F258A 135            D1=C                 To D1.
F258D 171            D1=D1+ 2             Undo next D1=D1-2.
F2590 738C  ENTU05   GOSUB  AS=FTY        Zero input flag
              *
F2594 D1    ENTU07   B=0    A             B[A]= counter for input chars.
F2596 1C1   ENTU09   D1=D1- 2             Execute next token.
F2599 14B            A=DAT1 B
              *
F259C 3100           LC(2)  =uHKB^        Check if end of field.
F25A0 9E2            ?A<C   B             End field token match?
F25A3 60             GOYES  ENTU20        No...check tokens.
F25A5 68B0           GOTO   ENUFLD        Yes...match end field.
              *-
              *-
F25A9       ENTU20
              *
              *      LCASC  \.MS*AZDE\    Following 9 lines do this.
              *
F25A9 3F             NIBHEX 3F            Next 8 tokens count input chars.
F25AB 54             CON(2) \E\           Input 5 chars (exponent).
F25AD 44             CON(2) \D\           Input digit
F25AF A5             CON(2) \Z\           Input digit
F25B1 14             CON(2) \A\           Input ASCII char.
F25B3 A2             CON(2) \*\           Input digit
F25B5 35             CON(2) \S\           Input digit
F25B7 D4             CON(2) \M\           Input digit
F25B9 E2             CON(2) \.\           Input digit or "."
              *
F25BB 2F             P=     15
F25BD 8F00           GOSBVL =MEMBER       Check if token in A[B] matches
      000
F25C4 460            GOC    ENTU30        No...check for other tokens.
F25C7 6B31           GOTO   CHRCNT        Yes...take care of count.
              *-
              *-
F25CB 8F00  ENTU30   GOSBVL =FINDA        Execute next token.
      000
              *
F25D2 85             CON(2) \X\           Skip input char.
F25D4 891            REL(3) ENT"X"
              *
F25D7 00             CON(2) =uSTRPT       Pointer to imbedded literal.
F25D9 681            REL(3) ENTstr          (Skip chars)
              *
F25DC 00             CON(2) =uMULT        Multiplier.
F25DE 2A1            REL(3) ENTmlt
              *
F25E1 00             CON(2) =uLOOPB       Loop on byte.
```

```
1510 F25E3 7A1          REL(3) ENTlpb
1511            *
1512 F25E6 34           CON(2) \C\          Input char or ignore ",".
1513 F25E8 F31          REL(3) ENT"C"
1514            *
1515 F25EB 05           CON(2) \P\          Input char or ignore ".".
1516 F25ED C31          REL(3) ENT"P"
1517            *
1518 F25F0 84           CON(2) \M\          Input compact form (European).
1519 F25F2 FE1          REL(3) ENT"M"
1520            *
1521 F25F5 B4           CON(2) \K\          Input compact form.
1522 F25F7 CF1          REL(3) ENT"K"
1523            *
1524 F25FA 00           CON(2) =uLOOPS      Loop on string.
1525 F25FC 091          REL(3) ENTlps
1526            *
1527 F25FF 00           CON(2) =uLOOPP      Loop on parentheses.
1528 F2601 D81          REL(3) ENTlpp
1529            *
1530 F2604 00           CON(2) =uRESTP      Restart parse.
1531 F2606 491          REL(3) ENTrst
1532            *
1533 F2609 00           CON(2) =uIMend      IMAGE end.
1534 F260B 0E0          REL(3) ENTend
1535            *
1536 F260E 00           CON(2) =uDELIM      Unfilled delimiter.
1537 F2610 640          REL(3) ENTdlm
1538            *
1539 F2613 24           CON(2) \B\          Input byte form.
1540 F2615 3A1          REL(3) ENT"B"
1541            *
1542 F2618 F2           CON(2) \/\          Read record to EOL.
1543 F261A B81          REL(3) ENT"/"
1544            *
1545 F261D 25           CON(2) \R\          Digit or convert "," to "."
1546 F261F E01          REL(3) ENT"R"
1547            *
1548 F2622 E5           CON(2) \^\          Skip over one variable
1549 F2624 C6F          REL(3) ENTUOS
1550            *
1551 F2627 00           CON(2) =uCPLXC      Complex execute
1552 F2629 800          REL(3) =CPLXER        (Error exit)
1553            *
1554            *  These IMAGE symbols are skipped for input:
1555            *
1556            *       @                   (Form Feed)
1557            *       uIMXCH              (Unrecognized IMAGE char)
1558            *
1559 F262C 00           CON(2) 0            Others skip to next token.
1560 F262E 5B2          GONC   ENTa09       Go always.
1561            *_
1562            *_
1563 F2631 8D00 CPLXER  GOVLNG =IMerr
           000
           ****************************************************************
           ****************************************************************
           **
           ** Name:       STRPcr - Strip trailing <Cr>, if any
           **
           ** Category:   LOCAL
           **
           ** Purpose:
           **      Remove the last character from the string if it is a <Cr>
           **
           ** Entry:
           **      P=0
           **      D1 points to the top of the stack (lowest address)
           **
           ** Exit:
           **      D1 adjusted if last character was a <Cr>
           **      Carry set if no <Cr>, carry clear if removed <Cr>
           **
           ** Calls:      None
           **
           ** Uses.......
           **  Inclusive: A[B],C[B],D1
           **
           ** Stk lvls:   0
           **
           ** History:
           **
           **    Date     Programmer              Modification
           **  --------   ----------   ---------------------------------
           **  12/02/83      NZ        Added documentation
           **  04/01/82      SC        Wrote routine
           **
           ****************************************************************
           ****************************************************************
F2638 31D0 STRPcr  LCHEX  0D               See if the last char is a <Cr>
F263C 14B          A=DAT1 B
F263F 966          ?A#C   B                Is it a <Cr>?
F2642 00           RTNYES                  No...return
F2644 171          D1=D1+ 2                Yes...strip it
F2647 03           RTNCC
           *-
           *-
F2649 8D00 strhed  GOVLNG =STRHED
      000
           *-
           *-
F2650 8C00 D1mstk  GOLONG =D1@AVE
      00
```

```
            EJECT
**************************************************************
**************************************************************
**
** Name:        ENUFLD - Clean up old field, set up new field
** Name:        ENTdlm - Clean up old field (reached delimiter)
**
** Category:    LOCAL
**
** Purpose:
**      "A new ENTER field has been encountered in the IMAGE"
**      Clean up the old one and prepare for the new.
**
** Entry:
**      P=0
**      D1 is the current execute pointer
**      B[A] is number of input characters (in DECIMAL)
**      STMTD1 contains current stack pointer
**      The 7 nibble device specifier is on the bottom of MTHSTK
**
** Exit:
**      P=0
**      D1 is the execute pointer for next item
**      STMTD1 contains current stack pointer
**      Device specifier unchanged on MTHSTK
**
** Calls:
**   ENTdlm:    STORFL
**   ENUFLD:    STORFL,AS=FTY,TstEnd,Mflg=0,NXTEXP,NXTDS-,SAVED1,
**              RCVOFS,SKP-LF,<ENTUO7>,<RTNCHK>
**
** Uses:        A,B,C,D,R0-R4,D0,D1,P,ST[11:0],STMTxx,FUNCxx,
**              All RAM EXPEXC is permitted to use
**
** Stk lvls:    7 (STORFL)
**
** Algorithm:
**      Clean up old field:
**        Read in pending chars and store in dest (STORFL)
**      If unfilled delimiter (ENTdlm), then back to ENTUSG.
**      Else (ENUFLD) a new input field is required;
**        Prepare for new field:
**          Save status bits in RAM.
**          Save offset to IMAGE execution in RAM.
**          Check if any more input items:
**            If not, then exit to NXTSTM.
**          Call EXPEXC.  (and DEST via NXTVA-)
**          Restore status bits.
**          Recover offset to IMAGE execution address.
**          Back to ENTUSG.
**
** History:
**
**    Date     Programmer              Modification
**  --------  ----------     ------------------------------------
```

```
1665                ** 01/11/84      NZ         Updated documentation
1666                ** 01/06/83      MB         Wrote routines.
1667                **
1668                ***************************************************************
1669                ***************************************************************
1670 F2656          ENTdlm                      New delimiter, but no enter field.
1671 F2656 76E1             GOSUB  STORFL       Input pending chars, store in dest.
1672 F265A 6B3F     ENTa09  GOTO   ENTU09       Next execution symbol.
1673                *-
1674                *-
1675 F265E          ENUFLD                      New enter field.
1676 F265E 7ED1             GOSUB  STORFL       Store previous field.
1677                *
1678                * Save the IMAGE type to CHNNSV (type is in C[S] now)
1679                *  3 - H or K IMAGE
1680                *  2 - String IMAGE
1681                *  1 - Numeric IMAGE
1682                *
1683 F2662 71B8             GOSUB  AS=FTY       Position D0 to CHNNSV
1684 F2666 14B              A=DAT1 B
1685 F2669 3100             LC(2)  =uHKB^
1686 F266D B46              C=C+1  S            C[S] = 1
1687                *
1688 F2670 962              ?A=C   B            H or K IMAGE? (C[B] = uHKB^)
1689 F2673 31               GOYES  HorK         Yes...set type = 3
1690 F2675 E6               C=C+1  A            (C[B] = uALit)
1691 F2677 962              ?A=C   B            String IMAGE?
1692 F267A F0               GOYES  StrIng       Yes...set type = 2
1693 F267C 5F0              GONC   NumIng       Go always...set type = 1
1694                *-
1695                *-
1696 F267F 8D00     Tstend  GOVLNG =TstEnd
           000
1697                *-
1698                *-
1699 F2686 B46      HorK    C=C+1  S
1700 F2689 B46      StrIng  C=C+1  S
1701 F268C 1544     NumIng  DAT0=C S            Save the IMAGE type in CHNNSV
1702                *
1703 F2690 7BEF             GOSUB  Tstend       Test for end of ENTER stmt.
1704 F2694 564              GONC   EndENT       Yes, end of ENTER stmt.
1705 F2697 133              AD1EX               Save D1 in A[A] (stack pointer).
1706 F269A 713C             GOSUB  Mflg=0       Clear multi-UDF flag, set TRACE ptr.
1707 F269E 131              D1=A                Restore D1 from A[A].
1708 F26A1 8F00             GOSBVL =NXTEXP      Get next expression.
           000
1709                *
1710 F26A8 7C9B             GOSUB  NXTDS-       Set up next destination variable.
1711                *
1712                * Get saved PC back from STMTDO and save AVMEME in STMTDO
1713                *
1714 F26AC 1B00             D0=(5) =STMTDO
           000
1715 F26B3 142              A=DAT0 A            A[A] = saved PC
1716 F26B6 103              R3=A                Save PC in R3
```

```
F26B9 144           DAT0=C A            C[A] = AVMEME from NXTDS-
                *
F26BC 8E00          GOSUBL =SAVED1      Save stack pointer in STMTD1
      00
                *
F26C2 174           D1=D1+ 5            Set D1 to status storage.
F26C5 147           C=DAT1 A            Read status bits.
F26C8 0A            ST=C                Restore status bits.
F26CA 8F00          GOSBVL =RCVOFS      Recover offset to xqt address.
      000
F26D1 135           D1=C                Position D1 to xqt address.
F26D4 1C7           D1=D1- 8            Skip (unused) field digit counters.
F26D7 6CBE          GOTO   ENTU07       Next execution symbol.
                *-
                *-
F26DB           EndENT                  End ENTER statement.
                *
                * The following test must be such that the jump to "exit" has
                * carry CLEAR, as RTNCHK checks carry to see if an error has
                * occurred.
                *
F26DB 966           ?A#C   B            Is it an '#'?
F26DE 50            GOYES  getEOL       No...just read and skip to EOL
F26E0 560           GONC   exit         Go always...just exit
                *-
                *-
F26E3 76F8      getEOL  GOSUB  SKP-LF   Skip characters to EOL.
F26E7 6098      exit    GOTO   RTNCHK   To next statement.
```

```
                EJECT
**************************************************************
**************************************************************
**
** Name:        ENTend - Execute the uMend token
**
** Category:    LOCAL
**
** Purpose:
**      Execute the uMend token.
**
** Entry:
**      P=0
**      D1 is the current execute pointer
**      B[A] is number of input characters (in DECIMAL)
**      STMTD1 contains current stack pointer
**      The 7 nibble device specifier is on the botton of MTHSTK
**      From ENTUSG through FINDA.
**
** Exit:
**      If there are more input items:
**       (returns through ENTU09)
**        P=0
**        D1 is the execute pointer for next item
**        STMTD1 contains current stack pointer
**        Device specifier unchanged on MTHSTK
**      If there are no more input items, exits via EndENT.
**
** Calls:       STORFL,TstEnd,ENDIMG,<ENTU09>
**
** Uses:
**  Inclusive: A,B,C,D,R0-R2,R3[15:5],R4,D0,D1,P,RESREG,FUNCD1,
**              ST[11:8,6,5,3:0]
**
** Stk lvls:   6 (CNTSTR)(<STOSUB>)
**
** Algorithm:
**      Clean up old field:
**        Read in pending chars and store in dest (STORFL)
**      Restore status bits from RAM at AvMemEnd.
**      Recover offset to beginning of IMAGE string.
**      If input fields have not been found, then
**        "Invalid USING" error (prevents infinite loop
**        when looking for input field).
**      If input field has been found, loop back to
**        recycle IMAGE string.
**
**
** History:
**    Date     Programmer              Modification
**  --------   ----------    --------------------------------
**  01/11/84      NZ         Updated documentation
**  01/06/83      MB         Wrote routines.
**
**************************************************************
```

```
1798             ***************************************************************
1799 F26EB       ENTend                        End of IMAGE string.
1800 F26EB 7151         GOSUB  STORFL          Read pending chars, store in dest.
1801 F26EF 7C8F         GOSUB  Tstend          Test end of ENTER stmt.
1802 F26F3 57E          GONC   EndENT          Yes, end of stmt.
1803 F26F6 8F00         GOSBVL =ENDING         Test valid flds, D1=start of IMAGE.
           000
1804 F26FD 135          D1=C
1805 F2700 560          GONC   ENTb09          Go always...recycle IMAGE string.
```

```
              EJECT
**************************************************************
**************************************************************
**
** Name:        CHRCNT - Count the number of chars to be input
**
** Category:    LOCAL
**
** Purpose:
**      Count the number of chars to be input from loop.
**
** Entry:
**      P=0
**      D1 is the current execute pointer
**      B[A] is number of input characters (in DECIMAL)
**      STMTD1 contains current stack pointer
**      The 7 nibble device specifier is on the bottom of MTHSTK
**
** Exit:
**      P=0
**      B[A] is the resultant count
**      D1 is the execute pointer for next item
**      STMTD1 contains current stack pointer
**      Device specifier unchanged on MTHSTK
**
** Calls:       COUNT
**
** Uses:
**  Inclusive: A[A],B[A],C[A],D[A],P,D1
**
** Stk lvls:    3 (COUNT)
**
** Note:
**      The E symbol generates a tokenized field
**      which looks like this:  "ESZZZ".  So it will
**      always generate 5 digit counts.
**
** Algorithm:
**      Call COUNTC, which does:
**        If accompanying multiplier (CNTMLT),
**          then set C[A]= multiplier, restore counter.
**          ELSE, set C[A]= 00001.
**        Add C to B (Dec mode).
**      If accompanying multiplier,
**        then restore the count (at D1 + 4) to value
**      Exit to ENTU09.
**
** History:
**
**    Date      Programmer              Modification
**  --------    ----------    --------------------------------
**  01/11/84        NZ        Updated documentation
**  01/06/83        MB        Wrote routines.
**
**************************************************************
```

```
                 ********************************************************************
F2703 7400 CHRCNT  GOSUB  COUNT        Count multiplier, if there.
F2707 6E8E ENTb09  GOTO   ENTU09       Process next execution symbol.
                 *-
                 *-
F270B 8F00 COUNT   GOSBVL =COUNTC      Process the count
      000
F2712 04           SETHEX
F2714 890          ?P=    0            Was a count specified?
F2717 00           RTNYES              No...just return
F2719 20           P=     0
F271B 173          D1=D1+ 4
F271E 15D3         DAT1=C 4            Restore the count field to initial.
F2722 1C3          D1=D1- 4
F2725 01           RTN
```

```
                        EJECT
             ******************************************************************
             ******************************************************************
             **
             ** Name:         ENT"C" - Execute the "C" symbol
             ** Name:         ENT"P" - Execute the "P" symbol
             ** Name:         ENT"R" - Execute the "R" symbol
             **
             ** Category:     LOCAL
             **
             ** Purpose:
             **      Execute the "C", "P", and "R" symbols.
             **
             ** Entry:
             **      P=0
             **      D1 is the current execute pointer
             **      B[A] is number of input characters (in DECIMAL)
             **      STMTD1 contains current stack pointer
             **      The 7 nibble device specifier is on the botton of MTHSTK
             **
             ** Exit:
             **      P=0
             **      D1 is the execute pointer for next item
             **      STMTD1 contains current stack pointer
             **      Device specifier unchanged on MTHSTK
             **      Exit to ENTU09.
             **
             ** Calls:        CSRC5,CNTSTR,CSLC5,ENTSTr
             **
             ** Uses.......
             **  Inclusive: A,B,C,D[15:13,5:0],R0-R2,D0,D1,P,ST[7:0],STMTD1
             **
             ** Stk lvls:   6 (CNTSTR)(ENTSTr)
             **
             ** Algorithm:
             **      For "C": load  002C  (0 byte and ",") into C reg.
             **      For "P": load  002E  (0 byte and ".") into C reg.
             **      For "R": load  2E2C  ("." and ",") into C reg.
             **      Save in R1[15:12].
             **      Input all pending chars.
             **      Put R1[15:12] in B[3:0].
             **      Input one char, ignoring or replacing as specified.
             **      Exit to ENTUSG.
             **
             ** History:
             **    Date      Programmer            Modification
             **  --------    ----------     --------------------------------
             **  01/11/84       NZ          Updated documentation
             **  01/06/83       MB          Wrote routines.
             **
             ******************************************************************
             ******************************************************************
 F2727 2C    ENT"C"  P=      12             Loads "," into C[B], 00 in C[3:2].
 F2729 0D    ENT"P"  P=P-1                  (For ENT"P", P is 0, gives P=14).
 F272B 0D            P=P-1                  Loads "." into C[B], 00 in C[3:2].
```

```
F272D 39C2 ENT"R"  LCHEX  002C002E2C     C[B]= Character to ignore.
      E200
      C200
F2739 8E00         GOSUBL =CSRC5
      00
F273F 109          R1=C                  Store character info in R1[15:12].
F2742 7151         GOSUB  CNTSTR         Input pending chars.
F2746 119          C=R1                  Char to ignore from R1[15:12]...
F2749 8E00         GOSUBL =CSLC5
      00
F274F D5           B=C    A              ...to B[3:0].
F2751 D0           A=0    A
F2753 E4           A=A+1  A              Input one char.
F2755 857          ST=1   sIGNOR         "Ignore char."
F2758 7B41         GOSUB  ENTSTr         Go read the character.
F275C 5AA          GONC   ENTb09         Go always (next execution symbol).
```

```
                       EJECT
            **************************************************************
            **************************************************************
            **
            ** Name:         ENTstr - Execute the uSTRPT token (string IMAGE)
            ** Name:         ENT"X" - Execute the "X" token (skip character)
            **
            ** Category:     LOCAL
            **
            ** Purpose:      ENTstr: Execute uSTRPT token.
            **               ENT"X": Execute "X" symbol.
            **
            ** Entry:
            **          P=0
            **          D1 is the current execute pointer
            **          B[A] is number of input characters (in DECIMAL)
            **          STMTD1 contains current stack pointer
            **          The 7 nibble device specifier is on the bottom of MTHSTK
            **
            ** Exit:
            **          P=0
            **          D1 is the execute pointer for next item
            **          STMTD1 contains current stack pointer
            **          Device specifier unchanged on MTHSTK
            **          Exits to ENTU09.
            **
            ** Calls:        CNTSTR,COUNT,CNTST1
            **
            ** Uses.......
            **  Inclusive: A,B,C,D[15:13,5:0],R0-R2,D0,D1,P,STMTD1,ST[7:0]
            **
            ** Stk lvls:    6 (CNTSTR)(CNTST1)
            **
            ** Algorithm:
            **          ENTstr:  Input pending chars.
            **                   Read in length of literal = #chars to trash
            **                   Goto ENTX07.
            **          ENT"X":  Input pending chars.
            **                   If accompanied by multiplier, read multiplier
            **                     into C[A].  Else, set C[A]=1.
            **            ENTX07 Read in specified #chars and trash.
            **                   Exit to ENTU09.
            **
            ** History:
            **    Date     Programmer              Modification
            **  --------   ----------    --------------------------------
            **  01/11/84      NZ         Updated documentation
            **  01/06/83      MB         Wrote routines.
            **************************************************************
            **************************************************************
F275F       ENTstr                       IMAGE Literal.
F275F 7431         GOSUB  CNTSTR         Input necessary chars.
F2763 1C9          D1=D1- 10             To literal length.
F2766 147          C=DAT1 A              Literal length= #chars to trash.
F2769 5A0          GONC   ENTX07         Go always...read and trash chars.
```

```
                *-
                *-
F276C 7721 ENT"X"  GOSUB  CNTSTR        Input necessary chars.
F2770 779F         GOSUB  COUNT         Count multiplier, if there.
F2774 D5   ENTX07  B=C    A             Put count into B[A].
F2776 856          ST=1   sTRASH        "Read but trash chars."
F2779 7D11         GOSUB  CNTST1        Input chars.
F277D 598  ENTc09  GONC   ENTb09        Go always...execute next symbol.
```

```
                        EJECT
                ****************************************************************
                ****************************************************************
                **
                ** Name:        ENTMLT - Execute the uMULT token.
                **
                ** Category:    LOCAL
                **
                ** Purpose:
                **      Execute the uMULT token.
                **
                ** Entry:
                **      P=0
                **      D1 is the current execute pointer
                **      B[A] is number of input characters (in DECIMAL)
                **      STMTD1 contains current stack pointer
                **      The 7 nibble device specifier is on the bottom of MTHSTK
                **
                ** Exit:
                **      P=0
                **      D1 is the execute pointer for next item
                **      STMTD1 contains current stack pointer
                **      Device specifier unchanged on MTHSTK
                **
                ** Calls:       DCRMNT
                **
                ** Uses.......
                **  Inclusive: A[B],C[A],D1
                **
                ** Stk lvls:    1 (DCRMNT)
                **
                ** Algorithm:
                **      Move D1 to multiplier reserve, check if open
                **        parentheses loop  (uOPNWM).
                **      If it is, change uOPNWM to uOPNM-.
                **      Move D1 to mulitplier counter, decrement.
                **      If no carry, exit to ENTUSG.
                **      If carry, restore counter to reserve value,
                **        set D1= value saved in D(A), exit to ENTUSG.
                **
                ** History:
                **    Date      Programmer              Modification
                **  --------    ----------     --------------------------------
                **  01/11/84       NZ          Updated documentation.
                **  01/06/83       MB          Wrote routines.
                **
                ****************************************************************
                ****************************************************************
 F2780 8F00 ENTmlt  GOSBVL =DCRMNT       Decrement multiplier.
       000
 F2787 55F          GONC   ENTc09        Go always...next execution symbol.
```

```
                        EJECT
               ******************************************************************
               ******************************************************************
               **
               ** Name:       ENTlpb - Execute the uLOOPB token
               ** Name:       ENTlps - Execute the uLOOPS token
               ** Name:       ENTlpp - Execute the uLOOPP token
               **
               ** Category:   LOCAL
               **
               ** Purpose:
               **      Execute the three loop tokens.
               **
               ** Entry:
               **      P=0
               **      D1 is the current execute pointer
               **      B[A] is number of input characters (in DECIMAL)
               **      STMTD1 contains current stack pointer
               **      The 7 nibble device specifier is on the bottom of MTHSTK
               **
               ** Exit:
               **      P=0
               **      D1 is the execute pointer for next item
               **      STMTD1 contains current stack pointer
               **      Device specifier unchanged on MTHSTK
               **
               ** Calls:      USloop
               **
               ** Uses:......
               **  Inclusive: A[S],C[A],D[A],D1,P
               **
               ** Stk lvls:   1 (USloop)
               **
               ** Algorithm:
               **      For uLOOPB:  Set P=3
               **      For uLOOPS:  Set P=15
               **                   Move D1 back to multiplier counter (C+P+1)
               **           ENlop3  Save original D1 in D (execution address
               **                     in case multiplier decrements past 0.)
               **                   Jump to ENm105 to decremnt counter, etc.
               **                      (exits to ENTUSG).
               **      For uLOOPP:  Move D1 to offset for open paren.
               **                   Recover offset (point to open paren).
               **                   Goto ENlop3.
               **
               ** History:
               **    Date     Programmer             Modification
               **  --------   ----------    --------------------------------
               **  01/06/83      MB         Wrote routines.
               **
               ******************************************************************
               ******************************************************************
     F278A 24   ENTlpb  P=    4           (For P=3: back up D1 4 nibs)
     F278C 0D   ENTlps  P=P-1             (P=15: back up D1 16 nibs)
     F278E 8F00 ENTlpp  GOSBVL =USloop    Back up D1 to multiplier.
```

```
            000
   2110 F2795 20            P=    0
   2111 F2797 55E           GONC  ENTc09          Go always...next execution char.
```

```
                          EJECT
                ***************************************************************
                ***************************************************************
                **
                ** Name:        ENTrst - Execute the uRESTP token
                **
                ** Category:    LOCAL
                **
                ** Purpose:
                **       Execute the uRESTP token.
                **
                ** Entry:
                **       P=0
                **       D1 is the current execute pointer
                **       B[A] is number of input characters (in DECIMAL)
                **       STMTD1 contains current stack pointer
                **       The 7 nibble device specifier is on the bottom of MTHSTK
                **
                ** Exit:
                **       P=0
                **       D1 is the execute pointer for next item
                **       STMTD1 contains current stack pointer
                **       Device specifier unchanged on MTHSTK
                **
                ** Uses.......
                **  Inclusive: A,B,C,D,R1,R2,R3[15:5],R4,D0,D1,P,RESREG,FUNCD1,
                **             ST[11:8,6,5,3:0]
                **
                ** Stk lvls:   7 (STORFL)
                **
                ** Algorithm:
                **       Store D1 (address of uRESTP token) in R0(9-5)
                **       for use back in MB&USG module.  Return from
                **       poll with carry cleared, XM=0.
                **
                ** History:
                **    Date      Programmer              Modification
                **  --------    ----------    --------------------------------
                **  01/11/84       NZ         Updated documentation
                **  01/06/83       MB         Wrote routines.
                **
                ***************************************************************
                ***************************************************************
 F279A          ENTrst                         Restart parse.
 F279A 72A0            GOSUB  STORFL
 F279E 8D00            GOVLNG =USGrst          End poll handler.
       000
```

```
                      EJECT
            ***************************************************************
            ***************************************************************
            **
            ** Name:        ENT"/" - Execute the "/" token
            **
            ** Category:    LOCAL
            **
            ** Purpose:     Execute "/" symbol.
            **
            ** Entry:
            **      P=0
            **      D1 is the current execute pointer
            **      B[A] is number of input characters (in DECIMAL)
            **      STMTD1 contains current stack pointer
            **      The 7 nibble device specifier is on the botton of MTHSTK
            **
            ** Exit:
            **      P=0
            **      STMTD1 contains current stack pointer
            **      Device specifier unchanged on MTHSTK
            **
            ** Calls:       STORFL,SKP-LF
            **
            ** Uses:......
            **  Inclusive:  A,B,C,D,R1,R2,R3[15:5],R4,D0,P,RESREG,FUNCD1,
            **              ST[11:0]
            **
            ** Stk lvls:    7 (STORFL)
            **
            ** Algorithm:
            **      Calls SKIP to skip to EOL of input record.
            **
            ** History:
            **    Date      Programmer              Modification
            **  --------    ----------      --------------------------------
            **  01/11/84        NZ          Updated documentation
            **  01/06/83        MB          Wrote routines.
            **
            ***************************************************************
            ***************************************************************
F27A5       ENT"/"                          Skip to EOL.
F27A5 7790          GOSUB  STORFL           Store pending item.
F27A9 703B          GOSUB  SKP-LF           Skip to end of line.
F27AD 560           GONC   ENT/03           Go if no error.
F27B0 6A7B          GOTO   ENTRex           Error exit
            *-
            *-
F27B4 6FDD ENT/03   GOTO   ENTU07           Next execution symbol.
```

```
                         EJECT
                  ****************************************************************
                  ****************************************************************
                  **
                  ** Name:        ENT"B" - Execute the "B" token
                  **
                  ** Category:    LOCAL
                  **
                  ** Purpose:
                  **      Execute the "B" symbol.
                  **
                  ** Entry:
                  **      P=0
                  **      D1 is the current execute pointer
                  **      B[A] is number of input characters (in DECIMAL)
                  **      STMTD1 contains current stack pointer
                  **      The 7 nibble device specifier is on the botton of MTHSTK
                  **
                  ** Exit:
                  **      P=0
                  **      D1 is the execute pointer for next item
                  **      STMTD1 contains current stack pointer
                  **      Device specifier unchanged on MTHSTK
                  **
                  ** Calls:       CNTSTR,STOBIN
                  **
                  ** Uses.......
                  **  Inclusive: A,B,C,D,R0[15:5],R1,R2,R3[15:5],R4,D0,D1,P,
                  **             RESREG,STMTD1,ST[11:0]
                  **
                  ** Stk lvls:    6 (CNTSTR)(<STOBIN>)
                  **
                  ** Algorithm:
                  **      Set B[A]=1 (counter for #chars to input)
                  **      Read one char (CNTSTR)
                  **      Exit to ENTU09.
                  **
                  ** History:
                  **    Date      Programmer            Modification
                  **  --------    ----------    ---------------------------------
                  **  01/12/84        NZ        Updated documentation
                  **  01/06/83        MB        Wrote routines.
                  **
                  ****************************************************************
                  ****************************************************************
 F27B8            ENT"B"                        B field in IMAGE.
 F27B8 E5                B=B+1  A               Input one char.  (B[A]=0 already)
 F27BA 79D0              GOSUB  CNTSTR          Read the character.
 F27BE 146               C=DAT0 A               Read stack pointer (from STMTD1).
 F27C1 7400              GOSUB  STOBIN          Convert and store the binary number.
 F27C5 6ACD ENTu05       GOTO   ENTU05          Next token.
                  *-
                  *-
 F27C9 135        STOBIN D1=C                   Set D1 to top of stack.
 F27CC D0                A=0    A
```

```
  2262 F27CE 14B          A=DAT1 B            Read the character.
  2263 F27D1 8F00         GOSBVL =HDFLT       Convert to floating number.
             000
  2264 F27D8 04           SETHEX
  2265 F27DA 1CD          D1=D1- 14
  2266 F27DD 61B0         GOTO   STODE1       Write value to stack, store it.
```

```
                   EJECT
**************************************************************
**************************************************************
**
** Name:        ENT"K" - Execute the "K" token
** Name:        ENT"H" - Execute the "H" token
**
** Category:    LOCAL
**
** Purpose:
**      Execute the "K" or "H" token: free format ENTER
**
** Entry:
**      P=0
**      D1 is the current execute pointer
**      B[A] is number of input characters (in DECIMAL)
**      STMTD1 contains current stack pointer
**      The 7 nibble device specifier is on the botton of MTHSTK
**
** Exit:
**      P=0
**      D1 is the execute pointer for next item
**      STMTD1 contains current stack pointer
**      Device specifier unchanged on MTHSTK
**      Exit to ENTUO5.
**
** Calls:       CS=TYP,ENTST2,ENT160,D1@AVE,TstEnd,AVE=D1,ENTST3
**
** Uses:
**  Inclusive: A,B,C,D,R0,R1,R2,R3[15:5],R4,D0,D1,P,ST[11:0],
**              RESREG
**
** Stk lvls:   7 (ENT160)
**
** Algorithm:
**      If destination is numeric and "H",
**        then set up to replace commas with decimal points.
**      Set up to read until terminator character match.
**      Read the data.
**      Do the assignment.
**      If more variables remaining,
**        then set AVMEME back to original value; goto ENTUO5.
**        else exit to next statement.
**
** History:
**
**   Date      Programmer           Modification
**  --------   ----------   ------------------------------
**  12/21/83      NZ        Added GOSUB to ENT"H", changed
**                          GOTO ENTFRM to GOC ENTFRM to fix
**                          SR #0039-1073(6) (ENTER USING "H";A$
**                          with a comma in the input character
**                          sequence)
**               SC/MB      Wrote
**
```

```
                 ***************************************************************
                 ***************************************************************
     F27E1 701A ENT"H"  GOSUB  CS=TYP          Check if the destination is string
     F27E5 33C2         LCASC  \.,\            Set up to replace "," with "."
           E2
     F27EB D5           B=C    A
     F27ED 857          ST=1   sIGNOR
     F27F0 450          GOC    ENTFFM          Numeric destination...DO change ","
                 *
     F27F3 847  ENT"K"  ST=0   sIGNOR          Don't change commas to "."
     F27F6 1B00 ENTFFM  D0=(5) =TERCHR         Read terminating char
           000
     F27FD 14A          A=DAT0 B               A[A] is the terminating character.
     F2800 845          ST=0   sCOUNT          Don't count chars.
     F2803 846          ST=0   sTRASH          Do keep chars.
     F2806 70A0         GOSUB  ENTST2          Read the characters.
     F280A 146          C=DAT0 A               Recall stack pointer from STMTD1.
     F280D 135          D1=C
     F2810 855          ST=1   KorH            This is either "K" or "H".
     F2813 8EFC         GOSUBL ENT160          Do the assignment
           7F
     F2819 733E         GOSUB  D1mstk          Set D1 to AVMEME.
     F281D 7E5E         GOSUB  Tstend          Reached end of statement?
     F2821 460          GOC    H&Kcnt          No...set up for next item.
     F2824 62CE         GOTO   exit            Yes...exit from ENTER USING.
                 *-
                 *-
     F2828 1B00 H&Kcnt  D0=(5) =STMTD0         Restore AVMEME to its old value
           000
     F282F 146          C=DAT0 A               (value was saved by STORFL)
     F2832 137          CD1EX
     F2835 7289         GOSUB  aVE=D1
                 *
     F2839 7290         GOSUB  ENTST3          Restore D1 to execute address
     F283D 578          GONC   ENTw05          Go always (process next item).
```

```
                        EJECT
              **************************************************************
              **************************************************************
              **
              ** Name:        STORFL - Read pending chars, store in destination
              **
              ** Category:    LOCAL
              **
              ** Purpose:
              **        Read pending input chars, store in dest.
              **
              ** Entry:
              **        P=0
              **        D1 is the current execute pointer
              **        B[A] is number of input characters (in DECIMAL)
              **        STMTD1 contains current stack pointer
              **        The 7 nibble device specifier is on the bottom of MTHSTK
              **
              ** Exit:
              **        P=0
              **        D1 is the execute pointer for next item
              **        STMTD1 contains current stack pointer
              **        Device specifier unchanged on MTHSTK
              **        B[A]=0
              **
              ** Calls:       CNTSTR,AS=FTY,CS=TYP,STRHED,GETNUM,POPSTK,D1@AVE,
              **                  <STOSUB>
              **
              ** Uses.......
              **  Inclusive: A,B,C<D,R0,R1,R2,R3[15:5],R4,D0,D1,P,ST[11:0],
              **             FUNCD1,RESREG
              **
              ** Stk lvls:   6 (CNTSTR)(<STOSUB>)
              **
              ** Algorithm:
              **        Input pending chars (CNTSTR).
              **        If inputting field, store stacked chars in
              **          variable destination.
              **        Return.
              **
              ** History:
              **     Date      Programmer             Modification
              **   --------    ----------    --------------------------------
              **   01/12/84       NZ         Updated documentation
              **   01/06/83       MB         Wrote routines.
              **
              **************************************************************
              **************************************************************
F2840         STORFL                         Store field in expr dest.
F2840 7350            GOSUB  CNTSTR          Input remaining chars.
F2844 7FC9            GOSUB  AS=FTY          Get IMAGE field type to A[S]
F2848 A4C             A=A-1  S               Inputting field?
F284B 400             RTNC                   No. Trashing chars.
              *
F284E 1B00            D0=(5) =STMTD1
```

```
           000
F2855 146             C=DAT0 A
F2858 135             D1=C                  Restore D1 to the top of the stack.
F285B 7699            GOSUB  CS=TYP         Get destination variable type.
F285F 441             GOC    STONUM         Numeric variable goto STONUM
                *
                * IMAGE type must not be numeric, as variable is not numeric
                *
F2862 A4C             A=A-1  S              Is the IMAGE type numeric?
F2865 4A0             GOC    badtyp         Yes..."Data Type" error
                *
F2868 7D00            GOSUB  strhed         Generates header for string
F286C 6620            GOTO   STODES         Store the string
                *-
                *-
F2870 66F9 badtyp     GOTO   BADTYP         "Data Type" error
                *-
                *-
F2874 844  STONUM     ST=0   MltItm         Var is numeric...check IMAGE type
F2877 A4C             A=A-1  S
F287A A4C             A=A-1  S              Is the IMAGE type string?
F287D 42F             GOC    badtyp         Yes..."Data Type" error
                *
F2880 7E28            GOSUB  GETNUM         Parse the number string from stack
F2884 7D19            GOSUB  popstk         Pop the item off the stack into A
F2888 74CD            GOSUB  D1mstk         Set D1 to AVMEME
F288C 1CF             D1=D1- 16             Back up for numeric field
F288F 1517 STODE1     DAT1=A W              Write out the item to the stack
F2893 66D8 STODES     GOTO   STOSUB         Do the assignment to the variable
```

```
                          EJECT
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:        CNTSTR - Read characters onto stack by count
                 ** Name:        CNTST1 - Read characters by count, obey sTRASH
                 **
                 ** Category:    LOCAL
                 **
                 ** Purpose:
                 **      Read characters onto stack, save stack pointer in STMTD1
                 **
                 ** Entry:
                 **      B[A] is the number of characters to read
                 **      STMTD1 is the current stack pointer
                 **
                 ** Exit:
                 **      Carry clear
                 **      D0 points to STMTD1
                 **      STMTD1 contains the new stack pointer
                 **      If an error is detected, takes a direct error exit
                 **
                 ** Calls:       DTOH,RESTD1,REDCHR
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,D[15:13,5:0],R0-R2,D0,D1,P,STMTD1,ST[7:0]
                 **
                 ** Stk lvls:    5 (REDCHR)
                 **
                 ** Algorithm:
                 **      CNTSTR:Set sTRASH=0  (Don't trash characters)
                 **      CNTST1:Set sIGNOR=0  (Don't ignore any characters)
                 **             Copy #chars from B[A] to A[A]
                 **             Convert #chars from decimal to hex, put into A[A]
                 **      ENTSTr:Set sCOUNT=1  (Do enter characters by count)
                 **             Save execute pointer in R0
                 **             If count <> 0,
                 **               then read characters from loop (REDCHR),
                 **                    save stack pointer in STMTD1
                 **             Zero B[A] (count)
                 **             Restore execute pointer
                 **             Return.
                 **
                 ** History:
                 **
                 **   Date      Programmer             Modification
                 **   --------  ----------  --------------------------------
                 **   12/19/83     NZ       Added documentation
                 **                SC       Wrote routine
                 **
                 ***************************************************************
                 ***************************************************************
     F2897 846   CNTSTR  ST=0   sTRASH        Don't trash.
     F289A 847   CNTST1  ST=0   sIGNOR        No special char to ignore.
     F289D D4            A=B    A             # input chars.
```

```
2491 F289F 8E00         GOSUBL =DTOM          Result in C[A]
           00
2492 F28A5 DA           A=C    A
2493 F28A7 855  ENTSTr  ST=1   sCOUNT         Count input chars.
2494 F28AA 137  ENTST2  CD1EX                 Save D1 (=xqt addr) in R0.
2495 F28AD 108          R0=C
2496 F28B0 8E00         GOSUBL =RESTD1        Restore stack pointer from STMTD1.
           00
2497 F28B6 8A8          ?A=0   A              Is the input count zero?
2498 F28B9 61           GOYES  ENTST3         Yes...skip the read phase.
2499 F28BB 783A         GOSUB  REDCHR         No...input chars.
2500 F28BF 491          GOC    REDCer
2501 F28C2 1B00         D0=(5) =STMTD1        Write the stack pointer to STMTD1.
           000
2502 F28C9 137          CD1EX
2503 F28CC 144          DAT0=C A
2504 F28CF D1   ENTST3  B=0    A              Zero counter to start again.
2505 F28D1 118          C=R0                  Restore D1 (=xqt addr).
2506 F28D4 135          D1=C
2507 F28D7 03           RTNCC
2508            *-
2509            *-
2510 F28D9 874  REDCer  ?ST=1  Memerr         Insufficient memory?
2511 F28DC 60           GOYES  MEMerr         Yes...go to MEMERR
2512 F28DE 6C4A         GOTO   ENTRex         No...set up the error, exit
2513            *-
2514            *-
2515 F28E2 8D00 MEMerr  GOVLNG =MEMERR        Say "Insufficient memory"
           000
2516            *-
2517            *-
2518 F28E9 8D00 D1fstk  GOVLNG =D1FSTK
           000
2519            *-
2520            *-
2521 F28F0 AC9  Fndmbb  C=B    S
2522 F28F3 8C00 Fndmbx  GOLONG =FNDMBX        Find the mailbox
           00
2523            *-
2524            *-
2525 F28F9 8C00 =getdev GOLONG =GETDev
           00
```

```
                        STITLE
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:       CKmode - Check if the mailbox is controller
                 **
                 ** Category:   PILUTL
                 **
                 ** Purpose:
                 **      Check if the mailbox is the loop controller.  If it is
                 **      not, take a direct error exit.
                 **
                 ** Entry:
                 **      D0 points to the selected mailbox
                 **
                 ** Exit:
                 **      Carry clear
                 **      Direct exit to error routine if not loop controller
                 **
                 ** Calls:      GETDev
                 **
                 ** Uses:       ST[3:0]
                 **
                 ** Stk lvls:   2 (GETDev)
                 **
                 ** History:
                 **
                 **   Date      Programmer              Modification
                 **  --------   ----------   ------------------------------
                 **  12/19/83      NZ        Updated documentation
                 **                SC        Wrote routine
                 **
                 ***************************************************************
                 ***************************************************************
F28FF 76FF =CKmode GOSUB  getdev      Check if controller
F2903 500          RTNNC              Controller...return, carry clear
F2906 300          LC(1)  =eBADMD     Not controller...error exit
F2909 20           P=     =ePIL
F290B 6F1A         GOTO   ENTRex      "Invalid Mode"
```

```
                  STITLE REQUEST execute
           ************************************************************
           ************************************************************
           **
           ** Name:       REQST - Execute the REQUEST statement
           **
           ** Category:   STEXEC
           **
           ** Purpose:
           **     Set up HPIL response to serial poll:
           **       If bit 6 if the status byte is set, loop SRQ will be
           **       set when the I/O CPU is in device mode.
           **     If the I/O CPU is the controller, it will remember the
           **     response value for serial poll when it becomes a device.
           **
           ** Entry:
           **     D0 is the PC
           **
           ** Exit:
           **     Through NXTSTM if no error, BSERR if error
           **
           ** Calls:      GLOOPM,GETARG,PUTE,<NXTSTM>
           **
           ** Uses.......
           **  Inclusive: A,B,C,D,R0-R4,D0,D1,P,STMTD0,ST[11:0],FUNCxx,
           **             All RAM EXPEXC is permitted to use
           **
           ** Stk lvls:   7 (GLOOPM)(GETARG)
           **
           ** History:
           **
           **   Date      Programmer             Modification
           **   --------  ----------     ---------------------------------
           **   12/20/83     NZ          Packed, changed call to GETARG to
           **                            call GLOOPM first to save a stack
           **                            level
           **   12/19/83     NZ          Added documentation
           **                SC          Wrote routine
           **
           ************************************************************
           ************************************************************
F290F 0000        REL(5) =REQSTd
      0
F2914 0000        REL(5) =REQSTp
      0
F2919 7000 =REQST GOSUB  =GLOOPM       Get loop number
F291D 7620        GOSUB  GETARG        Get argument
F2921 3500        LC(6)  =mSETS1       Set status length=1 byte
      0000
F2929 7ACB        GOSUB  pute
F292D D9          C=B    A
F292F F2          CSL    A
F2931 F2          CSL    A
F2933 3100        LC(2)  =mSETST       Load low 2 nibs of SET STATUS msg
F2937 24          P=     4
```

```
F2939 3100          LC(2)  =nSTS@4
F293D 76B8          GOSUB  pute             Set status value to B[B] value
F2941 8C54 RQSTRT   GOLONG ENTRTN
      6F
               *************************************************************
               *************************************************************
               **
               ** Name:        GETARG - Get an argument from memory
               **
               ** Category:    LOCAL
               **
               ** Purpose:
               **      Get an argument which follows an (optional) loop #
               **      (Assumes GLOOP# has been called just before this)
               **
               ** Entry:
               **      All exit conditions of GLOOP#
               **      D0 is the PC
               **
               ** Exit:
               **      D0 points to the mailbox
               **      B[B] is the value of the argument
               **      Carry clear
               **      P=0
               **
               ** Calls:       SAVED0,FNDCHK,SWAPD0,GTYPR+,RESTD0
               **
               ** Uses.......
               **  Inclusive: A,B,C,D,R0-R4,D0,D1,P,STMTD0,ST[11:0],FUNCxx,
               **             All RAM EXPEXC is permitted to use
               **
               ** Stk lvls:    6 (GTYPR+)
               **
               ** History:
               **
               **    Date      Programmer              Modification
               **  --------    ----------      --------------------------------
               **  02/22/84        NZ          Changed GOSUB FNDCHK to GOSUBL
               **  12/20/83        NZ          Installed fix for SR #0039-1075(1)
               **                              The fix involves moving the call
               **                              to GLOOP# to the calling routine
               **                              to save one RSTK level, then calling
               **                              GETARG
               **  12/19/83        NZ          Added documentation
               **                  SC          Wrote routine
               **
               *************************************************************
               *************************************************************
F2947 8E00 GETARG   GOSUBL =SAVED0          Save D0 in STMTD0 for use later
      00
F294D 8E00          GOSUBL =FNDCHK          Find the mailbox
      00
F2953 4D5           GOC    ErrorX           Error...exit
F2956 8E00          GOSUBL =SWAPD0          Save mailbox addr in STMTD0, get PC
      00
```

```
F295C 161             D0=D0+ 2          Skip the leading <tCOMMA>
F295F 8E00            GOSUBL =GTYPR+    Get the status byte
      00
F2965 4B4             GOC    ErrorX     Error...exit
F2968 8C00            GOLONG =RESTD0    Restore mailbox pointer
      00
                *-
                *-
F296E 7000 ENABfx GOSUB  =GLOOP#        Get loop number
F2972 71DF            GOSUB  GETARG     Get argument
F2976 6C60            GOTO   ENABL1     Continue with enable code
                *-
                *-
F297A 0               CON(1) =FIXSPC    1 nibble available here
F297B                 BSS    1-1
                ****************************************************************
                ****************************************************************
                **
                ** Name:       CKLOP# - Read and check loop # for range
                ** Name:       GETLOP - Check loop # for range, put into C[S]
                **
                ** Category:   LOCAL
                **
                ** Purpose:
                **      Get loop number from memory, if there.  If not there,
                **      return loop # 1.  If there, verify that the loop # is
                **      in the range 1 <= I <= 3
                **
                ** Entry:
                **      P=0,HEXMODE
                **      CKLOP#:D0 points to the loop # expression, if any
                **      GETLOP:B[A] is the loop # (in HEX)
                **
                ** Exit:
                **      Carry set
                **      C[S] is the loop # - 1
                **      If an error is detected, takes a direct exit to BSERR
                **
                ** Uses:
                **      CKLOP#:A,B,C,D,R0-R4,D0,D1,P,FUNCxx,ST[11:0],all RAM
                **             EXPEXC is permitted to use
                **      GETLOP:A[A],C[W]
                **
                ** Stk lvls:
                **      CKLOP#:6 (GTYPR+)
                **      GETLOP:0
                **
                ** History:
                **
                **   Date     Programmer             Modification
                **  --------  ----------   --------------------------------
                **  12/19/83     NZ        Updated documentation
                **  03/19/83     NZ        Modified routine
                **               SC        Wrote routine
                **
```

```
                 **************************************************************
                 **************************************************************
F297B AC2   =CKLOP# C=0     S
F297E 14A           A=DAT0  B          Read first token
F2981 A80           A=0     P          (Check if it is Fx hex)
F2984 A0C           A=A-1   P
F2987 B64           A=A+1   B
F298A 400           RTNC               If carry, done (return C[S]=0)
F298D 8E00          GOSUBL  =GTYPR+    Get byte from @ PC
      00
F2993 4D1           GOC     ErrorX     Error
F2996 D4    =GETLOP A=B     A          Copy loop # to A[A]
F2998 CC            A=A-1   A          Convert to option base zero
F299A 441           GOC     outrng     If carry, too small
F299D D2            C=0     A
F299F 303           LC(1)   3          Set C[A]="00003"
F29A2 8BE           ?A>=C   A          Is A[A] too big?
F29A5 A0            GOYES   outrng     Yes...too big
F29A7 A86           C=A     P          No...accept it
F29AA 816           CSRC               Put loop # into C[S]
F29AD 02            RTNSC              Set carry for exit
                 *-
                 *-
F29AF 20    outrng  P=      =eRANGE     SAY "ARG. OUT OF RANGE"
F29B1 60A0  ErrorX  GOTO    Errorx      SAY "ARG. OUT OF RANGE"
```

```
                          STITLE ON INTR/ENABLE INTR execute
               **************************************************************
               **************************************************************
               **
               ** Name:        ONINTx - Execute the ON INTR statement
               **
               ** Category:    STEXEC
               **
               ** Purpose:
               **      Execute the ON INTR statement
               **
               ** Entry:
               **      D0 is the PC
               **
               ** Exit:
               **      Through NXTSTM
               **
               ** Calls:       None
               **
               ** Uses.......
               **  Inclusive: C[A],D0,D1
               **
               ** Stk lvls:    0
               **
               ** History:
               **
               **    Date     Programmer             Modification
               **  --------   ----------   --------------------------------
               **  12/19/83       NZ       Added documentation
               **                 SC       Wrote routine
               **
               **************************************************************
               **************************************************************
 F29B5 0000           REL(5) =ONINTd
       0
 F29BA 0000           REL(5) =ONINTp
       0
 F29BF 86D   =ONINTx ?ST=0  13           Is the machine currently running?
 F29C2 F0             GOYES  ENTrtn      No...don't do anything
 F29C4 1F00           D1=(5) =ONINTR     Yes...save the current address...
       000
 F29CB 136            CD0EX
 F29CE 145            DAT1=C A           ...in the "ONINTR" RAM location
 F29D1 6F6F ENTrtn    GOTO   RQSTRT      Go to NXTSTM
               **************************************************************
               **************************************************************
               **
               ** Name:        ENABLE - Execute the ENABLE INTR statement
               **
               ** Category:    STEXEC
               **
               ** Purpose:
               **      Execute the ENABLE INTR statement
               **
               ** Entry:
                  **      D0 is the PC
                  **
                  ** Exit:
                  **      Through NXTSTM if OK, BSERR if error
                  **
                  ** Calls:       GLOOPM,GETARG,PUTC,<NXTSTM>
                  **
                  ** Uses.......
                  **  Inclusive: A,B,C,D,R0-R4,D0,D1,P,STMTD0,ST[11:0],FUNCxx,
                  **             All RAM EXPEXC is permitted to use
                  **
                  ** Stk lvls:   7 (GLOOPM)(GETARG)
                  **
                  ** History:
                  **
                  **    Date      Programmer             Modification
                  **  --------    ----------    --------------------------------
                  **  12/21/83        NZ        Split call to GETARG into two calls;
                  **                            one to GLOOPM, then to GETARG to
                  **                            fix a stack level bug (see REQST)
                  **  12/19/83        NZ        Added documentation
                  **                  SC        Wrote routine
                  **
                  ***************************************************************
                  ***************************************************************
 F29D5 0000              REL(5) =ENABLd
       0
 F29DA 0000              REL(5) =ENABLp
       0
 F29DF 6E8F =ENABLE GOTO    ENABfx          Goto enable fix space
                  *-
 F29E3 3300 ENABL1  LC(4)   =nSETIM         Set interrupt mask...
       00
 F29E9 AE9          C=B     B               ...to the value in B[B]
 F29EC 70FA         GOSUB   putc
 F29F0 60EF         GOTO    ENTrtn          Exit through NXTSTM
```

```
                        STITLE PASS CONTROL execute
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:        PASS - Execute the PASS CONTROL statement
                 **
                 ** Category:    STEXEC
                 **
                 ** Purpose:
                 **      Execute the PASS CONTROL statement (device specifier
                 **      is optional)
                 **
                 ** Entry:
                 **      D0 is the PC
                 **
                 ** Exit:
                 **      Through NXTSTM if OK, through BSERR if error
                 **
                 ** Calls:       GETDID,START,CKmode,UNLPUT,TALK,PUTE,PUTGF
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,D,R0-R4,D0,D1,P,STMTD1[3:0],STMTR1,ST[11:0],
                 **              FUNCxx,All RAM EXPEXC is permitted to use
                 **
                 ** Stk lvls:    7 (GETDID)
                 **
                 ** History:
                 **
                 **   Date      Programmer              Modification
                 **   --------  ----------   ---------------------------------
                 **   12/20/83      NZ       Packed 5 nibbles for future use
                 **   12/19/83      NZ       Added documentation
                 **                 SC       Wrote routine
                 **
                 ****************************************************************
                 ****************************************************************
F29F4 0000              REL(5) =PASSd
      0
F29F9 0000              REL(5) =PASSp
      0
F29FE 14A  =PASS        A=DAT0 B
F2A01 3100              LC(2)  =tCOMMA
F2A05 D3                D=0    A            Preset device to "LOOP"
F2A07 962               ?A=C   B            Is there a device specifier?
F2A0A B0                GOYES  PASS20       No...use "LOOP"
F2A0C 8E00              GOSUBL =GETDID      Yes...get the device specifier
      00
F2A12 4F3               GOC    Errorx       Error
F2A15 8E00 PASS20       GOSUBL =START       Find and set up the loop
      00
F2A1B 463               GOC    Errorx       Error
F2A1E 7DDE              GOSUB  CKmode       Make sure I'm the loop controller
F2A22 96B               ?D=0   B            Is this either "LOOP" or (nothing)?
F2A25 41                GOYES  PASS30       Yes...just send TCT
F2A27 8E00              GOSUBL =UNLPUT      No...unaddress all listeners
```

```
           00
     F2A2D 442                GOC     Errorx         Error
     F2A30 8E00               GOSUBL  =TALK          Make the device the talker
           00
     F2A36 4B1                GOC     Errorx         Error...set up code, goto BSERR
     F2A39 3100 PASS30        LC(2)   =nTCT@4        Send TCT
     F2A3D 8E00               GOSUBL  =PUTGF-        Get back response from mailbox
           00
     F2A43 4E0                GOC     Errorx         Error
     F2A46 890                ?P=     =pACK          Is it an "ACKNOWLEDGE" frame?
     F2A49 A6                 GOYES   CNTR35         Yes...OK
     F2A4B 20                 P=      0
     F2A4D 300                LC(1)   =eNORDY        No...Device Not Ready error
     F2A50 20                 P=      =ePIL
     F2A52 6000 Errorx        GOTO    =eRRORX
                *-
                *-
     F2A56 8C00 Chksts        GOLONG  =CHKSTS
           00
                *-
                *-
     F2A5C 3300 SETIM0        LC(4)   =nSETIM        Set interrupt mask to zero
           00
     F2A62 6D7A               GOTO    putc
                *-
                *-
     F2A66 0                  CON(1)  =FIXSPC        3 nibbles available here
     F2A67                    BSS     3-1
```

```
                          STITLE CONTROL ON/OFF execute
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:       CONTRL - Execute the CONTROL ON/OFF statements
                 **
                 ** Category:   STEXEC
                 **
                 ** Purpose:
                 **      Execute the CONTROL ON/OFF statements (take or give up
                 **      control on a loop)
                 **
                 ** Entry:
                 **      D0 is the PC
                 **
                 ** Exit:
                 **      Through NXTSTM if no error, through BSERR if error
                 **
                 ** Calls:      CKLOPN,FNDMBD,CHKSTS,PUTE,FNDCH-,PUTC,<NXTSTM>,
                 **             <REST10>
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,D,R0-R4,D0,D1,P,STMTD0,ST[11:0],FUNCxx,
                 **             All RAM EXPEXC is permitted to use
                 **
                 ** Stk lvls:   7 (CKLOPN)
                 **
                 ** History:
                 **
                 **   Date      Programmer              Modification
                 **   --------  ----------  ---------------------------------
                 **   12/19/83     NZ       Added documentation
                 **                SC       Wrote routine
                 **
                 ***************************************************************
                 ***************************************************************
F2A69 0000               REL(5) =CNTRLd
      0
F2A6E 0000               REL(5) =CNTRLp
      0
F2A73 161        =CONTRL D0=D0+ 2            Skip the tON/tOFF token for now
F2A76 710F               GOSUB  CKLOPN       Get the loop # from memory
F2A7A 1F00               D1=(5) =PCADDR      (C[S] is the loop #)
      000
F2A81 143                A=DAT1 A
F2A84 131                D1=A                Set D1 to the current PCADDR
F2A87 177                D1=D1+ 2+6          Skip the line length, CONTROL token
F2A8A 14B                A=DAT1 B            Read the tON/tOFF token
F2A8D 3100               LC(2)  =tON
F2A91 962                ?A=C   B            Is this CONTROL ON?
F2A94 32                 GOYES  CNTR40       Yes...set the controller flag
                 *
                 * CONTROL OFF if here
                 *
F2A96 8E00               GOSUBL =FNDMBD      Clear DISPLAY OK bits
```

```
               00
2956 F2A9C 458              GOC    Errorx        Error
2957 F2A9F 73BF             GOSUB  Chksts        Check if reset, get status
2958 F2AA3 4EA              GOC    Errorx        Error
2959 F2AA6 3300             LC(4)  =mCLRCA       Clear Controller Active state
           00
2960 F2AAC 703A             GOSUB  putc
2961 F2AB0 41A              GOC    Errorx
2962 F2AB3 6D8E CNTR35      GOTO   RQSTRT        Goto NXTSTM
2963            *-
2964            *-
2965 F2AB7 AC5  CNTR40      B=C    S             Save mailbox in B[S] for REST10
2966 F2ABA 8E00             GOSUBL =FNDCH-       Find and check the mailbox
           00
2967 F2AC0 419              GOC    Errorx
2968 F2AC3 3300             LC(4)  =mSETCA       Set Controller Active state
           00
2969 F2AC9 731A             GOSUB  putc
2970 F2ACD 448              GOC    Errorx
2971 F2AD0 AC9              C=B    S             Restore mailbox # from B[S]
2972 F2AD3 8C00             GOLONG =REST10       Restore IO (readdress, etc)
           00
2973            *-
2974            *-
2975 F2AD9 0                CON(1) =FIXSPC       4 nibbles available here
2976 F2ADA                  BSS    4-1
```

```
                       STITLE Zero program poll handler
               ****************************************************************
               ****************************************************************
               **
               ** Name:        hZERPG - Handler for the ZERO program poll
               **
               ** Category:    POLL
               **
               ** Purpose:
               **      Handle the ZERO program poll (set interrupt mask=0)
               **
               ** Entry:
               **      None
               **
               ** Exit:
               **      XM=1, carry clear
               **
               ** Calls:       SAVSTS,FNDMBX,CHKSTS,PUTC,RESSTS
               **
               ** Uses.......
               **  Inclusive: A,B[S],C,D0,P,SNAPBF[37:0]
               **
               ** Stk lvls:    1 (SAVSTS) (SAVSTS saves the levels in SNAPBF)
               **
               ** History:
               **
               **    Date      Programmer              Modification
               **   --------   ----------         ---------------------------------
               **   02/22/84       NZ             Changed call to FNDCHK into two
               **                                 calls (FNDMBX,CHKSTS) to fix a
               **                                 bug with mailboxes in manual mode
               **                                 interrupting the mailbox checking
               **   12/19/83       NZ             Added documentation
               **                  SC             Wrote routine
               **
               ****************************************************************
               ****************************************************************
 F2ADD 8E00 =hZERPG GOSUBL =SAVSTS        Save 5 RSTK levels & status bits
       00
 F2AE3 AC1          B=0    S              Counter for which loop is next
 F2AE6 760E ZERP10  GOSUB  Fndmbb         Find that mailbox
 F2AEA 431          GOC    ZERP30         Not found...exit
 F2AED 756F         GOSUB  Chksts         Check it
 F2AF1 460          GOC    ZERP20         Error...try next mailbox
 F2AF4 746F         GOSUB  SETIMO         Set interrupt mask to 0
 F2AF8 B45  ZERP20  B=B+1  S              Go to next loop
 F2AFB 5AE          GONC   ZERP10         Go "always" (if fall through, done)
               *-
               *-
 F2AFE 8E00 ZERP30  GOSUBL =RESSTS        Restore RSTK levels, D[A],ST[11:0]
       00
 F2B04 00           RTNSXM                Return, XM=1, Carry clear
               *-
               *-
 F2B06 0            CON(1) =FIXSPC        4 nibbles available here
```

```
   3030 F2B07              BSS    4-1
```

```
                      STITLE Exception poll handler
               *************************************************************
               *************************************************************
               **
               ** Name:        hEXCPT - Exception poll handler
               **
               ** Category:    POLL
               **
               ** Purpose:
               **      Handle the exception poll (check for EOL branch due)
               **
               ** Entry:
               **      None
               **
               ** Exit:
               **      If not ON INTR: XM=1, carry clear
               **      If ON INTR pending and due: exits through ONTIMR!
               **
               ** Calls:       FNDMBX,CHKSTS,PUTC,<ONTIMR>
               **
               ** Uses.......
               **  Inclusive: A,B,C,D0,D1,P,ST[11:0] (also what ONTIMR uses)
               **
               ** Stk lvls:    3 (CHKSTS)
               **
               ** History:
               **
               **    Date      Programmer              Modification
               **  --------    ----------    ---------------------------------
               **  02/22/84        NZ        Split call to FNDCHK into two calls
               **                            (FNDMBX,CHKSTS) to fix a bug with
               **                            multiple loops, one in manual mode
               **  12/19/83        NZ        Added documentation
               **                  SC        Wrote routine
               **
               *************************************************************
               *************************************************************
 F2B0A AC1     =hEXCPT B=0    S              Initialize loop counter to first
 F2B0D 7FDD    EXPT10  GOSUB  Fndmbb         Find the current mailbox
 F2B11 482             GOC    RtnSXM         If mailbox not found, done
 F2B14 7E3F            GOSUB  Chksts         Check it
 F2B18 490             GOC    EXPT15         Error...go to next one
               *
               * FNDCHK returns with status in C[X]
               *
 F2B1B 08              CSTEX
 F2B1D 870             ?ST=1  =sINTR         Interrupt pending?
 F2B20 80              GOYES  EXPT20         Yes...see if ON INTR branch defined
 F2B22 B45     EXPT15  B=B+1  S              No...check next loop
 F2B25 57E             GONC   EXPT10         Go "always" (if fall thru, OK)
               *-
               *-
               *
               * Interrupt pending on mailbox, see if ON INTR branch exists
               *
```

```
F2B28 1F00 EXPT20  D1=(5) =ONINTR
      000
F2B2F 147          C=DAT1 A
F2B32 8AE          ?C#0   A              Is the ON INTR address zero?
F2B35 B0           GOYES  EXPT40         No...see if program running
           *
           * Interrupt pending, but ONINTR=0, set Except and exit for now
           *
F2B37 850  EXPT30  ST=1   =Except
F2B3A 21   RtnSXM  P=     1              Clear carry and set XM
F2B3C 0D           P=P-1
F2B3E 00           RTNSXM
           *-
           *-
           *
           * Interrupt pending and ONINTR#0, check if program running
           *
F2B40 86D  EXPT40  ?ST=0  13             Running?
F2B43 4F           GOYES  EXPT30         No...set Except and keep waiting
           *
           * See if the ATTN key pressed
           *
F2B45 8E00         GOSUBL =CK=ATn        Check if ATTN key has been pressed
      00
F2B4B 5BE          GONC   EXPT30         Yes...wait for next time around
           *
           * Interrupt pending, ONINTR#0, Running; check if at end of line
           *
F2B4E 07           C=RSTK                Current PC is on third RSTK level
F2B50 D5           B=C    A                save first RSTK level in B[A]
F2B52 07           C=RSTK                Pop off the second RSTK level
F2B54 DA           A=C    A                save it in A[A]
F2B56 07           C=RSTK                Pop off the third RSTK level
F2B58 06           RSTK=C                  and push it back on
F2B5A DE           ACEX   A              Get the second RSTK level from A[A]
F2B5C 06           RSTK=C                  and push it back on
F2B5E DD           BCEX   A              Get the first RSTK level from B[A]
F2B60 06           RSTK=C                  and put it back on
           *
           * Now check if the PC is at an EOL
           *
F2B62 131          D1=A                  Set D1 to the current PC
F2B65 14B          A=DAT1 B
F2B68 3100         LC(2)  =tEOL          Check if it points to an EOL
F2B6C 966          ?A#C   B              Is it at EOL?
F2B6F 8C           GOYES  EXPT30         No...set Except, wait for next time
           *
           * We are going to do an end-of-line branch
           *
F2B71 137          CD1EX                 Save PC on stack
F2B74 06           RSTK=C
           *
F2B76 72EE         GOSUB  SETIM0         Set IM=0 to clear interrupt pending
F2B7A 1F00         D1=(5) =ONINTR
      000
```

```
  3138 F2B81 147          C=DAT1 A            Read the ONINTR address again
  3139 F2B84 08           CLRST               Clear ON ERROR & ON TIMER flags
  3140 F2B86 850          ST=1   =sEXTGS      Set external flag
  3141 F2B89 8D00         GOVLNG =ONTIMR      Take the jump
             000
  3142             *-
  3143             *-
  3144 F2B90 0            CON(1) =FIXSPC      8 nibbles available here
  3145 F2B91              BSS    8-1
```

```
                        STITLE Key definition poll handler
                ***************************************************************
                ***************************************************************
                **
                ** Name:        hKYDF - Handler for the keydef poll
                **
                ** Category:    POLL
                **
                ** Purpose:
                **      Handle the key def poll for HPIL key (#FF)
                **
                ** Entry:
                **      P=0
                **      R0[6:5] is the key number
                **
                ** Exit:
                **      If HPIL data and remote then define a colon-def key
                **      to execute the statement
                **
                ** Calls:       ASRC5,FNDMBX,CHKSTS,GETHSS,D1MSTK,CHKSTK,RDST30,
                **              STRPcr,D1=AVE,I/OALL
                **
                ** Uses.......
                **  Inclusive: A (If not handled)
                **  Inclusive: A,B,C,D,R0,R1,R2,D0,D1,P (If handled)
                **
                ** Stk lvls:    4 (RDST30)     (If handled...if not, 1)
                **
                ** History:
                **
                **   Date      Programmer              Modification
                **  --------   ----------     ----------------------------------
                **  02/22/84      NZ          Split call to FNDCHK into two calls
                **                            to fix a bug with multiple loops
                **                            with one in manual mode, changed
                **                            call to RDST35 to RDST30
                **  01/10/84      NZ          Changed size checking to always
                **                            get the first 255 characters from
                **                            the loop, if more than 255 received
                **  12/21/83      NZ          Added code to force valid size
                **                            (<4096 nibs) for key def...check
                **                            is done BEFORE call to I/OALL!
                **  12/19/83      NZ          Added documentation
                **  04/01/82      SC          Wrote routine
                **
                ***************************************************************
                ***************************************************************
F2B98 110       =hKYDF  A=R0                  Recall key number...
F2B9B 8E00              GOSUBL =ASRC5         ...from A[6:5]
      00
F2BA1 B64               A=A+1   B
F2BA4 559               GONC    RtnSXM        Not HPIL key...don't handle it
                *
                * Find out which mailbox has data available
                *
```

```
F2BA7 AC1             B=0     S               Start from mailbox #1
F2BAA 724D DFKY10     GOSUB   Fndmbb          Find loop B[S] (Sets Device bit)
F2BAE 464             GOC     NoKYDF          No mailbox has data available
F2BB1 71AE            GOSUB   Chksts          Check that mailbox
F2BB5 401             GOC     DFKY20          Error...try next one
F2BB8 D5              B=C     A               Save status bits in B[X]
F2BBA 7000            GOSUB   =GETHSS         Read mailbox's handshake bits
F2BBE 463             GOC     NoKYDF          If abort, exit
F2BC1 870             ?ST=1   =hsRQSR         Is this mailbox requesting service?
F2BC4 80              GOYES   DFKY30          Yes...see if it has data available
                *
                * Continue on to next mailbox...this one not requesting service
                *
F2BC6 845       DFKY20  B=B+1   S
F2BC9 50E             GONC    DFKY10          Go always
                *-
                *-
F2BCC           DFKY30
                *
                * Status bits are in B[X]
                *
F2BCC D9              C=B     A               Recall status bits
F2BCE 08              CSTEX
F2BD0 860             ?ST=0   =sDATAV         Is data available?
F2BD3 3F              GOYES   DFKY20          No...try next mailbox
                *
                * Read the data from the mailbox and save it on math stack
                *
F2BD5 777A            GOSUB   D1mstk          Set D1 to the top of stack
F2BD9 08              CLRST
F2BDB 7749            GOSUB   CHKSTK          See if room left on stack for string
F2BDF 2E              P=      14
F2BE1 31A0            LCHEX   0A              Put <Lf> in B[15:14] (Term. char)
F2BE5 AF5             B=C     W
F2BE8 D8              B=A     A               Put memory limit into B[A]
F2BEA AF0             A=0     W               Clear count, flag -23 indicator
F2BED CC              A=A-1   A               Set count="FFFFF"
F2BEF 8E5A            GOSUBL  RDST30          Read the data from the loop
      7F
F2BF5 454  NoKYDF     GOC     NOKYDF          Return no key def if error
F2BF8 7C3A            GOSUB   STRPcr          Strip off trailing <Cr>, if any
F2BFC 133             AD1EX                   A[A] is address of top of stack
F2BFF 8E00            GOSUBL  =D1=AVE
      00
F2C05 AF2             C=0     W               Clear C[5] for below
F2C08 147             C=DAT1  A               C[A] is bottom of stack
F2C0B E2              C=C-A   A               C[A] is string length in nibbles
F2C0D 81E             CSRB                    Convert length to bytes (temp)
F2C10 AF5             B=C     W               Put length into B[A] (for I/OALL)
F2C13 AF2             C=0     W               Truncate string to 255 chars max
F2C16 A6E             C=C-1   B
F2C19 8BD             ?B<=C   A               Is the length currently <=255?
F2C1C 40              GOYES   DFKY40          Yes...leave it as is
F2C1E D5              B=C     A               No...set it to 255.
F2C20 C5   DFKY40     B=B+B   A               Convert back to nibbles
```

```
F2C22 07              C=RSTK              Save 1 level...I/OALL uses three
F2C24 10A             R2=C                 RSTK levels if buffer shrinks
F2C27 3200            LC(3)  =bSTMXQ      Load HPIL stmt execute buffer ID
      0
F2C2C 8F00            GOSBVL =I/OALL      Allocate the buffer
      000
F2C33 11A             C=R2
F2C36 06              RSTK=C              Restore the RSTK level from R2
F2C38 470             GOC    DFKY50       Go if OK
                *
                * Not enough memory to create the stmt execute buffer
                *
                * If fail to return a key definition, set S0=0
                * XM is zero already
                *
F2C3B 840       NOKYDF ST=0   0           No key definition
F2C3E 03              RTNCC               Handled, no error
                *-
                *-
                *
                * Save the input string in the buffer
                * D0 points to the buffer header
                * D1 points to the buffer start
                *
F2C40 137       DFKY50 CD1EX              C[A] is the buffer start address
F2C43 162             D0=D0+ 3            D0 points to the buffer length
F2C46 142             A=DAT0 A            Read the buffer length
F2C49 1F00            D1=(5) =DEFADR
      000
F2C50 81C             ASRB                A[X] is the string length in bytes
F2C53 149             DAT1=A B            Write out the length to the buffer
F2C56 171             D1=D1+ 2            Move to key type
F2C59 BF2             CSL    W            Put buffer start address in C[5:1]
F2C5C 306             LC(1)  6            Type 6: colon def key
F2C5F 15D5            DAT1=C 6            Write type, buffer start address
F2C63 79E9            GOSUB  D1mstk       Set D1 to start of input string
F2C67 162             D0=D0+ 3            Set D0 past the buffer header
                *
F2C6A A6C       DFKY60 A=A-1  B           Are all characters written yet?
F2C6D 411             GOC    DFKY70       Yes...exit
F2C70 1C1             D1=D1- 2            No...read next character
F2C73 14F             C=DAT1 B
F2C76 14C             DAT0=C B            Write the character to buffer
F2C79 161             D0=D0+ 2
F2C7C 5DE             GONC   DFKY60       Go always
                *-
                *-
F2C7F 850       DFKY70 ST=1   0           Do have a key definition
F2C82 03              RTNCC               No error
                *-
                *-
F2C84 0               CON(1) =FIXSPC      18 nibbles available here
F2C85                 BSS    18-1
F2C96                 END
```

```
 A=SLEN  Abs  992402 #F2492 -  1112   253   923
 AS=FTY  Abs  991767 #F2217 -   668  1466  1683  2403
 ASRC5   Ext                -  3194
 AVE=D1  Ext                -   504
 Array   Abs       1 #00001 -    12   738
 BADTYP  Abs  991847 #F2267 -   740   737  2422
 BLDCON  Ext                -   419
 BytCnt  Abs       5 #00005 -    18  1337   876   910   925   927  1029  1069
 CHKASN  Ext                -   758
 CHKEOL  Ext                -   198   724
 CHKSTK  Abs  992550 #F2526 -  1283   901  3230
 CHKSTS  Ext                -  2895
 CHMMSV  Ext                -   668
 CHRCNT  Abs  993027 #F2703 -  1862  1495
 CK=ATn  Ext                -  3107
=CKLOPW  Abs  993659 #F297B -  2723  2943
 CKST10  Abs  992604 #F255C -  1301  1285
=CKmode  Abs  993535 #F28FF -  2560  2877
 CLMDUT  Abs  992442 #F24BA -  1165  1036  1043  1063
=CLMODE  Abs  992462 #F24CE -  1175   906  1173
 CNTR35  Abs  993971 #F2AB3 -  2962  2888
 CNTR40  Abs  993975 #F2AB7 -  2965  2951
 CNTRLd  Ext                -  2940
 CNTRLp  Ext                -  2941
 CNTST1  Abs  993434 #F289A -  2489  2003
 CNTSTR  Abs  993431 #F2897 -  2488  1933  1993  1999  2254  2402
=CONTRL  Abs  993907 #F2A73 -  2942
 COUNT   Abs  993035 #F270B -  1866  1862  2000
 COUNTC  Ext                -  1866
 CPLXER  Abs  992817 #F2631 -  1563  1552
 CS=TYP  Abs  991733 #F21F5 -   625   224   917  2324  2410
 CSLC5   Ext                -   480   482  1935
 CSRC5   Ext                -   490   492  1463  1931
 Chksts  Abs  993878 #F2A56 -  2895  2957  3018  3071  3203
 ChrTrp  Abs       7 #00007 -    22  1339   877   967
 Cmplex  Abs       3 #00003 -    14   736
 DO=PCA  Ext                -  1452
 D1=AVE  Ext                -  3241
 D1=AVS  Ext                -  1290
 D1@AVE  Ext                -  1609
 D1FSTK  Ext                -  2518
 D1MST+  Ext                -   731
 D1fstk  Abs  993513 #F28E9 -  2518   750
 D1mstk  Abs  992848 #F2650 -  1609   109   249   279   497   747   765  2340
                               2432  3228  3285
 DCRMNT  Ext                -  2053
 DEFADR  Ext                -  3278
 DEVADR  Abs  991682 #F21C2 -   540   177   184   242   305
 DFKY10  Abs  994218 #F2BAA -  3201  3214
 DFKY20  Abs  994246 #F2BC6 -  3213  3204  3224
 DFKY30  Abs  994252 #F2BCC -  3217  3209
 DFKY40  Abs  994336 #F2C20 -  3252  3250
 DFKY50  Abs  994368 #F2C40 -  3275  3259
 DFKY60  Abs  994410 #F2C6A -  3288  3294
 DFKY70  Abs  994431 #F2C7F -  3297  3289
 DTOH     Ext                   -  2491
 DsLoop   Ext                   -   166
 ENABL1   Abs   993763 #F29E3 -  2826  2676
=ENABLE   Abs   993759 #F29DF -  2824
 ENABLd   Ext                   -  2822
 ENABLp   Ext                   -  2823
 ENABfx   Abs   993646 #F296E -  2674  2824
 ENDING   Ext                   -  1803
 ENT"/"   Abs   993189 #F27A5 -  2199  1543
 ENT"B"   Abs   993208 #F27B8 -  2252  1540
 ENT"C"   Abs   993063 #F2727 -  1927  1513
 ENT"H"   Abs   993249 #F27E1 -  2324  1519
 ENT"K"   Abs   993267 #F27F3 -  2330  1522
 ENT"P"   Abs   993065 #F2729 -  1928  1516
 ENT"R"   Abs   993069 #F272D -  1930  1546
 ENT"X"   Abs   993132 #F276C -  1999  1501
 ENT/03   Abs   993204 #F27B4 -  2206  2202
 ENT120   Abs   991171 #F1FC3 -   198   191
 ENT130   Abs   991185 #F1FD1 -   207   199   297
 ENT150   Abs   991192 #F1FD8 -   209   269
 ENT155   Abs   991205 #F1FE5 -   214   210
 ENT160   Abs   991208 #F1FE8 -   215  2339
 ENT180   Abs   991225 #F1FF9 -   224   217   220   309
 ENT190   Abs   991263 #F201F -   248   231
 ENT200   Abs   991296 #F2040 -   260   256
 ENT220   Abs   991304 #F2048 -   268   225
 ENT250   Abs   991311 #F204F -   270
 ENT300   Abs   991321 #F2059 -   273   261
 ENT302   Abs   991330 #F2062 -   278   274
 ENT305   Abs   991378 #F2092 -   297   285
 ENT310   Abs   991382 #F2096 -   300   293
 ENT320   Abs   991393 #F20A1 -   305   301
=ENTER    Abs   991064 #F1F58 -   158
 ENTERp   Ext                   -   157
 ENTFFN   Abs   993270 #F27F6 -  2331  2328
 ENTREX   Abs   991090 #F1F72 -   170   159   173   898
 ENTRTN   Abs   991112 #F1F88 -   180  2619
 ENTRex   Abs   992043 #F232B -   898   761   907   941  2203  2512  2564
 ENTST2   Abs   993450 #F28AA -  2494  2335
 ENTST3   Abs   993487 #F28CF -  2504   501  2351  2498
 ENTSTr   Abs   993447 #F28A7 -  2493  1940
 ENTU00   Abs   992641 #F2581 -  1462  1458
 ENTU05   Abs   992656 #F2590 -  1466  1549  2257
 ENTU07   Abs   992660 #F2594 -  1468  1727  2206
 ENTU09   Abs   992662 #F2596 -  1469  1672  1863
 ENTU20   Abs   992681 #F25A9 -  1478  1474
 ENTU30   Abs   992715 #F25CB -  1498  1494
=ENTUSG   Abs   992609 #F2561 -  1452
 ENTX07   Abs   993140 #F2774 -  2001  1996
 ENTa09   Abs   992858 #F265A -  1672  1560
 ENTb09   Abs   993031 #F2707 -  1863  1805  1941  2004
 ENTc09   Abs   993149 #F277D -  2004  2054  2111
 ENTdel   Abs   991099 #F1F7B -   177   208   302
 ENTdln   Abs   992854 #F2656 -  1670  1537
 ENTend   Abs   993003 #F26EB -  1799  1534
 ENTlpb  Abs  993162 #F278A -  2107  1510
 ENTlpp  Abs  993166 #F278E -  2109  1528
 ENTlps  Abs  993164 #F278C -  2108  1525
 ENTnlt  Abs  993152 #F2780 -  2053  1507
 ENTrst  Abs  993178 #F279A -  2155  1531
 ENTrtn  Abs  993745 #F29D1 -  2785  2781  2829
 ENTstr  Abs  993119 #F275F -  1992  1504
 ENTw05  Abs  993221 #F27C5 -  2257  2352
 ENUFLD  Abs  992862 #F265E -  1675  1475
 ERROR   Ext                -   112
 ERRORX  Ext                -   170
 EXPT10  Abs  994061 #F2B0D -  3069  3080
 EXPT15  Abs  994082 #F2B22 -  3079  3072
 EXPT20  Abs  994088 #F2B28 -  3086  3078
 EXPT30  Abs  994103 #F2B37 -  3093  3103  3108  3129
 EXPT40  Abs  994112 #F2B40 -  3102  3089
 EndENT  Abs  992987 #F26DB -  1730  1704  1802
 Endfrm  Abs       3 #00003 -    15   219  1073  1078
 ErrorX  Abs  993713 #F29B1 -  2744  2666  2670  2730
 Errorx  Abs  993874 #F2A52 -  2892  2744  2874  2876  2881  2883  2886  2956
                               2958  2961  2967  2970
 Except  Ext                -  3093
 FINDA   Ext                -  1498
 FIXSPC  Ext                -   720   743  1122  2679  2902  2975  3029  3144
                               3301
 FNDCH-  Ext                -  2966
 FNDCHK  Ext                -  2665
 FNDMBD  Ext                -  2955
 FNDMBX  Ext                -  2522
 FORSTK  Ext                -   540   586
 FRAME-  Ext                -  1010
 FSTK-7  Abs  991712 #F21E0 -   586   280   881
 Fndmbb  Abs  993520 #F28F0 -  2521  3016  3069  3201
 Fndmbx  Abs  993523 #F28F3 -  2522
 GETARG  Abs  993607 #F2947 -  2664  2609  2675
 GETD09  Abs  991118 #F1F8E -   183   168
 GETD10  Abs  991121 #F1F91 -   184   164
 GETDID  Ext                -   158  2873
 GETDev  Ext                -  2525
 GETHSS  Ext                -  3206
=GETLOP  Abs  993686 #F2996 -  2731
 GETN10  Abs  991435 #F20CB -   372   370
 GETN20  Abs  991455 #F20DF -   379   408
 GETN30  Abs  991471 #F20EF -   392   387
 GETN40  Abs  991476 #F20F4 -   396   380
 GETN50  Abs  991512 #F2118 -   407   405
 GETN60  Abs  991518 #F211E -   411   398   401
 GETN80  Abs  991592 #F2168 -   431   427
 GETNUM  Abs  991410 #F20B2 -   360   268  2430
 GETX    Ext                -   962
 GLOOP#  Ext                -  2608  2674
 GTYPR+  Ext                -  2669  2729
 H&Kcnt  Abs  993320 #F2828 -  2346  2342
 HDFLT   Ext                -  2263
 HorK    Abs  992902 #F2686 -  1699  1689
 I/OALL  Ext                   -  3256
 IMerr   Ext                   -  1563
 KorM    Abs        5 #00005 -    19   214   273   308  2338
 MEMBER  Ext                   -  1493
 MEMERR  Ext                   -  2515
 MEMerr  Abs   993506 #F28E2 -  2515  2511
 MFLG=0  Ext                   -   772
 MLFFLG  Ext                   -   192   753
 Memerr  Abs        4 #00004 -    17   984   997  1067  1283  1301  2510
 Mflg=0  Abs   991951 #F22CF -   771   728  1706
 MltItm  Abs        4 #00004 -    16   215   230   307   369   386  2425
 NOKYDF  Abs   994363 #F2C3B -  3266  3238
 NRMCON  Ext                   -   420
 NUMSCN  Ext                   -   416
 NXTD10  Abs   991870 #F227E -   747   739
 NXTD20  Abs   991939 #F22C3 -   765   756
 NXTDS-  Abs   991816 #F2248 -   730  1710
=NXTDST  Abs   991793 #F2231 -   724   207   300
 NXTEXP  Ext                   -  1708
 NXTVA-  Ext                   -   730
 NoKYDF  Abs   994293 #F2BF5 -  3238  3202  3207
 Numing  Abs   992908 #F268C -  1701  1693
 ONINTR  Ext                   -  2782  3086  3137
 ONINTd  Ext                   -  2778
 ONINTp  Ext                   -  2779
=ONINTx  Abs   993727 #F29BF -  2780
 ONTIMR  Ext                   -  3141
 OUTPd   Ext                   -   156
=PASS    Abs   993790 #F29FE -  2868
 PASS20  Abs   993813 #F2A15 -  2875  2872
 PASS30  Abs   993849 #F2A39 -  2884  2879
 PASSd   Ext                   -  2866
 PASSp   Ext                   -  2867
 PCADDR  Ext                   -  2944
 POPMTH  Ext                   -   498   748
 PUTC    Ext                   -  1179
 PUTE    Ext                   -  1192
 PUTGF-  Ext                   -  2885
 RANGEN  Ext                   -   397
 RCVOFS  Ext                   -  1724
 RDATTY  Ext                   -   740
 RDS30.  Abs   992287 #F241F -  1019  1030
 RDST01  Abs   992001 #F2301 -   883   110
 RDST05  Abs   992029 #F231D -   894   890
 RDST10  Abs   992047 #F232F -   901   897
 RDST15  Abs   992099 #F2363 -   927   905   909
 RDST20  Abs   992139 #F238A -   943   913   918
 RDST25  Abs   992143 #F2[illegible]F -   946   911   928
 RDST30  Abs   992154 #F2[illegible]A -   952   947  1019  3237
 RDST35  Abs   992171 #F23AB -   960   953   994
 RDST40  Abs   992185 #F2[illegible]B9 -   964   993
 RDST45  Abs   992225 #F23E1 -   982   974   981
 RDST50  Abs   992231 #F23E7 -   984   968
 RDST52  Abs   992247 #F23F7 -   990   983
 RDST55  Abs   992252 #F23FC -   992   966   985   998
 RDST60  Abs  992260 #F2404 -   997   987
 RDST65  Abs  992266 #F240A -  1001   963
 RDST70  Abs  992291 #F2423 -  1022  1012
 RDST75  Abs  992301 #F242D -  1031   961  1018
 RDST80  Abs  992307 #F2433 -  1035  1009
 RDST85  Abs  992317 #F243D -  1041  1023
 RDST87  Abs  992345 #F2459 -  1052  1047
 RDST89  Abs  992347 #F245B -  1053  1049
 RDST90  Abs  992355 #F2463 -  1063  1032
 RDST95  Abs  992397 #F248D -  1078  1070  1072
 RDST99  Abs  992400 #F2490 -  1079  1076
 RED-LF  Abs  991972 #F22E4 -   875   209
 REDC00  Abs  991975 #F22E7 -   876   872
=REDCHR  Abs  991991 #F22F7 -   880  2499
 REDCer  Abs  993497 #F28D9 -  2510   211  2500
=REQST   Abs  993561 #F2919 -  2608
 REQSTd  Ext                -  2606
 REQSTp  Ext                -  2607
 RESSTS  Ext                -  3025
 REST10  Ext                -  2972
 RESTD0  Ext                -   283  2671
 RESTD1  Ext                -  2496
 RQSTRT  Abs  993601 #F2941 -  2619  2785  2962
 RTNCHK  Abs  991096 #F1F78 -   173  1742
 RtnSXM  Abs  994106 #F2B3A -  3094  3070  3196
 S-R0-3  Ext                -   626
 S-R1-1  Ext                -  1114
 SAVED0  Ext                -  2664
 SAVED1  Ext                -  1719
 SAVEIT  Ext                -   179   185
 SAVSTS  Ext                -  3014
 SETIM0  Abs  993884 #F2A5C -  2898  3020  3136
 SETTRM  Abs  992524 #F250C -  1236   942
 SKP-LF  Abs  991965 #F22DD -   871  1741  2201
 START   Ext                -   760   896  2875
 STKVCT  Ext                -   732
 STMTD0  Ext                -  1714  2346
 STMTD1  Ext                -  2407  2501
 STOBIN  Abs  993225 #F27C9 -  2260  2256
 STODC1  Abs  993423 #F288F -  2434  2266
 STODES  Abs  993427 #F2893 -  2435  2419
 STONUM  Abs  993396 #F2874 -  2425  2411
 STORE   Ext                -   485
 STORFL  Abs  993344 #F2840 -  2401  1671  1676  1800  2156  2200
 STOSUB  Abs  991594 #F216A -   473   275   278  2435
 STRHED  Ext                -  1606
 STRPcr  Abs  992824 #F2638 -  1598   222  3239
 SVTRC   Ext                -   771
 SWAPD0  Ext                -  2667
 Sign    Abs       6 #00006 -    20   378   402   406   426
 StrImg  Abs  992905 #F2689 -  1700  1692
 String  Abs       2 #00002 -    13
 TALK    Ext                -  2882
=TER/LF  Abs  992509 #F24FD -  1231  1168
 TERCHR  Ext                -   878  2331
 TRESD0  Ext                    -   186
 TRESD1  Ext                    -   421
 TSAVD1  Ext                    -   418
 Trash   Abs        6 #00006 -    21  1338   871   875   912   965  1071  1284
 TstEnd  Ext                    -  1696
 Tstend  Abs   992895 #F267F -  1696  1703  1801  2341
 UNLPUT  Ext                    -  2880
=UNT     Abs   992486 #F24E6 -  1182  1174
 USGrst  Ext                    -  2157
 USING   Ext                    -   195
 USloop  Ext                    -  2109
 YTML    Ext                    -   951
 ZERP10  Abs   994022 #F2AE6 -  3016  3022
 ZERP20  Abs   994040 #F2AF8 -  3021  3019
 ZERP30  Abs   994046 #F2AFE -  3025  3017
=aVE=D1  Abs   991675 #F21BB -   504   115   296   388   473   499   749  2349
 bSTMXQ  Ext                    -  3255
 badtyp  Abs   993392 #F2870 -  2422  2416  2428
 eABORT  Ext                    -  1008  1037
 eBADMD  Ext                    -  2562
 eDSPEC  Ext                    -   169
 eNORDY  Ext                    -  2890
 ePIL    Ext                    -  1054  2563  2891
 eRANGE  Ext                    -  2743
 eRRORX  Ext                    -  2892
 eUNEXP  Ext                    -  1052
 eXPEXC  Ext                    -   729
 exit    Abs   992999 #F26E7 -  1742  1738  2343
 fIEOT   Ext                    -   888
 getEOL  Abs   992995 #F26E3 -  1741   204  1737
=getdev  Abs   993529 #F28F9 -  2525   904  1166  2560
 hCPY5s  Ext                    -   955
=hENTER  Abs   991028 #F1F34 -   107
=hEXCPT  Abs   994058 #F2B0A -  3068
=hKYDF   Abs   994200 #F2B98 -  3193
=hZERPG  Abs   994013 #F2ADD -  3014
 hsRQSR  Ext                    -  3208
 mCLRCA  Ext                    -  2959
 mSETCA  Ext                    -  2968
 mSETIM  Ext                    -  2826  2898
 mSETST  Ext                    -  2615
 mSETS1  Ext                    -  2610
 mSETTC  Ext                    -  1239
 mSETTM  Ext                    -   939  1176  1178  1236
 mSFC05  Ext                    -  1191
 mSTS04  Ext                    -  2617
 mTCT04  Ext                    -  2884
 mUNT    Ext                    -  1183
 mXTSTM  Ext                    -   180
 outrng  Abs   993711 #F29AF -  2743  2733  2737
 pACK    Ext                    -  2887
 pENTR1  Abs   991050 #F1F4A -   115   111
 pEOT    Ext                    -  1011
 pSTATE  Ext                    -  1046
 pTERM   Ext                    -  1022
```

```
popstk  Abs  991653 #F21A5 -   497  2431
putc    Abs  992480 #F24E0 -  1179   940  1177  1184  1237  1241  2828  2899
                              2960  2969
pute    Abs  992503 #F24F7 -  1192   956  2611  2618
putefc  Abs  992498 #F24F2 -  1190  1232
rEV$    Ext                -   239   371
sCOUNT  Abs       5 #00005 -  1337  2333  2493
sDATAV  Ext                -  3223
sEXTGS  Ext                -  3140
sFLAG?  Ext                -   889
sIGNOR  Abs       7 #00007 -  1339  1939  2327  2330  2489
sINTR   Ext                -  3077
sTRASH  Abs       6 #00006 -  1338  2002  2334  2488
strhed  Abs  992841 #F2649 -  1606   238   260   364  2418
tCOMMA  Ext                -  2869
tENTER  Ext                -  1455
tEOL    Ext                -  3127
tON     Ext                -  2949
tUSING  Ext                -   189
uCPLXC  Ext                -  1551
uDELIM  Ext                -  1536
uHKB^   Ext                -  1472  1685
uIMend  Ext                -  1533
uLOOPB  Ext                -  1509
uLOOPP  Ext                -  1527
uLOOPS  Ext                -  1524
uMULT   Ext                -  1506
uRESTP  Ext                -  1530
uSTRPT  Ext                -  1503
```

```
Input Parameters

  Source file name is SC&ENT::MS

  Listing file name is SC/ENT:TI:ML::-1

  Object file name is SCXENT:TI:MS::-1

                                               111111
                                     0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                              TITLE  User Utility Routines <840301.1404>
  F2C96                       ABS    #F2C96          TIXHP6 address (fixed)
                   *
                   *          N   N  ZZZZZ   &     U   U  TTTTT  L
                   *          N   N      Z  & &    U   U    T    L
                   *          NN  N     Z   & &    U   U    T    L
                   *          N N N    Z     &     U   U    T    L
                   *          N  NN   Z     & & &  U   U    T    L
                   *          N   N  Z     &   &   U   U    T    L
                   *          N   N  ZZZZZ  && &    UUU     T    LLLLL
                   *
                   ************************************************************
                   ************************************************************
                   **
                   ** Name:          SEND - Execution of the SEND command
                   **
                   ** Category:      STEXEC
                   **
                   ** Purpose:
                   **       Send frame(s) on the [specified] loop
                   **
                   ** Entry:
                   **       D0 points to loop #, if any; if none, D0 points to the
                   **       first frame to send
                   **
                   ** Exit:
                   **       Through NXTSTM via ENDST, or through ERRORX
                   **
                   ** Calls:         GLOOP#,START+,GETDev,GFTYPE,FRAMEE,GST!NO,PUTC,
                   **                PUTD,PUTE,SAVED0,SWAPD0,RESTD0,SAVE2C,REST2C,
                   **                GETERR,<ENDST>
                   **
                   ** Uses.......
                   **  Exclusive: A,B,C,D,                  D0,D1,P
                   **  Inclusive: A,B,C,D,R0,R1,R2,R3,R4,D0,D1,P,ST[11:0],FUNCxx
                   **
                   ** Stk lvls:      7 (GLOOP#)
                   **
                   ** History:
                   **
                   **    Date      Programmer             Modification
                   **  --------    ----------      ---------------------------------
                   **  09/26/83       NZ           Updated documentation
                   **  08/02/83       NZ           Changed to not change frame count
                   **                              if device mode
                   **  04/01/83       NZ           Added set frame count=inf
                   **  03/01/83       NZ           Updated documentation
                   **
                   ************************************************************
                   ************************************************************
 F2C96 0000                  REL(5) =SENDd
       0
 F2C9B 0000                  REL(5) =SENDp
       0
 F2CA0 7B41 =SEND    GOSUB  GLOOP#          Get loop number
```

```
                  *
                  * GLOOPN returns with the loop number in C[S]
                  *
   F2CA4 7000           GOSUB  =SAVEDO        Save DO in STMTDO RAM
   F2CA8 D3             D=0    A              Clear D[X]
   F2CAA 8E00           GOSUBL =START+        Entry point for loop # in C[S]
         00
   F2CB0 451            GOC    SENDer         Error, P=error #
                  *
                  * Now DO points to the mailbox, STMTDO points to input string
                  *
   F2CB3 7000           GOSUB  =getdev        Check if in device mode
   F2CB7 4E5            GOC    SENd41         Yes...leave frame count as is
   F2CBA 3500           LC(6)  (=nSETFC)+#FFFFF Set frame count to don't count
         0000
   F2CC2 7000           GOSUB  =Pute
   F2CC6 6770     SENDer GOTO  SEND40         If carry set, GOTO eRRORX
                  *_
                  *_
   F2CCA 7D51     SEND10 GOSUB GFTYPE         Get Frame TYPE
                  *
                  * DO points at first character not in A-Z, A[A[S]:0] is frame
                  *
   F2CCE AF6            C=A    W
   F2CD1 D0             A=0    A              Clear substitute value
                  *
                  * FRAMEE leaves DO unchanged, C[X]: frame value, B[B]: mask
                  * FRAMEE also sets P=0!
                  *
   F2CD3 8E00           GOSUBL =FRAMEE
         00
   F2CD9 590            GONC   SEND15         If no carry, match!
                  *
                  * If NOT match, this is EOL!
                  *
   F2CDC 3200           LCHEX  F00            Value is F00 (EOL)
         F
   F2CE1 D5             B=C    A              Mask in B[B] (00)
                  *
   F2CE3 F2       SEND15 CSL   A
   F2CE5 F2             CSL    A
   F2CE7 AE9            C=B    B              Put mask in C[B], frame in C[4:2]
   F2CEA 7000           GOSUB  =SAVE2C        Save in STMTR1
   F2CEE 4C4            GOC    SEND5.         If carry (EOL), send it!
   F2CF1 14A            A=DAT0 B              Read in next token
   F2CF4 3100           LC(2)  =tCOMMA        Is there an expression?
   F2CF8 966            ?A#C   B
   F2CFB 04             GOYES  SEND5.         No...send the frame and continue
                  *
                  * Now need to get the expression (One byte)
                  *
   F2CFD 161            D0=D0+ 2              Skip the Comma token
   F2D00 7871     SEND20 GOSUB GST!NO         Get STring or Number (EXPEXC)
                  *
                  * GST!NO eliminates complex numbers from consideration!
                  * If number, converts to HEX and returns with # in A[A], carry
                  * clear (If overflow or <0, jumps to error)
                  * If string, returns with D1 pointing to string, D[A] = length
                  * of string (D1 needs to be decremented to next character),
                  * and carry is set.
                  * If complex, jumps to error routine
                  *
 F2D04 7000               GOSUB  =SWAPDO        Mailbox-->DO, PC-->RAM
 F2D08 517                GONC   SEND60         Number!
                  *
                  *
                  * String if here!
                  *
 F2D0B 7000 SEND30   GOSUB  =REST2C        Get back the value of byte, mask
                  *
                  * C[B] is the mask, C[4:2] is the value
                  *
 F2D0F D1                 B=0    A              Clear high nibbles of B[A]
 F2D11 AE5                B=C    B              Mask into B[B]
 F2D14 CF                 D=D-1  A              Carry if done...
 F2D16 4A2  SENd41   GOC    SEND41         ...done!
 F2D19 14B                A=DAT1 B              Now A[B] is the character value
 F2D1C 1C1                D1=D1- 2              Point to next character...
 F2D1F 0EF0               A=A&B  A              Mask the value...
 F2D23 F6                 CSR    A
 F2D25 F6                 CSR    A              Get value back into C[X]
                  *
                  * This is a hard-wired opcode calculation!!!!!!!
                  *
 F2D27 B56                C=C+1  M              Opcode for send frame!!!
 F2D2A 0EFA               C=C!A  A              OR in the frame value
 F2D2E 8E00               GOSUBL =PUTC          Send the frame
       00
 F2D34 56D                GONC   SEND30         Go if no error
 F2D37 6000 =eRRORX GOTO   =ERRORX
                  *-
                  *-
 F2D3B 483  SEND5.   GOC    SEND50         Go always
                  *-
                  *-
 F2D3E 48F  SEND40   GOC    eRRORX
 F2D41      SEND41
                  *
                  * Done with string handling
                  *
 F2D41 7000               GOSUB  =SWAPDO        Mailbox-->RAM, PC-->DO
                  *
                  * Check if tCOMMA...if so, continue at SEND20
                  *
 F2D45 14A                A=DATO B
 F2D48 161                DO=DO+ 2
 F2D4B 3100               LC(2)  =tCOMMA
 F2D4F 962                ?A=C   B              Is it a comma?
 F2D52 EA                 GOYES  SEND20         Yes...more data
 F2D54 3100               LC(2)  =tCOLON        Frame?
```

```
F2D58 966              ?A#C   B              Is it a frame type?
F2D5B 60               GOYES  SEND45         No...DONE!
F2D5D 6C6F             GOTO   SEND10         Yes...continue
                  *
                  * If here, then done with processing...
                  *
F2D61 7000 SEND45 GOSUB  =RESTDO         Restore mailbox pointer
F2D65 8E00        GOSUBL =GETERR         Check if detected an HPIL error
      00
F2D6B 4BC  SENDEr GOC    eRRORX          YES...report it!
F2D6E 8C00        GOLONG =ENDST          Next statement after cleanup
      00
                  *-
                  *-
F2D74 D0   SEND50 A=0    A               Fall through to send code
F2D76 7000        GOSUB  =SWAPDO         (Mailbox-->D0, PC-->RAM)
                  *
                  * Number if here (Value in A[A])
                  *
F2D7A 7000 SEND60 GOSUB  =REST2C         Restore value of frame
F2D7E D1          B=0    A
F2D80 D5          B=C    A               B[A] is now the mask
F2D82 F6          CSR    A
F2D84 F6          CSR    A               C[X] is now the frame value
F2D86 0EF0        A=A&B  A
F2D8A 0E3A        C=C!A  X               Now C[X] is the frame to send
                  *
                  * This is a hard-wired opcode calculation!!!!!!!!!!!!!!!
                  *
F2D8E B56         C=C+1  M               Opcode 1xxx (xxx is frame)
                  *
                  * Next, check if this is MTA or MLA (F04 or F02, respectively)
                  * (OR an EOL...F00 - if so, send EOLSTR)
                  *
F2D91 B26         C=C+1  XS
F2D94 A2E         C=C-1  XS              If carry, is MxA
F2D97 5D0         GONC   SEND70          Not MxA...continue
F2D9A 96A         ?C=0   B
F2D9D 21          GOYES  SEND80          This is EOL!
                  *
                  * This is another hard-wired opcode calculation!!!!!!
                  *
F2D9F AA2         C=0    XS
F2DA2 B56         C=C+1  M               Opcode 200x, x=4:T, x=2:L
F2DA5 8E00 SEND70 GOSUBL =PUTC           Send the frame
      00
F2DAB 629F        GOTO   SEND40          Check if all OK, continue
                  *-
                  *-
F2DAF 1F00 SEND80 D1=(5) =EOLLEN
      000
F2DB6 15F6        C=DAT1 7               Read in the EOL string, length
F2DBA D0          A=0    A
F2DBC A8A         A=C    P
F2DBF 81C         ASRB                   Convert to bytes
```

```
F2DC2 BF6           CSR    W             C[5:0] is the string!
F2DC5 AF5           B=C    W             Save in B[5:0] for SENDIT
F2DC8 A0C   SEND90  A=A-1  P             Check if done
F2DCB 461           GOC    SEND95        Done!
F2DCE AE9           C=B    B
F2DD1 BF5           BSR    W
F2DD4 F5            BSR    A             Next character is ready
F2DD6 8E00          GOSUBL =PUTD         Send the data byte
      00
F2DDC 5BE           GONC   SEND90        Loop back if no error
F2DDF 488           GOC    SENDEr        Go always...
            *-
            *-
F2DE2 D2    SEND95  C=0    A             Clear mask, value (DATA)
F2DE4 A6E           C=C-1  B             Mask is "FF", value=0
F2DE7 7000          GOSUB  =SAVE2C       Save it away for next item!
F2DEB 665F          GOTO   SEND41        Continue on
            **************************************************************
            **************************************************************
            **
            ** Name:       GLOOP# - Get loop # from RAM (if one present)
            **
            ** Category:   EXCUTL
            **
            ** Purpose:
            **      Get loop number from memory
            **
            ** Entry:
            **      D0 points to next token
            **
            ** Exit:
            **      P=0
            **      D0 points to next item on line
            **      C[S] is loop # [0-2]
            **      Carry set if no loop # given
            **
            ** Calls:      GTYPRM
            **
            ** Uses.......
            **  Inclusive: A,B,C,D,R0,R1,R2,R3,R4,D0,D1,P,ST[11:0],FUNCxx
            **
            ** Stk lvls:   6 (GTYPRM)
            **
            ** History:
            **
            **    Date     Programmer              Modification
            **  --------   ----------    --------------------------------
            **  09/26/83       NZ        Updated documentation
            **  03/01/83       NZ        Added documentation
            **
            **************************************************************
            **************************************************************
F2DEF 14A   =GLOOP# A=DAT0 B
F2DF2 20            P=     0
F2DF4 3100          LC(2)  =tSEMIC
```

```
F2DF8 AC2             C=0    S              Clear loop #...
F2DFB 966             ?A#C   B              Is there a loop #?
F2DFE 00              RTNYES                No...return
                *
                * Need to get the loop #
                *
F2E00 161             D0=D0+ 2              Skip the leading tSEMIC
F2E03 8E00            GOSUBL =GTYPRM        Get type (Sequence #) from RAM
      00
F2E09 4D1             GOC    GLOOPE         Error
F2E0C 161             D0=D0+ 2              Skip the trailing tSEMIC
                *
                * Now B[B] is the number
                *
F2E0F A6D             B=B-1  B              Decrement by 1...
F2E12 421             GOC    GLOOPe         Error!
F2E15 3120            LC(2)  2              Max loop #
F2E19 9E1             ?B>C   B
F2E1C 90              GOYES  GLOOPe         Too big!
F2E1E D9              C=B    A
F2E20 816             CSRC                  Now C[S] is loop #
F2E23 03              RTNCC
                *-
                *-
F2E25 20        GLOOPe  P=     =eRANGE
F2E27 6000      GLOOPE  GOTO   =ERRORX
                **************************************************************
                **************************************************************
                **
                ** Name:         GFTYPE - Get frame type from RAM
                **
                ** Category:     EXCUTIL
                **
                ** Purpose:
                **      Get frame type from RAM, given string of chars
                **
                ** Entry:
                **      D0 points to string of chars (<=7)
                **
                ** Exit:
                **      A contains the string (A[S] is WP value)
                **      Carry SET if error
                **
                ** Calls:        CONVUC,RANGEA
                **
                ** Uses.......
                **  Exclusive: A[W],C[W],P,D0
                **  Inclusive: A[W],C[W],P,D0
                **
                ** Stk lvls:     2 (CONVUC)
                **
                ** History:
                **
                **   Date      Programmer              Modification
                **  --------   ----------    --------------------------------
```

```
                 **  09/26/83      NZ         Updated documentation
                 **  03/01/83      NZ         Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
F2E2B AF0   =GFTYPE A=0    W
F2E2E AF2           C=0    W              Could be C=0 S
F2E31 181           D0=D0- 2
F2E34 161   GFTYP1  D0=D0+ 2
F2E37 14A           A=DAT0 B              Read the byte
F2E3A 8E00          GOSUBL =CONVUC        Convert to upper case
      00
F2E40 5B0           GONC   GFTYP2         Was lower case...OK
F2E43 8E00          GOSUBL =RANGEA        Check if in [A-Z]
      00
F2E49 4E0           GOC    GFTYP3         No...done
F2E4C 814   GFTYP2  ASRC
F2E4F 814           ASRC                  Shift around into high nibbles
F2E52 B46           C=C+1  S              Increment count of characters
F2E55 5ED           GONC   GFTYP1         Go always
                 *-
                 *-
F2E58 AE0   GFTYP3  A=0    B              Clear this entry!
F2E5B 94A           ?C=0   S
F2E5E 00            RTNYES                Carry set if error
F2E60 80DF          P=C    15
                 *
                 * Shift A[W] left circular P*2 times
                 *
F2E64 0D            P=P-1                 Set terminate on base zero count
F2E66 810   GFTYP4  ASLC
F2E69 810           ASLC
F2E6C 0D            P=P-1
F2E6E 57F           GONC   GFTYP4         Not done yet...keep shifting
                 *
                 * Now A[W] is zeroes, string
                 *
F2E71 A46           C=C+C  S              Convert to nibbles...
F2E74 A4E           C=C-1  S              ...and to base zero...
F2E77 ACA           A=C    S              ...and copy to A[S]
F2E7A 03            RTNCC
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:        GST!NO - Get string or number from RAM
                 **
                 ** Category:    EXCUTL
                 **
                 ** Purpose:
                 **      Get string or number from RAM
                 **      (If complex or out of range, exit to error)
                 **
                 ** Entry:
                 **      D0 points to the item
                 **
```

```
                ** Exit:
                **      Carry set: String...D1->first byte, D[A]=length(bytes)
                **      Carry clear: Number...A[A]=Hex value
                **
                ** Calls:      EXPEXC,GHEXBT
                **
                ** Uses.......
                **  Exclusive: A,  C,D,                   D1
                **  Inclusive: A,B,C,D,R0,R1,R2,R3,R4,D0,D1,P,ST[11:0],FUNCxx
                **
                ** Stk lvls:   5 (EXPEXC)
                **
                ** History:
                **
                **    Date     Programmer              Modification
                **  --------   ----------     ---------------------------------
                **  09/26/83       NZ         Updated documentation
                **  03/01/83       NZ         Added documentation
                **
                *************************************************************
                *************************************************************
    F2E7C 8E00 =GST!NO GOSUBL =eXPEXC       Expression execute
          00
                *
                * Now check if valid number or complex or NAN or ......
                *
                * If A[B]=#0F or 8F, than this is a string.
                * If A[B]=(3 legal digits), than this is a number.
                *
    F2E82 AE6          C=A    B
    F2E85 B06          C=C+1  P
    F2E88 A66          C=C+C  B
    F2E8B 96A          ?C=0   B
    F2E8E C2           GOYES  GST!20        This is a STRING!
    F2E90 AB6          C=A    X
    F2E93 05           SETDEC               Check if all BCD digits...
    F2E95 B36          C=C+1  X
    F2E98 A3E          C=C-1  X
    F2E9B 04           SETHEX
    F2E9D 932          ?A=C   X
    F2EA0 D0           GOYES  GST!10        This is a NUMBER!
                *
                * If here, have SOMETHING else!
                *
    F2EA2 20           P=     =eNNUMR       Non-numeric data
    F2EA4 6000 GST!ER  GOTO   =ERRORX
                *-
                *-
    F2EA8 20   GST!05  P=     =eRANGE
    F2EAA 49F          GOC    GST!ER        Go always
                *-
                *-
                *
                * Number!
                *
```

```
F2EAD 8E00 GST!10  GOSUBL =GHEXBT       Pop stack, Get HEX ByTe
      00
F2EB3 44F          GOC    GST!05        Range error
F2EB6 D4           A=B    A             GHEXBT returns B[A]=value
F2EB8 03           RTNCC                Carry clear for number
                *-
                *-
                *
                * String!
                *
F2EBA BF4  GST!20  ASR    W
F2EBD BF4          ASR    W             Now string length in A[A]
F2EC0 AF2          C=0    W             (Length is in nibbles)
F2EC3 D6           C=A    A
F2EC5 81E          CSRB                 Convert to bytes...
F2EC8 D7           D=C    A             Copy length to D[A]
F2ECA 17D          D1=D1+ 14            Skip string header (-2 for end)
F2ECD 137          CD1EX
F2ED0 C2           C=A+C  A             "Start" of string in C[A]...
F2ED2 135          D1=C                 ...and in D1
F2ED5 02           RTNSC                Carry set for string
F2ED7              END
```

```
 CONVUC  Ext                  -   328
 ENDST   Ext                  -   168
 EOLLEN  Ext                  -   205
 ERRORX  Ext                  -   138    288    415
 FRAMEE  Ext                  -    81
 GETERR  Ext                  -   166
 GFTYP1  Abs   994868 #F2E34 -   326    335
 GFTYP2  Abs   994892 #F2E4C -   332    329
 GFTYP3  Abs   994904 #F2E58 -   338    331
 GFTYP4  Abs   994918 #F2E66 -   346    349
=GFTYPE  Abs   994859 #F2E2B -   323     71
 GHEXBT  Ext                  -   425
=GLOOP#  Abs   994799 #F2DEF -   261     53
 GLOOPE  Abs   994855 #F2E27 -   288    272
 GLOOPe  Abs   994853 #F2E25 -   287    278    281
 GST'05  Abs   994984 #F2EA8 -   418    426
 GST'10  Abs   994989 #F2EAD -   425    410
 GST'20  Abs   995002 #F2EBA -   434    403
 GST'ER  Abs   994980 #F2EA4 -   415    419
=GST'NO  Abs   994940 #F2E7C -   392    102
 GTYPRM  Ext                  -   271
 PUTC    Ext                  -   136    201
 PUTD    Ext                  -   217
 Pute    Ext                  -    67
 RANGEA  Ext                  -   330
 REST2C  Ext                  -   118    176
 RESTDO  Ext                  -   165
 SAVE2C  Ext                  -    92    224
 SAVEDO  Ext                  -    57
=SEND    Abs   994464 #F2CA0 -    53
 SEND10  Abs   994506 #F2CCA -    71    161
 SEND15  Abs   994531 #F2CE3 -    89     82
 SEND20  Abs   994560 #F2D00 -   102    157
 SEND30  Abs   994571 #F2D0B -   118    137
 SEND40  Abs   994622 #F2D3E -   144     68    202
 SEND41  Abs   994625 #F2D41 -   145    125    225
 SEND45  Abs   994657 #F2D61 -   165    160
 SEND5.  Abs   994619 #F2D3B -   141     93     97
 SEND50  Abs   994676 #F2D74 -   171    141
 SEND60  Abs   994682 #F2D7A -   176    113
 SEND70  Abs   994725 #F2DA5 -   201    193
 SEND80  Abs   994735 #F2DAF -   205    195
 SEND90  Abs   994760 #F2DC8 -   212    218
 SEND95  Abs   994786 #F2DE2 -   222    213
 SENDEr  Abs   994667 #F2D6B -   167    219
 SENDd   Ext                  -    51
 SENDer  Abs   994502 #F2CC6 -    68     60
 SENDp   Ext                  -    52
 SENd41  Abs   994582 #F2D16 -   125     65
 START+  Ext                  -    59
 SWAPDO  Ext                  -   112    149    172
 eNNUMR  Ext                  -   414
 eRANGE  Ext                  -   287    418
=eRRORX  Abs   994615 #F2D37 -   138    144    167
 eXPEXC  Ext                  -   392
 getdev  Ext                    -    64
 mSETFC  Ext                    -    66
 tCOLON  Ext                    -   158
 tCOMMA  Ext                    -    95   155
 tSEMIC  Ext                    -   263
```

```
Input Parameters

  Source file name is NZ&UTL::MS

  Listing file name is NZ/UTL:TI:ML::-1

  Object file name is NZXUTL:TI:MS::-1

                                      111111
                            0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                  *
                  *
                  *      N   N  ZZZZZ   &     BBBB   III  FFFFF
                  *      N   N      Z  & &    B   B   I   F
                  *      NN  N     Z   & &    B   B   I   F
                  *      N N N    Z     &     BBBB    I   FFFF
                  *      N  NN   Z     & & &  B   B   I   F
                  *      N   N  Z      &  &   B   B   I   F
                  *      N   N  ZZZZZ   && &  BBBB   III  F
                  *
                         TITLE  Basic interface <840301.1328>
       F2ED7             ABS    #F2ED7        TI%HP6 address (fixed)
```

```
                     STITLE Cold start handler
               *************************************************************
               *************************************************************
               **
               ** Name:        PILCST - HPIL cold start handler routine
               **
               ** Category:    POLL
               **
               ** Purpose:
               **      I/O CPU cold start POLL handler routine
               **
               ** Entry:
               **      P=0, HEXMODE
               **
               ** Exit:
               **      Carry clear, XM=1, P=0
               **
               ** Calls:       I/OALL,FNDMBX,GETERR,CHKST+,D1=DSP,D1=DST
               **
               ** Uses.......
               **  Exclusive:      B[W],C[W],        R0,   D1,P
               **  Inclusive: A[W],B[W],C[W],D[15:5],R0,D0,D1,P
               **
               ** Stk lvls:   2 (FNDMBX)(I/OALL)(CHKST+)(GETERR)
               **
               ** Detail:
               **      Reset all HPIL mailboxes, set up LOOPST and DSPSET,
               **      set DISPLAY IS DISPLAY, PRINTER IS PRINTER
               **
               ** History:
               **
               **    Date     Programmer           Modification
               **  --------   ----------   ---------------------------------
               **  07/26/83       NZ       Added check for I/O CPU error
               **                          after resetting it
               **  06/30/83       NZ       Added wakeup of I/O CPU after
               **                          RESET (to be sure Manual Mode bit
               **                          is clear)
               **  03/15/83       NZ       Removed check for RAM changed
               **  02/22/83       NZ       Changed CLEAR of mailboxes into
               **                          RESET of mailboxes
               **  02/11/83       NZ       Added save of D[A] in R0
               **  12/21/82       NZ       Updated documentation
               **
               *************************************************************
               *************************************************************
F2ED7          =PILCST
               *
               * PIL buffer (used by PILCNF to determine if HPIL was present
               * at the last configuration before current one - if not, then
               * calls PILCST as a subroutine)
               *
F2ED7          PILCS0
F2ED7 D1               B=0    A             Allocate 0 nibs (no info to store)
F2ED9 DB               C=D    A
```

```
F2ED8 108           R0=C                  Save D[A] in R0 (I/OALL uses D[A])
F2EDE 3200          LC(3)  =bPILSV
      0
F2EE3 8F00          GOSBVL =I/OALL        I/O ALLocate
      000
F2EEA 118           C=R0
F2EED D7            D=C    A              Restore D[A] from R0
             *
             * Now reset all HP-IL mailboxes (Up to 16 of them!)
             *
F2EEF AF2           C=0    W
F2EF2 27            P=     7
F2EF4 308           LC(1)  8              Reset the mailbox
F2EF7 AF5           B=C    W              Save the message in B[8:0]
F2EFA AC9    PILCS3 C=B    S              Find out which mailbox I'm on...
F2EFD 8E00          GOSUBL =FNDMBX        ...and see if it's there
      00
F2F03 491           GOC    PILCS4         Not there...no more mailboxes
F2F06 AF9           C=B    W              Found one...reset it
F2F09 15C8          DAT0=C 9              Reset the mailbox, clear NRD bit
F2F0D 8E00          GOSUBL =GETERR        Wake it up, read the error message
      00
             *                            (ignore any error message here)
F2F13 7ED2          GOSUB  CHKST+         Set up parameters
F2F17 B45           B=B+1  S              Increment to next mailbox
F2F1A 5FD           GONC   PILCS3         Go always (carry= >16 mailboxes)
             *-
             *-
F2F1D        PILCS4
             *
             * Now initialize the IS-TBL
             *
F2F1D 7063          GOSUB  D1=DSP
             *
             * Set IS-DSP ="03F1FFF", IS-PRT="02F1FFF", IS-INP="FFFFFFF",
             * IS-PLT="FFFFFFF"
             *
F2F21 20            P=     0              FNDMBX leaves P<>0 when not found
F2F23 36FF          LCHEX  03F1FFF
      F1F3
      0
F2F2C 15D6          DAT1=C 7              Write IS-DSP entry
F2F30 176           D1=D1+ 7
F2F33 36FF          LCHEX  02F1FFF
      F1F2
      0
F2F3C 15D6          DAT1=C 7              Write IS-PRT entry
             *
             * Now enable the loop (LoopOK bit of DSPSET)
             *
F2F40 D2            C=0    A
F2F42 1D00          D1=(2) =LOOPST
F2F46 15D0          DAT1=C 1              Clear Offed, InptOK
F2F4A 7C33          GOSUB  D1=DST         Clear DispOK, set LoopOK
             *
```

```
                 * Set LoopOK until proven wrong
                 * Set Display to restart and check device ID
                 *
     F2F4E 307             LC(1)  7                *DispOK, Printr, Wallby, LoopOK
     F2F51 15D0            DAT1=C 1                Write bits out to RAM
                 *
                 * Set terminating character to LF for ENTER
                 *
     F2F55 1E00            D1=(4) =TERCHR
           00
     F2F5B 31A0            LCHEX  0A
     F2F5F 14D             DAT1=C B
                 *
                 * Done
                 *
     F2F62 21    =RTNCCX P=     1
     F2F64 0D            P=P-1                     Clear the carry...
     F2F66 00            RTNSXM                    ...and set XM
```

```
                          STITLE No key wakeup poll handler
                   ****************************************************************
                   ****************************************************************
                   **
                   ** Name:        PILWNK - Wakeup, no key poll handler
                   **
                   ** Category:    POLL
                   **
                   ** Purpose:
                   **      Deep sleep wakeup-no key
                   **
                   ** Entry:
                   **      None
                   **
                   ** Exit:
                   **      Carry clear, XM=1, P=0
                   **
                   ** Calls:       None
                   **
                   ** Uses.......
                   **  Inclusive: C[P],D1
                   **
                   ** Stk lvls:    0
                   **
                   ** NOTE: Must not alter D[A] or STATUS
                   **
                   ** History:
                   **
                   **    Date      Programmer              Modification
                   **  --------    ----------    --------------------------------
                   **  12/21/82        NZ        Updated documentation
                   **
                   ****************************************************************
                   ****************************************************************
F2F68 80E          =PILWNK SREQ?                 First check if SRQ pending
F2F6B 834                 ?SR=0
F2F6E F1                  GOYES  PILWNx          Not me (no SRQ)
                   *
                   * Check if this is a I/O CPU service request...if so, wake up
                   * the HP-71 by simulating the ATTN key (Setting ATNFLG#0)
                   * (Should really set ATNFLG = "F" to say "ATTN pressed once")
                   *
F2F70 824                 SR=0
F2F73 08                  CSTEX
F2F75 860                 ?ST=0  =sMBXsr
F2F78 20                  GOYES  WNK00
F2F7A 08           WNK00  CSTEX
F2F7C 401                 GOC    PILWNx
F2F7F 1F00                D1=(5) =ATNFLG
      000
F2F86 301                 LC(1)  1
F2F89 1550                DAT1=C P
                   *
                   * Now exit, carry clear, XM set
                   *
```

```
    186 F2F8D 64DF PILWNx  GOTO    RTNCCX         Return, clear carry, set XM
```

```
                          STITLE Configuration handler
               ****************************************************************
               ****************************************************************
               **
               ** Name:       PILCNF - Configuration poll handler for HPIL
               ** Name:       PILWKP - Deep-sleep wakeup poll (no processing)
               **
               ** Category:   POLL
               **
               ** Purpose:
               **      Configuration entry point - Restore buffers, set DSPCHX
               **      to address of display routine, etc
               **
               ** Entry:
               **      P=0,HEXMODE
               **
               ** Exit:
               **      Carry clear, XM=1, P=0
               **
               ** Calls:      RESTOR,I/ORES,PILCST,D1=DST,D1=DSP,D1=DSX,
               **             CHKASN,(PILWKs)
               **
               ** Uses.......
               **  Exclusive:      B[A],C[W],             D0,D1,P
               **  Inclusive: A[W],B[W],C[W],D[15:5],R0,D0,D1,P
               **
               ** NOTE: Must NOT alter D[A], Status
               **
               ** Stk lvls:   3 (PILCST)(CHKASN)
               **
               ** History:
               **
               **   Date     Programmer              Modification
               **  --------  ----------    ---------------------------------
               **  02/25/83     NZ         Moved IS-DSP check and DSPCHX set
               **                          later in the code
               **  02/18/83     NZ         Added check for IS-DSP before
               **                          setting DSPCHX
               **  02/11/83     NZ         Updated documentation (uses D,R0)
               **  12/21/82     NZ         Updated documentation
               **
               ****************************************************************
               ****************************************************************
 F2F91         =PILCNF
 F2F91 3200          LC(3)  =bPILSV       Check if save buffer is here
       0
 F2F96 7190          GOSUB  I/ores        Restore it
 F2F9A 460           GOC    PILCN1        Found it...continue
               *
               * Save buffer not found...therefore HPIL was not present at
               * last configuration poll...need to reset I/O CPU, set it up
               *
 F2F9D 763F          GOSUB  PILCST        Go through my coldstart code
               *
 F2FA1         PILCN1
```

```
                  *
                  * Set the display device to be restarted with next character
                  *
 F2FA1 75E2             GOSUB  D1=DST
 F2FA5 1572             C=DAT1 XS             Read display status...
 F2FA9 0B               CSTEX
 F2FAB 840              ST=0   =DispOK        Set the display to be restarted
 F2FAE 0B               CSTEX
 F2FB0 1552             DAT1=C XS             ...Write it back out
                  *
                  * Clear the OFFed bit in each device
                  *
 F2FB4 8E00             GOSUBL =RESTOR
       00
                  *
                  * Now reclaim all I/O buffers I use
                  * Reclaim IS-DSP, IS-PRT, bSTMXQ (shouldn't be needed), bPILAI
                  *
 F2FBA 1B00             D0=(5) (=IS-DSP)+3    Check if I/O buffer type
       000
 F2FC1 7850             GOSUB  PILWKs         Restore IS-DSP if needed
 F2FC5 166              D0=D0+ 7              Next entry
 F2FC8 7150             GOSUB  PILWKs         Restore IS-PRT if needed
 F2FCC 20               P=     0              (PILWKs leaves PWO)
                  *
 F2FCE 3200             LC(3)  =bSTMXQ
       0
 F2FD3 7450             GOSUB  I/ores         Restore HPIL stmt execute buffer
                  *
 F2FD7 3200             LC(3)  =bPILAI
       0
 F2FDC 7B40             GOSUB  I/ores         Restore the ASSIGNIO buffer
 F2FE0 7D92             GOSUB  D1=DSP         Check if a display is assigned
 F2FE4 15F6             C=DAT1 7              Read it in
 F2FE8 8E00             GOSUBL =CHKASN        Check if assigned
       00
 F2FEE 4A2              GOC    RTNCCx         Not assigned...leave DSPCHX alone
 F2FF1 7E92             GOSUB  D1=DSX         Display location...
 F2FF5 147              C=DAT1 A              Read it first...
 F2FF8 8AE              ?C#0   A
 F2FFB E1               GOYES  RTNCCx         Exit if occupied
 F2FFD 7500             GOSUB  PILxxx         Get address of REL(5) on RSTK...
                  *_
 F3001 0000             REL(5) =BDISPJ        Offset to display entry
       0
                  *_
                  *_
 F3006 07         PILxxx C=RSTK               ...pop it off...
 F3008 D5               B=C    A              ...save address in B[A]...
 F300A 135              D1=C                  ...and set D0 to offset
 F300D 147              C=DAT1 A              Read in display offset...
 F3010 C9               C=B+C  A              ...to get address of display jump
 F3012 7D72             GOSUB  D1=DSX         Point back to entry
 F3016 145              DAT1=C A              Write out display routine address
                  *
```

```
F3019          =PILWKP
F3019 684F RTNCCx  GOTO   RTNCCX
               *-
               *-
F301D 146  PILWKs  C=DAT0 A            Read in ID, type
F3020 80D0         P=C    0            P=type
F3024 884          ?P#    4            Single I/O buffer?
F3027 00           RTNYES              No...return (No buffer)
               *
               * I/O buffer...restore it
               *
F3029 F6           CSR    A            ID in C[X] now
F302B 8D00 I/ores  GOVLNG =I/ORES      Restore the I/O buffer
      000
```

```
                     STITLE Power-off poll handler
             *************************************************************
             *************************************************************
             **
             ** Name:        PILPOF -  Handler for power-off poll
             **
             ** Category:    POLL
             **
             ** Purpose:
             **      Power-off code for HPIL:
             **      -Sets device codes (DISPLAY, PRINTER, KEYBD, PLOTTER)
             **        to power-off values (to allow restart on next usage)
             **      -If flPDWN is clear and the OFFED flag is clear, sends
             **        power-down message to all I/O CPUs (up to 16) which
             **        are not in manual mode and are controller
             **
             ** Entry:
             **      P=0,HEXMODE
             **
             ** Exit:
             **      Carry clear, XM=1
             **
             ** Calls:       RESTRT,SFLAG?,FNDMBX,CHKSTS,PUTC+
             **
             ** Uses.......
             **  Exclusive:      B[S],C[W],D0,P,ST[11:0]
             **  Inclusive: A[W],B[W],C[W],D0,P,ST[11:0]
             **
             ** Stk lvls:    3 (RESTRT)(CHKSTS)
             **
             ** History:
             **
             **    Date      Programmer              Modification
             **  --------    ----------      ---------------------------------
             **  03/29/83        NZ          Added check of flPDWN flag before
             **                              powering down the loops
             **  12/21/82        NZ          Updated documentation
             **
             *************************************************************
             *************************************************************
F3032 7750   =PILPOF GOSUB  RESTRT          Restart all devices on loop
             *
             * Check if loop is OFFED (by OFFIO)
             *
F3036 1A00          D0=(4) =LOOPST
      00
F303C 1562          C=DATO XS
             *
             * =Offed is 11
             *
F3040 A26           C=C+C  XS           If carry, OFFED
F3043 454           GOC    PILP03       If carry (=Offed), exit
             *
             * Check if powerdown inhibit flag is set
             *
```

```
F3046 D8              C=D    A               Save D[A] in D0 (SFLAG? puts D0
F3048 134             D0=C                   into D[A] to save D0)
F304B 3100            LC(2)  =flPDWN         Check if power down inhibited
F304F 8E00            GOSUBL =sFLAG?
      00
F3055 433             GOC    PILP03          If carry, just return
                *
                * Now shut down all the loops...
                *
F3058 AC1             B=0    S               Initialize loop counter
F305B AC9       PILP01 C=B   S
F305E 8E00            GOSUBL =FNDMBX
      00
F3064 442             GOC    PILP03          No more mailboxes
F3067 8E00            GOSUBL =CHKSTS         Check status, RESET
      00
F306D 451             GOC    PILP02          In manual mode...leave it alone
                *
                * C[X] is the device status from I/O CPU
                *
F3070 0A              ST=C
F3072 860             ?ST=0  =sCONTR         Am I controller?
F3075 E0              GOYES  PILP02          No...try next loop
                *
                * OK to power down this loop
                *
F3077 20              P=     0
F3079 3100            LC(2)  =mPDLOP         Power down loop
F307D 8E00            GOSUBL =PUTC+          Send it
      00
                *
                * Don't check carry...even if carry set, continue with the
                * other loops (if any)
                *
F3083 B45       PILP02 B=B+1 S               Increment loop counter
F3086 54D             GONC   PILP01          Go always (if carry, > 16 loops)
                *
                * Done with power-off processing
                *
F3089 68DE      PILP03 GOTO  RTNCCX          Return, carry clear, XM set
```

```
                          STITLE Restart HPIL to search
                **************************************************************
                **************************************************************
                **
                ** Name:        RESTRT - Restart all HPIL devices (readdress)
                **
                ** Category:    PILUTL
                **
                ** Purpose:
                **      Restart all device addresses in the HPIL system
                **      (set to search for address at next access)
                **
                ** Entry:
                **      P=0, HEXMODE
                **
                ** Exit:
                **      P=0
                **      Carry clear
                **
                ** Calls:       RESTRs,CSRC5,CSLC5,FIBOFF
                **
                ** Uses.......
                **  Exclusive:       C[W],D0,P
                **  Inclusive: A[W],C[W],D0,P
                **
                ** Stk lvls:   2 (FIBOFF)
                **
                ** History:
                **
                **   Date     Programmer            Modification
                **  --------  ----------  ----------------------------------
                **  06/01/83     NZ       Added call to FIBOFF
                **  12/21/82     NZ       Updated documentation
                **
                **************************************************************
                **************************************************************
 F308D          =RESTRT
 F308D 137              CD1EX
 F3090 8E00             GOSUBL =CSLC5         Save D1 in C[9:5]
       00
 F3096 8F00             GOSBVL =FIBOFF        Restart FIB buffers
       000
 F309D 8E00             GOSUBL =CSRC5         Recall D1 to C[A]
       00
 F30A3 135              D1=C                  Restore D1
 F30A6 1B00             D0=(5) =DSPSET
       000
 F30AD 307              LC(1) 7               DispOK=0; Wallby,Printr,LoopOK=1
 F30B0 15C0             DAT0=C 1              Write them out
                *
                * Now deassign all devices
                *
 F30B4 1A00             D0=(4) =IS-DSP        Point to IS-DSP, set it OFF
       00
 F30BA 7B00             GOSUB  RESTRs         IS-DSP
```

```
F30BE 7400          GOSUB  RESTRs       IS-PRT
F30C2 7000          GOSUB  RESTRs       IS-INP
            *
            * Fall into RESTRs for IS-PLT (exit when done with RESTRs)
            *
F30C6       RESTRs
            *
            * D0 points to the entry
            *
F30C6 15E6          C=DAT0 7
F30CA 23            P=     3            Check if C[3]="F"...if so, not me
F30CC B06           C=C+1  P            If C[3]="F", then not HPIL/done
F30CF 401           GOC    RESTs4       Not HPIL or assigned to *
F30D2 B26           C=C+1  XS           If C[XS]="F", leave this alone
F30D5 4A0           GOC    RESTs4       Increment D0, return
F30D8 D2            C=0    A
F30DA CE            C=C-1  A
F30DC 15C2          DAT0=C 3            Write out "FFF"
F30E0 166   RESTs4  D0=D0+ 7            Move to the next entry
F30E3 20            P=     0
F30E5 03            RTNCC
```

```
                       STITLE Main loop poll handler
                ***************************************************************
                ***************************************************************
                **
                ** Name:        PILMLP - HPIL handler for main loop
                **
                ** Category:    POLL
                **
                ** Purpose:
                **      Main loop handler code - if display is not offed,
                **      set ST[LoopOK] true
                **
                ** Entry:
                **      P=0,HEXMODE
                **
                ** Exit:
                **      Carry clear,XM=1
                **
                ** Calls:       D1=DST
                **
                ** Uses.......
                **  Inclusive: C[XS],D1,P
                **
                ** Stk lvls:    1 (D1=DST)
                **
                ** History:
                **
                **    Date      Programmer              Modification
                **  --------    ----------   --------------------------------
                **  12/21/82        NZ       Updated documentation
                **  01/17/83        NZ       Changed Search from 4 to 5 (START
                **                           is now using ST[4] also)
                **
                ***************************************************************
                ***************************************************************
F30E7 1F00 =PILMLP D1=(5) =LOOPST        First check if loop is "OFFED"
      000
F30EE 1572         C=DAT1 XS
F30F2 0B           CSTEX
F30F4 870          ?ST=1  =Offed         Is it offed?
F30F7 20           GOYES  PILM05         Set carry if yes
F30F9 0B   PILM05  CSTEX
F30FB 451          GOC    PILMRC         If offed, just return
           *
           * Not OFFED by OFFIO...set loop OK true here
           *
F30FE 7881         GOSUB  D1=DST
F3102 1572         C=DAT1 XS
F3106 0B           CSTEX
F3108 850          ST=1   =LoopOK        Set Loop OK flag true again
F310B 0B           CSTEX
F310D 1552         DAT1=C XS             Write out the statuses
F3111 605E PILMRC  GOTO   RTNCCX         Return w/carry clear, XM=1
           *-
           *-
```

```
    518 F3115 0           CON(1) =FIXSPC        4 nibbles available here
    519 F3116             BSS    4-1
```

```
                 STITLE Service Request Handler
         ****************************************************************
         ****************************************************************
         **
         ** Name:        PILSRQ - HPIL service request handler
         **
         ** Category:    POLL
         **
         ** Purpose:
         **      HPIL service request poll handler - determine SRQ
         **      source, process SRQ
         **
         ** Entry:
         **      P=0,HEXMODE
         **
         ** Exit:
         **      Carry clear,P=0,XM=1
         **
         ** Calls:       SAVSTS,FNDMBX,GETHSS,CHKSTS,PUTCM,GETST-,SFLAG?,
         **              RESSTS
         **
         ** Uses.......
         **  Exclusive:      B[A],C[W],           D1,P
         **  Inclusive: A[W],B[A],C[W],D[15,5],D0,D1,P,SNAPBF[37:0]
         **
         ** Stk lvls:    1 (SAVSTS,RESSTS save all except call to SAVSTS)
         **
         ** NOTE: Must NOT use many RSTK levels OR any status bits
         **
         ** Algorithm:
         **      Check if mailbox SRQ...if not, return
         **      Find which mailbox is requesting service
         **      Check if interrupt pending...if pending, set exception
         **      Check if data available and remote mode and "dormant":
         **        if so, set up HPIL external key
         **      If not interrupt and not (data available and remote)
         **        then continue checking with next loop
         **
         ** History:
         **
         **   Date     Programmer              Modification
         **  --------  ----------      --------------------------------
         **  02/22/84     NZ           Added check for carry from CHKSTS
         **                            (also changed from CHKSET to CHKSTS
         **                            at REQSER to check for manual mode)
         **  10/20/83     NZ           Implemented ER #39-10744 (if the
         **                            first loop requesting service
         **                            does not have anything to do, try
         **                            any other loops for SRQ)
         **  12/21/82     NZ           Updated documentation
         **
         ****************************************************************
         ****************************************************************
F3119 80E  =PILSRQ SREQ?                    First check this is HPIL
F311C 834         ?SR=0
```

```
F311F 2F               GOYES  PILMRC        No request pending...exit
F3121 824              SR=0
F3124 0B               CSTEX
F3126 860              ?ST=0  =sMBXsr       Mailbox SRQ?
F3129 20               GOYES  PILS00        Set carry if not HPIL
F312B 0B       PILS00  CSTEX
F312D 43E              GOC    PILMRC        Not HPIL...exit
               *
               * This is an HPIL SRQ...service it
               *
F3130 7623             GOSUB  SAVSTS        Save status, 5 levels, D[A]
F3134 1F00             D1=(5) =MBOX^
      000
F313B 147              C=DAT1 A             Save old MBOX^ value in B[3:1]
F313E F2               CSL    A
F3140 D5               B=C    A             Mbox value in B[3:1], # in B[0]
               *                            Set up for mbox #1
F3142 816      PILS20  CSRC                 Shift mailbox nunber into C[S]
F3145 8E00             GOSUBL =FNDMBX       Look for the mailbox
      00
F314B 406              GOC    PILS50        Not found...done
F314E 7070             GOSUB  GETHSS        Read handshake nibbles (2)
F3152 870              ?ST=1  =hsRQSR       Requesting service?
F3155 90               GOYES  REQSER        Yes...see what it is
F3157 E5       PILS23  B=B+1  A             No...try next mailbox
F3159 D9               C=B    A
F315B 56E              GONC   PILS20        Go always (if more than 16, no)
               *-
               *-
               *
               * Mailbox requesting service pointed to by D0
               *
F315E 8E00     REQSER  GOSUBL =CHKSTS       Check this loop for reset,man mode
      00
F3164 42F              GOC    PILS23        Error...try next one
F3167 3300             LC(4)  =mSTSTC       Request status & clear SRQ
      00
F316D 8E00             GOSUBL =PUTCN
      00
F3173 8E00             GOSUBL =GETST-       Read the mailbox's status
      00
F3179 5B0              GONC   REQS10        (OK)
F317C 890              ?P=    =eABORT       Error from ATTN key hit?
F317F A3               GOYES  PILS50        Yes...exit routine NOW
F3181 F6               CSR    A             No...status is in C[3:1]
F3183 20               P=     0             (P was =ePIL)
F3185 0B       REQS10  CSTEX
               *
               * Check if there is an interrupt pending
               *
F3187 860              ?ST=0  =sINTR        Interrupt pending?
F318A 80               GOYES  REQS30        No...check if data is available
F318C 850              ST=1   =Except       Yes...set exception flag and exit
F318F 57C              GONC   PILS23        Go always...check next for remote ke
               *-
```

```
                *-
F3192           REQS30
                *
                * Check if there is data available
                *
F3192 860               ?ST=0  =sDATAV       Data available?
F3195 2C                GOYES  PILS23        No...try next mailbox
                *
                * Data is available...check if I/O CPU is in remote mode
                *
F3197 860               ?ST=0  =sRMOTE       Remote mode?
F319A DB                GOYES  PILS23        No...ignore the data, try next mbox
                *
                * Data available, remote mode...check if the HP-71 is dormant
                *
F319C 3100              LC(2)  =f1DORM
F31A0 8E00              GOSUBL =sFLAG?       Check the dormant flag
      00
F31A6 50B               GONC   PILS23        Not dormant...try next mailbox
                *
                * Data available, remote mode, dormant...generate special key
                *
F31A9 1F00              D1=(5) =KEYPTR
      000
F31B0 321F              LCHEX  FF1
      F
F31B5 15D2              DAT1=C 3             Set to one key, keycode = "FF"
                *
                * Restore MBOX^ value, restore status, RSTK, D[A], and exit
                *
F31B9 D9        PILS50  C=B    A
F31BB F6                CSR    A             Get mailbox # back to C[X]
F31BD 1F00              D1=(5) =MBOX^
      000
F31C4 15D2              DAT1=C 3             Restore the mailbox address
F31C8 72C2              GOSUB  RESSTS        Restore status, 5 levels, D[A]
F31CC 00                RTNSXM               Exit with carry clear, XM=1
                *-
                *-
F31CE 0                 CON(1) =FIXSPC       1 nibble available here
F31CF                   BSS    1-1
                ***************************************************************
                ***************************************************************
                **
                ** Name:        GETHSS - Get 2 handshake nibbles from I/O CPU
                **
                ** Category:    PILI/O
                **
                ** Purpose:
                **      Read the two handshake nibbles from I/O CPU to the HP-71
                **      and put into ST[7:0]
                **
                ** Entry:
                **      D0 points to HPIL mailbox
                **
                ** Exit:
                **      The two handshake nibbles from I/O CPU are in ST[7:0]
                **      Carry clear
                **
                ** Calls:      None
                **
                ** Uses:
                **  Inclusive: ST[7:0]
                **
                ** Stk lvls:   0
                **
                ** History:
                **
                **    Date     Programmer             Modification
                **  --------   ----------   --------------------------------
                **  09/29/83       NZ       Updated documentation
                **  04/01/83       SC       Wrote routine
                **
                ************************************************************
                ************************************************************
F31CF 08        =GETHSS CSTEX               Save C[X] in ST, put ST in C[X]
F31D1 160              D0=D0+ =oINHS
F31D4 14E              C=DAT0 B             Read two nibbles of handshake
F31D7 180              D0=D0- =oINHS
F31DA 08               CSTEX                Put back into ST, restore C[X]
F31DC 01               RTN                  Return, carry clear
```

```
                       STITLE Check and set up mailbox
              ***************************************************************
              ***************************************************************
              **
              ** Name:        CHKSET - Check if this mailbox has been reset
              ** Name:        CHKST+ - Set up this mailbox after reset
              **
              ** Category:    LOCAL
              **
              ** Purpose:
              **        Check if this mailbox has been reset...if so, set up
              **        device ID and accessory ID
              **
              ** Entry:
              **        D0 @ mailbox
              **
              ** Exit:
              **        D0 pointing to mailbox
              **        Carry clear:
              **          All OK (If mailbox had been reset, it has been set up)
              **        Carry set:
              **          Error...P, C[0] are error code
              **
              ** Calls:       PUTC,PUTE
              **
              ** Uses.......
              **  Exclusive: A[W],C[W],P
              **  Inclusive: A[W],C[W],P
              **
              ** Stk lvls:   1 (PUTC)(PUTE)
              **
              ** Detail:
              **        Check if RESET bit is set...if not, return, carry clear
              **        Set IDY timeout = 50 mS
              **        Set Accessory ID = (mSETAI)
              **        Set Device ID = (vDEVID)&Cr&Lf
              **
              ** History:
              **
              **    Date      Programmer              Modification
              **  --------    ----------     --------------------------------
              **  06/03/83        NZ         Added setting IDY timeout to 50ms
              **  03/16/83        NZ         Added clear of NRD if reset
              **  02/22/83        NZ         Wrote routine and documentation
              **
              ***************************************************************
              ***************************************************************
F31DE 160     =CHKSET D0=D0+ =oOUTHS
F31E1 1564            C=DAT0 S               Read into C[S]
F31E5 180             D0=D0- =oOUTHS
F31E8 A46             C=C+C  S               Check if reset
F31EB 500             RTNNC                  If no carry, has NOT been reset
              *
              * Need to set device and accessory ID here
              *
```

```
F31EE AF2             C=0    W
F31F1 15C8            DAT0=C 9              Clear NRD, etc
                *
F31F5 20        =CHKST+ P=     0
F31F7 3300            LC(4)  (=mSETIT)+50  Set IDY timeout to 50 msecs
      00
F31FD 8E00            GOSUBL =PUTC
      00
F3203 400             RTNC
F3206 3500            LC(6)  =mSETAl        Set accessory ID length
      0000
F320E 7960            GOSUB  Pute
F3212 400             RTNC
F3215 3500            LC(6)  =mSETAI
      0000
F321D 7A50            GOSUB  Pute           Set accessory ID value
F3221 400             RTNC
F3224 3500            LC(6)  =mSETDl        Set device ID length
      0000
F322C 7B40            GOSUB  Pute
F3230 400             RTNC
                *+
                *     LCASC  (=vDEVID)+#000A0D^#100000000 xxxx<Cr><Lf>
F3233 30              NIBHEX 30
F3235 0000            CON(8) =vDEVID        Value of device ID
      0000
F323D D0A0            NIBHEX D0A000
      00
                *+
F3243 AFA             A=C    W              Save in A[W]
F3246 B44       CHKSE1 A=A+1  S             Increment the pointer value
F3249 3500            LC(6)  =mSETDI        Set device ID
      0000
F3251 816             CSRC
F3254 816             CSRC
F3257 AE6             C=A    B              Copy next byte to C[B]
F325A 812             CSLC
F325D AC6             C=A    S              Copy count to C[S]
F3260 812             CSLC                  Now message is set up
F3263 7410            GOSUB  Pute           Send the message
F3267 400             RTNC
F326A 2E              P=     14             Don't alter A[S]
F326C B94             ASR    WP             Get next character
F326F B94             ASR    WP
F3272 20              P=     0
F3274 96C             ?A#0   B              Done yet?
F3277 FC              GOYES  CHKSE1         No...continue
F3279 01              RTN                   Yes...done
                *-
                *-
F327B 8C00      =Pute  GOLONG =PUTE
      00
                *-
                *-
F3281 1F00      =D1=DSP D1=(5) =IS-DSP
```

```
             000
  802 F3288 01           RTN
  803             *_
  804             *_
  805 F328A 1F00 =D1=DST D1=(5) =DSPSET
             000
  806 F3291 01           RTN
  807             *_
  808             *_
  809 F3293 1F00 =D1=DSX D1=(5) =DSPCHX
             000
  810 F329A 01           RTN
```

```
                        STITLE Utility routines
              ***************************************************************
              ***************************************************************
              **
              ** Name:        SAVEST - Save status bits in STSAVE
              ** Name:        RESTST - Restore status bits from STSAVE
              **
              ** Category:    SAVUTL
              **
              ** Purpose:
              **      Save or restore status bits in =STSAVE RAM
              **
              ** Entry:
              **      Nothing
              **
              ** Exit:
              **      Status bits saved in/restored from =STSAVE
              **
              ** Calls:       None
              **
              ** Uses.......
              **  Inclusive: STSAVE[2:0]/ST[11:0]
              **
              ** Stk lvls:    1 (internal push)
              **
              ** NOTE: Does not alter carry
              **
              ** History:
              **
              **    Date      Programmer            Modification
              **  --------    ----------    ---------------------------------
              **  12/21/82       NZ         Updated documentation
              **
              ***************************************************************
              ***************************************************************
F329C 06      =SAVEST RSTK=C                   Save C[A] on stack
F329E 136             CD0EX                    Save D0 in C[A]
F32A1 1B00            D0=(5) =STSAVE
      000
F32A8 0B              CSTEX
F32AA 15C2            DAT0=C 3                 Write out the status bits
F32AE 0B      xxxxST  CSTEX
F32B0 134             D0=C                     Restore D0
F32B3 07              C=RSTK                   Restore C[A]
F32B5 01              RTN
              *-
              *-
F32B7 06      =RESTST RSTK=C                   Save C[A] on stack
F32B9 136             CD0EX                    Save D0 in C[A]
F32BC 1B00            D0=(5) =STSAVE
      000
F32C3 0B              CSTEX
F32C5 15E2            C=DAT0 3                 Read back the status bits
F32C9 64EF            GOTO   xxxxST            Exit (Common code)
              ***************************************************************
```

```
             *************************************************************
             **
             ** Name:        SAVED0 - Save D0 in STMTD0
             ** Name:        RESTD0 - Restore D0 from STMTD1
             ** Name:        SWAPD0 - Exchange D0 with STMTD0
             ** Name:        SAVED1 - Save D1 in STMTD1
             ** Name:        RESTD1 - Restore D1 from STMTD1
             ** Name:        SAVE1A - Save A[W] in STMTR0
             ** Name:        REST1A - Restore A[W] from STMTR0
             ** Name:        SAVE2C - Save C[W] in STMTR1
             ** Name:        REST2C - Restore C[W] from STMTR1
             **
             ** Category:    SAVUTL
             **
             ** Purpose:
             **      Save or restore the value in mainframe STMTxx RAM:
             **        these go away between statement executions
             **
             ** Entry:
             **      None
             **
             ** Exit:
             **      RESTXX: Restores the register indicated by XX
             **      SAVEXX: Saves the register indicated by XX
             **
             ** Calls:       None
             **
             ** Uses.......
             **   Inclusive: The designated RAM for SAVE, register for REST
             **
             ** Stk lvls:    SAVExx: 1
             ** Stk lvls:    SWAPD0: 2
             **
             ** NOTE: Does not alter carry
             **
             ** History:
             **
             **    Date     Programmer            Modification
             **  --------   ----------    ------------------------------
             **  12/21/82      NZ         Updated documentation
             **
             *************************************************************
             *************************************************************
F32CD 06     =SAVED0 RSTK=C               Save C[A] on RSTK
F32CF 136            CD0EX
F32D2 1B00           D0=(5) =STMTD0
      000
F32D9 144            DAT0=C A
F32DC 136    SAVE0r  CD0EX
F32DF 07             C=RSTK               Restore C[A] from RSTK
F32E1 01             RTN
             *-
             *-
F32E3 06     =SAVED1 RSTK=C               Save C[A] on RSTK
F32E5 137            CD1EX
```

```
918 F32E8 1F00           D1=(5) =STMTD1
          000
919 F32EF 145            DAT1=C A
920 F32F2 137   SAVE1r   CD1EX
921 F32F5 07             C=RSTK                     Restore C[A] from RSTK
922 F32F7 01             RTN
923             *-
924             *-
925 F32F9 06    =RESTD0  RSTK=C                     Save C[A] on RSTK
926 F32FB 136            CD0EX
927 F32FE 1B00           D0=(5) =STMTD0
          000
928 F3305 146            C=DAT0 A
929 F3308 63DF           GOTO   SAVE0r
930             *-
931             *-
932 F330C 06    =RESTD1  RSTK=C                     Save C[A] on RSTK
933 F330E 137            CD1EX
934 F3311 1F00           D1=(5) =STMTD1
          000
935 F3318 147            C=DAT1 A
936 F331B 66DF           GOTO   SAVE1r
937             *-
938             *-
939 F331F 06    =SWAPD0  RSTK=C                     Save C[A] on RSTK
940 F3321 136            CD0EX
941 F3324 06             RSTK=C                     Save old D0 on RSTK
942 F3326 1B00           D0=(5) =STMTD0             This alters C[A]
          000
943 F332D 146            C=DAT0 A                   Get RAM D0 value
944 F3330 136            CD0EX                      RAM D0 value in D0
945 F3333 07             C=RSTK                     Old D0 value in C[A] now
946 F3335 136            CD0EX
947 F3338 06             RSTK=C                     Now push new D0 value
948 F333A 136            CD0EX
949 F333D 1B00           D0=(5) =STMTD0             Get address again
          000
950 F3344 144            DAT0=C A                   Write out old D0 value
951 F3347 07             C=RSTK                     Get new D0 value from RSTK
952 F3349 629F           GOTO   SAVE0r
953             *-
954             *-
955 F334D 06    =SAVE1A  RSTK=C                     Save C[A] on RSTK
956 F334F 136            CD0EX
957 F3352 1B00           D0=(5) =STMTR0
          000
958 F3359 1507           DAT0=A W
959 F335D 6E7F           GOTO   SAVE0r
960             *-
961             *-
962 F3361 136   =SAVE2C  CD0EX
963 F3364 06             RSTK=C                     Save D0 on RSTK
964 F3366 136            CD0EX
965 F3369 1B00           D0=(5) =STMTR1
          000
```

```
F3370 1547         DAT0=C W
F3374 136  SAVE0x  CD0EX
F3377 07           C=RSTK                Restore D0 from RSTK
F3379 136          CD0EX
F337C 01           RTN
           *-
           *-
F337E 06   =REST1A RSTK=C                Save C[A] on RSTK
F3380 136          CD0EX
F3383 1B00         D0=(5) =STMTR0
      000
F338A 1527         A=DAT0 W
F338E 6D4F         GOTO   SAVE0r
           *-
           *-
F3392 136  =REST2C CD0EX                 Get D0 into C[A] (Don't care if
           *                             C[A] is lost - will be replaced)
F3395 06           RSTK=C                Save D0 on RSTK
F3397 1B00-        D0=(5) =STMTR1
      000
F339E 1567         C=DAT0 W
F33A2 61DF         GOTO   SAVE0x
           **************************************************************
           **************************************************************
           **
           ** Name:      TSAVD0 - Save D0 in FUNCD0
           ** Name:      TRESD0 - Restore D0 from FUNCD1
           ** Name:      TSWAD0 - Exchange D0 with FUNCD0
           ** Name:      TSAVD1 - Save D1 in FUNCD1
           ** Name:      TRESD1 - Restore D1 from FUNCD1
           ** Name:      TSAV1A - Save A[W] in FUNCR0
           ** Name:      TRES1A - Restore A[W] from FUNCR0
           ** Name:      TSAV2C - Save C[W] in FUNCR1
           ** Name:      TRES2C - Restore C[W] from FUNCR1
           **
           ** Category:  SAVUTL
           **
           ** Purpose:
           **      Save or restore the value in mainframe FUNCxx RAM:
           **        these go away during function executions
           **
           ** Entry:
           **      None
           **
           ** Exit:
           **      TRESxx: Restores the register indicated by xx
           **      TSAVxx: Saves the register indicated by xx
           **
           ** Calls:     None
           **
           ** Uses.......
           **  Inclusive: The designated RAM for TSAV, register for TRES
           **
           ** Stk lvls:  TSAVxx: 1
           ** Stk lvls:  TSWAD1: 2
```

```
                  **
                  ** NOTE: Does not alter carry
                  **
                  ** History:
                  **
                  **   Date      Programmer             Modification
                  **  --------   ----------     ---------------------------------
                  **  12/21/82       NZ         Updated documentation
                  **
                  ***************************************************************
                  ***************************************************************
F33A6 06         =TSAVD0 RSTK=C                  Save C[A] on RSTK
F33A8 136                CD0EX
F33AB 1B00               D0=(5) =FUNCD0
      000
F33B2 144                DAT0=C A
F33B5 136        TSAV0r  CD0EX
F33B8 07                 C=RSTK                  Restore C[A] from RSTK
F33BA 01                 RTN
                  *-
                  *-
F33BC 06         =TSAVD1 RSTK=C                  Save C[A] on RSTK
F33BE 137                CD1EX
F33C1 1F00               D1=(5) =FUNCD1
      000
F33C8 145                DAT1=C A
F33CB 137        TSAV1r  CD1EX
F33CE 07                 C=RSTK                  Restore C[A] from RSTK
F33D0 01                 RTN
                  *-
                  *-
F33D2 06         =TRESD0 RSTK=C                  Save C[A] on RSTK
F33D4 136                CD0EX
F33D7 1B00               D0=(5) =FUNCD0
      000
F33DE 146                C=DAT0 A
F33E1 63DF               GOTO   TSAV0r
                  *-
                  *-
F33E5 06         =TRESD1 RSTK=C                  Save C[A] on RSTK
F33E7 137                CD1EX
F33EA 1F00               D1=(5) =FUNCD1
      000
F33F1 147                C=DAT1 A
F33F4 66DF               GOTO   TSAV1r
                  *-
                  *-
F33F8 06         =TSWAD1 RSTK=C                  Save C[A] on RSTK
F33FA 137                CD1EX
F33FD 06                 RSTK=C                  Save old D1 on RSTK
F33FF 1F00               D1=(5) =FUNCD1          This alters C[A]
      000
F3406 147                C=DAT1 A                Get RAM D1 value
F3409 137                CD1EX                   RAM D1 value in D1
F340C 07                 C=RSTK                  Old D1 value in C[A] now
```

```
F340E 137           CD1EX
F3411 06            RSTK=C                  Now push new D1 value
F3413 137           CD1EX
F3416 1F00          D1=(5) =FUNCD1          Get address again
      000
F341D 145           DAT1=C A                Write out old D1 value
F3420 07            C=RSTK                  Get new D1 value from RSTK
F3422 137           CD1EX
F3425 07            C=RSTK                  Recall old C[A]
F3427 01            RTN
              *_
              *_
F3429 136     =TSAV2C CD0EX
F342C 06            RSTK=C                  Save D0 on RSTK
F342E 136           CD0EX
F3431 1B00          D0=(5) =FUNCR1
      000
F3438 1547          DAT0=C W
F343C 136     TSAV0x  CD0EX
F343F 07            C=RSTK                  Restore D0 from RSTK
F3441 136           CD0EX
F3444 01            RTN
              *_
              *_
F3446 136     =TRES2C CD0EX                 Get D0 into C[A] (Don't care if
              *                             C[A] is lost - will be replaced)
F3449 06            RSTK=C                  Save D0 on RSTK
F344B 1B00          D0=(5) =FUNCR1
      000
F3452 1567          C=DAT0 W
F3456 65EF          GOTO   TSAV0x
              ***************************************************************
              ***************************************************************
              **
              ** Name:       SAVSTS - Save RSTK levels, Status bits, D[A]
              **
              ** Category:   SAVUTL
              **
              ** Purpose:
              **      Save 6 stack levels and status bits AND D[A] in SNAPBF
              **
              ** Entry:
              **      C[A] is first stack level
              **
              ** Exit:
              **      P=0, stack levels saved in =SNAPBF
              **      Carry clear
              **
              ** Calls:      None
              **
              ** Uses.......
              **  Inclusive: B[A],C[A],D0,P,SNAPBF[37:0]
              **
              ** Stk lvls:   (-6) (Saved in SNAPBF)
              **
```

```
                  ** History:
                  **
                  **    Date     Programmer            Modification
                  **  --------   ----------  ---------------------------------
                  **  12/21/82       NZ      Updated documentation
                  **
                  **************************************************************
                  **************************************************************
 F345A 20         =SAVSTS P=      16-5        Save 5 more levels
 F345C 1800              D0=(5) =SNAPBF       Snap buffer
       000
 F3463 144        =SAVST+ DAT0=C A            Write out first address
 F3466 164               D0=D0+ 5
 F3469 09                C=ST
 F346B 15C2              DAT0=C 3             Save status bits
 F346F 162               D0=D0+ 3
 F3472 07                C=RSTK               Pop calling address
 F3474 D5                B=C    A             Save calling address in B[A]
 F3476 07         SAVSTs C=RSTK               Pop a level
 F3478 144               DAT0=C A             Save it in SNAPBF
 F347B 164               D0=D0+ 5
 F347E 0C                P=P+1
 F3480 55F               GONC   SAVSTs        If no carry, not done yet
 F3483 D9                C=B    A             Recall calling address...
 F3485 06                RSTK=C               ...push back on stack...
 F3487 D8                C=D    A             ...SAVE D[A]...
 F3489 144               DAT0=C A
 F348C 03                RTNCC                ...and return, carry clear
                  **************************************************************
                  **************************************************************
                  **
                  ** Name:        RESSTS - Restore RSTK lvls, D[A], and statuses
                  **
                  ** Category:    SAVUTL
                  **
                  ** Purpose:
                  **      Restore status, 6 stack levels, and D[A] from =SNAPBF
                  **
                  ** Entry:
                  **      Nothing
                  **
                  ** Exit:
                  **      P=0, last stack level in C[A]
                  **      Carry clear
                  **
                  ** Calls:       None
                  **
                  ** Uses.......
                  **  Inclusive: B[A],C[A],D0,P
                  **
                  ** Stk lvls:   (+6) (Restores RSTK levels from SNAPBF)
                  **
                  ** History:
                  **
                  **    Date     Programmer            Modification
```

```
                 **  --------    ----------    --------------------------------
                 **  12/21/82        NZ        Updated documentation
                 **
                 ***************************************************************
                 ***************************************************************
F348E 28         =RESSTS P=      16-5          # of levels to restore -1
F3490 1B00               D0=(5) (=SNAPBF)+(6*5)+3 6 pointers @ 5 nibs+ 3 status
      000
F3497 146                C=DAT0 A
F349A D7                 D=C    A              Restore D[A]
F349C 07         =RESST+ C=RSTK                Pop calling address
F349E D5                 B=C    A              Save in B[A]
F34A0 184        RESSTs  D0=D0- 5              Predecrement the data pointer
F34A3 146                C=DAT0 A              Read the pointer
F34A6 06                 RSTK=C                Push address onto stack
F34A8 0C                 P=P+1
F34AA 55F                GONC   RESSTs         Loop back for next pointer
                 *
                 * Now fetch status bits and last stack level
                 *
F34AD 182                D0=D0- 3
F34B0 146                C=DAT0 A              Read status bits
F34B3 0A                 ST=C                  Push into status bits
F34B5 D9                 C=B    A
F34B7 06                 RSTK=C                Push calling address onto stack
F34B9 184                D0=D0- 5
F34BC 146                C=DAT0 A              Read last level
F34BF 03                 RTNCC
```

```
            STITLE HPIL error message driver
*********************************************************************
*********************************************************************
**
** Name:        ERROR - Error driver routine
** Name:        ERRORX - Error driver for execution errors
** Name:        ERRORP - Error driver for parse errors
** Name:        ERRORR - Error driver for parse (no RESPTR)
**
** Category:    PILUTL
**
** Purpose:
**      ERRORX is execute error - jumps to mferr
**      ERRORP is parse error - jumps to PARERR
**      ERRORR is parse error - jumps to PARERR, no RESPTR
**
** Entry:
**      P contains the error type:
**               0: Parse error (Type in C[0])
**               1: Tape error (Type in C[0])
**               2: HPIL error (Type in C[0])
**               3: <undefined>
**               4: Aborted
**               5: Invalid Device Spec
**               6: Non-numeric data
**               7: <undefined>
**               8: Out of range value
**               9: No Mailbox
**              10: <undefined>
**              11: Insufficient Memory
**              12: RESTORE IO needed
**              13: <undefined>
**              14: <undefined>
**              15: <undefined>
**
** Exit:
**      ERRORX, ERRORP, and ERRORR return to the mainframe
**      The error # is in C[B], P=0, C[3:2] is HP-IL LEX id
**      Carry set
**
** Calls:       GETMBX,ATNCHK,GETERR
**
** Uses.......
**  Inclusive: C[W],D0,P
**
** Stk lvls:    2 (GETERR) {ERRORX, ERRORP, ERRORR use 3}
**
** History:
**
**   Date      Programmer             Modification
**  --------   ----------    --------------------------------
**  01/24/84       NZ        Check P=  =eABORT after call to
**                           GETERR (if so, need to jump to a
**                           different place)
**  12/21/82       NZ        Updated documentation
```

```
                 **
                 ****************************************************************
                 ****************************************************************
     F34C1 7020 =ERRORX GOSUB  ERROR            Set up the error message
     F34C5 8C00         GOLONG =bSERR           (Jump to BSERR in mainframe)
           00
                 *-
                 *-
     F34CB 854  =ERRORR ST=1   4                Don't restore ntoken
     F34CE 80F0 =ERRORP CPEX   0                Put error # in C[0]
     F34D2 20           P=     =ePARSE          Parse error
     F34D4 7D00         GOSUB  ERROR            Set up the error message
     F34D8 84A  =ERROR! ST=0   10               Clear implied LET flag...
     F34DB 136          CD0EX                   Error # in D0[3:0]
     F34DE 8D00         GOVLNG =PARERR          ...and jump to error routine
           000
                 *-
                 *-
     F34E5 890  =ERROR  ?P=    =ePARSE          Is this a parse error?
     F34E8 23           GOYES  ERROR1           Yes...error subclass
     F34EA 890          ?P=    =eTAPE           Tape error?
     F34ED D2           GOYES  ERROR1           Yes...error subclass
     F34EF 890          ?P=    =ePIL            HPIL mailbox error?
     F34F2 82           GOYES  ERROR1           Yes...error subclass
     F34F4 880          ?P#    =eABORT          "Aborted"?
     F34F7 D1           GOYES  ERROR0           No...set up the message
                 *
                 * Aborted out...try to check status
                 *
     F34F9 7000         GOSUB  =GETMBX          Get the last mailbox used
     F34FD 8E00         GOSUBL =ATNCHK          Check if ATTN key hit twice
           00
     F3503 401          GOC    ERROR0           Yes...abort out
     F3506 7E11         GOSUB  Geterr           Get the error message
     F350A 570          GONC   ERROR-           No error...say "Aborted"
     F350D 880          ?P#    =eABORT          Error...is it "Aborted"?
     F3510 A0           GOYES  ERROR1           No...set up the message
                 *
     F3512 20   ERROR-  P=     =eABORT          "Aborted"
                 *
                 * P>ePIL...set C[0]=P, C[1]=ePIL+1
                 *
     F3514 80C0 ERROR0  C=P    0                Put error # in C[0]
     F3518 20           P=     (=ePIL)+1
     F351A 80C1 ERROR1  C=P    1                Error class --> C[1]
     F351E 22           P=     2
     F3520 3100         LC(2)  =LEXPIL
     F3524 20           P=     0
     F3526 02           RTNSC
```

```
                STITLE File spec execute handler
*************************************************************
*************************************************************
**
** Name:        FILSPx - File spec execution routine
**
** Category:    POLL
**
** Purpose:
**      File spec execution poll handler
**
** Entry:
**      ST(=sSTK) indicates whether this is literal/string
**      P=0
**      If literal:
**        STMTDO points to start of file spec
**      If string:
**        TASTK (=AVMEME) points to the string header in RAM
**
** Exit:
**      Carry XM
**      ----- --
**        0    0: Handled:A=first 8,R0=last 2 chars of name;
**                         D[S]=8; D[X]=loop address; ST8=1
**                         D[3]:bit 3 is don't fill in name,
**                              bit 2 is Acc ID=16 device
**                         R3=Device ID/Volume lbl; R2=output
**                         from SETUP (R2[14]=8!)
**                         ST[8]=1 (not simple filename)
**        0    1: Not handled: Nothing (DO restored by POLL)
**        1    X: Error: C[3:0] is error code for mferr*
**
** Calls:       SAVEST,D1@AVE,POP1S,D1=SDO,GETPI+,CHKMAS,ASLC4,
**              RESTST,TRESDO
**
** Uses.......
**  Exclusive: A,  C,D,RO,   R2,R3,   DO,D1,P
**  Inclusive: A,B,C,D,RO,R1,R2,R3,R4,DO,D1,P,FUNCxx,STMTR1,
**             STMTD1[3:0],ST[sDevOK]
**  SETS ST(8) if handled
**
** Stk lvls:   6 (GETPI+)
**
** History:
**
**   Date     Programmer             Modification
**  --------  ----------   ---------------------------------
**  05/31/83     NZ        Reworked acc ID check to take
**                         less code by removing check for
**                         mass storage, NOT Acc ID=16
**  05/11/83     NZ        Added check of accessory ID to
**                         return with a bit indicating mass
**                         storage - Acc ID=16, also able to
**                         properly indicate "FILL" bit now
**  03/17/83     NZ        Modified code around GETPI+ to
```

```
           **                              match new entry/exit conditions
           **  02/11/83      NZ            Added LOOP check for device type
           **  12/21/82      NZ            Updated documentation
           **
           ***************************************************************
           ***************************************************************
           *
           * Necessary to save status...GETPI+ saves them only if calls
           * to EXPEXC are needed for an expression
           *
F3528 707D =FILSPx GOSUB  SAVEST           Save status bits in =STSAVE
F352C 860          ?ST=0  =sSTK            Is this a literal in memory?
F352F E1           GOYES  FILSx1           Yes...recall start
           *
           * This is a string expression (already on the stack)
           *
F3531 8E00         GOSUBL =D1@AVE          (TASTK=AVMEME=MTHSTK)
      00
F3537 8F00         GOSBVL =POP1S           Pop the string
      000
           *
           * Now D1 @ start of string, A[A] is length
           *
F353E 137          CD1EX
F3541 D7           D=C    A                Temp save start in D[A]
F3543 C2           C=C+A  A
F3545 DF           CDEX   A                Now end in D[A], start in C[A]
F3547 137          CD1EX                   D1 points to start of string
F354A 5D1          GONC   FILSx2           Go always
           *_
           *_
F354D 8E00 FILSx1  GOSUBL =D1=SDO          Set D1 @ STMTDO
      00
F3553 143          A=DAT1 A
F3556 130          DO=A                    Point DO to the start of spec
F3559 14A          A=DATO B                If first character is tLITRL,
F355C 3100         LC(2)  =tLITRL            skip it
F3560 966          ?A#C   B
F3563 50           GOYES  FILSx2           Not tLITRL...go on
F3565 161          DO=DO+ 2                tLITRL...skip over it
           *
           * Now DO @ start of literal/D1 at start of string
           *
F3568 8E00 FILSx2  GOSUBL =GETPI+          Get the file name and device spec
      00
F356E 427          GOC    FILSPs           Not mine...don't handle it
           *
           * Now B,D have everything needed to find the device again
           *
           * Clear unused bits in D[M]
           *
F3571 AD3          D=0    M                Clear D[4:3] without changing D[S]
           *
           * Check if file spec was "" or "*" (if so, don't handle it)
           *
```

```
F3574 96F          ?DWO   B                 Not LOOP or NULL or "" or *
F3577 C0           GOYES  FILSx.
            *
            * Check that this is NOT "LOOP"
            *
F3579 2F           P=     15
F357B 300          LC(1)  =DsLoop           Check if LOOP
F357E 947          ?DWC   S                 LOOP?
F3581 A6           GOYES  FILSPm            No...don't handle it
            *
            * This is "LOOP"...not Acc ID=16 or mass storage, don't fill
            * name (Carry is CLEAR for LOOP)
            *
            * Set up for the mainframe to be able to save the device info
            *
F3583 2E    FILSx. P=     14
F3585 308          LC(1)  8                 Set device code=8 (HPIL)
F3588 10A          R2=C                     Save output from SETUP in R2
F358B AF9          C=B    W
F358E 108          R3=C                     Save device ID/volume label in R3
F3591 512          GONC   FILSx1            Go if "LOOP" was specified
            *
            * First check what the accessory ID is...
            *
F3694 8E00         GOSUBL =CHKMAS           Check if mass storage
      00
F359A 4A0          GOC    FILSx?            Either error or not Acc ID=16
F359D 23           P=     3
F359F 304          LC(1)  4                 This is Acc ID=16, fill in name
F35A2 551          GONC   FILSxM            Go always
            *-
            *-
            *
            * Check if the accessory ID is "MASS STORAGE"
            *
F35A5 880   FILSx? ?PW    =ePIL
F35A8 15           GOYES  FILSPe            Error...not HPIL error
F35AA 80F0         CPEX   0                 First check if Device Type error
F35AE 880          ?PW    =eDTYPE
F35B1 44           GOYES  FILSPE            Error
            *
            * This IS a device type error...
            *
F35B3 23    FILSx1 P=     3
F35B5 308          LC(1)  8
F35B8 A87   FILSxM D=C    P                 Set the "Don't fill filename" bit
F35BB 2F           P=     15
F35BD 308          LC(1)  8
F35C0 20           P=     0
            *
            * Device 8 is HP-IL
            *
F35C2 AC7          D=C    S                 First 8 chars in A[W]
F35C5 114          A=R4
F35C8 8E00         GOSUBL =ASLC4            Last 2 chars in A[3:0]
```

```
           00
1463 F35CE 120             AROEX                  First 8 chars in A, last 2 in RO
1464             *
1465             * Restore the caller's status first
1466             *
1467 F35D1 72EC            GOSUB  RESTST
1468             *
1469             * Now restore DO (PC) following the device spec
1470             *
1471 F35D5 79FD            GOSUB  TRESDO          (Saved by GETPI+)
1472             *
1473             * ST[8] means this is not a simple filename...
1474             *
1475 F35D9 858             ST=1   8
1476 F35DC 821             XM=0                   Be sure XM is zero - handled
1477 F35DF 03              RTNCC                  Return (Handled, OK)
1478             *-
1479             *-
1480 F35E1 890  FILSPs    ?P=    =eNORAM          Did I run out of memory?
1481 F35E4 51              GOYES  FILSPe          Yes...error
1482 F35E6 870             ?ST=1  =sDevOK         Was the device spec OK?
1483 F35E9 01              GOYES  FILSPe          Yes...loop error
1484 F35EB 78CC FILSPn    GOSUB  RESTST          Restore status bits from =STSAVE
1485 F35EF 21   DIDST1    P=     1
1486 F35F1 0D              P=P-1                  Clear carry, P=0
1487 F35F3 00              RTNSXM                 Return carry clear, XM set
1488             *-
1489             *-
1490 F35F5 80F0 FILSPE    CPEX   0
1491 F35F9 6BEE FILSPe    GOTO   ERROR            Return with C[3:0]->error #,RTNSC
```

```
                         STITLE Store device ID handler
               ***************************************************************
               ***************************************************************
               **
               ** Name:        hDIDST - Store device ID info (from R2,R3)
               **
               ** Category:    POLL
               **
               ** Purpose:
               **      Handler for device ID storage (D1 @ destination point)
               **
               ** Entry:
               **      R2 contains C[W] from SETUP
               **      (R2[14] is the device code from FILSPx)
               **      R3 contains the device ID/volume label
               **
               ** Exit:
               **      P=0
               **      Carry clear:
               **        XM=0: Device ID saved @ D1
               **        XM=1: Not HPIL (No response)
               **      (If error, takes direct error jump to ERRORX)
               **
               ** Calls:       SNAPRS,SAVEIT
               **
               ** Uses.......
               **  Exclusive:  B,C,             P
               **  Inclusive: A,B,C,D,R2,R3,D0,D1,P (If not handled, only C,P)
               **
               ** Stk lvls:    4 (SAVEIT)
               **
               ** History:
               **
               **    Date     Programmer              Modification
               **  --------   ----------    --------------------------------
               **  01/24/84      NZ         Moved DIDST1 into FILSPx to make
               **                           room for a GOLONG (needed 2 nibs)
               **  04/15/83      NZ         Moved first SNAPRS call to save D
               **                           in case not handled (FPOLL needs
               **                           D[A] to be around if not handled)
               **  04/01/83      SC         Changed to FPOLL, added SNAPRS
               **                           calls to set up pointers
               **  12/21/82      NZ         Updated documentation
               **
               ***************************************************************
               ***************************************************************
     F35FD     =hDIDST
     F35FD 11A          C=R2
     F3600 80DE         P=C     14
     F3604 888          ?P#     8           Is this an HPIL assignment?
     F3607 8E           GOYES   DIDST1      No...leave it alone
     F3609 8E00         GOSUBL  =sNAPRS     Restore D1 from save area
           00
     F360F 11B          C=R3
     F3612 AF5          B=C     W
```

```
F3615 11A              C=R2
F3618 8E00             GOSUBL =SAVEIT       Save the information @ (D1)
      00
F361E 821              XM=0                 Make sure XM=0
F3621 500              RTNNC                If no carry, all OK...done
F3624 6C9E             GOTO   ERRORX        If carry, error exit
            *-
            *-
F3628 8C00 Geterr      GOLONG =GETERR       Jump to get error message
      00
F362E                  END
```

```
 ASLC4   Ext                 -  1462
 ATNCHK  Ext                 -  1285
 ATNFLG  Ext                 -   180
 BDISPJ  Ext                 -   279
 CHKASN  Ext                 -   271
 CHKMAS  Ext                 -  1433
 CHKSE1  Abs  995910 #F3246  -   779   794
=CHKSET  Abs  995806 #F31DE  -   748
=CHKST+  Abs  995829 #F31F5  -   759    87
 CHKSTS  Ext                 -   369   605
 CSLC5   Ext                 -   431
 CSRC5   Ext                 -   433
=D1=DSP  Abs  995969 #F3281  -   801    96   269
=D1=DST  Abs  995978 #F328A  -   805   113   244   509
=D1=DSX  Abs  995987 #F3293  -   809   273   287
 D1=SDO  Ext                 -  1387
 D1@AVE  Ext                 -  1374
 DIDST1  Abs  996847 #F35EF  -  1485  1542
 DSPCHX  Ext                 -   809
 DSPSET  Ext                 -   435   805
 DispOK  Ext                 -   247
 DsLoop  Ext                 -  1415
=ERROR   Abs  996581 #F34E5  -  1273  1260  1267  1491
=ERROR'  Abs  996568 #F34D8  -  1268
 ERROR-  Abs  996626 #F3512  -  1292  1288
 ERROR0  Abs  996628 #F3514  -  1296  1280  1286
 ERROR1  Abs  996634 #F351A  -  1298  1274  1276  1278  1290
=ERRORP  Abs  996558 #F34CE  -  1265
=ERRORR  Abs  996555 #F34CB  -  1264
=ERRORX  Abs  996545 #F34C1  -  1260  1550
 Except  Ext                 -   621
 FIBOFF  Ext                 -   432
 FILSPE  Abs  996853 #F35F5  -  1490  1447
 FILSPe  Abs  996857 #F35F9  -  1491  1444  1481  1483
 FILSPm  Abs  996843 #F35EB  -  1484  1417
 FILSPs  Abs  996833 #F35E1  -  1480  1399
=FILSPx  Abs  996648 #F3528  -  1368
 FILSx#  Abs  996792 #F35B8  -  1453  1437
 FILSx.  Abs  996739 #F3583  -  1424  1410
 FILSx1  Abs  996685 #F354D  -  1387  1370
 FILSx2  Abs  996712 #F3568  -  1398  1384  1393
 FILSx?  Abs  996773 #F35A5  -  1443  1434
 FILSxl  Abs  996787 #F35B3  -  1451  1429
 FIXSPC  Ext                 -   518   659
 FNDMBX  Ext                 -    81   367   592
 FUNCD0  Ext                 -  1032  1050
 FUNCD1  Ext                 -  1041  1057  1065  1072
 FUNCR1  Ext                 -  1083  1094
 GETERR  Ext                 -    85  1553
=GETHSS  Abs  995791 #F31CF  -   695   594
 GETMBX  Ext                 -  1284
 GETPI+  Ext                 -  1398
 GETST-  Ext                 -   609
 Geterr  Abs  996904 #F3628  -  1553  1287
 I/OALL  Ext                 -    70
 I/ORES  Ext                 -   302
 I/ores  Abs  995371 #F302B  -   302   232   265   268
 IS-DSP  Ext                 -   258   441   801
 KEYPTR  Ext                 -   645
 LEXPIL  Ext                 -  1300
 LOOPST  Ext                 -   111   347   499
 LoopOK  Ext                 -   512
 MBOX^   Ext                 -   586   653
 Offed   Ext                 -   502
 PARERR  Ext                 -  1270
 PILCN1  Abs  995233 #F2FA1  -   240   233
=PILCNF  Abs  995217 #F2F91  -   230
 PILCS0  Abs  995031 #F2ED7  -    65
 PILCS3  Abs  995066 #F2EFA  -    80    89
 PILCS4  Abs  995101 #F2F1D  -    92    82
=PILCST  Abs  995031 #F2ED7  -    59   238
 PILM05  Abs  995577 #F30F9  -   504   503
=PILMLP  Abs  995559 #F30E7  -   499
 PILMRC  Abs  995601 #F3111  -   515   505   575   581
 PILP01  Abs  995419 #F305B  -   366   388
 PILP02  Abs  995459 #F3083  -   387   370   376
 PILP03  Abs  995465 #F3089  -   392   353   361   368
=PILPOF  Abs  995378 #F3032  -   343
 PILS00  Abs  995627 #F312B  -   580   579
 PILS20  Abs  995650 #F3142  -   591   599
 PILS23  Abs  995671 #F3157  -   597   606   622   630   635   641
 PILS50  Abs  995769 #F31B9  -   651   593   612
=PILSRQ  Abs  995609 #F3119  -   573
=PILWKP  Abs  995353 #F3019  -   290
 PILWKs  Abs  995357 #F301D  -   294   259   261
=PILWNK  Abs  995176 #F2F68  -   166
 PILWNx  Abs  995213 #F2F8D  -   186   168   179
 PILxxx  Abs  995334 #F3006  -   282   277
 POP1S   Ext                 -  1375
 PUTC    Ext                 -   761
 PUTC+   Ext                 -   382
 PUTCN   Ext                 -   608
 PUTE    Ext                 -   798
=Pute    Abs  995963 #F327B  -   798   764   767   770   787
 REQS10  Abs  995717 #F3185  -   615   610
 REQS30  Abs  995730 #F3192  -   625   620
 REQSER  Abs  995678 #F315E  -   605   596
=RESST+  Abs  996508 #F349C  -  1184
=RESSTS  Abs  996494 #F348E  -  1180   655
 RESSTs  Abs  996512 #F34A0  -  1186  1190
=REST1A  Abs  996222 #F337E  -   973
=REST2C  Abs  996242 #F3392  -   980
=RESTD0  Abs  996089 #F32F9  -   925
=RESTD1  Abs  996108 #F330C  -   932
 RESTOR  Ext                 -   253
=RESTRT  Abs  995469 #F308D  -   429   343
 RESTRs  Abs  995526 #F30C6  -   448   442   443   444
=RESTST  Abs  996023 #F32B7  -   857  1467  1484
 RESTs4  Abs  995552 #F30E0  -   461   455   457
=RTNCCX  Abs  995170 #F2F62  -   129   186   291   392   515
```

```
 RTNCCx  Abs  995353 #F3019 -   291   272   276
 SAVE0r  Abs  996060 #F32DC -   911   929   952   959   977
 SAVE0x  Abs  996212 #F3374 -   967   985
=SAVE1A  Abs  996173 #F334D -   955
 SAVE1r  Abs  996082 #F32F2 -   920   936
=SAVE2C  Abs  996193 #F3361 -   962
=SAVED0  Abs  996045 #F32CD -   907
=SAVED1  Abs  996067 #F32E3 -   916
 SAVEIT  Ext                -  1547
=SAVEST  Abs  995996 #F329C -   846  1368
=SAVST+  Abs  996451 #F3463 -  1131
=SAVSTS  Abs  996442 #F345A -  1129   585
 SAVSTs  Abs  996470 #F3476 -  1138  1142
 SNAPBF  Ext                -  1130  1181
 STMTD0  Ext                -   909   927   942   949
 STMTD1  Ext                -   918   934
 STMTR0  Ext                -   957   975
 STMTR1  Ext                -   965   983
 STSAVE  Ext                -   848   859
=SWAPD0  Abs  996127 #F331F -   939
 TERCHR  Ext                -   123
=TRES2C  Abs  996422 #F3446 -  1091
=TRESD0  Abs  996306 #F33D2 -  1048  1471
=TRESD1  Abs  996325 #F33E5 -  1055
 TSAV0r  Abs  996277 #F33B5 -  1034  1052
 TSAV0x  Abs  996412 #F343C -  1085  1096
 TSAV1r  Abs  996299 #F33CB -  1043  1059
=TSAV2C  Abs  996393 #F3429 -  1080
=TSAVD0  Abs  996262 #F33A6 -  1030
=TSAVD1  Abs  996284 #F33BC -  1039
=TSWAD1  Abs  996344 #F33F8 -  1062
 WNK00   Abs  995194 #F2F7A -   178   177
 bPILAI  Ext                -   267
 bPILSV  Ext                -    69   231
 bSERR   Ext                -  1261
 bSTMXQ  Ext                -   264
 eABORT  Ext                -   611  1279  1289  1292
 eDTYPE  Ext                -  1446
 eNORAM  Ext                -  1480
 ePARSE  Ext                -  1266  1273
 ePIL    Ext                -  1277  1297  1443
 eTAPE   Ext                -  1275
 fIDORM  Ext                -   639
 fIPDWN  Ext                -   359
=hDIDST  Abs  996861 #F35FD -  1538
 hsRQSR  Ext                -   595
 mPDLOP  Ext                -   381
 mSETAI  Ext                -   766
 mSETAl  Ext                -   763
 mSETDI  Ext                -   780
 mSETDl  Ext                -   769
 mSETIT  Ext                -   760
 mSTSTC  Ext                -   607
 oINHS   Ext                -   696   698
 oOUTHS  Ext                -   748   750
 sCONTR  Ext               -   375
 sDATAV  Ext               -   629
 sDevOK  Ext               -  1482
 sFLAG?  Ext               -   360   640
 sINTR   Ext               -   619
 sMBXsr  Ext               -   176   578
 sNAPRS  Ext               -  1543
 sRMOTE  Ext               -   634
 sSTK    Ext               -  1369
 tLITRL  Ext               -  1391
 vDEVID  Ext               -   775
 xxxxST  Abs  996014 #F32AE -   851   862
```

```
Input Parameters

  Source file name is NZ&BIF::MS

  Listing file name is NZ/BIF:TI:ML::-1

  Object file name is NZ%BIF:TI:MS::-1

                                              111111
                                    0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                *
                *
                *     N   N  ZZZZZ   &     III  00000  BBBB
                *     N   N     Z  & &      I   0   0  B   B
                *     NN  N    Z   & &      I   0   0  B   B
                *     N N N   Z     &       I   0   0  BBBB
                *     N  NN  Z    & & &     I   0   0  B   B
                *     N   N Z     &  &      I   0   0  B   B
                *     N   N  ZZZZZ  && &   III  00000  BBBB
                *
                      TITLE  I/O Buffer routines <840301.1355>
   F362E              ABS    #F362E        TIXMP6 address (fixed)
                **************************************************************
                **************************************************************
                **
                ** Name:        I/OFSC - Find a scratch I/O buffer (#C00->#FFF)
                **
                ** Category:    BUFUTL
                **
                ** Purpose:
                **      File I/O scratch buffer (Return ID of first unused
                **      buffer)
                **
                ** Entry:
                **      Nothing
                **
                ** Exit:
                **      P=0
                **      Carry clear: C[X] is buffer ID
                **      Carry set: no buffer available (C[X]=0)
                **
                ** Calls:       I/OFND
                **
                ** Uses.......
                **  Inclusive: A[W],C[X],D1,P
                **
                ** Stk lvls:    1 (I/OFND)
                **
                ** History:
                **
                **    Date      Programmer              Modification
                **  --------    ----------     --------------------------------
                **  09/27/83       NZ          Changed documentation to reflect
                **                             current routine (IOFSCR)
                **  01/04/83       NZ          Updated documentation
                **
                **************************************************************
                **************************************************************
   F362E 20     =I/OFSC P=     0
   F3630 8D00          GOVLNG =IOFSCR
         000
   F3637               END
```

```
*I/OFSC  Abs  996910 #F362E -     49
 IOFSCR  Ext                -     50
```

```
Input Parameters

  Source file name is NZ&IOB::MS

  Listing file name is NZ/IOB:TI:ML::-1

  Object file name is NZXIOB:TI:MS::-1

                                           111111
                                 0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                  *
                  *       N   N  ZZZZZ   &     DDDD    SSS   PPPP
                  *       N   N      Z  & &     D  D  S   S  P   P
                  *       NN  N     Z   & &     D  D  S      P   P
                  *       N N N    Z     &      D  D   SSS   PPPP
                  *       N  NN   Z     & & &   D  D      S  P
                  *       N   N  Z      &  &    D  D  S   S  P
                  *       N   N  ZZZZZ   && &  DDDD    SSS   P
                  *
                  *
                          TITLE  Display driver <840301.1344>
   F3637                  ABS    #F3637        TIXHP6 address (fixed)
                  **************************************************************
                  **************************************************************
                  **
                  ** Name:        BDISPJ - HPIL Character-oriented display routine
                  **
                  ** Category:    PILI/O
                  **
                  ** Purpose:
                  **      Routine to display characters on HPIL devices
                  **
                  ** Entry:
                  **      A[B] is a data byte
                  **      HEX mode
                  **
                  ** Exit:
                  **      A[B] is the data byte from entry
                  **      Display status bits restored
                  **      HEX mode, carry clear
                  **
                  ** Calls:       CHKASN,SETLP,FNDMBX,START,GTYPE,MTYL,FINDA,
                  **              GETMBX,WRITIT,SENDIT,SENDI+,PUTD,PUTX,END,
                  **              MOVCUR,MOVCU+,DO=CUR,DO@CUR,Clear?,SendBf,
                  **              BLANKC,LCleft,DSPCL?
                  **
                  ** Uses.......
                  **  Exclusive: A[15:2],B[W],C[W],D[A],           DO,D1,P,(ST)
                  **  Inclusive: A[15:2],B[W],C[W],D[15:13],D[5:0],DO,D1,P,(ST)
                  **
                  ** Stk lvls:   4 (START)
                  **
                  ** NOTE:
                  **      Does not alter A[B], returns (DSPSTA+3) in STatus bits
                  **
                  ** History:
                  **
                  **   Date     Programmer              Modification
                  **  --------  ----------    ---------------------------------
                  **  02/24/84     NZ         Reworked and packed to fix bug
                  **                          with (non-HP82163 device, insert
                  **                          mode, protected field following,
                  **                          and delete through end of line)
                  **  09/28/83     NZ         Updated documentation
                  **  06/24/83     NZ         Fixed bug of losing <Cr> if DISP
                  **                                   device is a printer device
                  **  05/18/83      NZ                 Changed return from GTYPE to
                  **                                   match new exit conditions of same
                  **  04/14/83      NZ                 Added check to ignore NULL char
                  **  02/16/83      NZ                 Removed Talker code (doesn't work
                  **                                   with multiple loop displays)
                  **  12/09/82      NZ                 Added documentation
                  **
                  ****************************************************************
                  ****************************************************************
                  Esc     EQU    #1B                   <Escape>
                  Bs      EQU    #08                   <Backspace>
                  *
                  RepCur  EQU    0                     Status bit...Replace the cursor
                  *
                  Delete  EQU    4                     Status bit...Delete character
                  CurLft  EQU    5                     Status bit...Cursor direction
                  SetCur  EQU    6                     Status bit...Set vs move cursor
                  Protec  EQU    SetCur                Status bit...Hit protected char?
                  *
                  *-
                  *-
 F3637            =BDISPJ
 F3637 1B00               D0=(5) =IS-DSP               IS assignment
       000
 F363E 15E6               C=DAT0 7                     Read it in...
 F3642 7000               GOSUB  =CHKASN               Check if assigned...
 F3646 551                GONC   DISP00                Assigned
 F3649 6A63 DISPoF        GOTO   DISPOF                This is NOT assigned...return
                  *-
                  *-
                  *
                  * Now get back the correct loop for the display
                  *
 F364D 7000 DISP02        GOSUB  =SETLP                SETUP sets C[S] to current mbox
 F3651 7000               GOSUB  =FNDMBX               FNDMBX sets MBOX^ to current mbox
 F3655 4D2                GOC    DISPNS                If carry, not found...not set up?
 F3658 67C0               GOTO   DISPOK
                  *-
                  *-
 F365C 1900 DISP00        D0=(2) =DSPSET               Status nibble for display
 F3660 0B                 CSTEX
 F3662 1562               C=DAT0 XS                    Read in status...
 F3666 0B                 CSTEX
 F3668 860                ?ST=0  =LoopOK
 F366B ED                 GOYES  DISPoF                Loop has been offed...exit now
 F366D D7                 D=C    A                     Put address in D[A] for START
 F366F 94E                ?C#0   S
 F3672 11                 GOYES  DISPNS                ...not current...set it up
 F3674 870                ?ST=1  =DispOK               Currently set up?
 F3677 6D                 GOYES  DISP02                Yes...check if mailbox is there
                  *
                  * Display is NOT set up...check if this is a new assignment
                  *
                  * (New assignments have BOTH ST(=H82163) and ST(=Printr) true)
```

```
                *
F3679 860              ?ST=0  =H82163         Not HP82163A?
F367C A0               GOYES  DISPNO          No...this is NOT a new assignment
F367E 860              ?ST=0  =Printr         Not printer?
F3681 50               GOYES  DISPNO          No...this is NOT a new assignment
F3683 850       DISPNS ST=1   =DispOK         Reuse this status as a flag
                *
                * If ST(DispOK)=1, then need to check accessory ID here
                *
F3686           DISPNO
                *
                * Loop is NOT set up for DISPLAY IS
                *
                * Save character on RSTK before calls to START, GTYPE, etc
                *
F3686 D6               C=A    A
F3688 06               RSTK=C                 Push the character
                *
                * Call START, with device specifier in D[A]...
                *
F368A 8E00             GOSUBL =START          Set up Loop
      00
F3690 4E3              GOC    DISPN.          Error
F3693 860              ?ST=0  =DispOK         Are the status bits OK already?
F3696 33               GOYES  DISPn4          Yes...continue
                *
                * Get the accessory ID of the device in A[B]
                *
F3698 8E00             GOSUBL =GTYPE          Returns Acc Id in A[B]
      00
F369E 403              GOC    DISPN.          Error if carry
                *
                * If no response, then A[B] is zeroed by GTYPE
                *
                * Now set DSPSET true, set up other bits of DSPSET using B[B],
                * then restore all and return
                *
F36A1 840              ST=0   =H82163         Preclear these statuses
F36A4 840              ST=0   =Printr
F36A7 80D1             P=C    1               Copy class nibble into P
F36AB 891              ?P=    1               Mass storage class?
F36AE 84               GOYES  DISPN1          Yes...error
F36B0 882              ?P#    2               Printer class device?
F36B3 80               GOYES  DISPn3          No...check if HP82163A
                *
                * Printer class device
                *
F36B5 850              ST=1   =Printr
F36B8 501              GONC   DISPn4          Go always
                *-
                *-
F36BB 20        DISPn3 P=     0
F36BD 3103             LCHEX  30              HP82163A accessory id
F36C1 966              ?A#C   B
F36C4 50               GOYES  DISPn4          Not an HP82163A
```

```
F36C6 850              ST=1    =H82163
F36C9        DISPn4
             *
             * Now set up the display as a listener (Acc ID in A[B])
             *
F36C9 8E00             GOSUBL =MTYL          (Character is on RSTK)
      00
F36CF 462    DISPN.    GOC     DISPN1        Error
F36D2 850              ST=1    =DispOK       Display set up
F36D5 1A00             D0=(4) =DSPSET
      00
F36DB 0B               CSTEX
F36DD 1542             DAT0=C XS             Write it back out
F36E1 0B               CSTEX
F36E3 1900             D0=(2) =IS-DSP
F36E7 DB               C=D     A
F36E9 15C2             DAT0=C 3              Write out the address
F36ED 07               C=RSTK
F36EF DA               A=C     A             Restore the character to A[B]
F36F1 20               P=      0
F36F3 5C2              GONC    DISPOK        Go always
             *-
             *-
             *
             * If here, had a loop error...clear DISPLAY IS
             *
F36F6 07     DISPN1    C=RSTK
F36F8 DA               A=C     A             Restore character from RSTK
F36FA 1A00             D0=(4) =IS-DSP        DISPLAY IS assignment
      00
F3700 146              C=DAT0 A              Read code nibble into C[3]
F3703 F6               CSR     A             (code into C[XS])
F3705 0B               CSTEX
F3707 85B              ST=1    11            Set "OFF"ed flag
F370A 0B               CSTEX
F370C F2               CSL     A             Back to C[3]
F370E AB2              C=0     X
F3711 A3E              C=C-1   X             C[X]=FFF
F3714 15C3             DAT0=C 4              OFF the display
F3718 6052             GOTO    DISPEX        Done
             *-
             *-
F371C 6792   DISPOx    GOTO    DISPOK        Done, don't check carry
             *-
             *-
             *
             * Loop is set up now
             *
F3720        DISPOK
             *
             * First ensure that not in an escape sequence
             *
F3720 1B00             D0=(5) =ESCSTA        Escape status
      000
F3727 15E0             C=DAT0 1              Read it...
```

```
F372B A0E          C=C-1  P              ...decrement it...
F372E 4B4          GOC    DISPnE         Not escape
              *
              * This is in an escape sequence...what do I do?
              *
              *
              * Check if printer...if so, return
              *
F3731 870          ?ST=1  =Printr
F3734 8E           GOYES  DISP0x         Exit, restore all levels
              *
              * Not a printer...continue
              *
F3736 90A          ?C=0   P              Is it "escape"?
F3739 90           GOYES  DISP1          Yes...check further
F373B 846 Dspsn0   ST=0   SetCur         No...send the character without
F373E 6552         GOTO   DspSn0           repositioning the cursor
              *_
              *_
              *
              * Escape mode
              *
F3742 844 DISP1    ST=0   Delete         Assume NOT a delete until proven
              *                          otherwise
F3745 8F00         GOSBVL =FINDA         A[B] is value
      000
F374C 34           CON(2) \C\            Right arrow
F374E 6C0          REL(3) RArrow
F3751 44           CON(2) \D\            Left arrow
F3753 7D0          REL(3) LArrow
F3756 05           CON(2) \P\            Delete character
F3758 890          REL(3) DelChr
F375B F4           CON(2) \O\            Delete character with wrap
F375D 390          REL(3) DelChr
F3760 E4           CON(2) \N\            Insert char with wrap
F3762 990          REL(3) InsChr
F3765 B4           CON(2) \K\            Delete through end of line
F3767 011          REL(3) DelLin
F376A 30           CON(2) 3              Cursor far right
F376C 4C0          REL(3) FarRt
F376F 40           CON(2) 4              Cursor far left
F3771 001          REL(3) FarLft
F3774 00           CON(2) 0              Others...
F3776 68F1         GOTO   EscSnd         Send <Esc> <character> & return
              *_
              *_
              *
              * If <Lf>: Send it immediately, independent of current mode
              * If <Cr>: If (not Printr): send immediately (Don't set cursor)
              *                        else: transmit buffer, then <Cr>
              * If chr$(0): Ignore it entirely if not in escape sequence
              * If <anything else> and <Printr>: return without action
              *
F377A 968 DISPnE   ?A=0   B              Is A[B]=0?
F377D F9           GOYES  DISP0x         Yes...exit.
```

```
F377F 31A0          LCHEX  0A              <Lf>
F3783 962           ?A=C   B
F3786 5B            GOYES  Dspsn0          Send it
F3788 30D           LCHEX  D               Preload <Cr>
F378B 870           ?ST=1  =Printr
F378E B0            GOYES  DISP.1          Check further in printer code
F3790 962           ?A=C   B               Is it a <Cr>?
F3793 8A            GOYES  Dspsn0          Yes...don't reposition the cursor
F3795 6251          GOTO   DISP2           No...process the character
              *-
              *-
F3799 966     DISP.1 ?A#C  B               Is it a <Cr>?
F379C 08            GOYES  DISP0x          No...Exit, no action
F379E 77C3          GOSUB  Clear?          Is the clear flag set?
F37A2 489           GOC    Dspsn0          Yes...send only the <Cr>
              *
              * This is a printer, and I got a <Cr>...
              * need to send whole buffer
              *
F37A5 1900          D0=(2) (=DSPBFS)-2     (Clear? leaves D0 @ DSPSTA+3)
F37A9 31F5          LC(2)  95
F37AD 161     DISP.2 D0=D0+ 2
F37B0 14A           A=DAT0 B
F37B3 968           ?A=0   B
F37B6 80            GOYES  DISP.3          End of buffer (Logical)
F37B8 A6E           C=C-1  B               End of buffer (Physical)?
F37BB 51F           GONC   DISP.2          No...try next character
              *
              * Now D0 points to first "non-character"
              *
F37BE AF0     DISP.3 A=0   W               Clear for ASRB below
F37C1 132           AD0EX
F37C4 3400          LC(5)  =DSPBFS
      000
F37CB 135           D1=C                   Set D1 @ DSPBFS also
F37CE EA            A=A-C  A
F37D0 81C           ASRB                   Now A[A] is # of characters
              *
              * Set up for HPIL transfer
              *
F37D3 7000          GOSUB  =GETMBX         Restore the HPIL mailbox to D0
F37D7 8E00          GOSUBL =WRITIT         Send the buffer
      00
F37DD 20            P=     0
F37DF 31D0          LCHEX  0D              Restore the <Cr>
F37E3 DA            A=C    A
F37E5 460           GOC    DISPEx          Exit if error
F37E8 7B93    DISP..  GOSUB  Putd          Send it to the printer
F37EC 6C71    DISPEx  GOTO   DISPEX
              *-
              *-
              *
              * Code to check if Insert or Delete
              *
F37F0         DelChr
```

```
            *
            * Delete character (Either HP82163A or "other")
            *
F37F0 854            ST=1     Delete         This IS a delete
F37F3 7CC1           GOSUB    SendBf         Send to end of line
F37F7 6171           GOTO     DISPEX         Restore, etc.
            *-
            *-
F37FB       InsChr
            *
            * Insert character (Send Esc Q Esc N to turn on insert mode)
            *
            * (Esc Q is for HP82163A, as it does not understand Esc N)
            *
F37FB 7000           GOSUB    =GETMBX        Get back the mailbox first
F37FF 35B1           LCHEX    1B511B         Esc Q Esc
      15B1
F3807 8E00           GOSUBL   =PUTX
      00
F380D 4ED            GOC      DISPEx         Error if carry
F3810 6A2F           GOTO     DspsnO         Now send the current char (N)
            *-
            *-
F3814       RArrow
            *
            * Right arrow
            *
F3814 7573           GOSUB    DO@CUR
F3818 14E            C=DAT0   B
F381B 96A            ?C=0     B
F381E F4             GOYES    DISPox         At end of buffer NOW
F3820 845            ST=0     CurLft
F3823 846   Arrow    ST=0     SetCur         This is NOT just a set, but MOVE
F3826 6981           GOTO     DISPMC         MOVCUR, DISPOX
            *-
            *-
F382A       LArrow
            *
            * Left arrow
            *
F382A 855            ST=1     CurLft
F382D 55F            GONC     Arrow          Go always (FINDA:RTNCC)
            *-
            *-
F3830       FarRt
            *
            * Cursor far right
            *
F3830 845            ST=0     CurLft         This is cursor RIGHT
F3833 7653  Farxx    GOSUB    DO@CUR         C[B] is current cursor value
F3837 DA             A=C      A              Save cursor value in A[B]
F3839 846            ST=0     SetCur         This is NOT just a SET, but MOVE
F383C 875   FarRt1   ?ST=1    CurLft         Is this LEFT?
F383F E0             GOYES    FarRt2         Yes...don't check for end
F3841 7843           GOSUB    DO@CUR         No...check if at end already
```

```
F3845 14E            C=DAT0 B
F3848 96A            ?C=0   B
F384B C0             GOYES  FarRt3          Already at far right of buffer
F384D 850  FarRt2    ST=1   RepCur          Reposition the cursor at new loc.
F3850 7C62           GOSUB  MOVCU+
F3854 57E            GONC   FarRt1          Moved it...move it again
F3857 20   FarRt3    P=     0               Force P back to zero
F3859 3130           LC(2)  3               Cursor far right
F385D 865            ?ST=0  CurLft          Is this RIGHT?
F3860 40             GOYES  FarEnd          Yes...exit
F3862 E6             C=C+1  A               No...(LEFT=4)
F3864 7D33 FarEnd    GOSUB  D0=CUR
F3868 148            DAT0=A B               Restore the cursor value
F386B DA             A=C    A
F386D 6641 DISPox    GOTO   DISPOX          Finish it up
           *-
           *-
F3871      FarLft
F3871 855            ST=1   CurLft
F3874 5EB            GONC   Farxx           Go always
           *-
           *-
           *
           * Delete through end of line
           *
F3877 8F00 DelLin    GOSBVL =SCNRT
      000
           *
           * Check if no protected fields after this...if none, send
           * <Esc> J (Clear to end of screen)
           *
F387E 4D0            GOC    DelL0           If carry, reached end of buffer
F3881 130            D0=A
F3884 14E            C=DAT0 B               Read in indicated character
F3887 96E            ?C#0   B
F388A 31             GOYES  DelL1           Protected field
F388C D4   DelL0     A=B    A
F388E 7DE2           GOSUB  GTPEsc          GETMBX, PUTEsc
F3892 415            GOC    DISPeX          Carry exit
F3895 31A4           LCASC  \J\
F3899 6E4F           GOTO   DISP..          Putd, DISPEX
           *-
           *-
           *
           * Delete to protected field
           *
F389D 870  DelL1     ?ST=1  =H82163         Is the display an HP82163A?
F38A0 90             GOYES  DelL2           Yes...skip turning off insert mode
F38A2 7413           GOSUB  InsOff          No...turn off insert mode
F38A6 453            GOC    DelEx           Error...set up the char, exit
F38A9 AF2  DelL2     C=0    W
F38AC DB             C=D    A
F38AE EE             C=A-C  A
F38B0 81E            CSRB
F38B3 E6             C=C+1  A               Increment for current character
```

```
            *
            * Now C[A] is count of blanks to send
            *
F38B5 DA            A=C     A               Copy count to A[A]
F38B7 D7            D=C     A               D[A]=count
F38B9 8E00          GOSUBL  =BLANKC         Blanks (Clear the items)
      00
F38BF AF5           B=C     W               Copy to B[7:0]
F38C2 8E00          GOSUBL  =SENDI+         Get mailbox, Send A[A] blanks
      00
F38C8 431           GOC     DelEx           If carry, abort
            *
            * Now back up to starting point
            *
F38CB DB            C=D     A
F38CD DA            A=C     A               Count to A[A]
F38CF C4            A=A+A   A               Double count for <Esc> D
F38D1 73D1          GOSUB   SendBk          Send Esc D's (count in A[A])
F38D5 460           GOC     DelEx           Error...set up the char, exit
F38D8 72F2          GOSUB   InsOn           Turn on insert mode (if not HP82163)
F38DC 20    DelEx   P=      0
F38DE 31B4          LCASC   \K\             Restore original character (K)
F38E2 DA            A=C     A
F38E4 6480  DISPeX  GOTO    DISPEX          Done...exit
            *-
            *-
F38E8       DISP2
            *
            * Check if it is an <Esc>...if so, do NOTHING until next char
            *
F38E8 31B1          LC(2)   Esc
F38EC 962           ?A=C    B               Is this an escape?
F38EF F0            GOYES   DISPoX          Yes...exit, no change
            *
            * Check if backspace - if so, do a backspace and return
            *
F38F1 3180          LC(2)   Bs              <Bs>
F38F5 966           ?A#C    B               Is this a backspace?
F38F8 A0            GOYES   DISP25          No...check further
            *
            * This is a backspace
            *
F38FA 6F2F          GOTO    LArrow          Carry MUST be clear for LArrow
            *-
            *-
F38FE 65B0  DISPoX  GOTO    DISPOX          Jump (GOYES out of range)
            *-
            *-
F3902 185   DISP25  D0=D0-  6               Move to DSPSTA from ESCSTA
F3905 15E2          C=DAT0  3
F3909 0A            ST=C                    Restore user status for DSPCL?
F390B 8F00          GOSBVL  =DSPCL?
      000
F3912 1A00          D0=(4)  (=DSPSTA)+3     Restore display status for me
      00
```

```
F3918 14E            C=DAT0 B
F391B 1A00           D0=(4) =DSPSET       Point to the HPIL status nibble
      00
F3921 1562           C=DAT0 XS            Recall the HPIL status from RAM
F3925 0A             ST=C
              *
              * Check if cursor is at end of buffer
              *
F3927 7A72           GOSUB  D0=CUR
F392B 14E            C=DAT0 B
F392E D5             B=C    A             Copy cursor value to B[B]
F3930 31F5           LC(2)  95
F3934 9E5            ?B<C   B             Reached physical end of buffer?
F3937 02             GOYES  DISP30        No...check if insert mode
              *
              * Cursor is at end of buffer...check if insert or replace mode
              *
F3939 870            ?ST=1  =Insert
F393C 2C             GOYES  DISPoX        Exit, no error (no room)
              *
              * At end of buffer, not insert...send char, backspace
              *
F393E 7000           GOSUB  =GETMBX       Get mailbox
F3942 3500           LCHEX  441B00
      B144
F394A AE6            C=A    B             (char)&<esc>&"D"
F394D 8E00           GOSUBL =PUTX         Send it
      00
F3953 6510           GOTO   DISPEX        Exit
              *-
              *-
F3957         DISP30
              *
              * Cursor is NOT at end of buffer...check if insert or replace
              *
F3957 860            ?ST=0  =Insert       Insert mode?
F395A 73             GOYES  DspSnd        Not Insert...send the char
              *
              * Insert mode...call SendBf (It checks for HP82163A)
              *
F395C 844            ST=0   Delete        This is NOT delete
F395F 7060           GOSUB  SendBf        Send to end of line
F3963 856            ST=1   SetCur        Set the cursor to new spot...
F3966 5F3            GONC   DspSn2        If OK, position it
              *
              * Following jump taken ONLY if entered through DISPEX
              * (Packing technique)
              *
F3969 5A4     DISPEX GONC   DISPOX        If no carry, finish up
F396C 4C0            GOC    DspErr        Go always
              *-
              *-
F396F 7C02    EscSnd GOSUB  GTPEsc        GETMBX, PUTEsc
F3973 846            ST=0   SetCur        ...DON'T set the cursor
F3976 512            GONC   DspSn1        Go unless interrupted
```

```
F3979 840  DspErr ST=0   =LoopOK       Interrupted
F397C 840         ST=0   =DispOK       (If interrupted, display not OK)
F397F 1B00        D0=(5) =DSPSET       Rewrite display settings
      000
F3986 0B          CSTEX
F3988 1542        DAT0=C XS
F398C 0B          CSTEX
F398E 452         GOC    DISPOX        Go always...exit
                  *-
                  *-
F3991      DspSnd
                  *
                  * Send the character and return
                  *
F3991 856         ST=1   SetCur        SET the cursor to next position
F3994 7000 DspSn0 GOSUB  =GETMBX       Find the mailbox...
F3998 D6   DspSn1 C=A    A             ...copy character to C[B]...
F399A 79E1        GOSUB  Putd          ...Send the character
F399E 4AD         GOC    DspErr        Interrupted
F39A1 866         ?ST=0  SetCur        Set the new cursor position?
F39A4 01          GOYES  DISPOX        No...exit
F39A6 7FB1 DspSn2 GOSUB  Clear?        Check if Clear is set
F39AA 490         GOC    DISPOX        Yes...exit (Don't move cursor)
F39AD 845         ST=0   CurLft        No...move the cursor RIGHT
F39B0 7901 DISPMC GOSUB  MOVCUR
F39B4      DISPOX
           *
           * Now restore status bits and return
           *
F39B4      DISPOF
F39B4 1B00        D0=(5) (=DSPSTA)+3   Display status bits
      000
F39BB 15E2        C=DAT0 3
F39BF 0A          ST=C                 Restore them
F39C1 03   RtnCC  RTNCC                Done...return, carry clear
           ***************************************************************
           ***************************************************************
           **
           ** Name:       SendBf - Insert/delete a char, send line if needed
           **
           ** Category:   LOCAL
           **
           ** Purpose:
           **      Insert/delete a character, even if this is an HP82163A
           **      display device
           **
           ** Entry:
           **      ST(Insert):
           **             if 1, insert (send from position through end)
           **                (send character from A[B] first)
           **      ST(Delete) is type:
           **             if 1, delete (send from next char to end,
           **                append blank)
           **             if 0, insert (send char from A[B], then to end)
           **
```

```
                ** Exit:
                **      A[B] is not changed from entry
                **      Carry clear:
                **        All OK (P=0)
                **      Carry set:
                **        Interrupted (P=error code)
                **
                ** Calls:      SCNRT,GETMBX,PUTEsc,PUTD,WRITIT,LCleft
                **
                ** Uses.......
                **  Exclusive: A[15:2],B[W],C[W],     D0,D1   ST[Protec]
                **  Inclusive: A[15:2],B[W],C[W],D[A],D0,D1,P,ST[Protec,3:0]
                **
                ** Stk lvls:   2 (WRITIT)(SCNRT)
                **
                ** History:
                **
                **    Date     Programmer               Modification
                **  --------   ----------   ----------------------------------
                **  02/24/84       NZ       Rearranged code to allow common
                **                          subroutines for turning off and
                **                          on the insert cursor on display
                **                          device
                **  06/24/83       NZ       Packed code by no longer preserve
                **                          D1 in this routine
                **  06/02/83       NZ       Added code to do Esc N (Insert w/
                **                          wrap)
                **  12/09/82       NZ       Added documentation
                **
                **************************************************************
                **************************************************************
F39C3           SendBf
                *
                * Find first character NOT to send (Either EOB or protected)
                *
F39C3 8F00            GOSBVL =SCNRT         Scan right
      000
                *
                * SCNRT returns A[A]-->past unprotected item, carry set if end
                * of buffer, D[A] is pointer to first after current position,
                * B[B] contains the entry A[B]
                *
F39CA 5C0             GONC   NotEnd         If carry, at end of buffer
                *
                * If Insert and End of buffer, return (Do nothing)
                *
F39CD 860             ?ST=0  =Insert        Is it NOT insert?
F39D0 70              GOYES  NotEnd         Not insert...continue
F39D2 864             ?ST=0  Delete         Is it a delete?
F39D5 CE              GOYES  RtnCC          No...buffer is full, insert: exit
F39D7           NotEnd
                *
                * B[B] is the new character...saved here for now
                *
                * D[A] is first char after current position in buffer
```

```
           *
F39D7 AF2          C=0    W              Clear high bits for CSRB below
F39DA DB           C=D    A              Start of string in C[A]
F39DC 135          D1=C                  Start of string in D1
F39DF 846          ST=0   Protec         Check if protected field
F39E2 130          D0=A
F39E5 14E          C=DAT0 B
F39E8 96A          ?C=0   B
F39EB 50           GOYES  NotPro         Not protected (EOB)
F39ED 856          ST=1   Protec
F39F0 137  NotPro  CD1EX                 Bring pointer back to C[A]...
F39F3 135          D1=C                  ...And copy back to D1
F39F6 EE           C=A-C  A              # of nibbles to send
F39F8 81E          CSRB                  C[A] is length to send (bytes)
F39FB DA           A=C    A              A[A] is length to send (bytes)
           *
           * Now D1 points past start of buffer, A[A] is a character count
           *
           * Get the mailbox address into D0 now...
           *
F39FD 7000         GOSUB  =GETMBX        Alters only C,D0
           *
           * Now D0 points to the mailbox
           *
           * Check if Protec is set...if so, and in insert mode, and not
           * HP82163A, then send <Esc>R to turn OFF insert mode
           *
F3A01 870          ?ST=1  =H82163        HP82163A?
F3A04 62           GOYES  Send#          Yes...continue
F3A06 876          ?ST=1  Protec         Protected?
F3A09 A1           GOYES  Send-          Yes...continue
           *
           * Not HP82163A, not protected...just send the char (or delete
           * escape sequence)
           *
F3A0B D0           A=0    A
F3A0D 864          ?ST=0  Delete         Is this a delete?
F3A10 90           GOYES  Send+          No...just the character
F3A12 7D61         GOSUB  PUTEsc         Yes...send Esc...
F3A16 480          GOC    Sendex
F3A19 D9   Send+   C=B    A              Copy B[B] (the character)
F3A1B 7861         GOSUB  Putd           ...send the character
F3A1F D4   Sendex  A=B    A              Restore the character from B[B]
F3A21 01           RTN                   Exit, preserve carry
           *-
           *-
           *
           * This is not HP82163A, Protected
           *
F3A23 7391 Send-   GOSUB  InsOff         Turn off insert mode, if on
F3A27 47F          GOC    Sendex         Error...restore, return
           *
           * Check if insert...if so, send the character in B[B] first
           * If not insert (if delete), skip first character in buffer
           *
```

```
                  * Check if this is the logical end of buffer
                  *
F3A2A 1C1         SendM    D1=D1- 2         Point to first character
F3A2D 14F                  C=DAT1 B         Check the character for EOB
F3A30 171                  D1=D1+ 2         Restore pointer to next char
F3A33 96E                  ?C#0   B         End of line?
F3A36 40                   GOYES  Send00    No...check if need to adjust
F3A38 D0                   A=0    A         Yes...set =0
F3A3A 874         Send00   ?ST=1  Delete    Delete?
F3A3D A1                   GOYES  SendNI    Yes...NOT insert
                  *
                  * This is an insert
                  *
F3A3F 1C1                  D1=D1- 2         This is an insert...
F3A42 96A                  ?C=0   B         Is it End of buffer?
F3A45 90                   GOYES  Send02    Yes...skip this adjustment
F3A47 876                  ?ST=1  Protec    Is it protected?
F3A4A 40                   GOYES  Send02    Yes...leave A[A] unchanged
F3A4C E4                   A=A+1  A         Increment count
                  *
                  * Now A[A] is corrected character count, D1 @ first char to
                  * be sent
                  *
F3A4E D9          Send02   C=B    A         Read the character from B[B]
F3A50 7331                 GOSUB  Putd      Send the character
F3A54 4AC                  GOC    Sendex    Error...exit
                  *
                  * This is the entry point for a delete
                  *
F3A57             SendNI
                  *
                  * Now retransmit the line...
                  *
F3A57 8E00                 GOSUBL =WRITIT   Send the data to the loop
      00
                  *
                  * If carry set, ATTN hit...return
                  *
F3A5D 41C                  GOC    Sendex    Exit after restoring A[B]
                  *
                  * Done with transfer now...check if delete; if so, send blank
                  *
F3A60 864                  ?ST=0  Delete
F3A63 D0                   GOYES  SendLs    Insert...no trailing blank
F3A65 3102                 LCASC  \ \       Delete...
F3A69 7A11                 GOSUB  Putd      ...send a trailing blank
F3A6D 41B                  GOC    Sendex    Exit if error
                  *
                  * Now D1 points to the "Next" character...subtract current
                  * position and divide by 2 to get # of bytes sent
                  *
F3A70 866         SendLs   ?ST=0  Protec    Is this NOT protected field?
F3A73 90                   GOYES  SendL1    Not protected...back up
F3A75 7551                 GOSUB  InsOn     Turn insert mode back on
F3A79 45A                  GOC    Sendex
```

```
F3A7C AF0  SendL1 A=0    W             Clear high bits for ASRB below
F3A7F 133         AD1EX
F3A82 3400        LC(5)  =DSPBFS
      000
F3A89 EA          A=A-C  A
F3A8B 81C         ASRB                 A[A] is # bytes from buffer start
F3A8E 1F00        D1=(5) =CURSOR
      000
F3A95 D2          C=0    A
F3A97 14F         C=DAT1 B             Read the cursor...
F3A9A EA          A=A-C  A             Now A[A] is # backspaces to send
F3A9C C4          A=A+A  A             Double for <Esc> D
F3A9E DC          ABEX   A             Now character in A[B], # in B[A]
F3AA0 814         ASRC
F3AA3 814         ASRC                 Save character in A[15:14]
F3AA6 D4          A=B    A             Count back to A[A]
F3AA8 7201 SendBk GOSUB  LCleft        Load C with Esc D Esc D
F3AAC AF5         B=C    W
F3AAF 8E00        GOSUBL =SENDIT       Send the sequence
      00
F3AB5 810         ASLC
F3AB8 810         ASLC                 Restore A[B] from A[15:14]
F3ABB 01          RTN                  Don't alter carry
                  **************************************************************
                  **************************************************************
                  **
                  ** Name:       MOVCUR - Move the cursor right/left
                  ** Name:       MOVCU+ - Move the cursor permanently (no restore)
                  **
                  ** Category:   LOCAL
                  **
                  ** Purpose:
                  **      Move the cursor in the direction specified by CurLft
                  **      status bit (Similar to mainframe routine by same name)
                  **
                  ** Entry:
                  **      CurLft set to move left, clear to move right
                  **      P=0
                  **
                  ** Exit:
                  **      Contents of A[A] restored upon exit
                  **      Carry set if no move
                  **      Carry clear if moved, cursor positioned on display
                  **      Clears ST(=LoopOK) if interrupted
                  **
                  ** Calls:      D0=CUR,MOVC60,GETMSK,SENDI+,LCleft
                  **
                  ** Uses.......
                  **  Exclusive: A[15:5],B[W],C[W],D[A],    P
                  **  Inclusive: A[15:5],B[W],C[W],D[A],D0,P,ST[3:0]
                  **
                  ** Stk lvls:   2 (SENDI+)
                  **
                  ** NOTE: Does not alter A[A]
                  **
```

```
                 ** History:
                 **
                 **    Date      Programmer              Modification
                 **  --------    ----------    --------------------------------
                 **  02/24/84       NZ         Moved MOVC60 to inline code (at
                 **                            MOVC10)
                 **  12/09/82       NZ         Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
 F3ABD 840  MOVCUR  ST=0   RepCur           Do NOT replace cursor
 F3AC0 71E0 MOVCU+  GOSUB  D0=CUR
 F3AC4 14E          C=DAT0 B
 F3AC7 D7           D=C    A                Save original value in D[B]
 F3AC9 D8           B=A    A                Save original character in B[A]
 F3ACB 14A  MOVC10  A=DAT0 B
 F3ACE CC           A=A-1  A                Assume LEFT first
 F3AD0 875          ?ST=1  CurLft           Is it LEFT?
 F3AD3 60           GOYES  MOVC12           Yes...good choice
 F3AD5 E4           A=A+1  A                No...undo LEFT,
 F3AD7 E4           A=A+1  A                  do RIGHT
 F3AD9 31F5 MOVC12  LC(2)  95
 F3ADD 9E6          ?A>C   B                Would this be past end of display?
 F3AE0 C6           GOYES  MOVC50           Yes, then restore original value
 F3AE2 148          DAT0=A B                No, then update cursor position
 F3AE5 D4           A=B    A                Save original char in A[B]
 F3AE7 8F00         GOSBVL =GETMSK          Get bit map (Alters B[A],C,D0,P)
       000
 F3AEE D8           B=A    A                Resave original char in B[B]
 F3AF0 15A0         A=DAT0 1                Read mask nibble
 F3AF4 0E06         A=A&C  P
 F3AF8 79A0         GOSUB  D0=CUR
 F3AFC 90C          ?A#0   P                Is it protected?
 F3AFF CC           GOYES  MOVC10           Yes, then keep looking
                 *
                 * Now calculate how far to move cursor, and which direction...
                 * ...and restore cursor value
                 *
 F3B01 D0           A=0    A                Clear high nibbles of A[A]
 F3B03 14A          A=DAT0 B                Read in cursor position
 F3B06 DB           C=D    A
 F3B08 870          ?ST=1  RepCur           Replace the cursor?
 F3B0B 50           GOYES  MOVC15           Yes...don't restore it
 F3B0D 14C          DAT0=C B                Restore original cursor position
 F3B10 B6A  MOVC15  A=A-C  B                Offset (Bytes) in A[B]
 F3B13 37B1         LCHEX  431B431B         Right arrows
       34B1
       34
 F3B1D 590          GONC   MOVC20           If carry, left arrow
                 *
                 * Left arrows needed
                 *
 F3B20 7AB0 MOVC17  GOSUB  LCleft           Left arrows
 F3B24 BE8          A=-A   B
 F3B27 AFD  MOVC20  BCEX   W                Move arrows to B[W], char to C[B]
```

```
F382A D7              D=C    A          Save char in D[B]
F382C 866             ?ST=0  SetCur     Is this a move or a set?
F382F 90              GOYES  MOVC30     No...MOVE that # of chars
               *
               * This is a set cursor...if next char is the destination, exit
               *
F3831 CC              A=A-1  A
F3833 8A8             ?A=0   A
F3836 21              GOYES  MOVC45     Exit w/o sending any(char in C,D)
               *
               * Must MOVE the cursor...send <Esc> C|D (A is # moves)
               *
F3838 C4       MOVC30 A=A+A  A          Double for <Esc>
F383A 8E00            GOSUBL =SENDI+    Get mailbox, send left arrows
      00
F3840 550             GONC   MOVC40     No interrupt...ok
F3843 840             ST=0   =LoopOK    Interrupt...clear =LoopOK
F3846 DB       MOVC40 C=D    A
F3848 DA       MOVC45 A=C    A          Restore the original character...
F384A 03              RTNCC             ...and return
               *-
               *-
F384C          MOVC50
F384C 866             ?ST=0  SetCur     Is it NOT SetCur?
F384F 11              GOYES  MOVC55     Not SetCur...OK to not move
               *
               * SetCur...need to take action if unable to move right
               *
               * First restore the cursor
               *
F3851 DB              C=D    A
F3853 14C             DAT0=C B          D0 is still at cursor...
F3856 D0              A=0    A
F3858 A6C             A=A-1  B
F385B CC              A=A-1  A          A[B]=FE (A=-A B will make this 2)
               *
               * Go move the cursor left 1 position (since this is SetCur,
               * MOVC17 reduces the count by one, therefore A[B] is now -2)
               *
F385D 52C             GONC   MOVC17     Go always
               *-
               *-
F3860          MOVC55
F3860 DB              C=D    A          C(B)=Original cursor
F3862 14C             DAT0=C B          Restore original cursor
F3865 D4              A=B    A          Restore original char from B[B]
F3867 02              RTNSC
               *************************************************************
               *************************************************************
               **
               ** Name:        Clear? - Check if the clear bit is set in DSPSTA
               **
               ** Category:    LOCAL
               **
               ** Purpose:
                 **      Set/clear carry if clear bit in DSPSTA is set/clear
                 **
                 ** Entry:
                 **      None
                 **
                 ** Exit:
                 **      Carry set if ST[Clear] is set, else clear
                 **      DO @ DSPSTA+3
                 **
                 ** Calls:      None
                 **
                 ** Uses.......
                 **  Inclusive: C[X],DO
                 **
                 ** Stk lvls:   0
                 **
                 ** History:
                 **
                 **    Date     Programmer             Modification
                 **  --------   ----------   --------------------------------
                 **  09/28/83      NZ        Added documentation
                 **
                 ************************************************************
                 ************************************************************
 F3869 1B00 Clear?  DO=(5) (=DSPSTA)+3   Point to status
       000
 F3870 15E2         C=DAT0 3             Read in 3 nibbles of status
 F3874 0B           CSTEX                Now check if CLEAR is set...
 F3876 870          ?ST=1  =Clear
 F3879 20           GOYES  Clear1        Set/clear carry...
 F387B 0B   Clear1  CSTEX                (Restore my status)
                 *
                 * If carry set, then =Clear is set
                 *
 F387D 01           RTN                  Return, carry unchanged
                 *_
                 *_
 F387F 7000 GTPEsc  GOSUB  =GETMBX       Get the mailbox
 F3883 31B1 PUTEsc  LC(2)  Esc           Send an Escape
 F3887 8C00 Putd    GOLONG =PUTD
       00
                 ************************************************************
                 ************************************************************
                 **
                 ** Name:       DO@CUR - Set DO to the current cursor position
                 **
                 ** Category:   LOCAL
                 **
                 ** Purpose:
                 **      Set DO to the cursor position in the display
                 **
                 ** Entry:
                 **      None
                 **
                 ** Exit:
                  **      D0 at cursor position
                  **      Carry clear
                  **      C[A] is cursor value (from =CURSOR)
                  **
                  ** Calls:       D0=CUR
                  **
                  ** Uses.......
                  **  Inclusive: C[A],D0
                  **
                  ** Stk lvls:    1 (D0=CUR)
                  **
                  ** History:
                  **
                  **    Date      Programmer              Modification
                  **  --------    ----------    ------------------------------
                  **  02/18/83        NZ        Added D0=CUR call, renamed to
                  **                            D0@CUR
                  **  12/09/82        NZ        Added documentation
                  **
                  **************************************************************
                  **************************************************************
 F3B8D 7410 D0@CUR  GOSUB  D0=CUR       Leaves D0 pointing to cursor loc
 F3B91 D2           C=0    A
 F3B93 14E          C=DAT0 B
 F3B96 161          D0=D0+ 2            (=CURSOR)-(=DSPBFS)
 F3B99 132          AD0EX               Save A[A] in D0, set A[A] to DSPBFS
 F3B9C CA           A=C+A  A
 F3B9E CA           A=C+A  A
 F3BA0 132          AD0EX               Restore A[A], set D0 to cursor
 F3BA3 03   Rtncc   RTNCC
                  *-
                  *-
 F3BA5 1B00 D0=CUR  D0=(5) =CURSOR
       000
 F3BAC 01           RTN
                  *-
                  *-
 F3BAE 37B1 LCleft  LCHEX  441B441B     Esc D Esc D
       44B1
       44
 F3BB8 01           RTN
                  *.
                  *-
 F3BBA 860  InsOff  ?ST=0  =Insert      Insert mode?
 F3BBD 6E           GOYES  Rtncc        No...leave alone
                  *
                  * This is not HP82163A, protected, insert mode...temporarily
                  * disable insert mode
                  *
 F3BBF 7CBF         GOSUB  GTPEsc       Get mailbox, Put Esc...
 F3BC3 400          RTNC                (Error)
 F3BC6 3126         LCASC  \A\          ...A
 F3BCA 6CBF         GOTO   Putd
                  *-
                  *-
```

```
F3BCE 870  InsOn   ?ST=1  =H82163        Is this an HP82163A?
F3BD1 2D           GOYES  Rtncc          Yes...exit
F3BD3 860          ?ST=0  =Insert        Am I in insert mode?
F3BD6 DC           GOYES  Rtncc          No...exit
F3BD8 77AF         GOSUB  PUTEsc         Send <Esc>N to turn insert on
F3BDC 400          RTNC
F3BDF 31E4         LCASC  \N\
F3BE3 63AF         GOTO   Putd
                *-
                *-
F3BE7 0            CON(1) =FIXSPC        16 nibbles available here
F3BE8              BSS    16-1
F3BF7              END
```

```
 Arrow    Abs  997411 #F3823 -   351    360
=BDISPJ   Abs  996919 #F3637 -    78
 BLANKC   Ext                -   433
 Bs       Abs       8 #00008 -    67    462
 CHKASN   Ext                -    81
 CURSOR   Ext                -   752    990
 Clear    Ext                -   932
 Clear1   Abs  998267 #F3B7B -   934    933
 Clear2   Abs  998249 #F3B69 -   929    281    551
 CurLft   Abs       5 #00005 -    72    350    359    367    371    382    392    663
                                 816
 DO=CUR   Abs  998309 #F3BA5 -   990    385    486    810    829    979
 DO@CUR   Abs  998285 #F3B8D -   979    346    368    373
 DISP..   Abs  997352 #F37E8 -   313    413
 DISP.1   Abs  997273 #F3799 -   279    273
 DISP.2   Abs  997293 #F37AD -   289    294
 DISP.3   Abs  997310 #F37BE -   298    292
 DISP00   Abs  996956 #F365C -    95     82
 DISP02   Abs  996941 #F364D -    89    105
 DISP1    Abs  997186 #F3742 -   236    228
 DISP2    Abs  997608 #F38E8 -   452    276
 DISP25   Abs  997634 #F3902 -   474    464
 DISP30   Abs  997719 #F3957 -   507    491
 DISPEX   Abs  997737 #F3969 -   524    199    314    326    449    504
 DISPEx   Abs  997356 #F37EC -   314    312    338
 DISPMC   Abs  997808 #F39B0 -   664    352
 DISPN.   Abs  997071 #F36CF -   169    131    138
 DISPN1   Abs  997110 #F36F6 -   187    149    169
 DISPNO   Abs  996998 #F3686 -   119    112    114
 DISPNS   Abs  996995 #F3683 -   115     91    103
 DISPOF   Abs  997812 #F39B4 -   669     83
 DISPOK   Abs  997152 #F3720 -   208     92    181
 DISPOX   Abs  997812 #F39B4     655    202    388    471    624    637    650    552
 DISPOx   Abs  997148 #F371C     202    223    267    280
 DISPeX   Abs  997604 #F38E4     449    411
 DISPn3   Abs  997051 #F36BB -   159    151
 DISPn4   Abs  997065 #F36C9 -   164    133    156    162
 DISPnE   Abs  997242 #F377A -   266    215
 DISPoF   Abs  996937 #F3649 -    83    100
 DISPoX   Abs  997630 #F38FE -   471    458    496
 DISPox   Abs  997485 #F386D     388    349
 DSPBFS   Ext                    287    300    749
 DSPCL?   Ext                -   477
 DSPSET   Ext                -    95    171    480    533
 DSPSTA   Ext                    478    560    929
 DelChr   Abs  997360 #F37F0 -   320    244    246
 DelEx    Abs  997596 #F38DC -   446    422    436    444
 DelL0    Abs  997516 #F388C -   409    404
 DelL1    Abs  997533 #F389D -   419    408
 DelL2    Abs  997545 #F38A9 -   423    420
 Dellin   Abs  997495 #F3877 -   399    250
 Delete   Abs       4 #00004 -    71    236    324    516    631    674    701    734
 DispOK   Ext                -   104    115    132    170    632
 DspErr   Abs  997753 #F3979     531    525    548
 DspSm0   Abs  997780 #F3994     545    230
```

```
Saturn Assembler      Display driver <840301.1344>      Thu Mar  1, 1984   1:44 pm
Ver. 3.39/Rev. 2306   Symbol Table                                         Page  22

 DspSn1   Abs   997784 #F3998 -    546   530
 DspSn2   Abs   997798 #F39A6 -    651   519
 DspSnd   Abs   997777 #F3991 -    540   612
 DspenO   Abs   997179 #F373B -    229   270   275   282   339
 ESCSTA   Ext                 -    212
 Esc      Abs       27 #0001B -     66   456   942
 EscSnd   Abs   997743 #F396F -    628   256
 FINDA    Ext                 -    238
 FIXSPC   Ext                 -   1020
 FNDMBX   Ext                 -     90
 FarEnd   Abs   997476 #F3864 -    385   383
 FarLft   Abs   997489 #F3871 -    391   264
 FarRt    Abs   997424 #F3830 -    363   262
 FarRt1   Abs   997436 #F383C -    371   379
 FarRt2   Abs   997453 #F384D -    377   372
 FarRt3   Abs   997463 #F3857 -    380   376
 Farxx    Abs   997427 #F3833 -    368   393
 GETMBX   Ext                 -    307   336   600   548   658   941
 GETMSK   Ext                 -    825
 GTPEsc   Abs   998271 #F3B7F -    941   410   628  1004
 GTYPE    Ext                 -    137
 H82163   Ext                 -    111   145   163   419   665  1010
 IS-DSP   Ext                 -     79   176   189
 InsChr   Abs   997371 #F37FB -    329   248
 InsOff   Abs   998330 #F3BBA -    998   421   687
 InsOn    Abs   998350 #F3BCE -   1010   445   746
 Insert   Ext                 -    495   611   629   998  1012
 LArrow   Abs   997418 #F382A -    356   242   468
 LCleft   Abs   998318 #F3BAE -    994   761   848
 LoopOK   Ext                 -     99   531   866
 MOVC10   Abs   998091 #F3ACB -    814   831
 MOVC12   Abs   998105 #F3AD9 -    820   817
 MOVC15   Abs   998160 #F3B10 -    842   840
 MOVC17   Abs   998176 #F3B20 -    848   889
 MOVC20   Abs   998183 #F3B27 -    850   844
 MOVC30   Abs   998200 #F3B38 -    863   853
 MOVC40   Abs   998214 #F3B46 -    867   865
 MOVC45   Abs   998216 #F3B48 -    868   869
 MOVC50   Abs   998220 #F3B4C -    872   822
 MOVC55   Abs   998240 #F3B60      892   874
 MOVCU+   Abs   998080 #F3AC0 -    810   378
 MOVCUR   Abs   998077 #F3ABD -    809   554
 MTYL     Ext                      168
 NotFnd   Abs   997847 #F3907 -    633   625   630
 NotPro   Abs   997872 #F39F0 -    648   646
 PUID     Ext                 -    943
 PUTEsc   Abs   998275 #F3B83 -    942   676  1014
 PUTX     Ext                 -    337   503
 Printr   Ext                 -    113   146   155   222   272
 Protec   Abs        6 #00006 -     74   642   647   667   709   743
 Putd     Abs   998279 #F3B87 -    943   313   647   679   717   737  1007  1017
 RArrow   Abs   997396 #F3814 -    342   240
 Replur   Abs        0 #00000 -     69   377   809   839
 RtnlC    Abs   997825 #F39C1      563   632
 Rtnic    Abs   998307 #F3BA3      987   999  1011  1013
```

```
SCNRT   Ext                  -   399   619
SENDI+  Ext                  -   435   864
SENDIT  Ext                  -   763
SETLP   Ext                  -    89
START   Ext                  -   130
Send#   Abs   997930 #F3A2A  -   695   666
Send+   Abs   997913 #F3A19  -   678   675
Send-   Abs   997923 #F3A23  -   687   668
Send00  Abs   997946 #F3A3A  -   701   699
Send02  Abs   997966 #F3A4E  -   716   708   710
SendBf  Abs   997827 #F39C3  -   615   325   517
SendBk  Abs   998056 #F3AA8  -   761   443
SendL1  Abs   998012 #F3A7C  -   747   744
SendLs  Abs   998000 #F3A70  -   743   735
SendNI  Abs   997975 #F3A57  -   722   702
Sendex  Abs   997919 #F3A1F  -   680   677   688   718   730   738   746
SetCur  Abs        6 #00006  -    73    74   229   351   370   518   529   544
                                 549   852   873
WRITIT  Ext                  -   308   726
```

```
Input Parameters

  Source file name is NZ&DSP::MS

  Listing file name is NZ/DSP:TI:ML::-1

  Object file name is NZXDSP:TI:MS::-1

                                        111111
                              0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                 *
                 *      N   N  ZZZZZ   &     BBBB   U   U  TTTTT
                 *      N   N      Z  & &    B   B  U   U    T
                 *      NN  N     Z   & &    B   B  U   U    T
                 *      N N N    Z     &     BBBB   U   U    T
                 *      N  NN   Z     & & &  B   B  U   U    T
                 *      N   N  Z      &  &   B   B  U   U    T
                 *      N   N  ZZZZZ   && &  BBBB    UUU     T
                 *
                 *
                        TITLE  BASIC UTILITIES <840301.1331>
   F3BF7                ABS    #F3BF7        TIXMP6 address (fixed)
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:        GETMBX - Get address of mailbox (last FNDMBX)
                 **
                 ** Category:    PTRUTL
                 **
                 ** Purpose:
                 **      Get the HPIL mailbox address from RAM and put it in DO
                 **
                 ** Entry:
                 **      Nothing
                 **
                 ** Exit:
                 **      C[A], DO-->Mailbox
                 **      Carry clear
                 **
                 ** Calls:       None
                 **
                 ** Uses.......
                 **  Inclusive: C[A],DO
                 **
                 ** Stk lvls:    0
                 **
                 ** NOTE: Does not alter P!
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **   --------  ----------    --------------------------------
                 **   11/11/82      NZ        Added documentation
                 **
                 ****************************************************************
                 ****************************************************************
   F3BF7 1B00    =GETMBX DO=(5) =MBOX^       Mailbox pointer (in RAM)
         000
   F3BFE 146            C=DATO A             Read the pointer to the mailbox
                 *
   F3C01 F2             CSL    A             Mbox address is stored as words
                 *                             offset from 20000!
   F3C03 80F4           CPEX   4
   F3C07 22             P=     2
   F3C09 80F4           CPEX   4             Set nibble 4 to 2 (page 20000)
```

```
                *
                * Now C[A] is the mailbox address
                *
 F3C0D 134              D0=C                    Put the address into D0...
 F3C10 03               RTNCC                   ...and return with carry clear!
                *****************************************************************
                *****************************************************************
                **
                ** Name:       SETLP - Set up C[S] for FNDMBX from D[A] info
                **
                ** Category:   PILUTL
                **
                ** Purpose:
                **      Given D[A] set up for device search, return the loop #
                **      minus one in C[S]
                **
                ** Entry:
                **      D[A] is device info (see START documentation)
                **
                ** Exit:
                **      Carry clear
                **      P=0
                **      Mailbox # in C[S]
                **
                ** Calls:      None
                **
                ** Uses.......
                **  Inclusive: C[A],C[S],P
                **
                ** Stk lvls:   0
                **
                ** History:
                **
                **   Date      Programmer              Modification
                **  --------   ----------    ---------------------------------
                **  11/11/82      NZ         Added documentation
                **
                *****************************************************************
                *****************************************************************
 F3C12 20       =SETLP  P=      0
 F3C14 310E             LCHEX   E0
 F3C18 0E6F             C=C!D   B               To check for FIND (Could be [A])
 F3C1C B66              C=C+1   B               If carry, is a FIND...
                *
                * If carry, FIND some device...if not carry, address
                * (If address, high bits of D[XS]=mailbox #; else D[3]=mbox #)
                *
 F3C1F DB               C=D     A               Copy to C[A] for either case
 F3C21 570              GONC    SETLP1          Go if address
 F3C24 F6               CSR     A
 F3C26 490              GOC     SETLP2          Go always (FIND Nth device)
                *-
                *-
                *
                * Address!
```

```
                 *
F3C29 8B6  SETLP1  CSR    X              (Clears C[XS])
F3C2C C6           C=C+C  A              Multiply C[X]*4
F3C2E C6           C=C+C  A              Now C[2] is the mailbox #
F3C30 80D2 SETLP2  P=C    2              Now P is the mailbox #...
F3C34 80CF         C=P    15             ...now in C[S]!
F3C38 20           P=     0
F3C3A 03           RTNCC
                 **************************************************************
                 **************************************************************
                 **
                 ** Name:       FNDMBX - Find an HPIL mailbox (C[S] is #)
                 ** Name:       FNDMB- - Find mailbox, clear disp bits, chk OFF
                 ** Name:       FNDMBD - Find an HPIL mailbox, clear disp bits
                 ** Name:       FNDMB+ - Find an HPIL mailbox (D[A] is spec)
                 **
                 ** Category:   PTRUTL
                 **
                 ** Purpose:
                 **      Search the configuration tables to find a HPIL mailbox
                 **      (C[S] is the number of the mailbox minus 1 - if C[S]
                 **      is 2 then find the 3rd mailbox!)
                 **
                 ** Entry:
                 **      FNDMBX,FNDMB-,FNDMBD:
                 **        C[S] is the mailbox number -1
                 **      FNDMB+:
                 **        D[A] is the device spec
                 **
                 ** Exit:
                 **      Carry clear: D0 points to the mailbox, (MBOX^) is set
                 **              to the mailbox
                 **      Carry set: Mailbox and/or configuration buffer not
                 **              found (P is the error number)
                 **
                 ** Calls:      CNFFND  (FNDMB+ also calls SETLP)
                 **
                 ** Uses.......
                 **  Exclusive: C[W],D0,P
                 **  Inclusive: C[W],D0,P
                 **
                 ** Stk lvls:   1 (CNFFND)(SETLP)
                 **
                 ** History:
                 **
                 **    Date     Programmer            Modification
                 **  --------   ----------   ---------------------------------
                 **  05/23/83      NZ        Reworked error exit for loop is
                 **                          now "OFFED" (Returns P= =eOFFED)
                 **  03/16/83      NZ        Changed FNDMBe to return P=eBADMD
                 **  03/08/83      NZ        Added FNDMB-
                 **  11/11/82      NZ        Added documentation
                 **
                 **************************************************************
                 **************************************************************
```

```
           *
           * First set C[S] to be the mailbox #, minus 1
           *
F3C3C 72DF =FNDMB+ GOSUB  SETLP
           *
           * C[S] is now the mailbox #
           *
F3C40      =FNDMB-
           *
           * Get LOOP STatus to clear InptOK bit
           *
F3C40 1B00         D0=(5) =LOOPST
      000
F3C47 1562         C=DAT0 XS             Read into ST[3:0]
F3C4B 0B           CSTEX
           *
           * Is the following test desirable??? (will error out if OFFED)
           *
F3C4D 20           P=     =eOFFED        Set P before the test
F3C4F 870          ?ST=1  =Offed         Is the loop "OFFED" (OFFIO)?
F3C52 20           GOYES  FNDMB.         Set carry if "RESTORE IO Needed"
F3C54     FNDMB.
F3C54 0B           CSTEX
F3C56 4A6          GOC    FNDMB9         "RESTORE IO Needed"
F3C59 D2           C=0    A              Clear "set up" bits, "Device" bit
F3C5B 1542         DAT0=C XS             Device, "set up" bits cleared
           *
           * Set DispOK bit false (Display is NOT set up on loop)
           *
F3C5F 1B00 =FNDMBD D0=(5) =DSPSET
      000
F3C66 1562         C=DAT0 XS
F3C6A 0B           CSTEX
F3C6C 840          ST=0   =DispOK        Display is NOT set up
F3C6F 0B           CSTEX
F3C71 1542         DAT0=C XS
           *
           * Get the mailbox address (search the device table for it)
           *
F3C75 80DF =FNDMBX P=C    15             Save mailbox # in P for now
F3C79 D6           C=A    A
F3C7B 7974         GOSUB  Calc5          Save A[A] in C[9:5]
F3C7F 80CF         C=P    15             Restore mailbox # to C[S]
F3C83 137          CD1EX                 SAVE D1 IN D0 (TEMPORARILY)
F3C86 134          D0=C
F3C89 20           P=     0
F3C8B 31DF         LCHEX  FD             CONFIGURATION BUFFER - MM I/O
F3C8F 8F00         GOSBVL =CNFFND        Configuration find
      000
F3C96 542          GONC   FNDMBE         ...Not found (error!!!)
           *
           * Found memory-mapped i/o buffer!!!!
           *
F3C99 173          D1=D1+ 4              Skip to proper offset into entry
F3C9C 24           P=     4
```

```
F3C9E 8A8   FNDMB1  ?A=0    A               Done searching yet?
F3CA1 A1            GOYES   FNDMBE          Yes...didn't find a mailbox!
F3CA3 147           C=DAT1  A
F3CA6 A0E           C=C-1   P               If zero, is PIL mailbox!
F3CA9 452           GOC     FNDMB3          Yep...found it!
                    *
                    * Haven't found it yet...keep trying!
                    *
F3CAC 179   FNDMB2  D1=D1+  10              Next entry
F3CAF 132           AD0EX
F3CB2 189           D0=D0-  10              Decrement A[A] by 10
F3CB5 132           AD0EX
F3CB8 55E           GONC    FNDMB1          Loop back for more...
                    *
                    * This is an error!
                    *
F3CBB 20    FNDMBE  P=      0
F3CBD 0D            P=P-1                   Set carry!!!
F3CBF 20            P=      =eNMBOX         No mailbox...carry is set!
                    *
                    * Restore A[A], D1 before returning (COMMON return code)
                    *
F3CC1 136   FNDMB9  CD0EX                   Old D1 value-->C, C[A] to D0
F3CC4 135           D1=C                    Now D1 is restored
F3CC7 7424          GOSUB   Csrc5
F3CCB DA            A=C     A               Now A[A] is restored
F3CCD 01            RTN
                    *_
                    *_
F3CCF       FNDMB3
                    *
                    * Found a mailbox...check if it is the correct one!
                    *
F3CCF A4E           C=C-1   S
F3CD2 59D           GONC    FNDMB2          Go to the next entry!
                    *
                    * Have THE mailbox!
                    * (P is still 4)
                    *
                    * Save the address away in MBOX^ first!
                    *
F3CD5 1F00          D1=(5) =MBOX^
      000
F3CDC 15D2          DAT1=C 3
                    *
                    * Now get the actual address
                    *
F3CE0 F2            CSL     A               Offset to words (multiply by 16)
F3CE2 302           LCHEX   2               Now C has the mailbox address!
F3CE5 21            P=      1
F3CE7 0D            P=P-1                   Clear carry, set P=0
F3CE9 57D           GONC    FNDMB9          GO ALWAYS!
                    ****************************************************************
                    ****************************************************************
                    **
```

```
          ** Name:        CHKASN - Check if an HPIL assignment is active
          **
          ** Category:    PILUTL
          **
          ** Purpose:
          **      Check if the assignment is none, HPIL, or "other"
          **      (If "OFF"ed, returns as if no assignment)
          **
          ** Entry:
          **      C[6:0] is the assignment table value
          **
          ** Exit:
          **      Carry set if not assigned/not HPIL/"OFF"ed/LOOP/NULL
          **      Carry clear if assigned...B[W],C[X] set up for START
          **        If C[S]<>0, this is a FIND (Address unknown)
          **
          ** Calls:       I/OFND
          **
          ** Uses.......
          **  Exclusive: B[W],C[W],P
          **  Inclusive: B[W],C[W],P
          **
          ** Stk lvls:    2 (pushed D1;I/OFND)
          **
          ** History:
          **
          **    Date     Programmer            Modification
          **  --------   ----------   --------------------------------
          **  11/11/82      NZ        Added documentation
          **
          ***************************************************************
          ***************************************************************
F3CEC     =CHKASN
          *
          * Assign table format:
          *
          *       nib:    usage:
          *       ---     ------
          *       2-0:    If device address known, address, loop # here
          *               If LOOP, nibs 1-0=0, nib 2 is loop #
          *               If NULL, F00
          *               If not known/not assigned/iobuffer, FFF
          *               If assigned, not HPIL, Fxx, xx<>FF
          *
          *         3:    If unassigned/not HPIL, F
          *               If IO buffer with one entry, 4
          *               If address specified, 0
          *               If type specified, loop # + 1 (nib 3: 1,2,3)
          *               If this assignment has been "OFF"ed, bit 3 is 1
          *
          *       6-4:    If type, nib 6: sequence #, nibs 5-4: Acc id
          *               If address, 6-4: address, loop #
          *               If IO buffer, 6-4: io buffer #
          *               If unassigned (NOT "OFF"ed), FFF
          *               If not HPIL and nib 3=F, not defined
```

```
                *
F3CEC AC2               C=0     S               Preclear "FIND" flag
F3CEF 20                P=      0
                *
                * Check if this is OK as is...
                *
F3CF1 96A               ?C=0    B               Is it LOOP or NULL?
F3CF4 00                RTNYES                  Yes..."not" set up
F3CF6 B26               C=C+1   XS
F3CF9 A2E               C=C-1   XS
F3CFC 500               RTNNC                   This is OK as is
F3CFF B36               C=C+1   X
F3D02 A3E               C=C-1   X
F3D05 4F0               GOC     CHKAS0
F3D08 02                RTNSC                   This is NOT a HPIL assignment!
                *-
                *-
F3D0A 0                 CON(1) =FIXSPC          11 nibbles available here
F3D0B                   BSS     11-1
                *-
                *-
F3D15           CHKAS0
                *
                * Check if this is not assigned (nibble 3="F")
                *
F3D15 23                P=      3
F3D17 B06               C=C+1   P
F3D1A A0E               C=C-1   P               Alter carry only...not value!
F3D1D 20                P=      0               Reset P to 0!
F3D1F 400               RTNC                    Not defined...return!
F3D22 BF6               CSR     W               Now code nibble in C[XS]
F3D25 92E               ?C#0    XS
F3D28 60                GOYES   CHKAS1          This is not an address...
F3D2A 6470              GOTO    CHKAS9          This is an address!
                *-
                *-
                *
                * If here, have either iobuffer, type, or "OFF"ed assignment
                *
F3D2E BF6       CHKAS1  CSR     W               C[1] is the code nibble!
F3D31 80D1              P=C     1               Copy C[1] into P
F3D35 80CF              C=P     15              Use C[S] to test it
                *
                * If C[S] is >=8, then "OFF"ed (RTNSC)
                *
F3D39 A46               C=C+C   S
F3D3C AC2               C=0     S               Clear it again!
F3D3F 20                P=      0
F3D41 400               RTNC                    If carry, "OFF"ed!
                *
                * Now either iobuffer or type
                *
F3D44 80D1              P=C     1
F3D48 890               ?P=     =SngDev         Is this a single entry buffer?
F3D4B 71                GOYES   CHKAS2          Yes...process it!
```

```
                  *
                  * This is a TYPE!
                  *
F304D F6                  CSR    A
F304F F6                  CSR    A                C[XS] is sequence #, C[B] is type
F3051 D5                  B=C    A                Copy to B[B]
                  *
                  * C[XS] is sequence #, P is loop # + 1 (C[4:3]=0)
                  *
F3053 0D                  P=P-1                   P is now loop #
F3055 80F3                CPEX   3                Get loop # in C[3]
F3059 A4E                 C=C-1  S                Set C[S]="F" for "FIND" flag
                  *
                  * Now C[3] is loop #, C[XS] is sequence #, P=0
                  *
F305C 3100                LC(2)  =DevTyp          This is a device type!
F3060 03                  RTNCC                   C[2] is seq #, B[B] is ACC ID
                  *                               C[3] is loop #
                  *_
                  *_
F3062             CHKAS2
                  *
                  * I/O buffer!
                  *
                  * C[4:2] is I/O buffer #
                  *
                  * Now save A[W] in B[W], D1 on RSTK
                  *
F3062 7540                GOSUB  CHKASs           Save info, find the buffer
F3066 563                 GONC   CHKASx           Not found...(Error!)
                  *
                  * Now D1 @ I/O buffer start, A[A] is length of buffer
                  *
F3069 147                 C=DAT1 A                Read type, seq #, loop #
F306C 172                 D1=D1+ 3                Move to next word
F306F 1537                A=DAT1 W
F3073 AFC                 ABEX   W                Restore A[W], B[W] is ID/label
F3076 816                 CSRC                    Type in C[S] now
F3079 F2                  CSL    A
F307B F2                  CSL    A
                  *
                  * Now C[3] is loop #, C[2] is sequence #
                  *
                  *
                  * P is now zero...clear C[S], set P=C[S]
                  *
F307D 80FF                CPEX   15               Find out what it is
                  *
                  * P is now device type
                  *
F3081 137                 CD1EX
F3084 1D00                D1=(2) =DevID           Preload Device ID
F3088 892                 ?P=    2                Device ID?
F308B 60                  GOYES  CHKAS3           (Set carry if Device ID)
F308D 1D00                D1=(2) =VolLbl          Volume label!
```

```
F3D91         CHKAS3
F3D91 A4E             C=C-1  S             Set C[S]="F"
F3D94 20      CHKAS4  P=     0
F3D96 07              C=RSTK               Restore D1
F3D98 137             CD1EX
F3D9B 03              RTNCC                Done (return, carry clear)
              *-
              *-
F3D9D 02      CHKASx  RTNSC
              *-
              *-
              *
              * This is an address!
              *
F3D9F         CHKAS9
F3D9F BF6             CSR    W             (Clears C[S])
F3DA2 A4E             C=C-1  S             Set C[S]="F" (Do store on return)
F3DA5 F6              CSR    A
F3DA7 F6              CSR    A             Now C[X] is the address!
F3DA9 03              RTNCC
              *-
              *-
F3DAB F6      CHKASs  CSR    A
F3DAD F6              CSR    A             Shift the ID to C[X]
F3DAF 20              P=     0             Set P=0 for later!
F3DB1 D5              B=C    A
F3DB3 07              C=RSTK               Save calling address in B[A]
F3DB5 137             CD1EX
F3DB8 06              RSTK=C               Save D1 on RSTK
F3DBA 137             CD1EX
F3DBD 06              RSTK=C               Restore calling routine address
F3DBF D9              C=B    A             Restore C[A]
F3DC1 AF8             B=A    W             Save A in B[W]
F3DC4 6943            GOTO   i/OFND        Find it!
              ************************************************************
              ************************************************************
              **
              ** Name:        SETUP - Given info from START, set up C[6:0]
              **
              ** Category:    PILUTL
              **
              ** Purpose:
              **      Build a recall string in C[6:0] (carry set if buffer
              **      required to store this)
              **
              ** Entry:
              **      D is the info returned from START
              **        D[X] is address, (loop #) * 1024
              **        D[S] is type (0=address, 1=device type, 2=device ID,
              **        3=volume label, 4=NULL, 5=LOOP)
              **        D[3] is sequence # for types 1 and 2
              **      B is as returned from START
              **
              ** Exit:
              **      C[6:0] is the information to put into an IS-xxx entry
```

```
                **      P=0
                **      C[S]=0 if entry will fit in IS-xxx, else C[S]#0
                **
                ** Calls:      CSLC5,CSRC4,CSLC3
                **
                ** Uses.......
                **  Inclusive: C[W],P
                **
                ** Stk lvls:   1 (CSLC5)(CSRC4)(CSLC3)
                **
                ** History:
                **
                **    Date     Programmer               Modification
                **  --------   ----------     ---------------------------------
                **  04/22/83      NZ          Fixed bug of creating an I/O buf
                **                            for NULL and LOOP
                **  11/12/82      NZ          Added documentation
                **
                ***************************************************************
                ***************************************************************
     F30C8      =SETUP
                ***************************************************************
                *
                * D[S] is type:
                *       0: Address
                *       1: Device type, sequence #
                *       2: Device ID, sequence #
                *       3: Volume label
                *       4: NULL
                *       5: LOOP
                *
                * Buffer layout:
                *   +------------------------------------------------------+
                *   | Device ID/vol Lbl | search type | loop # | sequence # |
                *   +------------------------------------------------------+
                * nibs:      16                 1          1         1
                * (high memory)                                  (low memory)
                *
                *
                * Layout of entry:
                *  Type=0,4,5: (For types 4 & 5, true addr = 0)
                *   +----------------------------------------------------+
                *   | Find address + loop*1024 | 0 | true addr + loop*1024 |
                *   +----------------------------------------------------+
                * nibs:           3              1            3
                * (high memory)                                  (low memory)
                *
                *  Type=1:
                *   +----------------------------------------------------+
                *   | Seq # | device type | loop + 1 | true addr+loop*1024 |
                *   +----------------------------------------------------+
                * nibs: 1          2           1              3
                *
                *
                ***************************************************************
```

```
               *
F3DC8 DB              C=D    A           Copy address first to save code
F3DCA ACB             C=D    S           Get device type from D[S]
F3DCD A4E             C=C-1  S
F3DD0 441             GOC    SETUP0      Address
F3DD3 A4E             C=C-1  S           Is it a device type (acc id)?
F3DD6 4E2             GOC    SETUP1      Yes...continue
F3DD9 A4E             C=C-1  S           Is it a device ID?
F3DDC 464             GOC    SETUP2      Yes...continue
F3DDF A4E             C=C-1  S           Is it a volume label?
F3DE2 404             GOC    SETUP2      Yes...continue
               *
               * This is either address, NULL, or LOOP
               *
F3DE5 7F03 SETUP0     GOSUB  Calc5       Rotate 5 nibbles (so C=0 A works)
F3DE9 D2              C=0    A           Clear device type (address=0)
F3DEB BF6             CSR    W
F3DEE AB8  SETUPx     C=D    X           Now C[6:0] is set up!
F3DF1 2F              P=     15
F3DF3 300             LC(1)  =DsNull     Check if NULL
F3DF6 20              P=     0
F3DF8 947             ?C#D   S
F3DFB 50              GOYES  SETUP,      Not NULL
F3DFD A2E             C=C-1  XS          NULL...set C[X]="F00"
F3E00 AC2  SETUP,     C=0    S           Clear flag for WILL fit...
F3E03 03              RTNCC              Return...WILL fit in entry!
               *_
               *_
F3E05          SETUP1
               *
               * Device type
               *
F3E05 AD2             C=0    M           Clear high nibbles of C[A]
F3E08 C6              C=C+C  A
F3E0A C6              C=C+C  A           C[3] is now loop #
F3E0C 72E2            GOSUB  Csrc4       Put loop # into C[S]
F3E10 DB              C=D    A           C[3] is sequence # now
F3E12 F6              CSR    A           C[2] is sequence #
F3E14 AE9             C=B    B           C[X] is sequence #, type
F3E17 B46             C=C+1  S           Now loop + 1 in C[S]
F3E1A 8E00            GOSUBL =CSLC4      C[6:4] is seq #, type; C[3]=loop
      00
F3E20 5DC             GONC   SETUPx      Go always!
               *_
               *_
F3E23          SETUP2
               *
               * Whether this is a device ID or a volume label, the following
               * is all the same!
               *
F3E23 D2              C=0    A
F3E25 AAB             C=D    XS          Loop*4 to C[XS]
F3E28 C6              C=C+C  A
F3E2A C6              C=C+C  A           Now loop # in C[3]
F3E2C F2              CSL    A           Loop # to C[4]
```

```
F3E2E 23             P=     3
F3E30 A8B            C=D    P               Copy D[3] (sequence #)
F3E33 BF2            CSL    W               Loop # to C[5], seq # to C[4]
F3E36 ABB            C=D    X               Copy true address to C[X]
F3E39 2F             P=     15
F3E3B 304            LC(1)  4               Offset from D[S] value for table
F3E3E A4B            C=C+D  S
F3E41 80FF           CPEX   15              Set C[S]="F", P=type+4
F3E45 80F3           CPEX   3               Store type in C[3], set P=0
F3E49 03             RTNCC                  Return, C[S]="F" (won't fit)
            ***********************************************************
            ***********************************************************
            **
            ** Name:        SAVEIT - Save device info at (D1) (7 nibbles)
            **
            ** Category:    PILUTL
            **
            ** Purpose:
            **       Save device descripter entry @ D1
            **
            ** Entry:
            **       D1 @ destination entry
            **       B,C are exit conditions of SETUP
            **
            ** Exit:
            **       Carry clear, P=0 (Error exits directly)
            **
            ** Calls:       CSRC3;4;5,CSLC4;9,I/OALL,I/OFSC,I/ODAL
            **
            ** Uses.......
            **  Exclusive: A,B,C,D,R2,R3,D0,D1,P
            **  Inclusive: A,B,C,D,R2,R3,D0,D1,P
            **
            ** Stk lvls:    3 (I/OALL)(I/ODAL)
            **
            ** Algorithm:
            **              Check if entry will fit in 7 nibbles:
            **              If will not fit, goto SAVEI1
            **       SAVEI0:Read old entry; write new entry
            **              If old entry used buffer, deallocate the buffer
            **              RTNCC
            **              ----
            **       SAVEI1:Create a buffer for the entry
            **              Write the entry
            **              Build the info for the 7 nibble field
            **              Goto SAVEI0
            **
            ** History:
            **
            **    Date      Programmer             Modification
            **  --------    ----------      --------------------------------
            **  07/21/83        NZ          Changed error exit to direct exit
            **  11/12/82        NZ          Added documentation
            **
            ***********************************************************
```

```
                  ***************************************************************
 F3E4B 94E   =SAVEII ?C#0    S              Does this need an I/O buffer?
 F3E4E 92            GOYES  SAVEI1          Yes...needs I/O buffer!
                  *
                  * Will fit in IS-xxx entry...write it!
                  *
 F3E50 15B6  SAVEI0  A=DAT1 7               Read old type...
 F3E54 15D6          DAT1=C 7               ...write new type...
                  *
                  * Now check if old type used an I/O buffer
                  *
 F3E58 AF6           C=A    W               Must be WORD for CSRC4 below!!!
 F3E5B 80D3          P=C    3               Check code nibble
 F3E5F 890           ?P=    =SngDev
 F3E62 20            GOYES  SAVEI-          Single item I/O buffer
 F3E64 20    SAVEI-  P=     0
 F3E66 500           RTNNC                  Done if no carry!
 F3E69 7582          GOSUB  Csrc4           Buffer # in C[X] now
 F3E6D 8E00          GOSUBL =I/odal         Deallocate the buffer
       00
 F3E73 20            P=     0
 F3E75 03            RTNCC
                  *_
                  *_
 F3E77       SAVEI1
                  *
                  * Will NOT fit in IS-xxx entry...create a buffer &write it out
                  *
                  * C[X] is true address, C[4] is sequence #, C[5] is loop #
                  * D[S] is type
                  *
 F3E77 7772          GOSUB  Csrc4
 F3E7B ACB           C=D    S               Save D[S] in C (--> R2)
 F3E7E 8E00          GOSUBL =CSLC9          C[8:5] is type, addr
       00
 F3E84 137           CD1EX
 F3E87 10B           R3=C                   Save D1 in R3[A],info in R3[11:5]
 F3E8A AF9           C=B    W
 F3E8D 10A           R2=C                   Save B[W] in R2
 F3E90 8E00          GOSUBL =I/OFSC         Find I/O scratch buffer
       00
 F3E96 425           GOC    NORAMe          Error...no buffers (eMEM?)
                  *
                  * Now Buffer ID in C[X]
                  *
 F3E99 D5            B=C    A               Save ID in B[X]
 F3E9B D2            C=0    A
 F3E9D 3131          LC(2)  19              Need 19 (decimal) nibs for it!
 F3EA1 DD            BCEX   A
 F3EA3 8F00          GOSBVL =I/OALL         Allocate a buffer for this!
       000
 F3EAA 5E3           GONC   NORAMe          Error (eMEM?)
                  *
                  * D1 @ data start, D0 @ buffer ID
                  *
```

```
F3EAD 118          C=R3                   Recover the first info
F3EB0 135          D1=C                   Recover pointer to save area
F3EB3 7832         GOSUB  Csrc5           Move address to C[X]
F3EB7 D7           D=C    A               Save address in D[X]
F3EB9 8E00         GOSUBL =CSRC3          Move Loop, seq #, type to C[X]
      00
F3EBF 1523         A=DAT0 X               Read buffer ID...
F3EC3 165          D0=D0+ 6               ...point to data area...
F3EC6 15C2         DAT0=C 3               Write out the seq #, loop, type
F3ECA 162          D0=D0+ 3               Point to next area
F3ECD 11A          C=R2                   Recall dev word
F3ED0 1547         DAT0=C W               Write out the device ID/vol label
             *
             * Now set up the descriptor entry!
             *
F3ED4 AB6          C=A    X               Get buffer ID
F3ED7 7022         GOSUB  Calc4           ID --> C[6:4]
F3EDB 23           P=     3
F3EDD 300          LC(1)  =SngDev         Single item buffer
F3EE0 20           P=     0
F3EE2 ABB          C=D    X               Recall address!
F3EE5 6A6F         GOTO   SAVEIO          Write it out, check old buffer
             *-
             *-
F3EE9 20     =NORAMe P=   =eNORAM         Insufficient memory
F3EEB 8C00         GOLONG =ERRORX         Set it up!
      00
             ***************************************************************
             ***************************************************************
             **
             ** Name:       RESTOR - Clear "OFFED" bits in IS table entries
             **
             ** Category:   PILUTL
             **
             ** Purpose:
             **      Reactivate all devices (clear their OFFED bits)
             **
             ** Entry:
             **      Nothing
             **
             ** Exit:
             **      Carry clear
             **
             ** Calls:      Nothing
             **
             ** Uses.......
             **  Inclusive: C[XS],D0
             **
             ** Stk lvls:   1 (Internal GOSUB)
             **
             ** NOTE: Does not alter P!
             **
             ** History:
             **
             **    Date     Programmer                Modification
```

```
                  **  --------    ----------      ------------------------------
                  **  11/12/82       NZ           Added documentation
                  **
                  ***************************************************************
                  ***************************************************************
 F3EF1 1B00 =RESTOR D0=(5) (=IS-DSP)+3   IS-DSP+3
       000
 F3EF8 7300        GOSUB  PILCNs
 F3EFC 166         D0=D0+ 7              IS-PRT+3
                  *
                  * Fall into PILCNs for IS-PRT, return carry clear
                  *
 F3EFF 1562 PILCNs  C=DAT0 XS
 F3F03 B26         C=C+1  XS
 F3F06 A2E         C=C-1  XS
 F3F09 4D0         GOC    PILCns         If "Fxx", leave as is!
 F3F0C 0B          CSTEX
 F3F0E 84B         ST=0   11             Clear OFFed flag
 F3F11 0B          CSTEX
 F3F13 1542        DAT0=C XS
 F3F17 03   PILCns  RTNCC
                  ***************************************************************
                  ***************************************************************
                  **
                  ** Name:        GETSTR - Set up for string/literal expression
                  **
                  ** Category:    EXCUTL
                  **
                  ** Purpose:
                  **      Set up either a literal or string expression
                  **
                  ** Entry:
                  **      D0 points to the item in memory
                  **
                  ** Exit:
                  **      If error, takes hard error exit (EXPEXC, REVPOP)
                  **      Carry clear
                  **      ST(=sSTK)=0: D0 points to the first character
                  **      ST(=sSTK)=1: D[A] is the end of the string
                  **                   D1 points to the first character
                  **                   A[A] is the string length in nibbles
                  **
                  ** Calls:       EXPEX+,RESTST,REVPOP,D1=AVE
                  **
                  ** Uses.......
                  **  Exclusive: A,  C,D,              D0,D1,P,       ST[sSTK]
                  **  Inclusive: A,B,C,D,R0,R1,R2,R3,R4,D0,D1,P,FUNCxx,ST[11:0]
                  **
                  ** Stk lvls:    5 (EXPEX+)
                  **
                  ** History:
                  **
                  **    Date     Programmer            Modification
                  **  --------    ----------      ------------------------------
                  **  03/16/83       NZ           Changed EXPEXC to EXPEX+, added
```

```
                **                              call to RESTST
                **  11/12/82      NZ            Added documentation
                **
                ****************************************************************
                ****************************************************************
F3F19 840       =GETSTR ST=0   =sSTK
F3F1C 14A               A=DAT0 B                Read in the first character
                *
                * Check first if this is t*!
                *
F3F1F 20                P=     0
F3F21 3100              LC(2)  =tCOLON          Check if device spec, no filename
F3F25 962               ?A=C   B                Is this device spec?
F3F28 83                GOYES  GETST1           Yes...exit, sSTK=0, D0 @ tCOLON
                *
                * This is not a literal device spec...check literal file spec
                *
F3F2A 161               D0=D0+ 2                If literal filespec, skip tLITRL!
F3F2D 3100              LC(2)  =tLITRL
F3F31 962               ?A=C   B                Is this a literal filespec?
F3F34 C2                GOYES  GETST1           Yes...exit, sSTK=0, skip tLITRL
F3F36 181               D0=D0- 2                No...undo D0=D0+ 2 done above
                *
                * This is not a literal, therefore must be a string expression
                *
F3F39 74C1              GOSUB  EXPEX+           Save status, evaluate the string
F3F3D 74D1              GOSUB  Restst           Restore status bits
F3F41 8F00      =GETST+ GOSBVL =REVPOP          Reverse it and pop it!
      000
                *
                * Now A(A) is the length, D1 points to the first byte!
                *
F3F48 850               ST=1   =sSTK            This is off the stack!
F3F4B 137               CD1EX
F3F4E D7                D=C    A                Save start of string in D[A]
F3F50 C2                C=C+A  A                Now C[A] points to string end
F3F52 8E00              GOSUBL =D1=AVE
      00
F3F58 145               DAT1=C A                ...write it out...
F3F5B DF                CDEX   A                ...put end in D[A], start in C[A]
F3F5D 135               D1=C                    ...put in D1...
F3F60 03        GETST1  RTNCC                   ...and return with all set up!
                ****************************************************************
                ****************************************************************
                **
                ** Name:        NXTCHR - Get next character from input
                **
                ** Category:    EXCUTL
                **
                ** Purpose:
                **      Get the next character from the input string
                **
                ** Entry:
                **      D1 points to next byte, if any
                **      ST(sSTK) is status:  1--> Reading from stack
```

```
           **                          0--> Reading from program memory
           **       IF ST(sSTK)=1, D[A] is the end of the string
           **
           ** Exit:
           **       P=0 if sSTK=0, P=(unchanged) if sSTK=1
           **       If carry clear, A[B] is the next byte
           **       If carry set, reached end of string
           **         (If sSTK=0, A[B] is terminating character)
           **
           ** Calls:       None
           **
           ** Uses.......
           **  Inclusive: A[B],D0,D1,P (D0 if sSTK=0, D1 if sSTK=1)
           **
           ** Stk lvls:    0
           **
           ** History:
           **
           **    Date      Programmer              Modification
           **  --------    ----------     ----------------------------------
           **  11/12/82       NZ          Added documentation
           **
           ************************************************************
           ************************************************************
F3F62 870  =NXTCHR ?ST=1  =sSTK
F3F65 71           GOYES  NXTCH1
F3F67 14A          A=DAT0 B
F3F6A 21           P=     1
F3F6C B04          A=A+1  P
F3F6F A0C          A=A-1  P
F3F72 20           P=     0
F3F74 400          RTNC
F3F77 161          D0=D0+ 2
F3F7A 03           RTNCC
           *_
           *_
F3F7C 14B  NXTCH1  A=DAT1 B
F3F7F 137          CD1EX
F3F82 8BF          ?C>=D  A
F3F85 20           GOYES  NXTCH2
F3F87 137  NXTCH2  CD1EX
F3F8A 400          RTNC
F3F8D 171          D1=D1+ 2
F3F90 03           RTNCC
           ************************************************************
           ************************************************************
           **
           ** Name:        LSTCHR - Unsupported entry point
           **
           ** Category:    LOCAL (EXCUTL)
           **
           ** Purpose:
           **      Inverse of nxtchr (Reverses the pointers)
           **
           ** Entry:
                **      Same as NXTCHR
                **
                ** Exit:
                **      D0 or D1 adjusted to the last character
                **      A[B] is the last character
                **      Carry set if D0/D1 NOT changed
                **
                ** Calls:      None
                **
                ** Uses.......
                **  Inclusive: A[B],D0,D1,P
                **
                ** Stk lvls:   0
                **
                ** Detail:
                **      NOTE!!! If reading from program memory AND NEXT char
                **      is a terminator, LSTCHR will NOT back up!
                **
                ** History:
                **
                **   Date      Programmer              Modification
                **  --------   ----------   ---------------------------------
                **  11/12/82      MZ        Added documentation
                **
                ***************************************************************
                ***************************************************************
 F3F92 870      =LSTCHR ?ST=1  =sSTK
 F3F95 A1               GOYES  LSTCH1
 F3F97 14A              A=DAT0 B
 F3F9A 21               P=     1
 F3F9C B04              A=A+1  P
 F3F9F A0C              A=A-1  P
 F3FA2 400              RTNC
 F3FA5 181              D0=D0- 2
 F3FA8 14A              A=DAT0 B
 F3FAB 20               P=     0
 F3FAD 03               RTNCC
                *-
                *-
 F3FAF 137      LSTCH1  CD1EX
 F3FB2 8BF              ?C>=D  A
 F3FB5 20               GOYES  LSTCH2
 F3FB7 137      LSTCH2  CD1EX
 F3FBA 400              RTNC
 F3FBD 1C1              D1=D1- 2
 F3FC0 03               RTNCC
                ***************************************************************
                ***************************************************************
                **
                ** Name:       BAKCHR
                **
                ** Category:   EXCUTL
                **
                ** Purpose:
                **      Unconditionally back up one character (undoes the
                **      operation of NXTCHR, only IF a NXTCHR has been done)
                **
                ** Entry:
                **      ST(=sSTK):
                **        1: Reading from stack (@ D1)
                **        0: Reading from memory (@ D0)
                **
                ** Exit:
                **      D0/D1 adjusted according to sSTK
                **      Carry clear
                **
                ** Calls:       None
                **
                ** Uses.......
                **  Inclusive: D0,D1 (D0 if sSTK=0, D1 if sSTK=1)
                **
                ** Stk lvls:   0
                **
                ** Detail:
                **      Allows backing up input stream one character if the
                **      caller knows that there is a character before current
                **      character
                **
                ** History:
                **
                **    Date     Programmer              Modification
                **  --------   ----------    ---------------------------------
                **  09/26/83       NZ        Updated documentation
                **  11/12/82       NZ        Added documentation
                **
                ***************************************************************
                ***************************************************************
F3FC2 870       =BAKCHR ?ST=1  =sSTK
F3FC5 70                GOYES  BAKCH1           String...back up D1
F3FC7 181               D0=D0- 2                Literal...back up D0
F3FCA 03                RTNCC
                *-
                *-
F3FCC 1C1       BAKCH1  D1=D1- 2                Back up D1
F3FCF 03                RTNCC
                ***************************************************************
                ***************************************************************
                **
                ** Name:        GETHEX - Evaluate literal expr, return hex value
                **
                ** Category:    GENUTL
                **
                ** Purpose:
                **      Get the value of an expression in program memory
                **
                ** Entry:
                **      D0 points to the expression in program memory
                **
                ** Exit:
                **      Carry clear: HEX value in A[3:0], A[4]=0, P=0
```

```
                 **        Carry set: Error (P=error #)
                 **
                 ** Calls:       EXPEX+,FLTDH,AVM+16,RESTST
                 **
                 ** Uses.......
                 **  Exclusive:     C,                       P
                 **  Inclusive: A,B,C,D,R0,R1,R2,R3,R4,D0,D1,P,FUNCxx
                 **
                 ** Stk lvls:    5 (EXPEX+)
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **  --------   ----------    --------------------------------
                 **  03/16/83       NZ        Changed to EXPEX+, added RESTST
                 **  11/12/82       NZ        Added documentation
                 **
                 ************************************************************
                 ************************************************************
 F3FD1 7C21 =GETHEX GOSUB  EXPEX+         Save status, call EXPEXC
 F3FD5 7C31         GOSUB  Restst         Restore status
 F3FD9 75E0         GOSUB  AVM+16         pop it off the stack, reset AVMEME
 F3FDD 309          LCHEX  9
 F3FE0 98A          ?C>=A  P              Real number?
 F3FE3 60           GOYES  GETHE1         Yes!
                 *
                 * Not real...must be complex or string?
                 *
 F3FE5 20           P=     =eNNUMR        Not real number!
 F3FE7 02           RTNSC
                 *-
                 *-
 F3FE9 8E00 GETHE1  GOSUBL =FLTDH         Convert to HEX number
       00
 F3FEF 5D0          GONC   GETHE3         Either <0 OR too big...error!
 F3FF2 24           P=     4              OK number...check MY range!
 F3FF4 90C          ?A#0   P
 F3FF7 60           GOYES  GETHE3         Positive, four or fewer digits
 F3FF9 20   GETHE2  P=     0              Reset P=0
 F3FFB 03           RTNCC
                 *-
                 *-
 F3FFD 20   GETHE3  P=     =eRANGE        Range error!
 F3FFF 02           RTNSC
                 ************************************************************
                 ************************************************************
                 **
                 ** Name:        GTYPRM - Get one-byte hex value from literal
                 ** Name:        GTYPR+ - Clear status bits 11:0, GTYPRM
                 ** Name:        GHEXBT - Pop number off stack, get hex byte value
                 ** Name:        GHEXB+ - Use A[W] as value, convert to hex byte
                 **
                 ** Category:    EXCUTL
                 **
                 ** Purpose:
```

```
                **      Given D0 pointing to a numeric expression in program
                **      memory, return the HEX value of the expression
                **
                ** Entry:
                **      ST(sSTK)=0: D0 points to the expression
                **      ST(sSTK)=1: A[W] contains a floating number
                **
                ** Exit:
                **      If carry clear, B[B] is the HEX type, B[4:2]=0,P=0,
                **        C[B]=(DevTyp), C[XS]=0
                **      If carry set, error (P=type)
                **
                ** Calls:       EXPEX+,RESTST,AVM+16,FLTDH
                **
                ** Uses.......
                **  Exclusive: A,B,C,                         P
                **  Inclusive: A,B,C,D,R0,R1,R2,R3,R4,D0,D1,P,FUNCxx
                **
                ** Stk lvls:    5 (EXPEX+)
                **
                ** History:
                **
                **    Date      Programmer              Modification
                **  --------    ----------   ---------------------------------
                **  03/16/83        NZ       Changed to EXPEX+, added RESTST
                **  03/02/83        NZ       Added GTYPR+ entry point
                **  11/12/82        NZ       Added documentation
                **
                ****************************************************************
                ****************************************************************
 F4001 08       =GTYPR+ CLRST                   Clear all status bits
 F4003 20       =GTYPRM P=      0
 F4005 870              ?ST=1   =sSTK           Is expression in A[W] now?
 F4008 E0               GOYES   GTYPR0          Yes...skip EXPEX+
 F400A 73F0             GOSUB   EXPEX+          Expression execution
 F400E 7301             GOSUB   Restst          Restore status
 F4012 7CA0     =GHEXBT GOSUB   AVM+16          Add 16 to AVMEME
 F4016          =GHEXB+
 F4016 309      GTYPR0  LCHEX   9
 F4019 986              ?C<A    P
 F401C C1               GOYES   GTYPRe          Not a floating number...error
 F401E 8E00             GOSUBL  =FLTDH          Convert to HEX
       00
 F4024 571              GONC    GTYPRr          Error!
 F4027 D1               B=0     A
 F4029 AEC              ABEX    B               Check if A[4:2] is zero
 F402C 8AC              ?A#0    A               Zero?
 F402F D0               GOYES   GTYPRr          No...range error!
                *
                * Now B[A] is the ID in HEX
                *
 F4031 3200             LC(3)   =DevTyp         This is a device TYPE!
       0
 F4036 01               RTN
                *_
                *-
     F4038 20   GTYPRe  P=      =eNNUMR
     F403A 02           RTNSC
                *-
                *-
     F403C 20   GTYPRr  P=      =eRANGE         Out of range!
     F403E 02           RTNSC
                **************************************************************
                **************************************************************
                **
                ** Name:        GADRRM - Get HPIL address from program memory
                ** Name:        GADRR+ - Get HPIL address from stack value
                **
                ** Category:    PILUTL
                **
                ** Purpose:
                **      Get an HPIL address from program memory
                **
                ** Entry:
                **      ST(sSTK)=0: D0 points to the expression in program mem
                **      ST(sSTK)=1: A[W] contains a floating number
                **
                ** Exit:
                **      Carry clear: C[X] is the HPIL address, P=0
                **      Carry set: Error (P is error #)
                **
                ** Calls:       EXPEX+,RESTST,AVM+16,GHEXB+
                **
                ** Uses.......
                **  Exclusive: A,B,C,D,                        P
                **  Inclusive: A,B,C,D,R0,R1,R2,R3,R4,D0,D1,P,FUNCxx
                **
                ** Stk lvls:    5 (EXPEX+)
                **
                ** History:
                **
                **    Date      Programmer              Modification
                **  --------    ----------      --------------------------------
                **  07/13/83       NZ           Added check for primary addr=0
                **  03/16/83       NZ           Changed to EXPEX+,added RESTST
                **  11/12/82       NZ           Added documentation
                **
                **************************************************************
                **************************************************************
     F4040 20   =GADRRM P=      0
     F4042 870          ?ST=1   =sSTK           Is expression already in A[W]?
     F4045 E0           GOYES   GADRR0          Yes...skip EXPEX+
     F4047 76B0         GOSUB   EXPEX+          EXPression EXCution
     F404B 76C0         GOSUB   Restst          Restore status bits
     F404F 7F60 =GADRR+ GOSUB   AVM+16          Skip the item
     F4053 AF6  GADRR0  C=A     W
     F4056 AF7          D=C     W               Save the expression in D
     F4059 79BF         GOSUB   GHEXB+          Get HEX byte (Primary address)
     F405D 400          RTNC                    Error...range error
     F4060 D9           C=B     A
```

```
F4062 AFF            CDEX   W             Save IP in D[A], get back expr
F4065 AFA            A=C    W             Put expression in A[W]
F4068 94C            ?A#0   S
F406B 35             GOYES  GADDRr        Negative!!
F406D 3260           LC(3)  6             If exp >6 (or negative), error!
      0
F4072 9B6            ?A>C   X
F4075 94             GOYES  GADDRr        Error (range)
F4077 A86            C=A    P
F407A B8E            C=-C-1 P
F407D 80D0           P=C    0             Now P-->First fractional digit+2
F4081 BD0    GADRR1  ASL    M
F4084 0C             P=P+1
F4086 5AF            GONC   GADRR1        Go if not done yet...
             *
             * Now the mantissa is properly adjusted to the fractional part
             * (The mantissa has the original integer part removed)
             *
F4089 D0             A=0    A
F408B BF0            ASL    W             Normalize the number!
F408E 948            ?A=0   S
F4091 70             GOYES  GADRR2        Now is normalized!
F4093 BF4            ASR    W
F4096 E4             A=A+1  A             Exponent=1 means use 2 digits
F4098 7A7F   GADRR2  GOSUB  GHEXB+
F409C 400            RTNC                 GHEXB+ sets HEX mode
             *
             * Now B[B] is secondary address, D[B] is primary address
             *
F409F 31F1           LC(2)  31            Check range of secondary address
F40A3 9E1            ?B>C   B             Is it legal range? [0,31]
F40A6 81             GOYES  GADDRr        No!!!
F40A8 9EB            ?D>=C  B
F40AB 31             GOYES  GADDRr        Bad primary range!
F40AD 96B            ?D=0   B
F40B0 E0             GOYES  GADDRr        Primary must be >0!
F40B2 D9             C=B    A
F40B4 F2             CSL    A             Shift the secondary address left
F40B6 C6             C=C+C  A               5 bits...then OR with D[X]
F40B8 0EFF           C=C!D  A             Now address is in C[X]
F40BC 03             RTNCC
             *-
             *-
F40BE 20     GADDRr  P=     =eRANGE
F40C0 02             RTNSC
             ***************************************************************
             ***************************************************************
             **
             ** Name:        AVM+16 - Pop a numeric value from AVMEME
             **
             ** Category:    PTRUTL
             **
             ** Purpose:
             **      Add 16 to AVMEME (to skip a numeric expression) and
             **      read in the value at the old D1
```

```
                  **
                  ** Entry:
                  **      AVMEME stack has a numeric item
                  **
                  ** Exit:
                  **      A[W] contains the old stack data item
                  **      D1 points to old (=AVMEME)
                  **      C[A] is NEW =AVMEME
                  **      Carry unchanged
                  **
                  ** Calls:      D1=AVE
                  **
                  ** Uses.......
                  **  Inclusive: A[W],C[A],C[S],D1
                  **
                  ** Stk lvls:   1 (D1=AVE)
                  **
                  ** NOTE: Preserves carry!!!!
                  **
                  ** History:
                  **
                  **   Date     Programmer              Modification
                  **  --------  ----------    ---------------------------------
                  **  07/13/83      NZ        Added read of A[W]
                  **  11/12/82      NZ        Added documentation
                  **
                  ***************************************************************
                  ***************************************************************
 F40C2 AC2  =AVM+16 C=0    S              Save carry status in C[S]
 F40C5 450          GOC    AVM++
 F40C8 B46          C=C+1  S
 F40CB 8E00 AVM++   GOSUBL =D1=AVE
       00
 F40D1 147          C=DAT1 A
 F40D4 137          CD1EX
 F40D7 17F          D1=D1+ 16
 F40DA 137          CD1EX
 F40DD 145          DAT1=C A
 F40E0 135          D1=C                  Leave D1-->AVMEME-16
 F40E3 1CF          D1=D1- 16
 F40E6 1537         A=DAT1 W              Read in the value to A[W]
 F40EA A4E          C=C-1  S              Sets carry if zero, else clears
 F40ED 01           RTN
                 *-
                 *-
 F40EF 816  Csrc5   CSRC
 F40F2 8C00 Csrc4   GOLONG =CSRC4
       00
                 *-
                 *-
 F40F8 812  Cslc5   CSLC
 F40FB 8C00 Cslc4   GOLONG =CSLC4
       00
                 *-
                 *-
```

```
1299 F4101 8E00 =EXPEX+ GOSUBL =SAVEST
           00
1300 F4107 8D00 =eXPEXC GOVLNG =EXPEXC
           000
1301            *-
1302            *-
1303 F410E 8D00 =i/OFND GOVLNG =I/OFND
           000
1304            *-
1305            *-
1306 F4115 8C00 Restst  GOLONG =RESTST
           00
1307            ****************************************************************
1308            ****************************************************************
1309            **
1310            ** Name:        CHKAIO - Check if device is an ASSIGN WORD
1311            **
1312            ** Category:    PILUTL
1313            **
1314            ** Purpose:
1315            **      Check if a string is an ASSIGN WORD (if so, return
1316            **      its value)
1317            **
1318            ** Entry:
1319            **      B contains a string (B[B] is the first character, any
1320            **      unused characters are #00)
1321            **
1322            ** Exit:
1323            **      P=0
1324            **      Carry set if buffer not found or not an ASSIGN WORD
1325            **      Carry clear if found...address in C[X]
1326            **
1327            ** Calls:       CSLC5,ASRC5,I/OFND
1328            **
1329            ** Uses.......
1330            **  Exclusive: A[W],C[W],P
1331            **  Inclusive: A[W],C[W],P
1332            **
1333            ** Stk lvls:   1 (I/OFND)(CSLC5)(ASRC5)
1334            **
1335            ** History:
1336            **
1337            **   Date     Programmer             Modification
1338            **  --------  ----------  ---------------------------------
1339            **  11/12/82     NZ       Added documentation
1340            **
1341            ****************************************************************
1342            ****************************************************************
1343 F411B 137  =CHKAIO CD1EX              Save D1 from I/OFND in C[9:5]
1344 F411E 76DF        GOSUB  Calc5
1345 F4122 20          P=     0
1346 F4124 3200        LC(3)  =bPILAI      ASSIGN IO buffer ID
           0
1347 F4129 71EF        GOSUB  i/OFND       I/O FiND
1348 F412D AFA         A=C    W            Save D1 in A[9:5]
```

```
F4130 AF2           C=0    W
F4133 04            SETHEX
F4135 490           GOC    CHKAI0         Found...
F4138 2F            P=     15
F413A 0C            P=P+1                 Set carry, P=0
F413C 4F1           GOC    CHKAI3         Go always (not found...restore D1)
              *-
              *-
              *
              * D1--> Table of assignments (length of 30 entries^4 nibbles)
              *
F413F 20      CHKAI0 P=    0
F4141 D0            A=0    A              Address counter
F4143 E4      CHKAI1 A=A+1 A              Increment A[B]
F4145 31F1          LC(2)  31             Check if done
F4149 9EE           ?A>=C  B
F414C E0            GOYES  CHKAI2         Done...not found!
F414E 15F3          C=DAT1 4
F4152 173           D1=D1+ 4
F4155 975           ?B#C   W
F4158 BE            GOYES  CHKAI1         Not a match.
              *
              * If carry clear, found it; else not found
              *
F415A D6      CHKAI2 C=A   A              Copy address to C[X]
F415C 8E00    CHKAI3 GOSUBL =ASRC5        Not found!
      00
F4162 131           D1=A                  Restore D1
F4165 01            RTN                   Return, carry unchanged
              *****************************************************************
              *****************************************************************
              **
              ** Name:       ROMTYP - Check if device is a RESERVED WORD
              **
              ** Category:   PILUTL
              **
              ** Purpose:
              **      Check if the string in B[W] is a RESERVED WORD; if so,
              **      return the value that corresponds to that word
              **
              ** Entry:
              **      B contains the string (B[B] is the first character)
              **
              ** Exit:
              **      P=0
              **      Carry clear: B[B] is the device type; B[XS]=0
              **      Carry set: not found
              **
              ** Calls:      None
              **
              ** Uses.......
              **  Inclusive: B[A],C[W],P  (B[A] only if found)
              **
              ** Stk lvls:   1 (Internal call)(internal push)
              **
```

```
                  ** History:
                  **
                  **    Date     Programmer               Modification
                  **  --------   ----------    ---------------------------------
                  **  09/26/83      NZ         Updated documentation
                  **  11/12/82      NZ         Added documentation
                  **
                  **************************************************************
                  **************************************************************
F4167 72A0        =ROMTYP GOSUB  ROMTY1
                  *
                  * TABLE!!!
                  *
                  *
                  * The table entry structure is:
                  *       1 nibble: length of name minus 1, in nibbles (n-1)
                  *       n nibbles: name (Bytes in order!)
                  *       2 nibbles: device type
                  *
                  * The table consists of entries terminated by length nibble=0
                  *
F416B 7                  NIBHEX 7              Length of "TAPE"
F416C 4614               NIBASC \TAPE\         TAPE:TYPE=10
      0554
F4174 01                 NIBHEX 01
F4176 D                  NIBHEX D              Length of "MASSMEM"
F4177 D414               NIBASC \MASSMEM\      MASSMEM:TYPE=1F (MASS MEM. CLASS)
      3535
      D454
      D4
F4185 F1                 NIBHEX F1
F4187 D                  NIBHEX D              Length of "PRINTER"
F4188 0525               NIBASC \PRINTER\      PRINTER:TYPE=2F (PRINTER CLASS)
      94E4
      4654
      25
F4196 F2                 NIBHEX F2
F4198 D                  NIBHEX D              Length of "DISPLAY"
F4199 4494               NIBASC \DISPLAY\      DISPLAY:TYPE=3F (DISPLAY CLASS)
      3505
      C414
      95
F41A7 F3                 NIBHEX F3
F41A9 7                  NIBHEX 7              Length of "GPIO"
F41AA 7405               NIBASC \GPIO\         GPIO:TYPE=40
      94F4
F41B2 04                 NIBHEX 04
F41B4 9                  NIBHEX 9              Length of "MODEM"
F41B5 D4F4               NIBASC \MODEM\        MODEM:TYPE=41
      4454
      D4
F41BF 14                 NIBHEX 14
F41C1 9                  NIBHEX 9              Length of "RS232"
F41C2 2535               NIBASC \RS232\        RS232:TYPE=42
      2333
      23
F41CC 24                NIBHEX 24
F41CE 7                 NIBHEX 7             Length of "HPIB"
F41CF 8405              NIBASC \HPIB\        HPIB:TYPE=43
      9424
F41D7 34                NIBHEX 34
F41D9 D                 NIBHEX D             Length of "INTRFCE"
F41DA 94E4              NIBASC \INTRFCE\     INTRFCE:TYPE=4F
      4525
      6434
      54
F41E8 F4                NIBHEX F4
F41EA D                 NIBHEX D             Length of "INSTRMT"
F41EB 94E4              NIBASC \INSTRMT\     INSTRMT:TYPE=5F (INSTRMT CLASS)
      3545
      2504
      45
F41F9 F5                NIBHEX F5
F41FB D                 NIBHEX D             Length of "GRAPHIC"
F41FC 7425              NIBASC \GRAPHIC\     GRAPHIC:TYPE=6F (GRAPHIC I/O)
      1405
      8494
      34
F420A F6                NIBHEX F6
            * END OF TABLE INDICATOR...NULL
F420C 0                 NIBHEX 0
            *
            * END OF TABLE!
            *
F420D 07    ROMTY1      C=RSTK               Get pointer to table from stack..
F420F 137               CD1EX                ..Put it in D1, put D1 in C[A]..
F4212 06                RSTK=C               ..and save D1 value on the stack!
            *
            * Loop to process names...
            *
F4214 AF2   ROMTY2      C=0    W
F4217 14F               C=DAT1 B             Read length of the device word
F421A 170               D1=D1+ 1
F421D 80D0              P=C    0             Copy length into P
F4221 890               ?P=    0             END OF TABLE??
F4224 12                GOYES  ROMTY3        Yes...restore D1, P; carry set!
            *
            * Have a non-zero length now!
            *
F4226 1571              C=DAT1 WP            Read the device word...
            *
F422A 171               D1=D1+ 2             Increment D1 by the length +2
F422D 137               CD1EX
F4230 809               C+P+1                If match, back off the +2!
F4233 137               CD1EX
            *
            * Now C[W] is the device word, zero-filled (if blank-filled is
            * desired, change the C=0 W above to a LCASC \        \)
            *
F4236 975               ?BNC   W
```

```
F4239 B0              GOYES  ROMTY2        Not matched!
               *
               * This is a match...continue!
               *
F423B 1C1             D1=D1- 2             Point to device type byte...
               *
               * (Carry is clear from the statement above)
               *
F423E D2              C=0    A             Clear C[XS]...
F4240 14F             C=DAT1 B             Read device type!
F4243 D5              B=C    A             Copy C[X] to B[X]
               *
               * Common return point!
               *
F4245 07       ROMTY3 C=RSTK
F4247 135             D1=C                 Restore D1...
F424A 20              P=     0
F424C D2              C=0    A
F424E 3100            LC(2)  =DevTyp       Device type
F4252 01              RTN                  ...and return, carry unchanged!
               **************************************************************
               **************************************************************
               **
               ** Name:       RDINFO - Read device info from SAVSTK + POLL
               **
               ** Category:   SAVSTK
               **
               ** Purpose:
               **      Read information from the SAVSTK, given one POLL level
               **      in front of the data
               **
               ** Entry:
               **      ST(=sDEST) is source/destination selector
               **
               ** Exit:
               **      P=0
               **      A[W] is first 8 chars
               **      R0 is last 2 chars
               **      D[A] is device
               **
               ** Calls:      None
               **
               ** Uses.......
               **  Inclusive: A[W],C[A],D[A],R0,D1,P
               **
               ** Stk lvls:   0
               **
               ** NOTE: This is similar to the mainframe routine by the same
               **       name except for the first few lines which skip the
               **       POLL save area
               **
               ** History:
               **
               **   Date      Programmer              Modification
               **  --------   ----------    ------------------------------
```

```
 1543                 **  11/12/82      NZ          Added documentation
 1544                 **
 1545                 ******************************************************************
 1546                 ******************************************************************
 1547 F4254 1F00 =RDINFO D1=(5) =SAVSTK
            000
 1548 F425B 143              A=DAT1 A
 1549 F425E 20               P=     0
 1550 F4260 D2               C=0    A
 1551 F4262 3100             LC(2)  =lPOLSV      Length of POLL save area
 1552 F4266 EA               A=A-C  A
 1553 F4268 131              D1=A                D1-->device save area
 1554 F426B 1C0              D1=D1- (=lDEVC)+4   Length of device +2 chars of name
 1555 F426E 1CF              D1=D1- 16           Length of 8 chars of name
 1556 F4271 860              ?ST=0  =sDEST
 1557 F4274 80               GOYES  RDIN10
 1558 F4276 1C0              D1=D1- (=lDEVC)+4
 1559 F4279 1CF              D1=D1- 16           Skip source info
 1560 F427C 1537 RDIN10      A=DAT1 W            First 8 chars
 1561 F4280 17F              D1=D1+ 16           Move past them
 1562 F4283 147              C=DAT1 A            Last 2 chars
 1563 F4286 108              R0=C                -->R0
 1564 F4289 173              D1=D1+ 4            Skip last 2 chars
 1565 F428C 147              C=DAT1 A            Device info
 1566 F428F D7               D=C    A            -->D
 1567 F4291 03               RTNCC
 1568 F4293                  END
 ASRC5   Ext                   -  1374
 AVM++   Abs  999627 #F40CB -  1278  1276
=AVM+16  Abs  999618 #F40C2 -  1275  1052  1121  1187
 BAKCH1  Abs  999372 #F3FCC -  1014  1009
=BAKCHR  Abs  999362 #F3FC2 -  1008
 CHKAI0  Abs  999743 #F413F -  1360  1351
 CHKAI1  Abs  999747 #F4143 -  1362  1369
 CHKAI2  Abs  999770 #F415A -  1373  1365
 CHKAI3  Abs  999772 #F415C -  1374  1354
=CHKAIO  Abs  999707 #F411B -  1343
 CHKAS0  Abs  998677 #F3015 -   347   339
 CHKAS1  Abs  998702 #F302E -   365   358
 CHKAS2  Abs  998754 #F3062 -   401   380
 CHKAS3  Abs  998801 #F3091 -   436   434
 CHKAS4  Abs  998804 #F3094 -   438
 CHKAS9  Abs  998815 #F309F -   450   359
=CHKASN  Abs  998636 #F3CEC -   303
 CHKASe  Abs  998827 #F30AB -   458   409
 CHKASx  Abs  998813 #F309D -   444   410
 CNFFND  Ext                   -   210
 CSLC4   Ext                   -   586  1296
 CSLC9   Ext                   -   687
 CSRC3   Ext                   -   710
 CSRC4   Ext                   -  1292
 Cslc4   Abs  999675 #F40FB -  1296   721
 Cslc5   Abs  999672 #F40F8 -  1295   204   560  1344
 Csrc4   Abs  999666 #F40F2 -  1292   581   672   685
 Csrc5   Abs  999663 #F40EF -  1291   241   708
 D1=AVE  Ext                   -   848  1278
 DSPSET  Ext                   -   193
 DevID   Ext                   -   432
 DevTyp  Ext                   -   396  1135  1506
 DispOK  Ext                   -   196
 DsNull  Ext                   -   565
 ERRORX  Ext                   -   730
=EXPEX+  Abs  999681 #F4101 -  1299   838  1050  1119  1185
 EXPEXC  Ext                   -  1300
 FIXSPC  Ext                   -   343
=FNDMB+  Abs  998460 #F3C3C -   168
=FNDMB-  Abs  998464 #F3C40 -   172
 FNDMB.  Abs  998484 #F3C54 -   185   184
 FNDMB1  Abs  998558 #F3C9E -   217   229
 FNDMB2  Abs  998572 #F3CAC -   225   251
 FNDMB3  Abs  998607 #F3CCF -   246   221
 FNDMB9  Abs  998593 #F3CC1 -   239   187   267
=FNDMBD  Abs  998495 #F3C5F -   193
 FNDMBE  Abs  998587 #F3CBB -   233   211   218
=FNDMBX  Abs  998517 #F3C75 -   202
 GADDRr  Abs  999614 #F40BE -  1235  1196  1199  1223  1225  1227
=GADRR+  Abs  999503 #F404F -  1187
 GADRR0  Abs  999507 #F4053 -  1188  1184
 GADRR1  Abs  999553 #F4081 -  1203  1205
 GADRR2  Abs  999576 #F4098 -  1216  1213
=GADRRM  Abs  999488 #F4040 -  1182
 GETHE1  Abs  999401 #F3FE9 -  1063  1055
 GETHE2  Abs  999417 #F3FF9 -  1068
 GETHE3  Abs  999421 #F3FFD -  1072  1064  1067
*GETHEX  Abs  999377 #F3FD1 -  1050
*GETMBX  Abs  998391 #F3BF7 -    47
*GETST+  Abs  999233 #F3F41 -   840
 GETST1  Abs  999264 #F3F60 -   852   826   833
*GETSTR  Abs  999193 #F3F19 -   818
*GHEXB+  Abs  999446 #F4016 -  1122  1190  1216
*GHEXBT  Abs  999442 #F4012 -  1121
*GTYPR+  Abs  999425 #F4001 -  1115
 GTYPRO  Abs  999446 #F4016 -  1123  1118
*GTYPRM  Abs  999427 #F4003 -  1116
 GTYPRe  Abs  999480 #F4038 -  1139  1125
 GTYPRr  Abs  999484 #F403C -  1143  1127  1131
 I/OALL  Ext                -   701
 I/OFND  Ext                -  1303
 I/OFSC  Ext                -   692
 I/odal  Ext                -   673
 IS-DSP  Ext                -   764
 LOOPST  Ext                -   176
 LSTCH1  Abs  999343 #F3FAF -   960   948
 LSTCH2  Abs  999351 #F3FB7 -   963   962
*LSTCHR  Abs  999314 #F3F92 -   947
 MBOX^   Ext                -    47   258
*NORAMe  Abs  999145 #F3EE9 -   729   693   702
 NXTCH1  Abs  999292 #F3F7C -   902   891
 NXTCH2  Abs  999303 #F3F87 -   906   905
*NXTCHR  Abs  999266 #F3F62 -   890
 Offed   Ext                -   183
 PILCNs  Abs  999167 #F3EFF -   770   765
 PILCns  Abs  999191 #F3F17 -   778   773
 RDIN10  Abs 1000060 #F427C -  1560  1557
*RDINFO  Abs 1000020 #F4254 -  1547
*RESTOR  Abs  999153 #F3EF1 -   764
 RESTST  Ext                -  1306
 REVPOP  Ext                -   840
 ROMTY1  Abs  999949 #F420D -  1462  1412
 ROMTY2  Abs  999956 #F4214 -  1468  1488
 ROMTY3  Abs 1000005 #F4245 -  1502  1473
*ROMTYP  Abs  999783 #F4167 -  1412
 Restst  Abs  999701 #F4115 -  1306   839  1051  1120  1186
 SAVEI-  Abs  999012 #F3E64 -   670   669
 SAVEIO  Abs  998992 #F3E50 -   661   726
 SAVEI1  Abs  999031 #F3E77 -   678   657
*SAVEIT  Abs  998987 #F3E4B -   656
 SAVEST  Ext                -  1299
 SAVSTK  Ext                -  1547
*SETLP   Abs  998418 #F3C12 -    94   168
 SETLP1  Abs  998441 #F3C29 -   111   103
 SETLP2  Abs  998448 #F3C30 -   114   105
*SETUP   Abs  998856 #F3DC8 -   511
 SETUP,  Abs  998912 #F3E00 -   570   568
 SETUPO  Abs  998885 #F3DE5 -   560   550
 SETUP1  Abs  998917 #F3E05 -   574   552
 SETUP2  Abs  998947 #F3E23 -   590   554   556
 SETUPx  Abs  998894 #F3DEE -   563   587
 SngDev  Ext                -   379   668   723
 VolLbl  Ext                -   435
 bPILAI  Ext                -  1346
 eNMBOX  Ext                -   235
 eNNUMR  Ext                -  1059  1139
 eNORAM  Ext                -   729
 eOFFED  Ext                -   182
 eRANGE  Ext                -  1072  1143  1235
=eXPEXC  Abs  999687 #F4107 -  1300
 fLTDH   Ext                -  1063  1126
=i/OFND  Abs  999694 #F410E -  1303   469  1347
 lDEVC   Ext                -  1554  1558
 lPOLSV  Ext                -  1551
 sDEST   Ext                -  1556
 sSTK    Ext                -   818   844   890   947  1008  1117  1183
 tCOLON  Ext                -   824
 tLITRL  Ext                -   831
```

```
Input Parameters

  Source file name is NZ&BUT::MS

  Listing file name is NZ/BUT:TI:ML::-1

  Object file name is NZXBUT:TI:MS::-1

                                          111111
                                0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                  *
                  *      N   N  ZZZZZ   &      CCC     A     SSS
                  *      N   N     Z  & &    C   C   A A   S   S
                  *      NN  N    Z   & &    C      A   A  S
                  *      N N N   Z     &     C      A   A   SSS
                  *      N  NN  Z    & & &   C      AAAAA      S
                  *      N   N  Z     &  &   C   C  A   A  S   S
                  *      N   N  ZZZZZ  && &   CCC   A   A   SSS
                  *
                  *
                         TITLE  CASSETTE ROUTINES<840301.1334>
   F4293                 ABS    #F4293          TIXHP6 address (fixed)
                  *************************************************************
                  *************************************************************
                  **
                  ** Name:       TSTAT,TSTATA - Check the drive status
                  **
                  ** Category:   PILUTL
                  **
                  ** Purpose:
                  **      Check status of mass storage device
                  **
                  ** Entry:
                  **      D[X] contains the address of the drive
                  **      D0 points to the mailbox
                  **
                  ** Exit:
                  **      Carry clear:
                  **        Drive is addressed as a talker
                  **        Status in C[B]
                  **      Carry set:
                  **        Error (P, C[0] are error code)
                  **
                  ** Calls:      YTML,PUTE,GETD (YTML only for TSTAT)
                  **
                  ** Uses.......
                  **  Exclusive: C[W],P
                  **  Inclusive: C[W],P,ST[3:0]
                  **
                  ** Stk lvls:   2 (YTML;PUTC)(GETD;GET)
                  **
                  ** History:
                  **
                  **    Date     Programmer             Modification
                  **  --------   ----------    ------------------------------
                  **  11/19/82       NZ        Added documentation
                  **
                  *************************************************************
                  *************************************************************
   F4293 7DA5 =TSTAT   GOSUB  Ytml
   F4297 400           RTNC                   Error
   F429A 20   =TSTATA  P=     0
   F429C 3500          LC(6)  (=mSST)+1       Send status, limit=1
         0000
   F42A4 8E00          GOSUBL =PUTE
```

```
           00
F42AA 400               RTNC                    Error
F42AD 7085  TSTAT1 GOSUB  Getd
F42B1 400               RTNC                    RTNSC if not data frame
F42B4 8001              P=C     1
F42B8 880               ?P#     0               Is it either BUSY or Error?
F42BB 40                GOYES   TSTAT2          Yes...check which!
F42BD 03                RTNCC                   No...all OK
            *_
            *_
F42BF 891   TSTAT2 ?P=      1                   Is it an error?
F42C2 00                RTNYES                  Yes...RTNSC
F42C4 55D               GONC    TSTATA          No...must be busy...try again
            ***************************************************************
            ***************************************************************
            **
            ** Name:         SEEKA - Seek a record (record # in A[3:0])
            ** Name:         SEEKB - Seek record (drive=listener,me=talker)
            **
            ** Category:     PILUTL
            **
            ** Purpose:
            **       Seek to the specified record
            **
            ** Entry:
            **       SEEKA: Desired record # is in A[3:0]
            **       SEEKB: Desired record # is in A[3:0], drive is talker,
            **              I am listener
            **       Drive address in D[X]
            **       D0 points to the mailbox
            **
            ** Exit:
            **       Carry clear:
            **         Drive is talker, I am listener, P=0
            **       Carry set:
            **         Error (P,C[0] are error code)
            **
            ** Calls:       MTYL,DDL,PUTD,<TSTAT>
            **
            ** Uses.......
            **  Exclusive: C[W],P
            **  Inclusive: C[W],P,ST[3:0]
            **
            ** Stk lvls:    2 (MTYL) <TSTAT>
            **
            ** History:
            **
            **    Date      Programmer               Modification
            **  --------    ----------     ----------------------------------
            **  11/19/82        NZ         Added documentation
            **
            ***************************************************************
            ***************************************************************
F42C7 7287  =SEEKA  GOSUB  Mtyl
F42CB 400           RTNC                       Error
```

```
F42CE 20    =SEEKB  P=     =Seek
F42D0 7367          GOSUB  Ddl
F42D4 400           RTNC                    Error
F42D7 D6            C=A    A                Get track # first
F42D9 F6            CSR    A
F42DB F6            CSR    A
F42DD 7097          GOSUB  Putd             Send track number
F42E1 400           RTNC                    Error
F42E4 D6            C=A    A                Now get record # on track
F42E6 7787          GOSUB  Putd             Send record number
F42EA 400           RTNC                    Error
            *
            * Following can be packed to GONC if needed
            *
F42ED 65AF          GOTO   TSTAT            Check status and exit
            **************************************************************
            **************************************************************
            **
            ** Name:       CHKMAS - Check if D[X] is mass storage device
            **
            ** Category:   PILUTL
            **
            ** Purpose:
            **      Check if a device (at D[X]) is mass storage
            **
            ** Entry:
            **      D[X] is device address
            **      D0 points to the mailbox
            **
            ** Exit:
            **      Carry clear:
            **        Device is mass storage (Acc ID=#10), P=0
            **      Carry set:
            **        Not mass storage OR loop error
            **        (P, C[0] are error code - if P= =ePIL, C[0]=eDTYPE,
            **        than C[1] is device class, A[B] is full Acc ID)
            **
            ** Calls:      GTYPE
            **
            ** Uses.......
            **  Exclusive:       C[W],P
            **  Inclusive: A[A],C[W],P,ST[3:0]
            **
            ** Stk lvls:   3 (GTYPE)
            **
            ** History:
            **
            **    Date     Programmer              Modification
            **  --------   ----------    --------------------------------
            **  05/25/83       NZ        Rewrote again to save code, added
            **                           exit condition for C[1] (device
            **                           class)
            **  02/16/83       NZ        Rewrote to not use mQSTAT, which
            **                           was removed from I/O CPU
            **                           (Added A[A] register usage)
```

```
                 **                                        (Added 2 stack levels)
                 **   11/19/82       NZ                    Added documentation
                 **
                 *************************************************************
                 *************************************************************
 F42F1 8E00 =CHKMAS GOSUBL =GTYPE          Get the acc ID of the device in A
       00
 F42F7 400           RTNC                  (Error)
 F42FA 3101          LCHEX  10             Check if Acc ID=16
 F42FE 966           ?A#C   B
 F4301 40            GOYES  CHKMAe         Not Acc ID=16
 F4303 03    Rtncc   RTNCC
             *-
             *-
 F4305 D6    CHKMAe  C=A    A              Copy accessory ID to C[B] first
 F4307 300           LC(1)  =eDTYPE        Device type error
 F430A 20            P=     =ePIL
 F430C 02            RTNSC
             *************************************************************
             *************************************************************
             **
             ** Name:        CHKBIT - Check if device indicates Acc ID=16
             **
             ** Category:    LOCAL
             **
             ** Purpose:
             **      Check if bit "4" of D[3] is set or clear
             **
             ** Entry:
             **      D[3:0] is device spec from file spec execute
             **
             ** Exit:
             **      Carry set if bit is set (Acc ID=16 device)
             **
             ** Calls:       None
             **
             ** Uses.......
             **  Inclusive: C[A]
             **
             ** Stk lvls:    0
             **
             ** History:
             **
             **    Date     Programmer             Modification
             **  --------   ----------   ---------------------------------
             **  05/12/83       NZ       Wrote routine and documentation
             **
             *************************************************************
             *************************************************************
 F430E D8    =CHKBIT C=D    A              Copy to C[A] for checking
 F4310 F2            CSL    A
 F4312 C6            C=C+C  A
 F4314 C6            C=C+C  A              Check the desired bit
 F4316 01            RTN                   Carry set iff bit set
             *************************************************************
```

```
                *************************************************************
                **
                ** Name:        CLEARN - Clear a record on device (send zeroes)
                ** Name:        CLLOOP - Send 0's to a device (A[A] is count)
                **
                ** Category:    PILI/O
                **
                ** Purpose:
                **      Clear a record (output zeroes to a specific record)
                **
                ** Entry:
                **      D[X] contains the address of the drive
                **      I/O CPU is talker, drive is listener
                **      Record number in A[3:0]
                **      D0 points to the mailbox
                **
                ** Exit:
                **      Carry clear:
                **        Successful (P=0)
                **      Carry set:
                **        Error (P, C[0] are error code)
                **
                ** Calls:       <SENDIT>
                **
                ** Uses.......
                **  Exclusive: A[A],B[W],      P
                **  Inclusive: A[A],B[W],C[W],P,ST[3:0]
                **
                ** Stk lvls:    1 <SENDIT>
                **
                ** History:
                **
                **   Date     Programmer            Modification
                **  --------  ----------   --------------------------------
                **  03/22/83     NZ        Removed CLEARR entry point
                **  11/19/82     NZ        Added documentation
                **
                *************************************************************
                *************************************************************
F4318 D0        =CLEARN A=0    A
F431A B24               A=A+1  XS          Set A[A]<--#00100 (256)
F431D AF1       =CLLOOP B=0    W           A[A] is the # of bytes to clear
F4320 8C00              GOLONG =SENDIT     Send all zeroes!
      00
                *************************************************************
                *************************************************************
                **
                ** Name:        FORMAT - Format medium in specified drive
                **
                ** Category:    EXCUTL
                **
                ** Purpose:
                **      Format medium in specified drive (initialize it)
                **
                ** Entry:
                 **      R0 contains vol label ([11:0]), # of entries ([15:12])
                 **      Drive address is in D[X]
                 **      D0 points to the mailbox
                 **
                 ** Exit:
                 **      Carry clear:
                 **        P=0, drive is rewinding (successful formatting)
                 **      Carry set:
                 **        Error (P, C[0] are error code)
                 **
                 ** Calls:        DDL,DDT,READI3,WRITIT,PRMSGA,CLLOOP,CLEARN,
                 **               MTYL,YTML,TSTAT,SEEKA,PUTALR,PUTDX,PUTD,PUTE,
                 **               GETD,ChkEOT,DdlWrt,D1=SCR,F->SCR,PUTDIR,
                 **               CSLC4,CSLC5,CSRC5,ASLC4,ASRC4,YMDHMS,<ENDTAP>
                 **
                 ** Uses.......
                 **  Exclusive: A,B,C,D,R0,   R2,D1,P
                 **  Inclusive: A,B,C,D,R0,R1,R2,D1,P,SCRTCH[63:0],ST[8:0]
                 **
                 ** Stk lvls:   4 (CLEARR)
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **  --------   ----------   ---------------------------------
                 **  11/19/82       NZ       Added documentation
                 **
                 **********************************************************
                 **********************************************************
 F4326 796F     =FORMAT GOSUB  TSTAT          Check drive status
 F432A 561              GONC   FORM10         OK...continue
 F432D 880              ?P#    =eTAPE         Is it a drive error message?
 F4330 00               RTNYES                No...must be for real
 F4332 80F0             CPEX   0              Yes...check further
 F4336 890              ?P=    =eNEWTA        Is it "New Medium" error?
 F4339 DE               GOYES  FORMAT         Yes...try again
 F433B 80F0             CPEX   0              No...
 F433F 02               RTNSC                 ...Error!
                 *-
                 *-
 F4341          FORM10                        Check if # entries is OK...
                 *
                 * Get # entries from R0[15:12]
                 *
 F4341 118              C=R0
 F4344 D2               C=0    A              Clear low nibbles for rotate...
 F4346 7157             GOSUB  Cslc4          ...Now C[A] is # of entries
                 *
                 * Convert to records and store in B[A]
                 *
 F434A 822              SB=0
 F434D C6               C=C+C  A
 F434F F6               CSR    A              Divide by 8
 F4351 832              ?SB=0                 Was there a remainder?
 F4354 40               GOYES  FORM20         No...continue
```

```
F4356 E6             C=C+1  A              Yes...increment to next record
F4358 AF5     FORM20 B=C    W              Copy to B[A], clear B[7:5]
              *
              * Get drive's maximum address (if it responds to MaxRec)
              *
              * Send DDT(MaxRec), ask for 2 bytes...(still talker from TSTAT)
              *
F435B 20             P=     =MaxRec        Send max addressable record
F435D 71F6           GOSUB  Ddt            (send it)
              *
              * Following line removed 10/20/83 to get 3 nibbles to fix the bug
              * noted about 15 lines below this (this RTNC is not really needed
              * as the only two reasons that DDT will error out are 1) ATTN pre
              * twice, and 2) I/O CPU has error bit set. Neither of these can
              * change before the PUTE immediately following, so PUTE will abor
              * with the same error.
              *
              *      RTNC
              *
F4361 3500           LC(6)  (=nSDA)+2      Send 2 bytes!
      0000
F4369 8E00           GOSUBL =PUTE
      00
F436F 400            RTNC
F4372 78C4           GOSUB  Getd           Get the data byte
F4376 551            GONC   FORM30         OK...in C[B]
F4379 7C61           GOSUB  ChkEOT         Check if EOT
F437D 400            RTNC                  If not EOT, then unexpected frame
              *
              * EOT...must be HP82161A (at least for size)
              *
F4380 20             P=     0
F4382 34FF           LC(5)  511            Max record address for HP82161A
      100
F4389 571            GONC   FORM50         Go always
              *-
              *-
              *
              * This is a device which does respond to MaxRec...read second
              * byte after saving first byte in A[3:2]
              *
F438C DA      FORM30 A=C    A
              *
              * Following line is a bug fix...fixes bug with INITIALIZE for an
              * extended Acc ID=16 protocol device and directory size
              *
F438E AA0            A=0    XS             Clear the (soon-to-be) nibble 4
F4391 F0             ASL    A
F4393 F0             ASL    A
F4395 75A4           GOSUB  Getd           Read second data byte
F4399 400            RTNC
              *
              * Now combine the two bytes in A[3:0]
              *
F439C AEA            A=C    B
```

```
F439F D6                C=A     A
F43A1 8AD     FORM50    ?B#0    A                Check if given dir length=0
F43A4 B0                GOYES   FORM60           Not zero...leave it as is
              *
              * Specified directory length is zero...need to use default
              *
              * Default is 1/32 of total records (ignore low bits)
              *
F43A6 D6                B=C     A                Copy total to B[A]...
F43A8 E6                B=B+1   A                ...add one for zero basing...
F43AA F5                BSR     A                ...divide by 16...
F43AC 81D               BSRB                     ...and 2 (total 32)!
F43AF         FORM60
              *
              * Now B[A] is directory length in records, R0[15:12] is length
              * in entries, C[A] is max addressable record address
              *
              * Check if room by the formula T - 2 - R >= N,
              * where T=total # of addressable records on medium (C[A]-1),
              *         R=# records needed for N directory entries (B[A]),
              *     and N=# of directory entries (R0[15:12]).
              *
F43AF CE                C=C-1   A                Offset to total recs - 2
F43B1 E9                C=C-B   A                Subtract # records needed
F43B3 421               GOC     FORM65           Error!!!
F43B6 110               A=R0                     Check if it passes test...
F43B9 D0                A=0     A                ...Preclear high nibbles...
F43BB 8E00              GOSUBL  =ASLC4           ...Rotate # entries into A[A]...
      00
F43C1 8BA               ?C>=A   A                ...and check for fit!
F43C4 60                GOYES   FORM70           OK...continue!
              *
              * Error...out of range!
              *
F43C6 20      FORM65    P=      =eRANGE          not OK...range error!
F43C8 02                RTNSC
              *-
              *-
F43CA         FORM70
              *
              * Now write the actual # of records for the directory from B[3:0]
              *
F43CA 110               A=R0
F43CD 8E00              GOSUBL  =ASLC4
      00
F43D3 23                P=      3
F43D5 A94               A=B     WP
F43D8 78C6              GOSUB   Asrc4
F43DC 100               R0=A                     R0[15:12] is # of records, rest is
              *                                  volume label
F43DF 7A96              GOSUB   Mtyl
F43E3 400               RTNC
F43E6 20                P=      =Format
F43E8 7B46              GOSUB   Ddl              Format all records of the medium
F43EC 400               RTNC
```

```
F43EF 70AE          GOSUB  TSTAT          Wait until finished, check status
F43F3 400           RTNC                  Error formatting medium
           **************************************************
           *
           * Now actually write the structure on the medium...
           *
           * R0[11:0] is volume label, R0[15:12] is size of
           * directory in records
           *
           **************************************************
F43F6 D0   =INITIL A=0     A
F43F8 7BCE          GOSUB  SEEKA          Seek to first record
F43FC 400           RTNC
F43FF 7A76          GOSUB  Mtyl           I am going to send data
F4403 400           RTNC
F4406 7B26          GOSUB  DdlWrt         Set the drive to write mode
F440A 400           RTNC
F440D 20            P=     0
F440F 3108          LCHEX  80             Disc ID (LIF standard)
F4413 22            P=     2
F4415 7E56          GOSUB  Putdx          ID is two bytes long
F4419 400           RTNC
           *
           * Now output volume name (currently in R0[11:0])
           *
F441C AF1           B=0    W
F441F 118           C=R0
           *
           * Following 4 lines added 10/20/83 to gain 10 nibbles to fix
           * a bug (DOT6 bug, below) by replacing the 5 lines commented
           * out 10 lines down from here
           *
F4422 8AE           ?C#0   A              Is the name zeroes?
F4425 80            GOYES  INIT05         No...continue
F4427 8E00          GOSUBL =BLANKC        Yes...use blanks
      00
F442D      INIT05
           *
F442D 2B            P=     11
F442F A95           B=C    WP             B[11:0] is now volume label
F4432 AF9           C=B    W
           *
           *        ?C#0   WP             Is the name zeroes?
           *        GOYES  INIT05         No...continue
           *        P=     0
           *        LCASC  \      \       Yes...set to blanks!
           *INIT05
           *
F4435 8E00          GOSUBL =PRMSGA        Send the name (6 bytes)
      00
F443B 400           RTNC
           *
           * Directory start address
           *
F443E D2            C=0    A              Clear C[B]
```

```
F4440 23           P=     3
F4442 7136         GOSUB  Putdx         Put first 3 bytes of dir start
F4446 400          RTNC
F4449 3120         LC(2)  2             Fourth byte of dir start is 2
F444D 7026         GOSUB  Putd          (Start of directory is record 2)
F4451 400          RTNC
                *
                * Next four bytes required for compatibility (with 3000!!!)
                * by the LIF standard
                *
F4454 3101         LCHEX  10
F4458 26           P=     6
                *
                * Also output first two bytes of length of directory (zeros)
                *
F445A 7916         GOSUB  Putdx
F445E 400          RTNC
                *
                * Now get the non-zero part of directory length
                *
F4461 118          C=R0
F4464 7336         GOSUB  Calc4         C[A] is number of records needed
                *
                * Output the last two bytes or directory length
                *
F4468 DA           A=C    A             Save low byte in A[B]
F446A F6           CSR    A
F446C F6           CSR    A             High byte first
F446E 7FF5         GOSUB  Putd          Send high byte
F4472 D6           C=A    A
                *
                * Output the last byte of directory length,
                * two bytes for version number, and two
                * required zero bytes
                *
                ************************************************************
                *                                                          *
                * Now set version number and version 1 information...     *
                * (Version 1 info: words 12-17, physical attributes;      *
                * words 18-20, volume time stamp)                          *
                *                                                          *
                * Physical attributes:                                     *
                * Word:             10   11   12   13   14   15   16   17 *
                * For tape, write: 0001 0000 0000 0002 0000 0001 0000 0100 *
                *                                                          *
                * Volume time stamp:                                       *
                * Word:                       18   19   20                 *
                * For all mass mem, write:   YYMM DDHH MMSS                *
                *                                                          *
                ************************************************************
                *
F4474 22           P=     2
F4476 7DF5         GOSUB  Putdx         Output last byte of dir length
                *                       and high byte of version number
F447A 400          RTNC
```

```
F447D 301          LCHEX  1               (This is LIF version 1)
F4480 23           P=     3
F4482 71F5         GOSUB  Putdx           Output version num + zero word
F4486 400          RTNC
             *
             * Determine if drive talks DDT6 here, and use that value for
             * device information
             *
F4489 7F95         GOSUB  D1=SCR          Set D1 @ SCRTCH for area to write
F448D 73B3         GOSUB  Ytml
F4491 400          RTNC
             *
             * Following 3 lines added 10/20/83 to fix a bug with extended-
             * Acc ID=16 protocol devices (DDT was forgotten); adds 9 nibbles
             * here (pack above saves 10 nibbles...1 filler nibble added at
             * ChkEOT, below)
             *
F4494 20           P=     =InpByt         Send implementation bytes
F4496 78B5         GOSUB  Ddt
F449A 400          RTNC
             *
F449D 3500         LC(6)  (=nSDA)+12      Read 12 bytes...
      0000
F44A5 AFA          A=C    W
F44A8 8E00         GOSUBL =PUTE           ...send message to drive
      00
F44AE 400          RTNC
F44B1 7983         GOSUB  Getd
F44B5 534          GONC   INIT10          No carry = device did send value
             *
             * Error from GETD means either EOT or ????
             *
F44B8 7020         GOSUB  ChkEOT          Check if EOT
F44BC 400          RTNC                   No...unexpected
             *
             * Fill in the correct default values for HP82161A
             *
F44BF AF2          C=0    W               Clear area first
F44C2 1557         DAT1=C W               Clear first 16 nibbles...
F44C6 17F          D1=D1+ 16
F44C9 15D7         DAT1=C 8               ...and last 8...
F44CD E6           C=C+1  A               ...set C[0]=1...
F44CF 173          D1=D1+ 4
F44D2 15D0         DAT1=C 1               Write # records per track
F44D6 1C5          D1=D1- 6               Position to # surfaces/medium
F44D9 15D0         DAT1=C 1               Write it
F44DD 1C7          D1=D1- 8               Position to # tracks/surface
F44E0 E6           C=C+1  A               Set C[0]=2
F44E2 15D0         DAT1=C 1               Write it!
F44E6 5B1          GONC   INIT20          Go always
             *-
             *-
F44E9 80FF   ChkEOT CPEX  15              Now P is FRAME value
F44ED 880          ?P#    =pEOT           Did I get an EOT?
F44F0 20           GOYES  ChkEOt
```

```
F44F2 80FF ChkEOt  CPEX   15
F44F6 01           RTN
                *-
                *-
F44F8 0            CON(1) =FIXSPC        1 nibble available here
                *-
                *-
                *
                * Device did respond...C[B] is data byte (READI3 writes it
                * at D1, increments D1 by 2, then jumps to READIT)
                *
F44F9 8E00 INIT10  GOSUBL =READI3        ...into =SCRTCH (enter READIT)
      00
F44FF 400          RTNC                  Error
                *
                * Device volume information is now in SCRTCH (12 bytes)
                *
F4502 7625 INIT20  GOSUB  D1=SCR         Reset D1 to =SCRTCH...
                *
                * First set me back as talker
                *
F4506 7375         GOSUB  Mtyl
F450A 400          RTNC
                *
                * Write volume infomation from =SCRTCH (12 bytes)
                *
F450D D2           C=0    A
F450F 30C          LC(1)  12
F4512 DA           A=C    A              Count in A[A]
F4514 7645         GOSUB  Writit         Send the data!
F4518 400          RTNC
                *
                * Save D0, D[A] in R2 (YMDHMS uses A-D,D0,D1,R0,R1,ST[7:0])
                *
F451B 136          CD0EX
F451E 7675         GOSUB  Calc5
F4522 DB           C=D    A
F4524 10A          R2=C
                *
                * Get creation date (current time)
                *
F4527 7F75         GOSUB  Ymdhms         C[11:0] is value
                *
                * Save time and date in R2, restore D0, D[A]
                *
F452B 12A          CR2EX
F452E D7           D=C    A
F4530 7555         GOSUB  Csrc5
F4534 134          D0=C
                *
                * Recover the time from R2 and continue
                *
F4537 112          A=R2
F453A 8E00         GOSUBL =ASLC4         A[15:4] is value now
      00
```

```
F4540 26          P=     6            Send 6 characters!
F4542 8E00        GOSUBL =PUTALR      Send from A, start with A[15:14]
      00
F4548 400         RTNC
F454B D2          C=0    A
F454D 316D        LCHEX  D6           Number of bytes left to clear
F4551 DA          A=C    A            ...into A[A] for CLLOOP
F4553 76CD        GOSUB  CLLOOP       Clear this many bytes
F4557 400         RTNC
F455A 7ABD        GOSUB  CLEARN       Clear record 1 (must be 0 for LIF)
F455E 400         RTNC
                *
                * Set the first directory entry to logical end of directory
                * (B[W] is zero from CLEARN - PUTDIR will not check status)
                *
F4561 7DA4        GOSUB  F->SCR       Put "FFF"s into SCRTCH
F4565 8E90        GOSUBL PUTDIR       Write a directory entry from D1
      A0
F456B 400         RTNC
                *
                * Fall through into ENDTAP!!!
                *
                **************************************************************
                **************************************************************
                **
                ** Name:        ENDTAP - Clean up the loop after mass mem action
                **
                ** Category:    PILUTL
                **
                ** Purpose:
                **      Check status of a drive, rewind it, and unaddress all
                **      talkers and listeners
                **
                ** Entry:
                **      D[X] is device address
                **      D0 points to the mailbox
                **
                ** Exit:
                **      Carry clear:
                **        P=0, all OK
                **      Carry set:
                **        Error...P, C[0] are error code
                **
                ** Calls:       TSTAT,MTYL,DDL,<UTLEND>
                **
                ** Uses.......
                **  Exclusive: C[W],P,ST[3:0]
                **  Inclusive: C[W],P,ST[3:0]
                **
                ** Stk lvls:    3 (TSTAT)
                **
                ** History:
                **
                **    Date      Programmer              Modification
                **  --------   ----------    --------------------------------
                ** 11/19/82       MZ         Added documentation
                **
                ***************************************************************
                ***************************************************************
                *
                * Code above falls into this code!!!
                *
    F456E 712D =ENDTAP GOSUB  TSTAT           Check status of drive to finish
    F4572 400          RTNC
    F4575 7405         GOSUB  Mtyl
    F4579 400          RTNC
    F457C 2F           P=     15              Set to ignore any data sent to it
    F457E 75B4         GOSUB  Ddl
    F4582 400          RTNC
    F4585 20           P=     =Rewind
    F4587 7CA4         GOSUB  Ddl             Rewind (home) the medium
    F458B 400          RTNC
    F458E 8C00         GOLONG =UTLEND         Clean up the loop
          00
                ***************************************************************
                ***************************************************************
                **
                ** Name:       READRM - Read a record from mass mem into RAM
                **
                ** Category:   PILI/O
                **
                ** Purpose:
                **      Read a specific record number
                **
                ** Entry:
                **      D1 points to the destination buffer
                **      A[3:0] contains the record number
                **      D[X] contains the drive address
                **      D0 points to the mailbox
                **
                ** Exit:
                **      Carry clear: OK (P=0)
                **      Carry set: Error (P, C[0] are error code)
                **
                ** Calls:      TSTAT,SEEKA,DdtRd,DDT,READSU,<TSTATA>
                **
                ** Uses.......
                **  Exclusive:      C[W],   P
                **  Inclusive: A[W],C[W],D1,P,ST[3:0]
                **
                ** Stk lvls:   3 (TSTAT)
                **
                ** Note: This routine will always read the device status first
                **        and ignore any device error that is reported initially
                **
                ** History:
                **
                **   Date     Programmer            Modification
                **  --------  ----------   --------------------------------
                **  08/09/83     MZ        Changed final TSTAT to TSTATA
```

```
           **  04/29/83      NZ         Added two buffer exchanges (cost=
           **                           9 bytes, makes media reads faster
           **                           and more efficient)
           **  04/04/83      SC         Ignore initial device error
           **  11/19/82      NZ         Added documentation
           **
           ****************************************************************
           ****************************************************************
F4594 7BFC =READR# GOSUB  TSTAT         Check device status (ignore carry)
F4598 7B2D         GOSUB  SEEKA         Seek to that record
F459C 400          RTNC
F459F 7A94         GOSUB  DdtRd         Read that record
F45A3 400          RTNC
F45A6 20           P=     =XchgT
F45A8 76A4         GOSUB  Ddt           Exchange buffers 0 and 1
F45AC 400          RTNC
F45AF 20           P=     =Read1
F45B1 7D94         GOSUB  Ddt           Send data from buffer 1
F45B5 400          RTNC
F45B8 3500         LC(6)  (=mSDA)+#100  #100 bytes = 1 record
      0000
           *
           * Read one record from the drive to the buffer (D1)
           *
F45C0 77A4         GOSUB  Readmu        Read from drive to (D1)
F45C4 400          RTNC
F45C7 20           P=     =XchgT
F45C9 7584         GOSUB  Ddt           Exchange buffers 0 and 1 back
F45CD 400          RTNC
           *
           * When here, all 256 bytes have been read
           *
F45D0 69CC         GOTO   TSTATA        Check final device status
           ****************************************************************
           ****************************************************************
           **
           ** Name:       WRITE# - Write to a specific record
           **
           ** Category:   PILI/O
           **
           ** Purpose:
           **      Write to a specific record on a mass mem device
           **
           ** Entry:
           **      D1 points to the input buffer
           **      A[3:0] contains the record number to be written
           **      D[X] contains the drive address
           **      D0 points to the mailbox
           **
           ** Exit:
           **      Carry clear if OK (P=0)
           **      Carry set if error (P, C[0] are error code)
           **
           ** Calls:      TSTAT,SEEKA,MTYL,DdlWrt,DDL,WRITIT
           **
```

```
            ** Uses.......
            **  Exclusive: A[A],        P
            **  Inclusive: A[A],C[W],D1,P,ST[8],ST[3:0]
            **
            ** Stk lvls:   3 (TSTAT)
            **
            ** Note: This routine always reads the device status first and
            **       ignores any initial device error.
            **
            ** History:
            **
            **    Date     Programmer             Modification
            **  --------   ----------    --------------------------------
            **  04/04/83       SC        Ignore initial device error
            **  11/19/82       NZ        Added documentation
            **
            ***************************************************************
            ***************************************************************
F45D4 7BBC  =WRITEN GOSUB  TSTAT         Check device status (ignore carry)
F45D8 7BEC          GOSUB  SEEKA
F45DC 400           RTNC
F45DF 7A94          GOSUB  Mtyl
F45E3 400           RTNC
F45E6 7B44          GOSUB  DdlWrt        Set drive to write mode
F45EA 400           RTNC
F45ED D0            A=0    A
F45EF B24           A=A+1  XS            A[A]=#00100 (1 record)
            *
            * Transfer 256 bytes (one record)
            *
F45F2 7864          GOSUB  Writit
F45F6 400           RTNC
F45F9 2F            P=     15            DDL15 = Ignore data!
F45FB 7834          GOSUB  Ddl           (Ignore data)
F45FF 400           RTNC
F4602 609C          GOTO   TSTAT         Check status, exit
            ***************************************************************
            ***************************************************************
            **
            ** Name:        MOVEFL - Move a file between two HPIL devices
            **
            ** Category:    PILI/O
            **
            ** Purpose:
            **      Move a block of "records" from one HPIL device to
            **      another
            **
            ** Entry:
            **      R1[A] = device addr of destination device (from FILSPx)
            **      R2[A] = device addr of source device (from FILSPx)
            **      R3[A] = record address of destination if mass mem
            **      B[A]  = record address of source if mass mem
            **      R3[9:5] = number of records to copy
            **
            ** Exit:
                **      PWO!
                **      Carry clear: OK
                **      Carry set: error (P, C[0] are error code)
                **
                ** Calls:       CSLC5,D1=AVE,CSRC10,CSLC10,START,GETDev,SEEKA,
                **              CHKBIT,DdtRd,READSU,D1@AVS,CSRC5,MTYL,DOL,ASRC10,
                **              WRITIT,hCPY5s,ASRC5,YTML
                **
                ** Uses.......
                **  Exclusive: A[W],C[W],D[A],R3[14:10],R4,DO,D1,P,ST[4:0]
                **  Inclusive: A[W],C[W],D[W],R3[14:10],R4,DO,D1,P,ST[8],ST[4:0]
                **
                ** Stk lvls:   3 (SEEKA)(hCPY5s)
                **
                ** Detail:
                **      COUNT# is R3[14:10]  - # of records this transfer
                **      COUNTD is R4[9:5]    - # of records already finished
                **      COUNTR is R4[14:10]  - # of records remaining
                **      COUNT  is R3[9:5]    - # of records to move (total)
                **
                ** History:
                **
                **   Date     Programmer              Modification
                **  --------  ----------   --------------------------------
                **  08/29/83     NZ        Changed where I set up A[A] for
                **                         the source so that the call to
                **                         START doesn't destroy # records
                **  08/19/83     NZ        Added checks for device mode and
                **                         changed calls to FNDMB+ to START
                **  05/25/83     NZ        Added checks for mass mem...if not
                **                         mass mem, then just move bytes
                **  01/14/83     NZ        Fixed several bugs!
                **  01/10/83     NZ        Added documentation
                **
                ***************************************************************
                ***************************************************************
F4606           =MOVEFL
F4606 11B               C=R3
F4609 D2                C=0   A
F460B 7984              GOSUB  Calc5          Save # of records in R4[14:10]
F460F 10C               R4=C                  Save record count in R4[9:5]!
                *
                * R4[9:5] is the count of how many records I have moved,
                * R4[14:10] is # of records remaining
                *
F4612 8E00      MOVEF1  GOSUBL =D1=AVE        Set D1=AVMEME
      00
F4618 147               C=DAT1 A
F461B 1C4               D1=D1- 5              Point to AVMEMS
F461E AF0               A=0   W               Clear high nibs for ASRB
F4621 143               A=DAT1 A
F4624 131               D1=A                  Set D1 @ AVMEMS
                *
                * AVMEME in C[A], AVMEMS in A[A]
                *
```

```
F4627 E2           C=C-A   A           C[A] is # nibbles available
F4629 DA           A=C     A
F462B 81C          ASRB                A[A] is # bytes available
F462E F4           ASR     A
F4630 F4           ASR     A           A[A] is # records available
F4632 20           P=      =eNORAM
F4634 8A8          ?A=0    A
F4637 00           RTNYES              Error...memory too small
             *
             * A[A] is # of records to copy at a chunk, D1 @ AVMEMS
             *
F4639 11C          C=R4
F463C 7554         GOSUB   Carc10      Now C[A] is # of records left
F4640 8AE          ?C#0    A
F4643 40           GOYES   MOVEF2      Not done...continue
F4645 03           RTNCC               Done...return, carry clear
             *-
             *-
F4647 E2     MOVEF2 C=C-A  A
F4649 560          GONC    MOVEF3      If no carry, not done
F464C CA           A=A+C   A           Set A=old C (A+(C-A) = C)
F464E D2           C=0     A           Set remaining count = 0
F4650 7444   MOVEF3 GOSUB  Calc5
             *
             * Pause here to set COUNTB (R3[14:10]) to COUNTA(A[A])
             *
F4654 12B          CR3EX
F4657 7A34         GOSUB   Carc10
F465B D6           C=A     A           Copy COUNTA to COUNTB
F465D 8E00         GOSUBL  =CSLC10
      00
F4663 12B          CR3EX               Restore C, R3 (with new value)
             *
             * Now continue on...(C[A] is number of records done)
             *
F4666 7E24         GOSUB   Calc5
F466A 10C          R4=C                Write the counts back out
             *
             * Copy the nibbles...need to call SETUP every time...
             *       increment position by # records moved
             *
F466D 11A          C=R2                Get source address
F4670 D7           D=C     A
F4672 7D04         GOSUB   Start       Set up for src, find that mailbox
F4676 400          RTNC                Not found...error!
             *
             * Set A[A] to the number of records done
             *
F4679 114          A=R4
F467C 8E00         GOSUBL  =ASRC5      A[A]=# records done
      00
             *
             * First check if in device mode (if so, just send data)
             *
F4682 8E00         GOSUBL  =GETDev     Check if device mode
```

```
           00
F4688 412           GOC     MOVEd1         Device mode...just send data
                 *
                 * Check if this is a mass mem or other device
                 *
F468B 7F7C          GOSUB   CHKBIT         If mass mem, carry set
F468F 4A0           GOC     MOVEF,         Mass mem...Seek, Read
F4692 7EA1          GOSUB   Ytml           Not mass mem...just make me talker
F4696 6010          GOTO    MOVEF4         Check carry, continue
                 *-
                 *-
                 *
                 * A[A] is # records offset to file data
                 *
F469A C0    MOVEF,  A=A+B   A              Get source record #
F469C 7AA3          GOSUB   Seeka          Go to that record
F46A0 400           RTNC
F46A3 7693          GOSUB   DdtRd          Read the data from the drive
F46A7 400   MOVEF4  RTNC
F46AA 11B   MOVEd1  C=R3                   Now get COUNT# back from R3[14:10]
F46AD 74E3          GOSUB   Csrc10
F46B1 F2            CSL     A
F46B3 F2            CSL     A              Convert COUNT# to BYTES
F46B5 8E00          GOSUBL  =hCPY5s        Set up for SDA/SFC message
           00
F46BB 7CA3          GOSUB   Readeu         Read after set-up
F46BF 400           RTNC                   Error!
                 *
                 * Now have the data in RAM, starting at AVMEMS!
                 *
F46C2 8E00          GOSUBL  =D1@AVS        Set D1 to (AVMEMS)
           00
F46C8 119           C=R1                   Get the destination address
F46CB D7            D=C     A
F46CD 72B3          GOSUB   Start          Find the destination mailbox
F46D1 400           RTNC
F46D4 8E00          GOSUBL  =GETDev        Check if device mode
           00
F46DA 413           GOC     MOVEF6         Yes...just send data
F46DD 7D2C          GOSUB   CHKBIT         Check if mass storage
F46E1 551           GONC    MOVEF5         Not mass storage...skip Seek
F46E4 11C           C=R4
F46E7 7E93          GOSUB   Csrc5          Now COUNTD is in C[A]
F46EB 113           A=R3                   A[A] is dest address
                 *
                 * Now C[A] is COUNTD (done), A[A] is dest address
                 *
F46EE CA            A=A+C   A              A[A] is desired address!
F46F0 7653          GOSUB   Seeka          Seek to that record
F46F4 400           RTNC
F46F7 7283  MOVEF5  GOSUB   Mtyl           I am talker now
F46FB 400           RTNC
F46FE 7C0C          GOSUB   CHKBIT         Check again if mass storage
F4702 590           GONC    MOVEF6         Not mass storage...skip Write
F4705 7C23          GOSUB   DdlWrt
```

```
F4709 400            RTNC
F470C 113  MOVEF6    A=R3
F470F 8E00           GOSUBL =ASRC10       Get COUNTN from R3[14:10]
      00
                *
                * A[A] is now the count in records, D1 @ AVMEMS
                *
F4715 11C            C=R4
F4718 7D63           GOSUB  Csrc5         C[A] is now COUNTD (done)
F471C C2             C=C+A  A             Update COUNTD to new value
F471E 7673           GOSUB  Cslc5
F4722 10C            R4=C                 Write it back out!
F4725 F0             ASL    A
F4727 F0             ASL    A             A[A] is N bytes now
F4729 7133           GOSUB  Writit        Send the data to the drive!
F472D 400            RTNC
F4730 61EE           GOTO   MOVEF1        Loop back to finish if more
                **************************************************************
                **************************************************************
                **
                ** Name:        FINDFL - Set up loop, get a directory entry
                ** Name:        FINDF+ - Set up loop, get directory entry (MS)
                ** Name:        FINDFx - Find a file on a mass storage device
                **
                ** Category:    FILUTL
                **
                ** Purpose:
                **      Find file on external device (for FINDF+ and FINDFx,
                **      the device must be a mass storage device)
                **
                ** Entry:
                **      FINDFL,FINDF+:
                **        First 8 characters in A[W], last 2 in R0[3:0]
                **        D[A] is device address (set up by FILSPx poll handler)
                **      FINDFx:
                **        D[X] is mass storage device address
                **        D0 points to the mailbox
                **        First 8 chars of name in R0, last 2 in R1[3:0]
                **
                ** Exit:
                **      Carry clear:
                **        File directory entry in =SCRTCH[32]
                **        A[A] is starting record (A[4]=0)
                **        C[A] is number of records (C[4]=0)
                **        D1 points to file type
                **        B[3:0] is directory pointer for file (B[3:1] is
                **          record number, B[0] is entry within record)
                **      Carry set:
                **        P=0: Names don't match (same conditions as carry clear)
                **        P#0: Error (P, C[0] are error code)
                **
                ** Calls:       START,CHKBIT,CHKMAe,YTML,D1=SCR,READSU,hCPY5s,
                **  FINDFx --> GETDR!,NXTEN+,CSRC5,CSLC5,GETDIR,GETZER
                **
                ** Uses.......
```

```
                 **  Exclusive: A,B,C,          D1,P,               ST[5]
                 **  Inclusive: A,B,C,D[15:5],D1,P,SCRTCH[63:0],ST[5:0]
                 **
                 ** Stk lvls:   5 (GETDR!)
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **  --------   ----------    --------------------------------
                 **  10/07/83       NZ        Updated documentation
                 **  05/25/83       NZ        Added check for mass storage, not
                 **                           Acc ID=16 (if true, RTNSXM)
                 **  05/12/83       NZ        Removed call to CHKMAS, replaced
                 **                           with call to CHKBIT (checks bits
                 **                           from FILSPx); removed CONWUC call
                 **  02/11/83       NZ        Added ST(Loop?)
                 **  11/19/82       NZ        Added documentation
                 **
                 *************************************************************
                 *************************************************************
F4734 850        =FINDFL ST=1   =sLoop?       LOOP is allowed for FINDFL
F4737 6600               GOTO   FINDf+
                 *-
                 *-
F473B 840        =FINDF+ ST=0   =sLoop?       LOOP not allowed for FINDF+
F473E            FINDf+
F473E 120                AR0EX                Save first 8 chars in R0
F4741 101                R1=A                 Save last 2 chars in R1
F4744 7B33               GOSUB  Start         Set up the transfer!
F4748 400                RTNC                 Error...return!
F474B 968                ?D=0   B             Is this "LOOP"?
F474E 56                 GOYES  FINDF1        Yes...just read 32 bytes, check
                 *
F4750 7AB8               GOSUB  CHKBIT        Check if Acc ID=16 bit set
F4754 427                GOC    FINDFx        Mass storage...continue
                 *
                 * If here, need to check sLoop?...if NOT set, then error!
                 *
F4757 7AA8               GOSUB  CHKMAe        Set up device type error...
F475B 860                ?ST=0  =sLoop?       ...check if needed!
F475E 00                 RTNYES               Error!!! (Set up by CHKMAe)
                 *
                 * Device is OK here...just read in the directory info!
                 *
F4760 70E0               GOSUB  Ytml          Device is talker
F4764 400                RTNC
F4767 3500               LC(6)  (=mSDA)+32    Directory length is 32 bytes
      0000
F476F 7982       FIND12  GOSUB  D1=SCR
F4773 74F2               GOSUB  Readsu        Save length in A[A], read data
F4777 400                RTNC                 Error if carry!
                 *
                 * Now check if the name is OK or not...
                 *
F477A 110                A=R0                 Recall first 8 chars
```

```
F477D 1D00          D1=(2) =SCRTCH       Move to name field
F4781 1577          C=DAT1 W             Pre-read name
F4785 17F           D1=D1+ 16            Move to 9th and 10th char of name
F4788 D1            B=0    A             Clear directory pointer first!
F478A 8A8           ?A=0   A             Name specified?
F478D 51            GOYES  FIND14        No...accept it regardless of value
F478F 976           ?A#C   W             Different name?
F4792 71            GOYES  FINDfn        Yes...error (Names don't match)
F4794 111           A=R1                 No...check last 2 chars
F4797 D6            C=A    A             (Copy C[4])
F4799 15F3          C=DAT1 4             Read last 2 chars
F479D 8A6           ?A#C   A             Last 2 chars match?
F47A0 90            GOYES  FINDfn        No...error (Names don't match)
F47A2 173     FIND14 D1=D1+ 4            Yes...position to TYPE
F47A5 67A0          GOTO   FINDF4        Set up exit conditions and exit
              *-
              *-
F47A9 75FF FINDfn   GOSUB  FIND14        Set up A,C (P=0 before call)
F47AD 02            RTNSC                PWO if too big, else bad name
              *-
              *-
F47AF 20   FINDle   P=     =eDSPEC       Device spec error (LOOP)
F47B1 02            RTNSC
              *-
              *-
F47B3 860  FINDF1   ?ST=0  =sLoop?       Is LOOP allowed?
F47B6 9F            GOYES  FINDle        No...error!
F47B8 D2            C=0    A
F47BA 3102          LC(2)  32            Read 32 bytes from I/O CPU
F47BE 8E00          GOSUBL =hCPY5a       Set for frame count/SDA
      00
F47C4 5AA           GONC   FIND12        Go always
              *-
              *-
              *
              * Find the file on the mass storage device
              *
F47C7 840  =FINDFx  ST=0   =sLoop?       If here, this cannot be LOOP!
F47CA 7E90          GOSUB  GETDR!        Get directory start, first entry
F47CE 400           RTNC                 Error
              *
              * Entry name in A[W], D1 points to last 2 chars
              *
F47D1 173  FINDF0   D1=D1+ 4             Skip last 2 chars
              *
              * Both the EOD mark (#FFFF) and PURGED file type (#0000) are
              * symmetric bytewise, so I can speed up the search and save
              * code by just reading the value straight from RAM (not swapping
              * the bytes as I normally should)
              *
F47D4 15F3          C=DAT1 4             Read in the type.
F47D8 23            P=     3
F47DA B16           C=C+1  WP            Check for end of directory
F47DD 415           GOC    FINDfn        File not found!
F47E0 A1E           C=C-1  WP            Check for purged file
```

```
F47E3 91A           ?C=0   WP
F47E6 F1            GOYES  FINDF1         PURGED!
             *
             * Now check if names match
             *
F47E8 118           C=R0
F47EB 976           ?A#C   W              Check first 8 chars
F47EE 71            GOYES  FINDF1
F47F0 1C3           D1=D1- 4
F47F3 15F3          C=DAT1 4
F47F7 173           D1=D1+ 4              Leave D1 @ type!
F47FA 121           AR1EX                 Now check last 2 chars
F47FD 912           ?A=C   WP
F4800 A4            GOYES  FINDF3         MATCH!
F4802 121           AR1EX                 Get back directory information
F4805        FINDF1
             *
             * This is NOT the file! Get directory ptr from B[3:0]...
             *
F4805 78A2          GOSUB  NXTEN+         Get next entry (carry if new rec)
F4809 D5            B=C    A              Store back in B[3:0]
F480B 5A1           GONC   FINDF2         Not new record...read next entry
             *
             * Next record needed...check if reached physical EOD yet
             *
F480E AFB           C=D    W
F4811 7472          GOSUB  Csrc5          Directory length in C[3:0]
F4815 23            P=     3
F4817 A1E           C=C-1  WP             Decrement record count...
F481A 91A           ?C=0   WP             More records?
F481D 21            GOYES  FINDFn         No...file not found (EOD)
F481F 7572          GOSUB  Cslc5          Yes...read next record
F4823 AF7           D=C    W              Save count back in D[8:5]
             *
             * Now read next entry, loop back
             *
F4826 7B80   FINDF2 GOSUB  GETDIR         Read next entry after status!
F482A 56A           GONC   FINDF0         (Can pack this by GOTO, move
             *                            FINDF0 up one line)
F482D 02            RTNSC                 Error!
             *-
             *-
F482F        FINDFn
             *
             * File not found
             *
F482F 20            P=     0
F4831 300           LC(1)  =eNFILE        File not found...
F4834 20            P=     =eTAPE         ...drive error!
F4836 02            RTNSC
             *-
             *-
F4838 8C00   Getzer GOLONG =GETZER        Read 4 bytes, check first two=0
      00
             *-
```

```
                 *-
     F483E 8C00 Getd    GOLONG =GETD
           00
                 *-
                 *-
     F4844 8C00 Ytml    GOLONG =YTML
           00
                 *-
                 *-
     F484A 121  FINDF3  AR1EX                  Save last 2 chars of name again
                 *
                 * Found the file (D1 is at file type)
                 *
     F484D 173  FINDF4  D1=D1+ 4               Skip to start address field
     F4850 74EF         GOSUB  Getzer          Read 4 bytes, check first two=0
     F4854 431          GOC    FINDFe          Error (First two bytes # 0)
     F4857 DA           A=C    A               Save start address in A[3:0]
                 *
                 * Now get the length in records
                 *
     F4859 7BDF         GOSUB  Getzer          Read 4 bytes, check first two=0
     F485D 4A0          GOC    FINDFe          Error (First two bytes # 0)
     F4860 1CF          D1=D1- 16              Move back to start address...
     F4863 1C3          D1=D1- 4               ...and back to file type
     F4866 03           RTNCC                  Done!
                 *-
                 *-
     F4868      FINDFe
                 *
                 * Argument out of range
                 *
     F4868 20           P=     =eRANGE
     F486A 02           RTNSC
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:      GETDR! - Get first directory entry from drive
                 ** Name:      GETDIR - Get the next directory entry from drive
                 ** Name:      GETDR" - Get the next directory entry @ B[3:0]
                 ** Name:      GETDR# - Get the next directory entry @ A[3:0]
                 ** Name:      GETDR+ - Get the next directory entry @ A[S]
                 **
                 ** Category:  FILUTL
                 **
                 ** Purpose:
                 **      GETDR!: Get the first entry in an LIF directory
                 **      GETDR": Get the B[3:0]th entry in an LIF directory
                 **      GETDR#: Get the A[3:0]th entry in an LIF directory
                 **      GETDR+: Get the A[S] entry in the current record
                 **      GETDIR: Get the next entry in an LIF directory
                 **
                 ** Entry:
                 **      D[X] is the drive address
                 **      D0 points to the mailbox
                 **      GETDIR: Drive is addressed as talker, me as listener
           **      GETDR": B[3:0] is the directory entry #
           **      GETDR#: A[3:0] is the directory entry #
           **      GETDR+: A[S] is the directory offset nibble in record
           **
           ** Exit:
           **      Carry clear:
           **        Directory entry in =SCRTCH[32]
           **        A[W] is first 8 chars of filename
           **        D1 points past first 8 chars of filename
           **      Carry set:
           **        Error (P, C[0] are error code)
           **
           ** Calls:      GDIRST,SEEKA,DDT,MTYL,PUTD,YTML,TSTATA,READSC,
           **             D1=SCR
           **
           ** Uses.......
           **  Exclusive: A,  C,        P
           **  Inclusive: A,B,C,D[15:5],P,SCRTCH[63:0],ST[4:0]
           **
           ** Stk lvls:   GETDR!: 4 (GDIRST)
           ** Stk lvls:   GETDR": 3 (SEEKA)(TSTATA)
           ** Stk lvls:   GETDR#: 3 (SEEKA)(TSTATA)
           ** Stk lvls:   GETDR+: 3 (TSTATA)
           ** Stk lvls:   GETDIR: 3 (TSTATA)
           **
           ** History:
           **
           **   Date     Programmer            Modification
           **  --------  ----------   --------------------------------
           **  11/19/82      NZ       Added documentation
           **
           ***************************************************************
           ***************************************************************
F486C 7860 =GETDR! GOSUB  GDIRST        Get directory start
F4870 400          RTNC
F4873 D4   =GETDR" A=B    A
F4875 814  =GETDR# ASRC                 Save BP value in A[S]
F4878 AD0          A=0    M             Clear high nibble for SEEK
F487B 784A         GOSUB  SEEKA         Go to that record
F487F 400          RTNC
F4882 77B1         GOSUB  DdtRd         Read that record (Drive is talker)
F4886 400          RTNC
F4889 948          ?A=0   S             Is the BP to be zero?
F488C 92           GOYES  GETDIR        Yes...skip setting it!
F488E 7BE1 =GETDR+ GOSUB  Mtyl          I must be talker for this!
F4892 400          RTNC
F4895 20           P=     =SetBP
F4897 7C91         GOSUB  Ddl           Set byte pointer command
F489B 400          RTNC
F489E 810          ASLC                 Get pointer in A[0]
F48A1 D6           C=A    A             Copy A[0] to C[0]
F48A3 F2           CSL    A             Entry * 16
F48A5 C6           C=C+C  A             Entry * 32
F48A7 76C1         GOSUB  Putd          Send the Byte pointer value
F48AB 400          RTNC
```

```
F48AE 729F          GOSUB  Ytnl           I am listener!
F48B2 400           RTNC
                 *
                 * Drive should already be talker for GETDIR!
                 *
F48B5 71E9 =GETDIR GOSUB  TSTATA         Check if successful read!
F48B9 400           RTNC
F48BC 3500          LC(6)  (=mSDA)+32     Length of one directory entry
      0000
F48C4 7F91          GOSUB  Readsc         Read into scratch RAM!
F48C8 400           RTNC                  Error!
F48CB 7D51          GOSUB  D1=SCR         Go back to SCRTCH...
F48CF 1537          A=DAT1 W              Read the first 8 chars of name...
F48D3 17F           D1=D1+ 16             Skip name field...
F48D6 03            RTNCC                 And return!
                 ************************************************************
                 ************************************************************
                 **
                 ** Name:        GDIRST - Get directory start and information
                 **
                 ** Category:    FILUTL
                 **
                 ** Purpose:
                 **       Locate the start of directory (and length) on mass mem
                 **       and return both to the caller
                 **
                 ** Entry:
                 **       D[X] contains the drive address
                 **       DO points to the mailbox
                 **
                 ** Exit:
                 **       Carry clear:
                 **         B[W] contains:
                 **           Directory start pointer in [3:0], [15:12]
                 **           Start of data area in [7:4]
                 **           Zero in [11:8]
                 **         D[W] contains:
                 **           Drive address in [A] (No change)
                 **           Number of directory records in [8:5]
                 **           Address of LAST data record + 1 [12:9]
                 **           Zero in [15:13]
                 **       Carry set:
                 **         Error (P, C[0] are error code)
                 **
                 ** Calls:       SEEKA,DdtRd,READSC,D1=SCR,GETALR,ASLC9,ASRC4,
                 **              GETZER,(GDIRSM),ASRC9,CSRC8,ASRC3,ASLC3,CSLC4
                 **
                 ** Uses.......
                 **  Exclusive: A,B,C,D[15:5],D1,P
                 **  Inclusive: A,B,C,D[15:5],D1,P,SCRTCH[63:0],ST[3:0]
                 **
                 ** Stk lvls:   3 (SEEKA)(GDIRSB)
                 **
                 ** History:
                 **
```

```
                  **    Date      Programmer              Modification
                  **  --------    ----------    ---------------------------------
                  **  11/19/82       NZ         Added documentation
                  **
                  ***************************************************************
                  ***************************************************************
 F48D8 D0         =GDIRST A=0    A
 F48DA 79E9               GOSUB  SEEKA          (Leaves drive as talker)
 F48DE 400                RTNC
 F48E1 7851               GOSUB  DdtRd          Read medium at current record
 F48E5 400                RTNC
 F48E8 20                 P=     0
 F48EA 3500               LC(6)  (=mSDA)+24     Read LIF ID, label, start addr,
       0000
                  *                             length, version #, Secondary ID
 F48F2 7171               GOSUB  Readsc
 F48F6 400                RTNC                  Error...bad read
 F48F9 7F21               GOSUB  D1=SCR         Reset D1 to start of data
 F48FD 22                 P=     2
 F48FF 8E00               GOSUBL =GETALR        Get LIF ID
       00
                  *
                  * Check if this is an LIF format medium (LIF ID=#8000)
                  *
 F4905 3300               LCHEX  8000
       08
 F490B 23                 P=     3
 F490D 916                ?A#C   WP
 F4910 F1                 GOYES  GDIRSe         Not LIF...error
 F4912 17B        GDIRS1  D1=D1+ 12             Skip volume label (ignore)
 F4915 AF0                A=0    W
 F4918 24                 P=     4
 F491A 8E00               GOSUBL =GETALR        Get start address of directory
       00
 F4920 958                ?A=0   M              If any but low 3 nibs#0, error!
 F4923 11                 GOYES  GDIRS3         OK!
 F4925 20         GDIRSE  P=     =eTSIZE        Error!
 F4927 80F0       GDIRsE  CPEX   0
 F492B 20                 P=     =eTAPE         Drive error (Size of File)
 F492D 02                 RTNSC
                  *-
                  *-
 F492F            GDIRSe
 F492F 20                 P=     =eNOLIF        Not LIF!
 F4931 45F                GOC    GDIRsE         Go always
                  *-
                  *-
 F4934 8E00       GDIRS3  GOSUBL =ASLC9
       00
                  *
                  * A=[<--000--> <--Directory start address--> <--000-->]
                  *    15.....12,11..........................9,8.......0
                  *
                  *
                  * Now read number of records in the directory
                  *
F493A 177                D1=D1+ 8               Skip unneeded info in header
F493D 15B3               A=DAT1 4               Read first two bytes of length
F4941 173                D1=D1+ 4               Skip past them...
F4944 8AC                ?A#0   A
F4947 ED                 GOYES  GDIRSE          Too big!
F4949 22                 P=     2               Read 2 bytes...
F494B 8E00               GOSUBL =GETALR         Read the last two bytes of length
      00
                  *
                  * A=[<--Dir start address--> <--0000--> <--Dir length-->]
                  *    15...................13,12.......4,3..............0
                  *
F4951 7F41               GOSUB  Asrc4
                  *
                  * A=[<--Dir length-->,<--Dir start address-->,<--000-->]
                  *    15............12,11....................9,8.......0
                  *
                  * Now get the extension field...if extension > 0, read it!
                  *
F4955 D2                 C=0    A               Clear high nibble...
F4957 15F3               C=DAT1 4               ...Read in the extension...
F495B 8AE                ?C#0   A               ...is it zero (no extensions)?
F495E A0                 GOYES  GDIRS4          No...read it.
                  *
                  * Extension field=0...fill in the default value for tape end
                  *
F4960 3200               LC(3)  #200            First record past tape
      2
F4965 5C3                GONC   GDIRS8          Go always!
                  *-
                  *-
F4968 3500 GDIRS4        LC(6)  (=mSDA)+12      Send 12 bytes from here...
      0000
F4970 73F0               GOSUB  Readsc          ...to SCRTCH!
F4974 400                RTNC                   Error!
                  *
                  * READSC uses A[5:0] only
                  *
F4977 1E00               D1=(4) (=SCRTCH)+16
      00
F497D 77BE               GOSUB  Getzer
F4981 491                GOC    GDIRS7          Too big...use #FFFF
                  *
                  * Put # of records per track into A[A]
                  *
F4984 DA                 A=C    A
                  *
                  * A[3:0] is # of records per track, A[4]=0
                  *
F4986 1CF                D1=D1-  16             Point to surfaces/medium
                  *
                  * Call subroutine to get surfaces/medium and multiply times
                  * records per track (result in A[3:0])
                  *
```

```
F4989 7060          GOSUB  GDIRSM
F498D 4D0           GOC    GDIRS7          Too big...use #FFFF
               *
               * A is now (records/track) * (surfaces/medium)
               *
F4990 7890          GOSUB  D1=SCR          Tracks/surface
               *
               * Get tracks/surface, multiply times (records/track *
               *                                      surfaces/medium)
               *
F4994 7550          GOSUB  GDIRSM
               *
               * Now A[3:0] is tracks/medium! (= last rec #)
               *
               * A=[<-Dir length->,<-Dir start addr->,<-0->,X,<-last rec #->]
               *    15..........12,11...............9,8...5,4,3............0
               *
F4998 580           GONC   GDIRS9          All OK if no carry
F499B D2       GDIRS7 C=0  A               More than I can do...use #FFFF!
F499D 23            P=     3
F499F A1E           C=C-1  WP              Default value! (#FFFF)
F49A2 DA       GDIRS8 A=C  A               C[3:0] is # of records in dir
F49A4          GDIRS9
F49A4 8E00          GOSUBL =ASRC9          Roll to correct fields for return
      00
               *
               * A=[<-0->,<-last rec #->,<-dir length->,<-dir start addr->]
               *    15.11,10...........7,6............3,2................0
               *
F49AA AF2           C=0    W
F49AD AB6           C=A    X               C[X] is dir start address
F49B0 F2            CSL    A               Set record pntr to zero (first)
F49B2 D5            B=C    A               Set PTRC to Directory start
F49B4 8E00          GOSUBL =CSRC8          Shift directory start to [11:8]
      00
               *
               * PTRF area is now in C[3:0]...
               *
F49BA AB6           C=A    X               Copy directory start to C[3:0]
F49BD 8E00          GOSUBL =ASRC3          Rotate directory length to A[3:0]
      00
F49C3 23            P=     3
F49C5 A12           C=C+A  WP              Now C[3:0] is PTRF initial value
F49C8 8E00          GOSUBL =ASLC3          Rotate A[W] back where it belongs
      00
F49CE 79C0          GOSUB  Calc4
F49D2 A99           C=B    WP              Copy PTRC (set up) to C[3:0]...
F49D5 AF5           B=C    W               ...and finish setting all PTRs
               *
               * Now set PFC, Dlenl, NEW, PhEOD, and Tendr
               *
F49D8 AF6           C=A    W               Directory length and medium end...
F49DB BF2           CSL    W               ...shift...
F49DE BF2           CSL    W               ...to C[8:5]...
F49E1 2C            P=     12
```

```
F49E3 DB                C=D    A             ...copy D[A] to C[A]...
F49E5 AF3               D=0    W             ...clear high nibbles of D...
                *                            ...(PFC, NEW, PhEDO)...
F49E8 A97               D=C    WP            ...and copy it all to D!
                *
                * Done with initialization!
                *
F49EB 03                RTNCC
                *-
                *-
                *
                * This is the routine to get from RAM & multiply by A[3:0]
                * (Uses A[A], C[A], D1, P!!) (P is NOT zero on return!)
                *
F49ED 774E GDIRSM GOSUB Getzer               Read 2 bytes=0, 2 more into C[A]
F49F1 400               RTNC                 Error if not zero
                *
                * Use D1 as a temporary holding area for multiplicand
                *
F49F4 131               D1=A
F49F7 D0                A=0    A             Clear product area
                * D1 is multiplicand, C[A] is multiplier, A[A] is zero
F49F9 137               CD1EX
                * D1 is multiplier, C[A] is multiplicand, A[A] is zero
F49FC 1C0  GDIRSm       D1=D1- 1             Decrement multiplier...
F49FF 490               GOC    GDIRsM        ...End of loop!
F4A02 CA                A=A+C  A             Add multiplicand to product...
F4A04 57F               GONC   GDIRSm        If no carry, repeat loop!
F4A07 02                RTNSC                If carry, WAY too big!
                *-
                *-
                *
                * Now product in A[A], multiplicand in C[A]
                *
F4A09 24   GDIRsM       P=     4             ...point to high nibble...
F4A0B 90C               ?A#0   P             ...and check if product too big.
F4A0E 00                RTNYES               TOO big!
                *
                * Return with C[3:0] = multiplicand, A[3:0] = product
                *
F4A10 03                RTNCC                Size is OK!
                ***************************************************************
                ***************************************************************
                **
                ** Name:        F->SCR - Write "FFF"s to SCRTCH ram
                **
                ** Category:    LOCAL
                **
                ** Purpose:
                **        Write 64 nibbles of "FFF" into SCRTCH RAM
                **
                ** Entry:
                **        None
                **
                ** Exit:
                 **      Carry clear, D1 @ =SCRTCH+64,P=15
                 **
                 ** Calls:      D1=SCR
                 **
                 ** Uses.......
                 **  Inclusive: C[W],D1,P,SCRTCH[63:0]
                 **
                 ** Stk lvls:   1 (D1=SCR)
                 **
                 ** History:
                 **
                 **    Date     Programmer             Modification
                 **  --------   ----------    ---------------------------------
                 **  02/18/83       NZ        Added call to D1=SCR to pack code
                 **  01/06/83       NZ        Added routine and documentation
                 **
                 ***************************************************************
                 ***************************************************************
F4A12 7610 =F->SCR GOSUB  D1=SCR
F4A16 AF2          C=0    W
F4A19 A7E          C=C-1  W           C="FFFFFFFFFFFFFFFF"
F4A1C 23           P=     3           Write out 64 nibbles (4*16)
F4A1E 1557 F->SC!  DAT1=C W
F4A22 17F          D1=D1+ 16
F4A25 0D           P=P-1              Decrement counter
F4A27 56F          GONC   F->SC!      Not done...continue
F4A2A 03           RTNCC              Done...carry clear!
                 *-
                 *-
F4A2C 1F00 =D1=SCR D1=(5) =SCRTCH
      000
F4A33 01           RTN
                 *-
                 *-
F4A35 20   DdlWrt  P=     =Write
F4A37 8C00 Ddl     GOLONG =DDL
      00
                 *-
                 *-
F4A3D 20   =DdtRd  P=     =Read
F4A3F 7F00         GOSUB  Ddt
F4A43 400          RTNC
F4A46 6358 Tstata  GOTO   TSTATA
                 *-
                 *-
F4A4A 6C78 Seeka   GOTO   SEEKA
                 *-
                 *-
F4A4E 6448 Tstat   GOTO   TSTAT
                 *-
                 *-
F4A52 8C00 Ddt     GOLONG =DDT
      00
                 *-
                 *-
```

```
F4A58 8C00 Putc     GOLONG =PUTC
      00
                *-
                *-
F4A5E 840  Writit   ST=0   =LoopOK         Do not abort out with ONE ATTN
F4A61 8C00          GOLONG =WRITIT
      00
                *-
                *-
F4A67 71CF Readsc   GOSUB  D1=SCR
F4A6B 8C00 Readsu   GOLONG =READSU
      00
                *-
                *-
F4A71 8C00 Putd     GOLONG =PUTD
      00
                *-
                *-
F4A77 8C00 Putdx    GOLONG =PUTDX
      00
                *-
                *-
F4A7D 8C00 Mtyl     GOLONG =MTYL
      00
                *-
                *-
F4A83 8C00 Start    GOLONG =START
      00
                *-
                *-
F4A89 816  Csrc5    CSRC
F4A8C      Cslc12
F4A8C 816  Csrc4    CSRC
F4A8F 8C00 Csrc3    GOLONG =CSRC3
      00
                *-
                *-
F4A95      Csrc10
F4A95 812  Cslc6    CSLC
F4A98 812  Cslc5    CSLC
F4A9B      Csrc12
F4A9B 812  Cslc4    CSLC
F4A9E      Csrc13
F4A9E 8C00 Cslc3    GOLONG =CSLC3
      00
                *-
                *-
F4AA4 8C00 Asrc4    GOLONG =ASRC4
      00
                *-
                *-
F4AAA 8D00 Ymdhms   GOVLNG =YMDHMS
      000
                ************************************************************
                ************************************************************
                **
                ** Name:        NXTENT - Move to next directory entry
                ** Name:        LSTENT - Move to previous directory entry
                **
                ** Category:    PILUTL
                **
                ** Purpose:
                **      Increment/decrement to next/last directory entry
                **
                ** Entry:
                **      C[3:0] is the current entry
                **
                ** Exit:
                **      C[3:0] is next/last entry
                **      P=0
                **      Carry set if crossed record boundary, else clear
                **
                ** Calls:       None
                **
                ** Uses.......
                **  Inclusive: C[3:0],P
                **
                ** Stk lvls:    0
                **
                ** History:
                **
                **    Date     Programmer            Modification
                **  --------   ----------   ---------------------------------
                **  12/08/82      NZ        Added routine and documentation
                **
                ***************************************************************
                ***************************************************************
F4AB1 D9        =NXTEN+ C=B     A
F4AB3 23        =NXTENT P=      3
F4AB5 0B                CSTEX
F4AB7 853               ST=1    3               Set high bit to propagate carry
F4ABA 0B                CSTEX
F4ABC B16               C=C+1   WP              Increment counter
F4ABF 0B                CSTEX
F4AC1 863               ?ST=0   3               Is this zero (Nibble is zero)?
F4AC4 11                GOYES   LSTEN1          Yes...set carry
F4AC6 5E0               GONC    LSTEN1          Go always...clear carry
                *-
                *-
F4AC9 23        =LSTENT P=      3
F4ACB A1E               C=C-1   WP
F4ACE 0B                CSTEX
F4AD0 873               ?ST=1   3               >7?
F4AD3 20                GOYES   LSTEN1          Yes...set carry
F4AD5 843       LSTEN1  ST=0    3               Clear unconditionally!
F4AD8 0B                CSTEX
F4ADA 20                P=      0               Always set P=0!!!
F4ADC 01                RTN                     Carry set if new entry,else clear
                ***************************************************************
                ***************************************************************
```

```
**
** Name:        NEWFIL,NEWFI+ - create a file on mass memory
**
** Category:    FILUTL
**
** Purpose:
**      Create a new file on a medium, given a pointer to the
**      file data and all info needed to create the directory
**      entry. If NEWFIL is called by CREATE, the file will be
**      initialized according to its create code.
**
** Entry:
**      ST[=sOVERW]=1 if overwrite existing file, 0 if error on
**         existing file
**      D[X] is device address (D[B]=0 if LOOP)
**      R0 is first 8 chars of name
**      R4[15:12] is last 2 chars of name
**      R1[5:0] is new file size in bytes
**      R1[9:6] is new file type
**      R1[14:10] is new file data start (RAM address)
**         (If zero, don't copy any file...check CCode)
**      R1[15] = 0 if called by COPY with device spec,
**         "F" if called by COPY with LOOP or non-mass storage
**           device (D[B]#0 means non-mass storage device)
**         create code if called by CREATE
**      R2[7:0] is data for implementation bytes ([B] is first
**         byte of implementation field...byte 28)
**      (R2[B] is FIRST byte of implementation info)
**   NEWFIL:
**      D0 points to the mailbox
**
** Exit:
**      Carry clear:
**        P=0, R3 is file information (B[W] internally):
**          [3:0]: Current directory pointer (of no value)
**          [7:4]: Pointer to start of data area for file
**          [11:8]: Pointer to old directory location (if found)
**          [15:12]: Pointer to new directory location of file
**        R1 is unchanged from entry conditions
**          (If R1[S]="F" and R1[B]#"00" then R1[5:2] has been
**           incremented, R1[B]=0)
**        The file has been created on the mass storage medium
**      Carry set:
**        Error (P,C[0] are error code)
**
** Calls:       START,CHKBIT,GDIRST,SEEKA,DdtRd,READSC,GT2BYT,
**              NXTENT,PT2BYT,YMDHMS,MTYL,<ENDTAP>,I/OFND,PURFIB,
**              FTYPF#,CHKSEC,CHKSIZ,PUGFIB,NEWF80,NEWF84,NEWF90,
**              NEWF.O,GETMBX,D1=SCR,F->SCR
**              CSRC3;4;5;8;9;12,ASRC4,CSLC3;4;5;8;12
**
** NEWF80 -->v ASRC4;8,CSRC2;3;12,CSLC3,YMDHMS,PT2BYT,DdlPur,
**              SEEKA,MTYL,DDL,PUTD,PUTC,D1=SCR
** NEWF84 -->v PT2BYT,CSLC2;6,MTYL,GT2BYT,CSRC13
** PUTDR# -->v SEEKA,MTYL
** NEWF90 -->v DdlPwr,DDL,PUTD
** PUTDIR ---> DDL,D1=SCR,<NEWF.3>
**
** NEWF.0 -->v CSRC4;10,SEEKA,MTYL,DDL,<INITFL>
** NEWF.3 ---> WRITIT,GETST,PUTC,<TSTAT>
**
** Uses.......
**  Exclusive: A,B,C,D,R0,R2,R3,R4,D0,D1,P
**  Inclusive: A,B,C,D,R0,R2,R3,R4,D0,D1,P,SCRTCH[63:0],ST[8,4:0]
**
** Stk lvls:   5 (PUGFIB)(Only if deleting FIB entry:file existed
** Stk lvls:   4 (GDIRST)(NEWF80;YMDHMS)
**
** Detail:
**      Consolidates into one pass through the directory the
**        following actions for mass storage:
**             1. Find the file on the medium (if present)
**             2. Find a space on the medium sufficient to hold
**                  the file, giving preference to the place
**                  it was before (if found in 1.)
**             3. Purge the old directory entry, if not using
**                  same entry for new file
**             4. Write the new directory entry
**             5. Copy the file to the data area of the medium
**
** Algorithm:
**   0: Get directory information
**      Initialize PTRC,PTRD,PTRF,PTRL,PTRN,PFC
**       (PTRC is current directory entry   <== dir_start
**        PTRD is "hole" in directory space <== dir_start
**        PTRF is "hole" in file space      <== 0
**        PTRL is old directory entry       <== 0
**        NEW is new directory entry flag   <== 0
**        PFC is count of purged files      <== 0
**        )
**      Seek to the start of the directory space
**      --
**   1: Read a directory entry @ PTRC into =SCRTCH
**      --
**      -- Check if done with medium directory
**      --
**      IF ((end of directory) THEN 5:
**      --
**      -- Check if have enough information already
**      --
** 1.2: IF (PTRL#0 AND NEW#0) THEN 5:
**      --
**      -- Check if in_file is purged
**      --
** 1.3: IF (in_file_type = 0) THEN 2:
**      --
**      -- Check if names match (found old file)
**      --
**      IF (in_file_name # new_file_name) THEN 3:
**      --
**          -- Check if overwrite is permitted
**          --
**          IF (ST[sOVERW]=0) THEN ERROR (File Exists)
**          --
**          IF (old file is secure) THEN ERROR (File protect)
**          --
**          Mark FIB entry to be purged if old file is open
**          --
**          -- Check if room for new file in old file
**          --
**          IF (in_file_space < new_file_size) THEN 1.5:
**          --
**          -- It fits here...use this entry!
**          --
**          PTRF <== in_file_start
**          PTRD <== PTRC
**          --
**          Write new_file_implementation into SCRTCH directory entry
**          Write new_file_type into SCRTCH directory entry
**          --
**          Get current time and date from mainframe
**          --
**          GOSUB 8.4: -- Write time&date, output entry @ PTRD
**          --
**          GOTO 7:    -- Transfer file data to PTRF, exit cleanly
**          -----------------------------------------------------
**          --
**          -- Found old file, file won't fit here...mark as purged
**          --
**    1.5:  PTRL <== PTRC
**          --
**          -- Count a purged file, get the next directory entry
**          --
**      2:  PFC <== PFC + 1
**          GOTO 4:
**          -----------------------------------------------------
**      3:  --
**          -- Names don't match...check if found new space yet
**          -- (If found new space, continue to look for old name)
**          --
**          IF (NEW#0) THEN 4:
**          --
**          -- Check if this file terminates a purged block AND
**          -- the file would fit here
**          --
**          IF (PFC#0 AND ((in_file_start - PTRF)>=new_file_size))
**                                   THEN NEW <== 1 @ GOTO 4:
**          --
**          -- Won't fit OR not termination of purged block
**          --
**    3.4:  PFC <== 0
**          PTRF <== in_file_start + in_file_length
**          PTRD <== PTRC + 1
**          --
**          -- Fall through to code to loop back for next entry
**       --
**    4: PTRC <== PTRC + 1
**       IF (NOT End_of_directory) THEN 1:
**       --
**       PhEOD <== 1  -- Set Physical End of directory flag...
**       --
**       -- ...and fall through to End_of_directory code
**       --
**    5: --
**       -- Check why we are done...end_of_file or finished
**       --
**       IF (NEW=0) THEN 6:
**       --
** 5.5: GOSUB 8:   -- Purge the old file, create new directory
**       --
**       GOTO 7:    -- Copy the data to (PTRF), exit cleanly
**       ---------------------------------------------------
**    6: --
**       -- Check physical end_of_directory and no purged files
**       --
**       IF (PhEOD AND PFC=0) THEN ERROR ("Directory Full")
**       --
**       -- Check if room at end of medium for new_file
**       --
** 6.2: IF (NOT (room at end)) THEN ERROR ("End of Medium")
**       --
**       GOSUB 8:   -- Purge the old file, create new directory
**       --
**       -- Check if room for logical end_of_directory mark
**       --
**       IF ((PTRD + 1) = physical_end_of_directory) THEN GOTO 7:
**       --
**       -- Write an End of Directory mark to the medium
**       --
** 6.7: Set SCRTCH="FF...FF" -- Set up EOD mark in RAM
**       --
**       GOSUB 9:   -- Write the directory entry here
**       --
**    7: GOSUB W:   -- Copy the data to the medium
**       --
**       -- Delete the FIB entry marked to be deleted (if any)
**       --
**       GOSUB Purge_marked_FIB_entry (PUGFIB)
**       --
**       IF (device is mass storage) THEN GOTO Rewind&status
**       --
**       -- Destination is LOOP/non-mass storage
**       --
** 7.5: IF (device is LOOP) THEN GOTO send ETO
**       --
**       GOTO untalk_unlisten_end
**       ---------------------------------------------------
**       ---------------------------------------------------
**       --
**       -- Subroutine to write the directory to the medium
**      --
**      -- Found room for the new file...check if found old
**      -- (If found it and writing somewhere else, purge it)
**      --
**    8: IF (PTRLWO AND PTRLWPTRD) THEN PTRL_file_type <== 0
**      --
**      -- Before copying data, build the new directory entry
**      --
** 8.2: Get current time and date: set up type, start addr,
**         and length of file
**      --
** 8.4: Set up time and date, volume #, end flag, and implementat
**      --
**      -- Now directory entry is set up...write it to the medium
**      --
**      GOSUB SEEK(PTRD)
**      --
**      -- Write the new directory entry to the medium
**      --
**    9: Set up partial write mode to read in the record, repositi
**      --
** 9.5: Set to write mode (buffer 0 contains the record)
**      Set the byte pointer to the correct entry
**      --
**      Write the new entry
**      --
**      RETURN -- End of subroutine 8:
**      ----------------------------------------------------
**      ----------------------------------------------------
**      --
**      -- Subroutine to write the data to the medium
**      --
**    #: IF [(data length=0) OR (data address=0) OR "LOOP"] AND
**         (this is a COPY)) THEN RETURN
**      --
**      -- If this is a COPY, transfer data else initialize it
**      --
**      IF (NOT LOOP) THEN SEEK(PTRF)
**      --
**      IF CREATE THEN initialize data area (INITFL), RETURN
**      --
**      COPY new_file_data TO (PTRF) (Send last byte as END)
**      --
**      RETURN -- End of subroutine #:
**
**
** History:
**
**   Date     Programmer              Modification
**  --------  ----------    ----------------------------------
**  10/11/83      NZ        Updated documentation
**  09/01/83      NZ        Added call to DELFIB to fix bug
**                          with not closing assign # to the
**                          destination of a COPY command,
**                          packed to install this fix
```

```
                 **  07/18/83      NZ          Added status bit for overwriting
                 **                            file
                 **  06/12/83      NZ          Changed CHKMAS call to use bits
                 **                            that are set by FILSPx
                 **  03/02/83      NZ          Added sending nENDM to I/O CPU
                 **  02/06/83      NZ          Added CHKMAS in NEWFI+
                 **  02/04/83      NZ          Added LOOP check in several spots
                 **  02/03/83      NZ          Rearranged order of copy...now
                 **                              writes directory entry BEFORE
                 **                              writing the data
                 **  11/19/82      NZ          Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
F4ADE 71AF  =NEWFI+ GOSUB  Start           Set up the loop
F4AE2 400           RTNC                   Error???                        <<<<
                 *
                 * Now check if mass storage device...if not, check R1[S]:
                 *        If R1[S]=0, set R1[S]="F" (not mass storage)
                 *        If R1[S]#0, this is a create...error!
                 *
F4AE5 96B           ?D=0   B               "LOOP"?
F4AE8 90            GOYES  NEWF++          Yes...set R1[S]
                 *
                 * Check if bit "4" of D[3] is set...if so, then mass storage
                 *
F4AEA 7028          GOSUB  CHKBIT          Check mass storage bit
F4AEE 4B0           GOC    NEWFIL          Mass storage...continue on!
F4AF1 119   NEWF++  C=R1
F4AF4 A4E           C=C-1  S
F4AF7 109           R1=C                   Set for "LOOP" or not MS
F4AFA 119   =NEWFIL C=R1                   Check if LOOP or Non-MS device
F4AFD B46           C=C+1  S
F4B00 690           GONC   NEWF01          Not LOOP
F4B03 AF1           B=0    W               LOOP...set all pointers=0, enter
F4B06 6082          GOTO   NEWF55            at a later entry point
                 *_
                 *_
F4B0A 7ACD  NEWF01  GOSUB  GDIRST          Get directory start, etc
                 *
                 * 0: Initialization
                 *
                 * GDIRST leaves start of directory (Dstrt) in A[X], length of
                 * directory (Dleng) in A[6:3], address of next record after
                 * the last one on the medium (Ilast) in A[10:7]
                 *
                 * Now initialize my internal pointers
                 *
                 * Name  Value  Register nibs Description:
                 * ----  -----  -------- ---- ---------------------------------
                 * PTRC: Dstrt  B[3:0]     4  Current directory pointer
                 * PTRD: Dstrt  B[15:12]   4  Directory pointer (new space)
                 * PTRF: Dend   B[7:4]     4  File pointer (to data area)
                 * PTRL:   0    B[11:8]    4  Pointer to old name (last) entry
                 * NEW:    0    D[S]       1  Flag- indicates PTRD is new entry
```

```
                * PFC:      0      D[14]        1  Purged file currently found
                * PhEOD:    0      D[13]        1  Physical end_of directory reached
                * NName:given      R0,R4[15:12] New file name (20 nibbles)
                * NSize:given      R1[5:0]      6  New file size (bytes)
                * NType:given      R1[9:6]      4  New file type
                * NData:given      R1[14:10]    5  New file data start (in RAM)
                * CCode:given      R1[15]       1  Create code (if not zero,F)
                * NImpl:given      R2[7:0]      8  New file implementation bytes
                * Dlenl:Dleng      D[8:5]       4  Directory records left to process
                *                                    (includes current record)
                * Tendr:Tlast      D[12:9]      4  Medium end (address of next record)
                *
                * All directory pointers are of the form [3 nibs][1 nib]:
                *    The [3 nibs] field is the directory record number.
                *    The [1 nib] field is the entry number within the record.
                *
                * If carry, check what the error is...if "New Medium", try again
                *
F4B0E 5A1               GONC    NEWF05          OK...continue
                *
                * Check for "New Medium" error ...close files, continue
                *
F4B11 8B0               ?P#     =sTAPE
F4B14 00                RTNYES                  Error during status
F4B16 80F0              CPEX    0
F4B1A 8B0               ?P#     =eNEWTA         New medium?
F4B1D 20                GOYES   NEWF03
F4B1F 80F0      NEWF03  CPEX    0               Carry: not "New Medium"
F4B23 400               RTNC                    If carry, return the error
F4B26 53E               GONC    NEWF01          Go always...try again!
                *-
                *-
                *
                * Seek the first record of the directory...in A[X]
                *
F4B29 AD0       NEWF05  A=0     M               Clear high nibbles
F4B2C 7A1F              GOSUB   Seeks           Seek to that record
F4B30 400               RTNC                    Error with medium or loop
F4B33 760F              GOSUB   DdtRd           Read command
F4B37 400               RTNC                    Error
                *
                * 1: Read in an entry (at PTRC)
                *
F4B3A 20        NEWF10  P=      0
F4B3C 3500              LC(6)   (=mSDA)+32      Read 32 bytes...
      0000
F4B44 7F1F              GOSUB   Readsc          ...into =SCRTCH!
F4B48 400               RTNC                    Error!
F4B4B 1D00              D1=(2)  (=SCRTCH)+20    Type!
F4B4F 15F3              C=DAT1  4
F4B53 23                P=      3
F4B55 B16               C=C+1   WP              If carry, then End of directory
F4B58 560               GONC    NEWF12          Not end of directory
F4B5B 6622      NEWF11  GOTO    NEWF50          End of directory!
                *
```

```
                 *-
F4B5F 94B  NEWF12  ?D=0   S             Is NEW=0?
F4B62 B1           GOYES  NEWF13        Yes...continue
F4B64 AF9          C=B    W
F4B67 8E00         GOSUBL =CSRC8        Get PTRL into C[3:0]
      00
F4B6D 91A          ?C=0   WP            Is PTRL=0? (P is 3)
F4B70 D0           GOYES  NEWF13        Yes...continue
                 *
                 * PTRL#0 and NEW#0...call it end of directory
                 *
F4B72 58E          GONC   NEWF11        Go always!
                 *-
                 *-
F4B75 6751 NEWF2.  GOTO   NEWF20        Jump (out of range)
                 *-
                 *-
F4B79 6F51 NEWF3.  GOTO   NEWF30        Jump (out of range)
                 *-
                 *-
F4B7D      NEWF13
                 *
                 * Check if in_type=0
                 *
F4B7D 15F3         C=DAT1 4             Reread type from SCRTCH+#20
F4B81 91A          ?C=0   WP            Purged file?
F4B84 1F           GOYES  NEWF2.        Yes...process it
                 *
                 * This is not a purged file...check if names match
                 *
F4B86 1C3          D1=D1- 4             Set D1<-last 2 characters of name
F4B89 15B3         A=DAT1 4             Read them into A[3:0] for now
F4B8D 1CF          D1=D1- 16            First 8 characters of name
F4B90 1577         C=DAT1 W             Read them!
F4B94 120          AR0EX                First 8 chars in A[W], C[W]
F4B97 976          ?A#C   W
F4B9A 20           GOYES  NEWF14        Sets carry if no match
F4B9C 120  NEWF14  AR0EX                Swap name back into R0, A[3:0]
F4B9F 490          GOC    NEWF3.        Not a match...continue
                 *
                 * First 8 chars match...check if last 2 also match
                 *
F4BA2 11C          C=R4
F4BA5 72FE         GOSUB  Csrc12        Get last 2 chars in C[3:0]
F4BA9 912          ?A=C   WP
F4BAC 50           GOYES  NEWF1a        Match...check room
F4BAE 5AC          GONC   NEWF3.        Go always...Not match
                 *-
                 *-
                 *
                 * Names match...check if overwrite permitted (if not, error)
                 *
F4BB1 20   NEWF1a  P=     0
F4BB3 300          LC(1)  =eEFILE       File exists
F4BB6 860          ?ST=0  =sOVERW       Overwrite it?
```

```
F4BB9 92                 GOYES  NEWF1d       No...error (Duplicate file)
               *
               * Overwrite permitted...check if file is secure
               *
F4BBB 1D00               D1=(2) (=SCRTCH)+20  Point to type field
F4BBF AF9                C=B    W            Save B in R3 temporarily!
F4BC2 10B                R3=C
               *
               * FTYPF# destroys R0, but the name is also in SCRTCH[15:0]
               *
F4BC5 7928               GOSUB  GT2BYO       Read file type
F4BC9 DA                 A=C    A            File type is in A[A] now
F4BCB 8E00               GOSUBL =FTYPF#      Get file type #
      00
F4BD1 541                GONC   NEWF1c       Not found...OK (continue)
               *
               * Found...check if secure
               *
F4BD4 8E00               GOSUBL =CHKSEC      If secure, returns with carry set
      00
F4BDA 5B0                GONC   NEWF1c       Not secure...OK to continue
               *
               * File is secure...error!
               *
F4BDD 20       =fPROT    P=     0            Set up "File Protected" error
F4BDF 300                LC(1)  =efPROT      File Protected!
F4BE2 20       NEWF1d    P=     =eTAPE
F4BE4 02                 RTNSC
               *-
               *-
               *
               * Not secure...kill the FIB entry (if any) for the file!
               *
F4BE6          NEWF1c
               *
               * First build the FIB file data pointer
               *
F4BE6 DB                 C=D    A
F4BE8 1F00               D1=(5) (=SCRTCH)+28  Start address (third byte)
      000
F4BEF 7108               GOSUB  GT2BYT       Read two bytes!
F4BF3 77AE               GOSUB  Calc3
F4BF7 3200               LC(3)  =bFIB
      0
F4BFC 8E00               GOSUBL =I/OFND      Find the FIB buffer
      00
F4C02 798E               GOSUB  Carc3        Now C[6:0] is pointer!
               *
               * D1 @ FIB buffer, C[6:0] is address of file
               *
F4C06 8E00               GOSUBL =PURFIB      Find and mark the FIB entry
      00
               *
               * Restore R0 from SCRTCH and B[W] from R3
               *
```

```
F4C0C 7C1E         GOSUB  D1=SCR
F4C10 1577         C=DAT1 W
F4C14 108          R0=C                Restore R0[W] from SCRTCH
F4C17 11B          C=R3
F4C1A AF5          B=C    W            Restore B[W] from R3
            *
            * Registers are restored...check if room for new file here
            *
F4C1D 111          A=R1                Get file length (given)
F4C20 1D00         D1=(2) (=SCRTCH)+36 Length of file field @ 3rd byte
            *
            * NOTE: if length of existing file is > 2^16 sectors, this
            * code will treat it as if it were (size modulo 2^16)
            *
F4C24 7CC4         GOSUB  GT2BYT       ...Read 2 bytes, start at D1
F4C28 F2           CSL    A
F4C2A 25           P=     5
F4C2C B92          CSL    WP           Now C[5:0] is length in bytes
F4C2F 99A          ?A<=C  WP           Does it fit?
F4C32 60           GOYES  NEWF1b       Yes...set it up!
F4C34 6680         GOTO   NEWF15       No...continue
            *-
            *-
            *
            * New file will fit in space for the old file (already on medium)
            *
            * Copy start address to PTRF
            *
F4C38 1CB   NEWF1b D1=D1- 12           Point to start address @ 3rd byte
F4C3B 75B4         GOSUB  GT2BYT       Read 2 bytes into C[3:0]
F4C3F 785E         GOSUB  Cslc4        ...shift to C[7:4]...
F4C43 23           P=     3
F4C45 A99          C=B    WP           ...copy PTRC to C[3:0]...
F4C48 27           P=     7
F4C4A A95          B=C    WP           ...and set PTRF<==in_start
F4C4D 7B3E         GOSUB  Csrc4        Shift PTRC to C[15:12]
F4C51 2B           P=     11
F4C53 A99          C=B    WP
F4C56 10B          R3=C                Copy PTRC==>PTRD! (save B in R3)
F4C59 112          A=R2                Get implementation bytes into A
F4C5C 1D00         D1=(2) (=SCRTCH)+56 (Implementation bytes)
F4C60 1597         DAT1=A 8            Write out the 4 bytes!
            *
            * Update the file type to the "new" type
            *
F4C64 119          C=R1                Get type from R1[9:6]
F4C67 712E         GOSUB  Csrc4        Get to C[5:2]
F4C6B 1D00         D1=(2) (=SCRTCH)+20 Point to type field
F4C6F 7894         GOSUB  PT2BYT       Output 2 bytes from C[5:2] to D1
            *
            * Now B[W] in R3; Save R1[W] in R2; D[A] in R4[9:5]
            * (YMDHMS uses A-D,P,D0,D1,R0,R1,ST[7:0])
            *
F4C73 119          C=R1
F4C76 10A          R2=C                R1 in R2
```

```
F4C79 DB            C=D    A
F4C7B 791E          GOSUB  Calc5
F4C7F 10C           R4=C                 D[A] in R4[9:5]
F4C82 742E          GOSUB  Ymdhms
              *
              * Now C[11:0] is date info
              *
F4C86 AF5           B=C    W             Save date info in B temporarily
F4C89 11C           C=R4
F4C8C 79FD          GOSUB  Csrc5
F4C90 D7            D=C    A             Restore D[A]
F4C92 7000          GOSUB  =Getmbx       Restore D0
F4C96 1F00          D1=(5) (=SCRTCH)+56
      000
F4C9D 15F7          C=DAT1 8             Recall impl bytes (for NEWF84)
F4CA1 12A           CR2EX                Restore R2, fetch R1 value
F4CA4 109           R1=C                 Restore R1
F4CA7 11B           C=R3                 Recall B[W] value
F4CAA AFD           BCEX   W             Restore B[W], fetch date info
F4CAD 1C2           D1=D1- 3             Position to where NEWF84 expects
F4CB0 7EF2          GOSUB  NEWF84        Write the date, vol label, impl
F4CB4 400           RTNC                 Error somewhere!
F4CB7 6E61          GOTO   NEWF70        Copy file to (PTRF), exit cleanup
              *_
              *_
              *
              * 1.5: Found the old file, new file won't fit there
              *
F4CBB         NEWF15
              *
              * Found old file, but it's too small now...consider it purged
              *
F4CBB D9            C=B    A             Set PTRL<==PTRC
F4CBD 8E00          GOSUBL =CSLC8
      00
F4CC3 27            P=     7
F4CC5 A99           C=B    WP
F4CC8 2B            P=     11
F4CCA A95           B=C    WP            Now PTRL=PTRC
              *
              * 2: Mark a purged file and loop back
              *
F4CCD 2E      NEWF20 P=    14
F4CCF B07     NEWF25 D=D+1 P             Make PFC non-zero
F4CD2 4CF           GOC    NEWF25        If carry, wrap around!
F4CD5 6080    NEWF4. GOTO  NEWF40        Increment to next entry, loop back
              *_
              *_
              *
              * 3: Names don't match, non-purged file...check if found a
              *    place for the file yet (if so, continue looking for the
              *    old file on the medium)
              *
F4CD9 94F     NEWF30 ?D#0  S             Is NEW#0?
F4CDC 9F            GOYES  NEWF4.        Yes...continue looking for old
```

```
                 *
                 * Check if (PFC#0) AND ((Start-PTRF) >= new_size)
                 *
                 * First check PFC=0 (If zero, skip)
                 *
F4CDE 2E                P=     14
F4CE0 90B               ?D=0   P                Is PFC zero?
F4CE3 D3                GOYES  NEWF34           Yes...reset PTRF, PTRD and cont
                 *
                 * Now check if enough room!
                 *
F4CE5 1D00              D1=(2) (=SCRTCH)+28     In_file_start (Start@ third byte)
F4CE9 7704              GOSUB  GT2BYT           Read 2 bytes,start @ D1,to C[3:0]
                 *
                 * C[A] is now In_file_start...get PTRF, check if file fits.
                 *
F4CED 7900              GOSUB  CHKSIZ           Check if fits (carry if not)
F4CF1 4E2               GOC    NEWF34           Doesn't fit...continue
                 *
                 * The new file WILL fit at PTRF
                 *
F4CF4 B47               D=D+1  S                NEW <== 1 (PTRD is location)
F4CF7 5E5               GONC   NEWF40           Go always
                 *-
                 *-
F4CFA AF4  CHKSIZ       A=B    W                Get PTRF into A[3:0]
F4CFD 73AD              GOSUB  Asrc4
F4D01 23                P=     3
F4D03 B12               C=C-A  WP               Compute (In_file_start - PTRF)
                 *
                 * Get NSize next, convert to records (Use next integer record)
                 *
F4D06 111               A=R1                    A[5:0] is size in bytes
F4D09 822               SB=0                    Use the Sticky Bit to check if
F4D0C BF4               ASR    W                  any bits were shifted off the
F4D0F BF4               ASR    W                  end of A!
F4D12 832               ?SB=0                   Any bits lost?
F4D15 40                GOYES  CHKSIz           No...skip increment statement
                 *
                 * NOTE: if file size is ever > #FFFFF00, this won't work
                 *
F4D17 E4                A=A+1  A                Increment A[3:0]
                 *
                 * Now C[3:0] is (In_file_start - PTRF), A[3:0] is NSize(Recs)
                 *
F4D19 996  CHKSIz       ?A>C   WP               Does it fit?
F4D1C 00                RTNYES                  No...set carry
F4D1E 03                RTNCC                   Yes...clear carry
                 *-
                 *-
F4D20      NEWF34
                 *
                 * File won't fit OR no purged files before it
                 *
F4D20 2E                P=     14
```

```
F4D22 A83           D=0     P               PFC <== 0
                *
                * Set PTRF <== In_file_start + In_file_length
                *
F4D25 1D00          D1=(2) (=SCRTCH)+28 Back to In_file_start...
F4D29 77C3          GOSUB   GT2BYT          Read In_file_start into C[3:0]
F4D2D DA            A=C     A               Save In_file_start in A[3:0]
F4D2F 173           D1=D1+ 4                Move to In_file_length + 4
F4D32 7EB3          GOSUB   GT2BYT          Read In_file_length into C[3:0]
                *
                * Now A[3:0] is In_file_start, C[3:0] is In_file_length
                *
F4D36 23            P=      3               Set up for C=B WP below
                *
                * NOTE: if in_file(start+length)>#FFFF, this will be incorrect!
                *
F4D38 C2            C=C+A   A               C[3:0] is in_file(start + length)
F4D3A 7D5D          GOSUB   Cslc4           Shift to C[7:4]
F4D3E A99           C=B     WP
F4D41 27            P=      7
F4D43 A95           B=C     WP              Copy to B[7:4]!
                *
                * Now set PTRD <== PTRC + 1
                * (PTRC is in C[3:0] NOW!)
                *
F4D46 796D          GOSUB   NXTENT          Increment to next entry
F4D4A 7E3D          GOSUB   Csrc4           Now C[3:0] is PTRC+1...
F4D4E 2B            P=      11              ...move to C[15:11]...
F4D50 A99           C=B     WP
F4D53 AF5           B=C     W               ...and copy to PTRD!
                *
                * Fall through to...
                *
                * 4: Code to loop back for next entry
                *
F4D56           NEWF40
                *
                * Increment PTRC, loop back if not record carry...else check
                * for end-of-directory, decrement record count
                *
F4D56 775D          GOSUB   NXTEN+          C=PTRC, Increment to next entry
F4D5A D5            B=C     A               Store back in PTRC
F4D5C 460           GOC     NEWF45          Wrap!...Decrement record count
F4D5F 6ADD      NEWF1.  GOTO    NEWF10          Loop back for next entry
                *_
                *_
                *
                * Check for physical end of directory
                *
F4D63 AFB       NEWF45  C=D     W
F4D66 7F1D          GOSUB   Csrc5           Get Dlenl into C[3:0]
                *
                * By the definition of Dlenl, this can't borrow (I check zero
                * every time I decrement and original value is > 0)
                *
```

```
F4D6A CE              C=C-1  A            Decrement C[3:0] (Can't borrow)
F4D6C 23              P=     3            Check C[3:0]
F4D6E 91A             ?C=0   WP           Done?
F4D71 C0              GOYES  NEWF48       Yes...Physical end of directory
F4D73 712D            GOSUB  Calc5
F4D77 AF7             D=C    W            Store back into Dlenl
F4D7A 54E             GONC   NEWF1.       Go always
                *-
                *-
F4D7D 2D        NEWF48 P=    13           Point to PhEOD...
F4D7F B07             D=D+1  P            ...and set it true
                *
                * 5: Reached end of file...process it now
                *
F4D82           NEWF50
                *
                * First check if have a space for the new file
                *
F4D82 94B             ?D=0   S            NEW=0?
F4D85 D0              GOYES  NEWF60       Yes...no room yet
                *
                * Have room for it...process it here
                *
F4D87 72E0      NEWF55 GOSUB NEWF80       Purge old, create new file entry
F4D8B 400             RTNC                Error during write
F4D8E 6790            GOTO   NEWF70       Copy data to (PTRF), cleanup&exit
                *-
                *-
                *
                * 6: End of directory, no space found for file yet
                *
F4D92           NEWF60
                *
                * If (PFC=0 AND physical End_of_directory) THEN Error!
                *
                * Check PFC=0 first
                *
F4D92 2E              P=     14
F4D94 90F             ?D#0   P
F4D97 A1              GOYES  NEWF62       Need to check if room on medium
                *
                * Now check Physical End_of_directory
                *
F4D99 2D              P=     13           Point to PhEOD...
F4D9B 90B             ?D=0   P            ...check if reached PhEOD
F4D9E 31              GOYES  NEWF62       Not physical end_of_directory
F4DA0 20              P=     0            Is physical end_of_directory...
F4DA2 300             LC(1)  =eDIRFL      Directory is full!
F4DA5 20        NEWFeT P=    =eTAPE       (Medium error)
F4DA7 02              RTNSC
                *-
                *-
F4DA9 20        NEWF61 P=    0
F4DAB 300             LC(1)  =eEOTAP      End of medium
F4DAE 46F             GOC    NEWFeT       Go always
```

```
             *-
             *-
             *
             * Not physical end_of_directory...check if room for file @ end
             *
F4DB1        NEWF62
             *
             * PTRD points to the directory entry to be used...if room!
             *
             * First check if room at end of medium for this file.
             *
             * IF ((Tendr - PTRF) >= NSize) THEN room at end
             *
             * Get Tendr first...
             *
F4DB1 AFB          C=D    W
F4DB4 8E00         GOSUBL =CSRC9         Shift into C[3:0]
      00
             *
             * Now check if the file will fit here
             *
F4DBA 7C3F         GOSUB  CHKSIZ         Check if room for file
F4DBE 4AE          GOC    NEWF61         No...End of medium error
             *
             * Room for the file...write it here!
             *
F4DC1 78A0         GOSUB  NEWF80         Purge old, create new dir entry
F4DC5 400          RTNC                  Error during write
             *
             * Check if room for the end_of_directory mark here
             *
             * If got here by logical end_of_directory and PTRC is at the
             * last directory entry before physical EOD, then set PhEOD for
             * the following test!
             *
F4DC8 75EC         GOSUB  NXTEN+         Increment to next entry
F4DCC 562          GONC   NEWF67         Not new record...continue on
             *
             * New record...check if this was the LAST one
             *
F4DCF AFB          C=D    W
F4DD2 73BC         GOSUB  Csrc5          Get Dlenl into C[3:0]
F4DD6 CE           C=C-1  A              Can't carry by its definition
F4DD8 23           P=     3
F4DDA 91A          ?C=0   WP             Physical end of directory?
F4DDD 90           GOYES  NEWF66         Yes...no more records in directory
             *
             * If physical end_of_directory is false, then there IS room
             * for the end_of_directory mark.  If physical, then check if
             * PFC>1...if so, room for end_of_directory mark.
             *
             * Check first for physical end_of_directory
             *
F4DDF 2D           P=     13
F4DE1 908          ?D=0   P              Is this physical EOD?
```

```
F4DE4 F0              GOYES  NEWF67        No...OK to write EOD mark
F4DE6         NEWF66
              *
              * Have reached physical end of directory...check if any purged
              * directory entries available to write the logical EOD mark
              *
F4DE6 2E              P=     14            Check # of purged files
F4DE8 A0F             D=D-1  P             (Decrement PFC)
F4DEB 4A3             GOC    NEWF70        If PFC was zero, no room for EOD
F4DEE 90B             ?D=0   P             More than one purged entry?
F4DF1 53              GOYES  NEWF70        No...no room for EOD mark
              *
              * Write the end_of_directory mark
              *
F4DF3 AF9     NEWF67  C=B    W             Get PTRD into C[15:12]...
F4DF6 71AC            GOSUB  Csrc12        ...Move to C[3:0]...
F4DFA 75BC            GOSUB  NXTENT        ...increment to next entry!
F4DFE DA              A=C    A             Copy the pointer to A[3:0]
F4E00 788C            GOSUB  Cslc12        ...move back to C[15:12]...
F4E04 AF5             B=C    W             ..and copy back to B (Rest is OK)
F4E07 814             ASRC                 Entry # in A[S], record in A[X]
F4E0A AD0             A=0    M             (Clear unused nibbles)
F4E0D 793C            GOSUB  Seeka         Go to that record
F4E11 400             RTNC                 Error during seek
F4E14 756C            GOSUB  Mtyl          I send data to the medium
F4E18 400             RTNC                 Error
              *
              * Write "FFF"s to SCRTCH (For the end_of_directory mark)
              *
F4E1B 73FB            GOSUB  F->SCR        Write 64 nibs of "F" to SCRTCH
F4E1F 77F1            GOSUB  NEWF90        Read the record, update, write
F4E23 400             RTNC                 If carry, error writing EOD
              *
              * 7: Copy the data to the medium
              *
F4E26 7532    NEWF70  GOSUB  NEWF.0        Copy the data to the medium
F4E2A 400             RTNC
              *
              * Fall into clean-up code...(rewind device, etc)
              *
F4E2D 20              P=     0
F4E2F AF9             C=B    W
F4E32 10B             R3=C                 Put B[W] into R3!
              *
              * Now delete the FIB buffer marked by PURFIB (if any)
              *
F4E35 DB              C=D    A
F4E37 10A             R2=C                 Save D[A] in R2
F4E3A 8F00            GOSBVL =PUGFIB       Delete first FIB marked as purged
      000
F4E41 7000            GOSUB  =Getmbx       Get D0 back to the mailbox
F4E45 11A             C=R2
F4E48 D7              D=C    A
F4E4A 11B             C=R3                 Check if LOOP
              *
```

```
F4E4D 97A           ?C=0   W             LOOP?
F4E50 80            GOYES  NEWF75        Yes...don't rewind!
F4E52 8CA1          GOLONG ENDTAP        Carry = result
      7F
            *-
            *-
F4E58 96F   NEWF75  ?D#0   B             Is this "LOOP"?
F4E5B C0            GOYES  Utlend        No...clean up
F4E5D 3100          LC(2)  =nENDM        Yes...set ETO
F4E61 8C00          GOLONG =PUTC+
      00
            *-
            *-
F4E67 8C00  =Utlend GOLONG =UTLEND       Unt, Unl, END
      00
            *-
            *-
            *
            * 8: Subroutine to write the new directory entry to the medium
            *
F4E6D       NEWF80
            *
            * First check if found the old file (If found and writing
            * somewhere else, purge this first)
            *
            * IF (PTRL#0 AND PTRL#PTRD) THEN PTRL_file_type <== 0
            *
            * First check PTRL#0
            *
F4E6D AF4           A=B    W             Get PTRL into A[11:8]...
F4E70 8E00          GOSUBL =ASRC8        ...move to A[3:0]...
      00
F4E76 23            P=     3
F4E78 91C           ?A#0   WP            ...and check if non-zero
F4E7B 60            GOYES  NEWF8!        Non-zero...check PTRL#PTRD
F4E7D 6E60  NEWF8.  GOTO   NEWF82        Zero...continue
            *-
            *-
            *
            * Now check PTRL#PTRD...Use A to fetch PTRD
            *
F4E81 AF9   NEWF8!  C=B    W             Get PTRD into C[15:12]...
F4E84 731C          GOSUB  Csrc12        ...shift into C[3:0]...
F4E88 912           ?A=C   WP            ...and check for equality
F4E8B 2F            GOYES  NEWF8.        EQUAL...skip purge
            *
            * Need to purge the file here (PTRL is in A[3:0])
            *
            * If this purge were to be done when it is FOUND, there will
            * be less medium wear, but the file would be purged even if an
            * error occurs while trying to create the new file
            *
F4E8D 814           ASRC                 Shift PTRL - get record # in A[X]
            *
            * Now A[X] is the record #, A[S] is the directory entry #
```

```
                *
F4E90 A80             A=0     P             (P is still 3 from above stmts)
F4E93 73B8            GOSUB   Seeka         Go to that record
F4E97 400             RTNC                  Error
F4E9A 7FDB            GOSUB   Mtyl          Send DDL to the drive
F4E9E 400             RTNC
                *
                * Read the record into buffer zero of the drive
                *
F4EA1 8E00            GOSUBL =DdlPwr        Send partial write mode, MTYL
      00
F4EA7 400             RTNC                  Error
                *
                * Set the drive mode back to WRITE mode (NOT partial write)
                *
F4EAA 7788            GOSUB   DdlWrt        Write mode (Sets Byte pointer=0)
F4EAE 400             RTNC
                *
                * Now buffer 0 contains the record...modify the file type
                * at PTRL (set to zero) and write the record out to the medium
                *
F4EB1 20              P=      =SetBP        Set byte pointer
F4EB3 7088            GOSUB   Ddl
F4EB7 400             RTNC
F4EBA 810             ASLC                  Move entry # to A[0]
F4EBD F0              ASL     A             Shift into the B field (*16)
F4EBF C4              A=A+A   A             Double it (*32)
F4EC1 31A0            LC(2)   10            Byte # within entry of file type
F4EC5 A62             C=C+A   B             Now C[B] points to the file type
F4EC8 75A8            GOSUB   Putd          Send it!
F4ECC 400             RTNC
                *     P=      =Write0       (Write0 is 0, P is already 0)
F4ECF 7468            GOSUB   Ddl           Set WRITE mode
F4ED3 400             RTNC
F4ED6 D2              C=0     A             Clear C[B]
F4ED8 7598            GOSUB   Putd          Send first byte of type (PURGED)
F4EDC 400             RTNC
F4EDF 3300            LC(4)   =mENDf        Send last byte as an END frame
      00
F4EE5 7F68            GOSUB   Putc
F4EE9 400             RTNC
F4EEC           NEWF82
                *
                * Now ready to write the new entry (Create it in SCRTCH first)
                *
F4EEC 7C38            GOSUB   D1=SCR        Name...
F4EF0 110             A=R0                  (First 8 chars)
F4EF3 1517            DAT1=A  W             (Write first 8 chars)
F4EF7 17F             D1=D1+  16
                *
                * At this point, save the contents of R1 @(=SCRTCH)+#10, B[W]
                * @(=SCRTCH)+#20, D0 @(=SCRTCH)+#30, and D[A,15:13] @(=SCRTCH)
                * +#35 so that I can call YMDHMS, which uses D0,D1,A-D,R0,R1
                *
F4EFA 119             C=R1
```

```
2728 F4EFD 1557          DAT1=C W              Save R1 @ (=SCRTCH)+#10
2729 F4F01 17F           D1=D1+ 16
2730 F4F04 AF9           C=B    W
2731 F4F07 1557          DAT1=C W              Save B @ (=SCRTCH)+#20
2732 F4F0B 17F           D1=D1+ 16
2733 F4F0E 136           CD0EX
2734 F4F11 145           DAT1=C A              Save D0 @ (=SCRTCH)+#30
2735 F4F14 174           D1=D1+ 5
2736 F4F17 AFB           C=D    W
2737 F4F1A 708B          GOSUB  Calc3
2738 F4F1E 15D7          DAT1=C 8              Save D[A,15:13] @ (=SCRTCH)+#36
2739                *
2740                * Now I am ready to call YMDHMS
2741                *
2742 F4F22 748B          GOSUB  Ymdhms         Returns with info in C[11:0]
2743                *
2744                * Registers A,B,D,D0,D1,R0,R1 are NOT defined now!
2745                *
2746                * Restore registers and write out the info
2747                *
2748 F4F26 AF7           D=C    W              Save time in D[W] for now
2749 F4F29 11C           C=R4
2750 F4F2C 7B6B          GOSUB  Csrc12         Get last 2 chars in C[3:0]
2751 F4F30 1F00          D1=(5) (=SCRTCH)+16  Point to filename
           000
2752 F4F37 1537          A=DAT1 W              Read in R1 from =SCRTCH+#10
2753 F4F3B 101           R1=A                  Restore it
2754 F4F3E 15D3          DAT1=C 4              Write out last two chars of name
2755 F4F42 173           D1=D1+ 4
2756 F4F45 7B5B          GOSUB  Asrc4
2757 F4F49 AF6           C=A    W
2758 F4F4C 7BB1          GOSUB  PT2BYT         Output file type
2759 F4F50 AF2           C=0    W
2760 F4F53 15D7          DAT1=C 8              Clear out start address field
2761 F4F57 177           D1=D1+ 8              Move to B[W] save area
2762                *
2763                * Set start address <== PTRF
2764                *
2765 F4F5A 1577          C=DAT1 W              PTRF is in C[7:4]...
2766 F4F5E AF5           B=C    W              ...(restore B[W])...
2767 F4F61 8E00          GOSUBL =CSRC2         ...shift into C[5:2]...
           00
2768 F4F67 1C3           D1=D1- 4              ...position to START field...
2769 F4F6A 7D91          GOSUB  PT2BYT         ...Put 2 bytes, D1=D1+ 4
2770                *
2771                * D1 now points @ (=SCRTCH)+ #20 (LENGTH field)
2772                *
2773 F4F6E AF2           C=0    W
2774 F4F71 15D3          DAT1=C 4              Clear first 2 bytes of LENGTH
2775 F4F75 173           D1=D1+ 4              Skip to second half!
2776                *
2777                * Set length field <== (NSize + 255) DIV 256
2778                *
2779 F4F78 119           C=R1                  NSize is in C[5:0]!
2780 F4F7B 96A           ?C=0   B              Is this an even # of records?
```

```
F4F7E 61               GOYES  NEWF8,          Yes...continue
F4F80 826              C=C+1  XS              No...add 1 to it!
F4F83 550              GONC   NEWF83          If carry, propagate into C[M]
F4F86 856              C=C+1  M
F4F89 970     NEWF83   ?B#0   W               Loop?
F4F8C 80               GOYES  NEWF8,          No...continue
F4F8E AE2              C=0    B               Yes...
F4F91 109              R1=C                   ...set length=# recs * 256
F4F94         NEWF8,
              *
              * Now C[5:2] is length in records
              *
F4F94 7371             GOSUB  PT2BYT          Put 2 bytes, increment D1 by 4
              *
              * D1 is now @ (=SCRTCH)+ #28 (time of creation field)
              *
F4F98 177              D1=D1+ 8               Skip to saved D0
F4F9B 147              C=DAT1 A
F4F9E 147              C=DAT1 A               Read in D0...
F4FA1 134              D0=C                   ...restore it
F4FA4 174              D1=D1+ 5
F4FA7 15F7             C=DAT1 8               Read in D stuff...
F4FAB 70EA             GOSUB  Csrc3           ...rotate to correct place...
F4FAF AFF              CDEX   W               ...and put in D[W], fetch time
F4FB2 1CC     NEWF84   D1=D1- 13              Back up to start of time field
              *
              * Output it in the proper order!
              *
F4FB5 2A               P=     16-6            Increment P until carry...6 times
F4FB7 7ADA             GOSUB  Cslc6           Move to C[B],C[15:6]
F4FBB 140     NEWF85   DAT1=C B               Write this byte...
F4FBE 171              D1=D1+ 2               ...move to next byte...
F4FC1 8E00             GOSUBL =CSLC2          ...shift in next byte...
      00
F4FC7 0C               P=P+1                  ...increment count...
F4FC9 51F              GONC   NEWF85          ...if no carry, continue!
              *
              * Now output volume number, END flag
              *
F4FCC 22               P=     2
F4FCE 3310             LCHEX  8001            Volume 1, END
      08
F4FD4 7331             GOSUB  PT2BYT          Put 2 bytes from C[5:2]
              *
              * D1 is now at the implementation bytes
              *
F4FD8 11A              C=R2                   Get NImpl from R2[7:0]
F4FDB 15D7             DAT1=C 8               Write them out!
F4FDF 970              ?B#0   W               LOOP or non-MS device?
F4FE2 01               GOYES  NEWF87          No...continue
F4FE4 96B              ?D=0   B               LOOP?
F4FE7 66               GOYES  NEWF97          Yes...skip addressing!
              *
              * Non-mass storage...address me as talker, device as Listener
              *
```

```
F4FE9 709A          GOSUB  Mtyl          Controller...address me as talker
F4FED 5F5           GONC   NEWF97        Go if no error
F4FF0 02            RTNSC                Return with error
              *-
              *-
              *
              * Now entry is created in SCRTCH...write it to the medium
              *
F4FF2 1F00   NEWF87  D1=(5) (=SCRTCH)+36
      000
F4FF9 75F0          GOSUB  GT2BYO        Read 2 bytes (size in records)
F4FFD 10A           R2=C                 Save size of file in R2[A]
              *
F5000 AF9           C=B    W             Copy PTRD into C[15:12]...
F5003 D2            C=0    A             ...clear nibbles "above" PTRD...
F5005 759A          GOSUB  Csrc13        ...shift into C[2:0], C[S]...
F5009 AFA    =PUTDRM A=C   W             ...save all in A[W]...
F500C 7A3A          GOSUB  Seeka         ...goto the correct record
F5010 400           RTNC
F5013 766A          GOSUB  Mtyl          Make me talker, drive as listener
F5017 400           RTNC
F501A        NEWF90
F501A 8E00          GOSUBL =DdlPwr       Partial write mode, check status
      00
F5020 400           RTNC
              *
              * Set back to write mode before sending data to drive
              *
F5023 7E0A          GOSUB  DdlWrt        Write mode
F5027 400           RTNC
              *
              * Set byte pointer to current position
              *
F502A 20            P=     =SetBP
F502C 770A          GOSUB  Ddl           Set byte pointer
F5030 400           RTNC
F5033 810           ASLC                 Get entry number back to A[0]
F5036 AE6           C=A    B
F5039 F2            CSL    A             C[B] is now entry number * 16...
F503B C6            C=C+C  A             ...* 32...
F503D 703A          GOSUB  Putd          ...Send to the drive
F5041 400           RTNC
              *
              * Set back to WRITE mode
              *
F5044        =PUTDIR
              *
              * Entry to write a directory entry from SCRTCH
              *
F5044 20            P=     =Write0       Write mode (resume)
F5046 7DE9   =PUTDR" GOSUB Ddl
F504A 400           RTNC
              *
              * Now send the entry to the drive
              *
```

```
F504D      NEWF97
F504D 7B09        GOSUB  D1=SCR        Point to the entry...
F5051 D2          C=0    A
F5053 20          P=     0             P could be non-zero from jump in
F5055 31F1        LC(2)  31            Send all but the last byte.
F5059 DA          A=C    A
F505B 6160        GOTO   NEWF.3        (WRITIT,mENDf, check drive status)
           *-
           *-
F505F 119  NEWF.0 C=R1                 Get NData into C[14:10]
F5062 25          P=     5
F5064 91E         ?C#0   WP            Is the file size zero?
F5067 40          GOYES  NEWF.1        No...seek to the data area?
F5069 03   NEWF.c RTNCC                Yes...don't seek to the data area
           *-
           *-
F506B 762A NEWF.1 GOSUB  Csrc10        Shift to C[4:0]
F506F 8AE         ?C#0   A             Is NData zero? (no copy)
F5072 F0          GOYES  NEWF.2        No...continue on
           *
           * NData is zero...no data address to copy (check if CREATE)
           *
F5074 25          P=     15-10         Point at R1[S]
F5076 90A         ?C=0   P             Is this a COPY?
F5079 0F          GOYES  NEWF.c        Yes...don't seek to the data area
F507B B06         C=C+1  P             Is this a non-mass storage device?
F507E 4AE  NEWF.C GOC    NEWF.c        Yes...don't seek!
F5081 135  NEWF.2 D1=C                 Set D1 <== start of data
F5084 979         ?B=0   W             LOOP?
F5087 02          GOYES  NEWF98        Yes...skip SEEK
F5089 AF9         C=B    W
F508C 7CF9        GOSUB  Csrc4         Get PTRF into C[3:0]...
F5090 DA          A=C    A             ...Copy to A[3:0]...
F5092 7489        GOSUB  Seeka         ...and SEEK to that record
F5096 400         RTNC
F5099 70E9        GOSUB  Mtyl          I must be talker to do DDLs
F509D 400         RTNC
F50A0 7199        GOSUB  DdlWrt        Write mode...
F50A4 400         RTNC
F50A7 111  NEWF98 A=R1                 Copy NSize to A[A]...
F50AA CC          A=A-1  A             ...leave 1 byte to END...
F50AC 948         ?A=0   S             Called by COPY?
F50AF E0          GOYES  NEWF.3        If so, copy it
F50B1 B44         A=A+1  S             LOOP?
F50B4 480         GOC    NEWF.3        Yes...copy it
F50B7 8C00        GOLONG =INITFL       Initialize file if CCode#0
      00
           *-
           *-
F50BD 7D99 NEWF.3 GOSUB  Writit        Send (NSize) bytes to the device
F50C1 400         RTNC
           *
           * Because the ENDf message is a SEND message, make sure I am
           * active talker first (otherwise will get Invalid Mode error)
           *
```

```
F50C4 8E00 NEWF..  GOSUBL =GETST        Get status...(sets P=0)
      00
F50CA 400          RTNC
F50CD 0B           CSTEX
F50CF 860          ?ST=0  =sTALKA       Talker active?
F50D2 20           GOYES  NEWF.,        (Set carry if not)
F50D4 0B   NEWF.,  CSTEX
F50D6 40E          GOC    NEWF..        Not talker active...wait!
F50D9 3300         LC(4)  =nENDF        End frame
      00
F50DF 14F          C=DAT1 B             Read value of last data byte
F50E2 7279         GOSUB  Putc          Send the last frame as an END
F50E6 400          RTNC
F50E9 979          ?B=0   W             LOOP?
F50EC 29           GOYES  NEWF.C        Yes...return, carry clear
F50EE 6F59         GOTO   Tstat         Check drive status! (carry=status)
           ***************************************************************
           ***************************************************************
           **
           ** Name:       GETBYT - Read bytes from RAM (most sig. first)
           **
           ** Category:   LOCAL
           **
           ** Purpose:
           **      Read "P" bytes from RAM into C from D1 (Bytes are high
           **      bytes first)
           **
           ** Entry:
           **      P= # of bytes to read - 1
           **      D1 points to first byte
           **
           ** Exit:
           **      P=0
           **      Carry clear
           **      C contains (P+1) bytes of data
           **      D1 points to the next byte (first one NOT used)
           **
           ** Calls:      None
           **
           ** Uses.......
           **  Inclusive: C[W],D1,P  (Unused nibbles of C shifted left)
           **
           ** Stk lvls:   0
           **
           ** History:
           **
           **   Date      Programmer              Modification
           **   --------  ----------   --------------------------------
           **   11/19/82     NZ        Added documentation
           **
           ***************************************************************
           ***************************************************************
F50F2 D2   =GT2BY0 C=0    A             Clear C[A] first
F50F4 21   =GT2BYT P=     1             Read 2 bytes
F50F6 BF2  =GETBYT CSL    W             Preshift C over one byte
```

```
F50F9 BF2            CSL    W
F50FC 14F            C=DAT1 B
F50FF 171            D1=D1+ 2
F5102 00             P=P-1                  Is this the end?
F5104 51F            GONC   GETBYT          No...get another
F5107 20             P=     0               Set P=0
F5109 03             RTNCC
               **************************************************************
               **************************************************************
               **
               ** Name:       PT2BYT - Wtite 2 bytes, high byte first, to RAM
               **
               ** Category:   LOCAL
               **
               ** Purpose:
               **      Output 2 bytes at D1 from C[5:2] (C[5:4] first,then
               **      C[3:2])
               **
               ** Entry:
               **      C[5:2] contains the two bytes
               **      D1 points to destination RAM
               **
               ** Exit:
               **      D1 points to first byte following the written data
               **      Carry clear
               **
               ** Calls:      CSRC4
               **
               ** Uses.......
               **  Exclusive:   D1
               **  Inclusive: C[W],D1 (C[W] is shifted right circular 4 nibs)
               **
               ** Stk lvls:   1 (CSRC4)
               **
               ** History:
               **
               **    Date      Programmer              Modification
               **  --------    ----------    --------------------------------
               **  11/19/82       NZ         Added documentation
               **
               **************************************************************
               **************************************************************
F510B 15D3 =PT2BYT DAT1=C 4                 Write the low byte first...
F510F 7979           GOSUB  Csrc4           ...get the high byte into C[B]...
F5113 14D            DAT1=C B               ...write the high byte
F5116 173            D1=D1+ 4               Increment D1 past data...
F5119 03             RTNCC                  ...and return with carry clear
F511B                END
```

```
 ASLC3   Ext                   -  1539
 ASLC4   Ext                   -   406   421   645
 ASLC9   Ext                   -  1441
 ASRC10  Ext                   -  1022
 ASRC3   Ext                   -  1536
 ASRC4   Ext                   -  1695
 ASRC5   Ext                   -   964
 ASRC8   Ext                   -  2651
 ASRC9   Ext                   -  1522
 Asrc4   Abs 1002148 #F4AA4 -  1695   424  1460  2377  2756
 BLANKC  Ext                   -   466
=CHKBIT  Abs 1000206 #F430E -   212   973  1004  1017  1107  2057
=CHKMAS  Abs 1000177 #F42F1 -   169
 CHKMAe  Abs 1000197 #F4305 -   177   173  1112
 CHKSEC  Ext                   -  2211
 CHKSIZ  Abs 1002746 #F4CFA -  2376  2367  2536
 CHKSIz  Abs 1002777 #F4D19 -  2396  2388
=CLEARN  Abs 1000216 #F4318 -   257   654
=CLLOOP  Abs 1000221 #F431D -   259   652
 CSLC10  Ext                   -   945
 CSLC2   Ext                   -  2813
 CSLC3   Ext                   -  1692
 CSLC8   Ext                   -  2330
 CSRC2   Ext                   -  2767
 CSRC3   Ext                   -  1683
 CSRC8   Ext                   -  1531  2144
 CSRC9   Ext                   -  2532
 ChkEOT  Abs 1000681 #F44E9 -   590   351   570
 ChkEOt  Abs 1000690 #F44F2 -   593   592
 Cslc12  Abs 1002124 #F4A8C -  1681  2588
 Cslc3   Abs 1002142 #F4A9E -  1692  2232  2737
 Cslc4   Abs 1002139 #F4A9B -  1690   318   506  1540  2273  2423
 Cslc5   Abs 1002136 #F4A98 -  1688   627   901   938   950  1029  1213  2299
                               2465
 Cslc6   Abs 1002133 #F4A95 -  1687  2810
 Csrc10  Abs 1002133 #F4A95 -  1686   928   943   988  2903
 Csrc12  Abs 1002139 #F4A9B -  1689  2182  2585  2662  2750
 Csrc13  Abs 1002142 #F4A9E -  1691  2848
 Csrc3   Abs 1002127 #F4A8F -  1683  2235  2803
 Csrc4   Abs 1002124 #F4A8C -  1682  2278  2289  2432  2918  3037
 Csrc5   Abs 1002121 #F4A89 -  1680   639  1007  1027  1208  2307  2456  2556
 D1=AVE  Ext                   -   907
=D1=SCR  Abs 1002028 #F4A2C -  1634   548   609  1121  1354  1414  1504  1623
                               1664  2243  2718  2888
 D1@AVS  Ext                   -   997
 DDL     Ext                   -  1639
 DDT     Ext                   -  1654
 Ddl     Abs 1002039 #F4A37 -  1639   110   430   711   714   840  1336  2696
                               2706  2866  2882
 DdlPur  Ext                   -  2684  2855
 DdlWrt  Abs 1002037 #F4A35 -  1638   447   830  1019  2689  2860  2924
 Ddt     Abs 1002066 #F4A52 -  1654   335   558   767   770   779  1643
=DdtRd   Abs 1002045 #F4A3D -  1642   764   985  1329  1407  2124
=ENDTAP  Abs 1000814 #F456E -   706  2626
 F->SC'  Abs 1002014 #F4A1E -  1627  1630
```

```
=F->SCR   Abs 1002002 #F4A12 -  1623   660  2599
=FINDF+   Abs 1001275 #F473B -  1098
 FINDF0   Abs 1001425 #F47D1 -  1170  1219
 FINDF1   Abs 1001477 #F4805 -  1197  1183  1189
 FINDF2   Abs 1001510 #F4826 -  1218  1203
 FINDF3   Abs 1001546 #F484A -  1243  1195
 FINDF4   Abs 1001549 #F484D -  1247  1142
=FINDFL   Abs 1001268 #F4734 -  1094
 FINDFe   Abs 1001576 #F4868 -  1261  1249  1255
 FINDFl   Abs 1001395 #F47B3 -  1153  1105
 FINDFn   Abs 1001519 #F482F -  1224  1180  1212
=FINDFx   Abs 1001415 #F47C7 -  1164  1108
 FINDf+   Abs 1001278 #F473E -  1099  1095
 FINDfn   Abs 1001385 #F47A9 -  1145  1135  1140
 FIND12   Abs 1001327 #F476F -  1121  1158
 FIND14   Abs 1001378 #F47A2 -  1141  1133  1145
 FINDle   Abs 1001391 #F47AF -  1149  1154
 FIXSPC   Ext               -   597
 FORM10   Abs 1000257 #F4341 -   312   302
 FORM20   Abs 1000280 #F4358 -   328   326
 FORM30   Abs 1000332 #F438C -   365   350
 FORM50   Abs 1000353 #F43A1 -   380   358
 FORM60   Abs 1000367 #F43AF -   391   381
 FORM65   Abs 1000390 #F43C6 -   412   403
 FORM70   Abs 1000394 #F43CA -   416   408
=FORMAT   Abs 1000230 #F4326 -   301   307
 Format   Ext               -   429
 GDIRS1   Abs 1001746 #F4912 -  1424
 GDIRS3   Abs 1001780 #F4934 -  1441  1429
 GDIRS4   Abs 1001832 #F4968 -  1478  1470
 GDIRS7   Abs 1001883 #F499B -  1517  1486  1500
 GDIRS8   Abs 1001890 #F49A2 -  1520  1475
 GDIRS9   Abs 1001892 #F49A4 -  1521  1516
 GDIRSE   Abs 1001765 #F4925 -  1430  1453
 GDIRSM   Abs 1001965 #F49ED -  1564  1499  1509
=GDIRST   Abs 1001688 #F48D8 -  1404  1322  2069
 GDIRSe   Abs 1001775 #F492F -  1436  1423
 GDIRSm   Abs 1001980 #F49FC -  1574  1577
 GDIRsE   Abs 1001767 #F4927 -  1431  1438
 GDIRsM   Abs 1001993 #F4A09 -  1584  1575
 GETALR   Ext               -  1416  1427  1455
=GETBYT   Abs 1003766 #F50F6 -  2993  2998
 GETD     Ext               -  1237
=GETDIR   Abs 1001653 #F48B5 -  1349  1218  1332
=GETDR'   Abs 1001580 #F486C -  1322  1165
=GETDR"   Abs 1001587 #F4873 -  1324
=GETDR#   Abs 1001589 #F4875 -  1325
=GETDR+   Abs 1001614 #F488E -  1333
 GETDev   Ext               -   968  1002
 GETST    Ext               -  2941
 GETZER   Ext               -  1234
=GT2BY0   Abs 1003762 #F50F2 -  2991  2204  2843
=GT2BYT   Abs 1003764 #F50F4 -  2992  2231  2257  2272  2363  2411  2414
 GTYPE    Ext               -   169
 Getd     Abs 1001534 #F483E -  1237    56   349   373   565
 Getmbx  Ext                    -  2309  2619
 Getzer  Abs 1001528 #F4838 -  1234  1248  1254  1485  1564
 INIT05  Abs 1000493 #F442D -   467   465
 INIT10  Abs 1000697 #F44F9 -   604   566
 INIT20  Abs 1000706 #F4502 -   609   587
 INITFL  Ext                    -  2932
*INITIL  Abs 1000438 #F43F6 -   442
 InpByt  Ext                    -   557
 LSTEN1  Abs 1002197 #F4AD5 -  1750  1741  1742  1749
*LSTENT  Abs 1002185 #F4AC9 -  1745
 LoopOK  Ext                    -  1660
 MOVEF,  Abs 1001114 #F469A -   982   974
 MOVEF1  Abs 1000978 #F4612 -   907  1035
 MOVEF2  Abs 1001031 #F4647 -   934   930
 MOVEF3  Abs 1001040 #F4650 -   938   935
 MOVEF4  Abs 1001127 #F46A7 -   986   976
 MOVEF5  Abs 1001207 #F46F7 -  1015  1005
 MOVEF6  Abs 1001228 #F470C -  1021  1003  1018
*MOVEFL  Abs 1000966 #F4606 -   898
 MOVEd1  Abs 1001130 #F46AA -   987   969
 MTYL    Ext                    -  1674
 MaxRec  Ext                    -   334
 Mtyl    Abs 1002109 #F4A7D -  1674   107   427   445   613   708   828  1015
                               1333  2594  2679  2834  2852  2922
 NEWF++  Abs 1002225 #F4AF1 -  2059  2053
 NEWF.,  Abs 1003732 #F50D4 -  2946  2945
 NEWF..  Abs 1003716 #F50C4 -  2941  2947
 NEWF.0  Abs 1003615 #F505F -  2896  2605
 NEWF.1  Abs 1003627 #F506B -  2903  2899
 NEWF.2  Abs 1003649 #F5081 -  2914  2905
 NEWF.3  Abs 1003709 #F50BD -  2935  2893  2929  2931
 NEWF.C  Abs 1003646 #F507E -  2913  2953
 NEWF.c  Abs 1003625 #F5069 -  2900  2911  2913
 NEWF01  Abs 1002250 #F4B0A -  2069  2064  2115
 NEWF03  Abs 1002271 #F4B1F -  2113  2112
 NEWF05  Abs 1002281 #F4B29 -  2121  2104
 NEWF1.  Abs 1002847 #F4D5F -  2449  2467
 NEWF10  Abs 1002298 #F4B3A -  2129  2449
 NEWF11  Abs 1002331 #F4B5B -  2138  2150
 NEWF12  Abs 1002335 #F4B5F -  2141  2137
 NEWF13  Abs 1002365 #F4B7D -  2159  2142  2146
 NEWF14  Abs 1002396 #F4B9C -  2176  2175
 NEWF15  Abs 1002683 #F4CBB -  2325  2263
 NEWF1a  Abs 1002417 #F4BB1 -  2191  2184
 NEWF1b  Abs 1002552 #F4C38 -  2271  2262
 NEWF1c  Abs 1002470 #F4BE6 -  2225  2207  2212
 NEWF1d  Abs 1002466 #F4BE2 -  2218  2194
 NEWF2.  Abs 1002357 #F4B75 -  2153  2165
 NEWF20  Abs 1002701 #F4CCD -  2338  2153
 NEWF25  Abs 1002703 #F4CCF -  2339  2340
 NEWF3.  Abs 1002361 #F4B79 -  2156  2177  2185
 NEWF30  Abs 1002713 #F4CD9 -  2349  2156
 NEWF34  Abs 1002784 #F4D20 -  2401  2358  2368
 NEWF4.  Abs 1002709 #F4CD5 -  2341  2350
 NEWF40  Abs 1002838 #F4D56 -  2441  2341  2373
 NEWF45   Abs 1002851 #F4063 -  2455  2448
 NEWF48   Abs 1002877 #F4D7D -  2470  2464
 NEWF50   Abs 1002882 #F4D82 -  2475  2138
 NEWF55   Abs 1002887 #F4D87 -  2484  2066
 NEWF60   Abs 1002898 #F4D92 -  2492  2480
 NEWF61   Abs 1002921 #F4DA9 -  2513  2537
 NEWF62   Abs 1002929 #F4DB1 -  2521  2500  2506
 NEWF66   Abs 1002982 #F4DE6 -  2571  2560
 NEWF67   Abs 1002995 #F4DF3 -  2584  2551  2570
 NEWF70   Abs 1003046 #F4E26 -  2605  2319  2486  2578  2580
 NEWF75   Abs 1003096 #F4E58 -  2629  2625
 NEWF8!   Abs 1003137 #F4E81 -  2661  2654
 NEWF8,   Abs 1003412 #F4F94 -  2789  2781  2786
 NEWF8.   Abs 1003133 #F4E7D -  2655  2664
 NEWF80   Abs 1003117 #F4E6D -  2641  2484  2541
 NEWF82   Abs 1003244 #F4EEC -  2714  2655
 NEWF83   Abs 1003401 #F4F89 -  2785  2783
 NEWF84   Abs 1003442 #F4FB2 -  2805  2317
 NEWF85   Abs 1003451 #F4FBB -  2811  2815
 NEWF87   Abs 1003506 #F4FF2 -  2842  2828
 NEWF90   Abs 1003546 #F501A -  2854  2600
 NEWF97   Abs 1003597 #F504D -  2887  2830  2835
 NEWF98   Abs 1003687 #F50A7 -  2926  2916
=NEWFI+   Abs 1002206 #F4ADE -  2045
=NEWFIL   Abs 1002234 #F4AFA -  2062  2058
 NEWFeT   Abs 1002917 #F4DA5 -  2509  2515
=NXTEN+   Abs 1002161 #F4AB1 -  1733  1201  2446  2550
=NXTENT   Abs 1002163 #F4AB3 -  1734  2431  2586
 PRMSGA   Ext                -   479
=PT2BYT   Abs 1003787 #F510B -  3036  2291  2758  2769  2793  2821
 PUGFIB   Ext                -  2618
 PURFIB   Ext                -  2239
 PUTALR   Ext                -   647
 PUTC     Ext                -  1657
 PUTC+    Ext                -  2632
 PUTD     Ext                -  1668
=PUTDIR   Abs 1003588 #F5044 -  2877   661
=PUTDR"   Abs 1003590 #F5046 -  2882
=PUTDR#   Abs 1003529 #F5009 -  2849
 PUTDX    Ext                -  1671
 PUTE     Ext                -    54   347   563
 Putc     Abs 1002072 #F4A58 -  1657  2712  2950
 Putd     Abs 1002097 #F4A71 -  1668   115   118   489   513  1342  2703  2709
                                2872
 Putdx    Abs 1002103 #F4A77 -  1671   452   486   500   537   542
 READI3   Ext                -   604
=READR#   Abs 1000852 #F4594 -   761
 READSU   Ext                -  1665
 Read     Ext                -  1642
 Read1    Ext                -   769
 Readsc   Abs 1002087 #F4A67 -  1664  1352  1412  1479  2131
 Readsu   Abs 1002091 #F4A6B -  1665   776   992  1122
 Rewind   Ext                -   713
 Rtncc    Abs 1000195 #F4303 -   174
 SCRTCH   Ext                -  1128  1484  1634  2133  2198  2230  2252  2283
```

```
                                     2290  2310  2362  2410  2751  2842
=SEEKA    Abs 1000135 #F42C7 -  107   443   762   826  1327  1405  1648
=SEEKB    Abs 1000142 #F42CE -  109
 SENDIT   Ext                -  260
 START    Ext                - 1677
 Seek     Ext                -  109
 Seeka    Abs 1002058 #F4A4A - 1648   983  1013  2122  2592  2677  2850  2920
 SetBP    Ext                - 1335  2695  2865
 Start    Abs 1002115 #F4A83 - 1677   958  1000  1102  2045
=TSTAT    Abs 1000083 #F4293 -   50   123   301   432   706   761   826   842
                               1651
 TSTAT1   Abs 1000109 #F42AD -   56
 TSTAT2   Abs 1000127 #F42BF -   64    60
=TSTATA   Abs 1000090 #F429A -   52    66   784  1349  1645
 Tstat    Abs 1002062 #F4A4E - 1651  2954
 Tstata   Abs 1002054 #F4A46 - 1645
 UTLEND   Ext                -  716  2635
=Utlend   Abs 1003111 #F4E67 - 2635  2630
=WRITE#   Abs 1000916 #F45D4 -  825
 WRITIT   Ext                - 1661
 Write    Ext                - 1638
 Write0   Ext                - 2881
 Writit   Abs 1002078 #F4A5E - 1660   621   837  1033  2935
 XchgT    Ext                -  766   778
 YMDHMS   Ext                - 1698
 YTML     Ext                - 1240
 Ymdhms   Abs 1002154 #F4AAA - 1698   633  2301  2742
 Ytml     Abs 1001540 #F4844 - 1240    50   549   975  1118  1344
 bFIB     Ext                - 2233
 eDIRFL   Ext                - 2508
 eDSPEC   Ext                - 1149
 eDTYPE   Ext                -  178
 eEFILE   Ext                - 2192
 eEOTAP   Ext                - 2514
 eNEWTA   Ext                -  306  2111
 eNFILE   Ext                - 1229
 eNOLIF   Ext                - 1437
 eNORAM   Ext                -  921
 ePIL     Ext                -  179
 eRANGE   Ext                -  412  1265
 eTAPE    Ext                -  303  1230  1432  2108  2218  2509
 eTSIZE   Ext                - 1430
 efPROT   Ext                - 2217
=fPROT    Abs 1002461 #F4BDD - 2216
 fTYPF#   Ext                - 2206
 hCPY5s   Ext                -  991  1157
 i/OFND   Ext                - 2234
 mENDM    Ext                - 2631
 mENDf    Ext                - 2711  2948
 mSDA     Ext                -  346   561   772  1120  1351  1410  1478  2130
 mSST     Ext                -   53
 pEOT     Ext                -  591
 sLoop?   Ext                - 1094  1098  1113  1153  1164
 sOVERW   Ext                - 2193
 sTALKA   Ext                - 2944
```

```
Input Parameters

  Source file name is NZ&CAS::MS

  Listing file name is NZ/CAS:TI:ML::-1

  Object file name is NZXCAS:TI:MS::-1

                                          111111
                                0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
   1               *
   2               *       N   N  ZZZZZ   &     H   H  N   N  D DD
   3               *       N   N      Z  & &    H   H  N   N  D   D
   4               *       NN  N     Z   & &    H   H  NN  N  D   D
   5               *       N N N    Z     &     HHHHH  N N N  D   D
   6               *       N  NN   Z     & & &  H   H  N  NN  D   D
   7               *       N   N  Z     &  &    H   H  N   N  D   D
   8               *       N   N  ZZZZZ   && &  H   H  N   N  DDDD
   9               *
  10               *
  11                       TITLE  POLL HANDLERS <840301.1747>
  12 F511B                 ABS    #F511B        TIXHP6 address (fixed)
  13                       RDSYMB  TIXEQU
```

```
                          STITLE DATA FILE HANDLERS
                *
                ***************************************************************
                ***************************************************************
                **
                ** Name:        hVER$ - Handler for the VER$ poll
                **
                ** Category:    POLL
                **
                ** Purpose:
                **      Add HPIL info to the VER$ string
                **
                ** Entry:
                **      P=0, R2[A] is AVMEMS, R3[A] is current end of VER$
                **      string
                **
                ** Exit:
                **      P=0, XM set, R3 updated to new location
                **
                ** Calls:       None
                **
                ** Uses.......
                **  Inclusive: A[W],C[W],D1,R3[A]
                **
                ** Stk lvls:    0
                **
                ** History:
                **
                **   Date     Programmer             Modification
                **   --------  ----------       ---------------------------------
                **   10/20/83     NZ            Changed first instruction from
                **                              CR3EX to C=R3 to fix bug with
                **                              insuffient memory for my response
                **                              destroying R3 pointer
                **   03/30/83     NZ            Changed to just RTNSXM (carry=?)
                **   11/22/82     NZ            Added code and documentation
                **
                ***************************************************************
                ***************************************************************
 F511B 11B     =hVER$  C=R3                    Get D1 pointer
 F511E 135             D1=C                    Put in D1
 F5121 112             A=R2                    Get AVMEME
 F5124 1CF             D1=D1- 16               Subtract length I'm adding
 F5127 137             CD1EX                   Now check if there is room!
 F512A 8B6             ?A>C   A
 F512D 42              GOYES  hVER$1           No room...clear carry, exit
 F512F 135             D1=C                    Room...update D1, R3
 F5132 10B             R3=C
 F5135 3F02            LCASC  \ HPIL:  \       (Last 2 filled in by PILVER)
       02A3
       C494
       0584
       02
 F5147 3300            LC(4)  =PILVER
       00
```

```
F514D 1557          DAT1=C W              Write it out!
F5151        hVER$1
F5151 00            RTNSXM                Set XM (say not handled)
             *****************************************************************
             *****************************************************************
             **
             ** Name:        hFINDF - Find file handler (pFINDF poll)
             **
             ** Category:    POLL
             **
             ** Purpose:
             **      Handle the POLL of (pFINDF), find a specified file
             **      in the given mass memory device for HPIL devices
             **
             ** Entry:
             **      R0: First 8 chars of file name
             **      R1[3:0]: Last 2 chars of file name
             **      D[A]: Device address as returned from FILSPx handler
             **      D[S]: Device type from FILSPx
             **
             ** Exit:
             **      Carry clear: (file found, no errors)
             **        R0[3:0]: starting record number
             **        R0[6:4]: device address
             **        R0[10:7]: 0000
             **        R0[14:11]: file type
             **        R0[15]: 8 (HPIL)
             **        R1[0]: entry # in the directory record (0-7)
             **        R1[3:1]: record # of the directory entry
             **        R1[5:4]: 00
             **        R1[9:6]: length of file in sectors
             **      Carry set:
             **        Error (C[3:0] are the error number)
             **
             ** Calls:       CKBITL,START,FINDFx,CSLC5,DATSTR,ENDTAP,<ERROR>
             **
             ** Uses:
             **  Exclusive:     C,        R0,R1,      P
             **  Inclusive: A,B,C,D[15:5],R0,R1,D0,D1,P,SCRTCH[63:0],ST[5:0]
             **
             ** Stk lvls:    6 (FINDFx)
             **
             ** History:
             **
             **   Date      Programmer            Modification
             **  --------   ----------    ---------------------------------
             **  10/14/83      NZ         Updated documentation
             **  04/01/83      SC         Wrote routine
             **
             *****************************************************************
             *****************************************************************
F5153 7D26  =hFINDF GOSUB  CKBITL         Check if HPIL and mass memory
F5157 500           RTNNC                 No...don't handle (XM set by CKBITL)
F515A 7DC2          GOSUB  Start          Set up the loop, D0
F515E 4E2           GOC    hFNFer         Error!
```

```
F5161 8E00           GOSUBL =FINDFx       Find the file on the device
      00
F5167 452            GOC    hFNFer        Error (either not found or loop err)
               *
               * If no carry, then C[3:0] is number of records, B[3:0] is the
               * directory pointer for the file, A[3:0] is then starting record
               * of the file on the device, and D1 points to the file type in
               * the directory entry (which is in SCRTCH[63:0])
               *
F516A 7143           GOSUB  Calc5         C[8:5]=number of records
F516E D2             C=0    A
F5170 BF2            CSL    W             C[9:6]=number of records
F5173 23             P=     3
F5175 A99            C=B    WP            C[3:0]=directory pointer for file
F5178 20             P=     0
F517A 109            R1=C                 R1 is set up for exit conditions
F517D 7010           GOSUB  DATSTR        Set up R0 exit conditions in C[W]
F5181 108            R0=C                 Put into R0 for exit
F5184 8EE9           GOSUBL Endtap        Rewind device, unaddress all
      A0
F518A 500            RTNNC                If carry clear, done!
F518D 6250     hFNFer GOTO  ERror         Error...set up C[3:0], RTNSC
               **************************************************************
               **************************************************************
               **
               ** Name:       DATSTR, DATST+ - Set up data from FINDFx in C[W]
               **
               ** Category:   LOCAL
               **
               ** Purpose:
               **      Set up the data from FINDFx for single register return
               **
               ** Entry:
               **      DATSTR:
               **        P=0
               **        D1 points to the file type in RAM (high byte first)
               **      DATST+:
               **        D[X]=device address
               **        A[3:0]=file start address (record number)
               **
               ** Exit:
               **      P=0
               **      Carry clear
               **      C[15]=8, C[14:11]=file type, C[6:4]=device address,
               **      C[3:0]=file start record number
               **
               ** Calls:      GT2BYT,CSLC7,CSLC4
               **
               ** Uses.......
               **  Exclusive: C[W],   P
               **  Inclusive: C[W],D1,P
               **
               ** Stk lvls:   1 (GT2BYT)(CSLC7)(CSLC4)
               **
               ** History:
```

```
              **
              **   Date      Programmer            Modification
              **  --------   ----------   ---------------------------------
              **  10/14/83      NZ        Added documentation
              **
              ***********************************************************
              ***********************************************************
F5191 AF2     DATSTR C=0    W
F5194 308            LC(1)  8             Will end up in C[S] (HPIL device)
F5197 8E4C           GOSUBL Gt2byt        Read file type from SCRTCH
      A0
F519D 8E00           GOSUBL =CSLC7        C[11]=8, C[10:7]=file type
      00
F51A3 AB8     DATST+ C=D    X             C[6:3]=0000, C[X]=device address
F51A6 7803           GOSUB  Cslc4
F51AA 23             P=     3
F51AC A96            C=A    WP            Copy file start addr from A[3:0]
F51AF 20             P=     0
F51B1 03             RTNCC
              ***********************************************************
              ***********************************************************
              **
              ** Name:         hCREAT - Handle POLL for pCREAT (HPIL device)
              **
              ** Category:     POLL
              **
              ** Purpose:
              **      Creates a new file in a mass memory device
              **
              ** Entry:
              **      D[X]=device address
              **      D[S]=device type (if HPIL, 8)
              **      STMTR0=first 8 chars of the file name
              **      STMTR1[3:0]=last 2 chars of the file name
              **      STMTR1[6:5]=offset to data (from file type table)
              **      STMTR1[13:10]=file type
              **      STMTR1[14]=create code
              **
              **      R2[A]=first parameter for CREATE:
              **      ------------------------------------------------------
              **      Code  Format Implied       Meaning of this parameter
              **      ----  ----------------     ------------------------
              **        0   Executable           Data length in nibbles
              **        1   DATA (fixed length)  Number of records
              **        2   SDATA (41C data)     Number of (8-byte) registers
              **        4   TEXT (variable len)  File length in bytes
              **        8   External type        File length in bytes
              **
              **      R3[A]=second parameter for CREATE:
              **      ------------------------------------------------------
              **      Code  Format Implied       Meaning of this parameter
              **      ----  ---------------      ------------------------
              **        1   DATA (fixed length)  Record length in bytes
              **      (any) (not DATA)           (ignored)
              **
```

```
                ** Exit:
                **      P=0
                **      Carry clear:
                **        File created on device, initialized if copy code#0
                **        R3[7:4]=start of data area for file
                **        R3[15:12]=directory entry pointer for the file
                **      Carry set:
                **        Error (C[3:0] is the error number)
                **
                ** Calls:      CKHPIL,START,CHKMAS,ASLC3,CSRC4,CSLC4,A-MULT,
                **             CSLC6,NEWFIL
                **
                ** Uses:
                **  Exclusive: A,  C,  R0-R4,   D1,P,             ST[8]
                **  Inclusive: A,B,C,D,R0-R4,D0,D1,P,SCRTCH[63:0],ST[8,4:0]
                **
                ** Stk lvls:   5 (NEWFIL) (File does not exist currently)
                **
                ** History:
                **
                **    Date     Programmer             Modification
                **  --------   ----------   ---------------------------------
                **  10/14/83       NZ       Updated documentation
                **  04/01/83       SC       Wrote routine
                **
                *************************************************************
                *************************************************************
F51B3           =hCREAT
F51B3 76D5             GOSUB  CKHPIL         Check if device=8
F51B7 500              RTNNC                 Not HPIL
F51BA 7D62             GOSUB  Start          Set up mailbox, etc
F51BE 412              GOC    ERror          Error starting up
F51C1 96B              ?D=0   B              Is this LOOP or NULL?
F51C4 80               GOYES  CRTF00         Yes...exit, don't handle
F51C6 8E00             GOSUBL =CHKMAS        Check acc ID
      00
F51CC 560              GONC   CRTF01         HP82161...continue
F51CF 6DE2 CRTF00      GOTO   hCPYXM         Not HP82161...don't handle!
                *-
                *-
F51D3 AF0  CRTF01      A=0    W
F51D6 11A              C=R2
F51D9 8AE              ?C#0   A              File size specified?
F51DC 80               GOYES  CRTF05         If so, continue
F51DE 20               P=     =eRANGE        Error...file size not specified
F51E0 6344 ERror       GOTO   hCPYer         Jump to "GOTO   Error"
                *-
                *-
F51E4 DA   CRTF05      A=C    A              A= First parm (# sectors/bytes)
F51E6 1F00             D1=(5) (=STMTR1)+5    Position to offset to data
      000
F51ED D2               C=0    A
F51EF 14F              C=DAT1 B              C[A] = Offset to data
F51F2 137              CD1EX                 Subtract 5 (length of length field)
F51F5 1C4              D1=D1- 5
```

```
F51F8 137              CD1EX
F51FB 178              D1=D1+ 9
F51FE 1574             C=DAT1 S                C[S] = Create code of the file
                *
                * Look at the create code and implementation field to compute
                * the total file length in bytes
                *
F5202 94E              ?C#0   S
F5205 01               GOYES  CRTF10
                *
                * Mainframe executable file (Create code zero)
                *
F5207 CA               A=A+C  A                Length is requested + subheader
                *
                * Implementation field for create code zero is length in nibs
                *
F5209 102              R2=A                    Implementation field in directory
F520C E4               A=A+1  A
F520E 81C              ASRB                    Convert to bytes (round up)
F5211 6860      CRTF4. GOTO   CRTF40           Continue create (A[A] is # bytes)
                *-
                *-
F5215 A46       CRTF10 C=C+C  S
F5218 48F              GOC    CRTF4.           Create code 8...R2, R3 are set up
F521B A46              C=C+C  S
F521E 5B0              GONC   CRTF20           Not create code 4 (check further)
                *
                * Variable length record file (LIF1 type) (Create code 4)
                *
F5221 AF2              C=0    W
F5224 10A              R2=C                    Implementation field in directory
F5227 425              GOC    CRTF40           Go always (A[A] is # bytes)
                *-
                *-
F522A A46       CRTF20 C=C+C  S
F522D 542              GONC   CRTF30           Not create code 2...must be 1
                *
                * HP41C data file
                *
                * The bytes of the implementation field in the directory are:
                *
                *  BYTE #      MEANING
                *  -------     ----------------------------------
                *    28        High order byte of size (in registers)
                *    29        Low order byte of size
                *    30        Protection field (0=unsecured, 1=secured)
                *    31        Unused
                *
F5230 AF2              C=0    W
F5233 AE6              C=A    B
F5236 F2               CSL    A
F5238 F2               CSL    A
F523A 814              ASRC
F523D 814              ASRC
F5240 AE6              C=A    B
```

```
F5243 10A          R2=C                     Implementation field in directory
F5246 8E00         GOSUBL =ASLC3            A[A]=file length in nibbles
      00
F524C 81C          ASRB                     A[A]=file length in bytes
F524F 4A2          GOC  CRTF40              Go always
            *-
            *-
            *
            * FIXED LENGTH RECORD DATA FILE
            *
F5252 AF6   CRTF30 C=A    W                 C[3:0]= # of logical records
F5255 8E00         GOSUBL =CSRC4
      00
F525B 113          A=R3
F525E 8AC          ?A#0   A                 Logical record length specified?
F5261 50           GOYES  CRTF35            Yes...use it
F5263 B24          A=A+1  XS                No...default to 256 bytes
F5266 23    CRTF35 P=     3
F5268 A96          C=A    WP                C[3:0]=Logical record length
F526B 20           P=     0
F526D 7142         GOSUB  Calc4
F5271 12A          CR2EX                    R2[7:4]=Rec length,R2[3:0]=# recs
F5274 8E00         GOSUBL =A-MULT           Compute file length
      00
            *
            * Now R2 = implementation field, A[A] = file length in bytes
            * Put the file size, file type and create code into R1
            * Put the file name into R0 and R4[15:12]
            *
F527A 1C3   CRTF40 D1=D1- 4
F527D AF2          C=0    W
F5280 15F3         C=DAT1 4                 C[3:0] = file type
F5284 8E00         GOSUBL =CSLC6            (into C[9:6])
      00
F528A 25           P=     5
F528C A96          C=A    WP                Copy all 6 nibs
F528F 173          D1=D1+ 4
F5292 1574         C=DAT1 S                 C[S] = Create code
F5296 109          R1=C
F5299 AF2          C=0    W
F529C 1CD          D1=D1- 14
F529F 15F3         C=DAT1 4                 C[3:0] = Last 2 chars of filename
F52A3 8E00         GOSUBL =CSRC4
      00
F52A9 10C          R4=C                     R4[15:12]= Last 2 chars of name
F52AC 1CF          D1=D1- 16
F52AF 1577         C=DAT1 W
F52B3 108          R0=C                     R0=First 8 characters of filename
F52B6 840          ST=0   =sOVERW           Do NOT overwrite an existing file!
F52B9 7000         GOSUB  =NEWFIL           Create the file on the tape
F52BD 500          RTNNC                    If no carry, no error...done
F52C0 6363         GOTO   hCPYer            Error...set it up
            ************************************************************
            ************************************************************
            **
```

```
                  ** Name:       hRDCBF - Read current record into FIB buffer
                  **
                  ** Category:   POLL
                  **
                  ** Purpose:
                  **      Read the current record of the FIB pointed to by STMTD1
                  **      into its FIB buffer
                  **      (FAST POLL)
                  **
                  ** Entry:
                  **      STMTD1 contains the FIB address for the file
                  **
                  ** Exit:
                  **      Carry clear, XM=0
                  **      Current record has been read into FIB buffer
                  **      A[W],D[W], and D1 are restored from SNAPBF (SNAPRS)
                  **      If error, jumps directly to BSERR after setting up error
                  **
                  ** Calls:      STBUF+,START,WRTADR,READRM,CSLC9,UTLEND,ACES=0,
                  **             <SNAPRS>,<ERRORX>
                  **
                  ** Uses:
                  **  Inclusive: A,B,C,D,D0,D1,P,ST[4:0]
                  **
                  ** Stk lvls:   3 (READRM)(START) {1 level saved during these}
                  **
                  ** Detail:
                  **      STBUF+ saves a stack level in D[11:7], RSTORE restores
                  **      it to the RSTK
                  **
                  ** History:
                  **
                  **   Date     Programmer            Modification
                  **  --------  ----------    ---------------------------------
                  **  10/14/83      NZ        Updated documentation
                  **  04/01/83      SC        Wrote routine
                  **
                  ***********************************************************
                  ***********************************************************
F52C4 7CC0        =hRDCBF GOSUB  STBUF+        Check if HPIL,set up D[X],D1;
                  *                            save RSTK level in D[11:7] if HPIL
F52C8 500                 RTNNC                Not HPIL
F52CB 7C51                GOSUB  Start         Set up the mailbox, D0
F52CF 4C2                 GOC    Errorx        Error exit
F52D2 7B31                GOSUB  WRTADR        Compute current record
                  *
                  * A[3:0] is the record number of the current record
                  *
F52D6 8E00                GOSUBL =READRM       Read the record to the buffer @ D1
      00
F52DC 4F1         RSTOR+ GOC     Errorx        Error exit
                  *
                  * Restore the RSTK saved in D[11:7]
                  * Set access mode in FIB to zero (not modified)
                  * Exit through SNAPRS to restore A,D,D0, and D1 from SNAPSV
```

```
               *
F52DF AFB    RSTORE C=D    W              Restore one RSTK level...
F52E2 8E00          GOSUBL =CSLC9         ...from D[11:7]
      00
F52E8 06            RSTK=C
               *
F52EA 7000          GOSUB  =Utlend        Clean up the loop (unaddress all)
F52EE 4D0           GOC    Errorx         Error exit
F52F1 7D00          GOSUB  ACES=0         Set access code to zero (clean)
F52F5 8D00   =sNAPRS GOVLNG =SNAPRS       Restore A, D, D0, D1
      000
               *-
               *-
F52FC 8C00   Errorx GOLONG =ERRORX
      00
               *-
               *-
               *
               * ACES=0 sets the access code of the current FIB to zero
               *
F5302 7B21   ACES=0 GOSUB  d0=FIB
F5306 16A           D0=D0+ =oACCSb        Position to the access code in FIB
F5309 D2            C=0    A
F530B 15C0          DAT0=C 1              Write out a zero (not modified)
F530F 6F64          GOTO   RtnXM0         Return with XM=0, carry clear
               ****************************************************************
               ****************************************************************
               **
               ** Name:        hWRCBF - Write current record to mass mem device
               **
               ** Category:    POLL
               **
               ** Purpose:
               **      Flush the current record for this FIB entry out to
               **      the mass memory device (buffer contents, current
               **      position, and record address are not changed by this
               **      operation)
               **      (FAST POLL)
               **
               ** Entry:
               **      STMTD1 contains the FIB address for the file
               **
               ** Exit:
               **      Carry clear, XM=0
               **      Current record has been flushed out to mass mem device
               **      A[W],D[W],D0, and D1 are restored from SNAPSV (SNAPRS)
               **      If error, jumps directly to BSERR after setting up error
               **
               ** Calls:       STBUF+,START,WRTADR,WRITEN,<RSTOR+>
               **
               ** Uses:
               **  Inclusive: A,B,C,D,D0,D1,P,ST[8,4:0]
               **
               ** Stk lvls:    3 (START)(WRITEN) {a level is saved in D for these
               **
```

```
                ** History:
                **
                **    Date     Programmer              Modification
                **  --------   ----------    --------------------------------
                **  10/14/83       NZ        Updated documentation
                **  04/01/83       SC        Wrote routine
                **
                ***************************************************************
                ***************************************************************
F5313 7D70      =hWRCBF GOSUB  STBUF+        Check if HPIL, set up D[X],D1;
                *                            save RSTK level in D[11:7] if HPIL
F5317 500               RTNNC                Not HPIL
F531A 7D01              GOSUB  Start         Set up the mailbox, D0
F531E 4DD               GOC    Errorx        Error exit
F5321 7CE0              GOSUB  WRTADR        Compute current record
F5325 8E00              GOSUBL =WRITEM       Write the buffer to mass mem device
      00
F532B 60BF              GOTO   RSTOR+        Restore RSTK level, exit
                ***************************************************************
                ***************************************************************
                **
                ** Name:       hRDNBF - Flush current FIB buffer, read next
                **
                ** Category:   POLL
                **
                ** Purpose:
                **      Flush the current FIB buffer out to the mass memory
                **      device (if altered), read the next record into the FIB
                **      buffer, and update the current position
                **      (FAST POLL)
                **
                ** Entry:
                **      STMTD1 contains the FIB address for the file
                **
                ** Exit:
                **      Successful:
                **        Carry clear, XM=0
                **        Next record is read into the FIB buffer
                **        Current position in FIB is set to start of next record
                **        File access nibble in FIB is set to zero
                **      Error:
                **        Direct jump to BSERR after setting up the error code
                **
                ** Calls:      STBUF+,START,WRTADR,WRITEM,STUPBF,GETMBX,READRM,
                **             ACES=0,<RSTORE>
                **
                ** Uses:
                **  Inclusive: A,B,C,D,D0,D1,P,ST[8,4:0]
                **
                ** Stk lvls:   3 (START)(WRITEM)(READRM) {1 level saved in D}
                **
                ** History:
                **
                **    Date     Programmer              Modification
                **  --------   ----------    --------------------------------
```

```
                   **  10/14/83      NZ         Updated documentation
                   **  04/01/83      SC         Wrote routine
                   **
                   ***************************************************************
                   ***************************************************************
     F532F 7160 =hRDNBF GOSUB  STBUF+          Check if HPIL, set up D[X], D0;
                   *                            save RSTK level in D[11:7] if HPIL
     F5333 500            RTNNC                 Not HPIL
     F5336 71F0           GOSUB  Start          Set up mailbox, D0
     F533A 41C            GOC    Errorx         Error exit
     F533D 70D0           GOSUB  WRTADR         Compute current record
     F5341 2C             P=     12             Check access (set up by STBUF+)
     F5343 90B            ?D=0   P              Is access nibble = 0?
     F5346 D0             GOYES  RDNB10         Yes...just read next record
     F5348 20             P=     0              No...
     F534A 8E00           GOSUBL =WRITEM        Write FIB buffer to mass memory
           00
     F5350 48A            GOC    Errorx         Error exit
                   *
     F5353 20      RDNB10 P=     0
     F5355 7E50           GOSUB  STUPBF         Set up D1 to start of FIB buffer
     F5359 78C0           GOSUB  Getmbx         Set D0 back to mailbox
     F535D E4             A=A+1  A              Select next record...
     F535F 8E00           GOSUBL =READRM        ...read next record
           00
     F5365 469            GOC    Errorx         Error exit
     F5368 769F           GOSUB  ACES=0         Set access code=0 (not modified)
     F536C 16E            D0=D0+ (oDBEGb)-(oACCSb)+5
     F536F 16D            D0=D0+ (oCPOSb)-(oDBEGb)-5  Position to current position
     F5372 146            C=DAT0 A              Read current position into C[A]
                   *
                   * The current position is the number of nibbles from data start
                   * for the file
                   *
     F5375 81E            CSRB                  Turn nibbles into bytes (forces
     F5378 816            CSRC                    the current position to be at an
     F537B 816            CSRC                    even byte boundary when done)
     F537E E6             C=C+1  A              Increment to next record number
     F5380 812            CSLC
     F5383 812            CSLC
     F5386 A76            C=C+C  W              Convert back to nibbles
     F5389 144            DAT0=C A              Write out updated current position
     F538C 7590           GOSUB  Getmbx         Set D0 back to the mailbox
     F5390 6E4F           GOTO   RSTORE         Clean up the loop, restore A,D,D0,D1
                   ***************************************************************
                   ***************************************************************
                   **
                   ** Name:         STBUF+,STUPBF - Set to read/write current recrd
                   ** Name:         WRTADR - Write device addr into FIB, <STUPBF>
                   **
                   ** Category:     LOCAL
                   **
                   ** Purpose:
                   **      STBUF+:
                   **        Check if HPIL...if not, RTNCC,XM=1
```

```
                 **        Save one RSTK level in D[11:7]
                 **      STUPBF:
                 **        Set D[12] to the access nibble for buffer, D1 to the
                 **        FIB buffer, D[A] to the device address, A[3:0] to
                 **        the current record position
                 **
                 ** Entry:
                 **      STMTD1 contains the FIB address of this file
                 **
                 ** Exit:
                 **      Carry clear:
                 **        Not HPIL...XM=1
                 **      Carry set:
                 **        D[12] is the access nibble for this buffer
                 **        D[11:7] is the RSTK value of the caller's caller
                 **        P=0
                 **        D[A] is the device address
                 **        A[3:0] is the current record number
                 **
                 ** Calls:      DO=FIB,CKHPI+,CSRC9,I/OFND,CHKASN
                 **
                 ** Uses.......
                 **  Inclusive: A[W],B[W],C[W],D[W],DO,D1,P
                 **
                 ** Stk lvls:   2 (CHKASN) {RSTK level already saved for this}
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **  --------   ----------   ----------------------------------
                 **  10/14/83       NZ       Added documentation
                 **
                 **************************************************************
                 **************************************************************
 F5394 7990  STBUF+ GOSUB  dO=FIB       Set DO to the start of the FIB
 F5398 16B          DO=DO+ =oDEVCb      Skip to device type
 F539B 1564         C=DATO S
 F539F 7DE3         GOSUB  CKHPI+       Check if HPIL
 F53A3 500          RTNNC               No...return, carry clear (XM=1)
 F53A6 07           C=RSTK              .......
 F53A8 D7           D=C    A            .......
 F53AA 07           C=RSTK              .. Save caller's caller RSTK value
 F53AC 8E00         GOSUBL =CSRC9       .. in D[11:7]
       00
 F53B2 AFF          CDEX   W            .......
 F53B5 06           RSTK=C              .......
                 *
 F53B7 7670  STUPBF GOSUB  dO=FIB       Set DO at FIB entry
 F53BB 16A          DO=DO+ =oACCSb      Position to access nibble
 F53BE 2C           P=     12
 F53C0 1560         C=DATO P            Read access nibble into C[12]...
 F53C4 A87          D=C    P            ...and save it in D[12]
 F53C7 20           P=     0
 F53C9 188          DO=DO- (oACCSb)-(oFBFNb)
 F53CC 146          C=DATO A            Read the FIB buffer number([X])
```

```
F53CF 8E00          GOSUBL =i/OFND
      00
F53D5 4B0           GOC    STUP10       Found the buffer
F53D8 300           LC(1)  =eSYSer      Not found..."System Error" (HPIL)
F53DB 20            P=     =ePIL        This is an HPIL message
F53DD 6E1F          GOTO   Errorx       Error exit
              *-
              *-
F53E1 167   STUP10  DO=DO+ (oCOPYb)-(oFBFMb)
F53E4 16E           DO=DO+ (oDBEGb)-(oCOPYb)+4
F53E7 15E6          C=DAT0 7            C[6:0] is device address info
F53EB 8E00          GOSUBL =CHKASN      Set up for START to get the addr
      00
F53F1 D7            D=C    A            (Info for START into D[3:0])
              *
F53F3 183   STUP20  DO=DO- 4            Position DO to data begin
F53F6 15A3          A=DAT0 4            A[3:0]=data start record number
F53FA 163           DO=DO+ 4
F53FD 16E           DO=DO+ (oCPOSb)-(oDBEGb)-4
F5400 AF2           C=0    W
F5403 146           C=DAT0 A            C[A]=current position (in nibbles)
F5406 81E           CSRB                Convert nibble position to byte
F5409 F6            CSR    A
F540B F6            CSR    A            C[A] is number of records offset
F540D CA            A=A+C  A            A[A] is current record number
F540F 02            RTNSC               Carry set=set up for HPIL
              *-
              *-
F5411 7C10  WRTADR  GOSUB  d0=FIB
F5415 16C           DO=DO+ (oFBEGb)
F5418 16B           DO=DO+ (oDBEGb)-(oFBEGb)+4
F541B DB            C=D    A
F541D 1543          DAT0=C X            Store device address into FIB
F5421 7ECF          GOSUB  STUP20       Set A[3:0] to current record #
F5425 8C00 =Getmbx  GOLONG =GETMBX      Set DO back to the mailbox
      00
              *-
              *-
F542B 8C00 Start    GOLONG =START
      00
              *-
              *-
F5431 8D00 d0=FIB   GOVLNG =DO=FIB
      000
              ****************************************************************
              ****************************************************************
              **
              ** Name:        hPRTCL - Print class poll handler for HPIL
              **
              ** Category:    POLL
              **
              ** Purpose:
              **       Respond to the PRINT class poll, if this is "OUTPUT"
              **       or "PLOT" (and the device is HPIL!)
              **
```

```
            ** Entry:
            **      P=0, HEXMODE, D0 @ =MLFFLG
            **      If this is HPIL and (OUTPUT or PLOT):
            **        STMTR1[8:2] is the 7 nibble device specifier
            **        STMTR1[10:9] is the position for OUTPUT/PLOT
            **        STMTR1[12:11] is the length for OUTPUT/PLOT
            **        STMTR0[0] is either OUTPTt or PLOTt
            **
            ** Exit:
            **      Carry clear, P=0, HEXMODE
            **      XM=0:
            **        Entry conditions for STMTRx are maintained
            **        STMTR0[5:1] is the address of PRASCI
            **        STMTR0[10:6] is the address of STMTR1+9
            **      XM=1: NOT handled by me!
            **
            ** Calls:       TSAVD1,CSLC5,CSLC3,TSAV2C,PRTIS+,TRES2C,CSRC3,CSRC
            **
            ** Uses.......
            **  Exclusive:      C,  D0,P
            **  Inclusive: A,B,C,D,D0,P,FUNCD0,FUNCD1,FUNCR1
            **
            ** Stk lvls:   3 (PRTIS+) (2 RSTK levels saved first)
            **
            ** NOTE: Must NOT use D1, status bits!
            **
            ** History:
            **
            **    Date      Programmer              Modification
            **  --------    ----------     --------------------------------
            **  12/15/82        NZ         Added documentation
            **
            ****************************************************************
            ****************************************************************
F5438       =hPRTCL
            *
            * D0 @ MLFFLG now
            *
F5438 D2           C=0    A
F543A 14E          C=DAT0 B               Read MLFFLG, type
F543D 80D1         P=C    1               P=type
F5441 890          ?P=    =OUTPTt         "OUTPUT" type?
F5444 70           GOYES  hPRTCO          Yes...do it!
F5446 880          ?P#    =PLOTt          "PLOT" type?
F5449 84           GOYES  hPRTXM          No...exit, XM=1
            *
            * Need to re-setup the loop now!
            *
F544B 8E00 hPRTCO  GOSUBL =TSAVD1         Save D1 temporarily (restored by
      00
            *                               PRTIS+)
F5451 1F00         D1=(5) (=STMTR1)+2     ...point to 7 nibble handler...
      000
            *+
F5458 07           C=RSTK                 Save 2 RSTK levels,ST in FUNCR1
```

```
F545A 7150         GOSUB  Calc5
F545E 07           C=RSTK
F5460 8E00         GOSUBL =CSLC3
      00
F5466 09           C=ST
F5468 8E00         GOSUBL =TSAV2C       (Save in FUNCR1)
      00
            *+
F546E 8E00         GOSUBL =PRTIS+       ...set it all up!...
      00
            *+
F5474 8E00         GOSUBL =TRES2C       Restore RSTK levels before check
      00
F547A 0A           ST=C                 Restore status bits
F547C 8E00         GOSUBL =CSRC3
      00
F5482 06           RSTK=C               Restore second level
F5484 8E00         GOSUBL =CSRC5
      00
F548A 06           RSTK=C               Restore first level
            *+
F548C 831          ?XM=0                Handled?
F548F 60           GOYES  hPRTC1        Yes...continue
F5491 6B20  hPRTXM GOTO   hCPYXM        No...exit,XM=1,carry clear
            *-
            *-
F5495       hPRTC1
            *
            * Loop is set up now, A[A] is address of PRASCI
            *
F5495 25           P=     5
F5497 3400         LC(5)  (=STMTR1)+9   Position and length for OUTPUT
      000
F549E 20           P=     0
F54A0 1B00         D0=(5) (=STMTR0)+1   Handler address
      000
F54A7 D6           C=A    A             Copy handler address from A[A]
F54A9 15C9         DAT0=C 10            (Write it out!)
F54AD 03           RTNCC                Done!
            ***********************************************************
            ***********************************************************
            **
            ** Name:        hCOPYx - Copy POLL handler (HPIL)
            **
            ** Category:    STEXEC
            **
            ** Purpose:
            **       Handler for COPY execute POLL
            **
            ** Entry:
            **       A[W] is first 8 chars of filename
            **       R0[3:0] is last 2 chars
            **       D[A] is source device information
            **       P=0
            **       ST(=EXTDV) set if either of both file specs are HPIL
```

```
              **       ST(=sUNDEF) set if both file names are zero (undef'd)
              **       ST(=sCARD) set if destination device is CARD or PCRD
              **       R2 has destination device info!!!!!
              **       SAVSTK: (offsets from SAVSTK pointer)
              **          -62 => -1: (POLL save area)
              **          -87 => -63: (Source info)
              **         -112 => -88: (Destination info)
              **
              **         Info format: low mem         ---          high mem
              **                      First 8 chars...last 2 chars...device
              **
              ** Exit:
              **       P=0
              **       Carry set: Error...error # in C[3:0]
              **       Carry clear:
              **         XM=0: handled
              **         XM=1: not handled
              **       SAVSTK unchanged from entry
              **
              ** Calls:      ASLC4;6;12,ASRC3;4;5;10,BLANKC,CHRIN-,CHKBIT,
              **             CLMODE,CRTF,CSLC2;5;10,CSRC5;10,DO=FRO,D1=S20,
              **             DdtRd,ENDTAP,FINDF,FINDFL,FNDMB+,FRAME-,GETBYT,
              **             GETD,GETDev,GETDST,GETMBX,GETTYP,GETX,hCPY5S,
              **             hCPYE.,hCPYEL,hCPYXM,hRNMsd,LEXBF+,MOVEFL,NEWFI+,
              **             PRGFMF,PUTE,RDINFD,RDINFO,READSU,SEEKA,TRES2C,
              **             TSAV2C,TSTAT,UTLEND
              **
              ** Uses.......
              **  Inclusive: A-D,RO-R4,DO,D1,P,ST[8,4:0],FUNCRO;1,FUNCDO,SCRTCH
              **
              ** Stk lvls:   6 (NEWFIL;PUGFIB)
              **
              ** History:
              **
              **    Date     Programmer              Modification
              **  --------   ----------   ---------------------------------
              **  12/21/83      NZ        Added check for zero-length file
              **                          in hCPY50...was sending an SDA
              **                          even if no more data was expected
              **                          from the device
              **  10/30/83      NZ        Added fix for bug...if in device
              **                          mode and receive a zero-length file
              **                          which already exists in RAM, the
              **                          machine would lock up.  DO was
              **                          being destroyed in the check for
              **                          the file existing (FINDF).
              **  09/07/83      NZ        Added check for destination=HPIL
              **                          for COPY from mainframe to external
              **  05/12/83      NZ        Removed convert to upper case for
              **                          destination
              **  01/12/83      NZ        Updated documentation
              **
              *************************************************************
              *************************************************************
    F54AF 812 Calc5   CSLC
```

```
F54B2 8C00 Calc4   GOLONG =CSLC4
      00
                *-
                *-
F54B8      =hCOPYx
F54B8 870          ?ST=1  =sEXTDV      Is any of this external device?
F54BB 80           GOYES  hCPY10       Yes...continue
F54BD      hCPY6.
           *
           * Copy tape to tape (whole volume)
           *
           * TWO cases...both on same loop vs. on different loops!
           *
F54BD 21   hCPYXM  P=     1
F54BF 0D           P=P-1               Clear carry...
F54C1 00           RTNSXM              Return, carry clear
           *-
           *-
F54C3 872  hCPY10  ?ST=1  =sCARD       Is either one CARD?
F54C6 7F           GOYES  hCPYXM       Yes...not for me!!!
F54C8 DB           C=D    A
F54CA B06          C=C+1  P            Check if source is mainframe
F54CD 442          GOC    hCPY3.       Source is (not specified)
F54D0 DB           C=D    A            Not (not specified)...
F54D2 A06          C=C+C  P            Check if source is HPIL
F54D5 5C1          GONC   hCPY3.       Source is NOT HPIL...copy main
           *
           * Source is external...check if HP-IL
           *
F54D8 90E          ?C#0   P
F54DB 2E           GOYES  hCPYXM       Not for me!
           *
           * Source IS HP-IL...check further
           *
F54DD 11A          C=R2                Read back destination info
F54E0 D5           B=C    A            Save device in B[A] for loop>loop
F54E2 B06          C=C+1  P            Check if dest is (not specified)
F54E5 480          GOC    hCPY5.       Destination is (not specified)
F54E8 A05          B=B+B  P            Check if destination is HPIL
F54EB 451          GOC    hCPY12       Destination is external
F54EE 62B2 hCPY5.  GOTO   hCPY50       Destination is not HPIL
           *-
           *-
F54F2      hCPY3.
           *
           * Check if destination is HPIL
           *
F54F2 11A          C=R2
F54F5 A06          C=C+C  P            This MUST carry...sEXTDV was set
F54F8 90E          ?C#0   P            Is this HPIL?
F54FB 2C           GOYES  hCPYXM       No...don't handle!
F54FD 6A21         GOTO   hCPY30       Copy from main to loop
           *-
           *-
F5501      hCPY12
```

```
                  *
                  * Destination is external...check if HP-IL
                  *
F5501 90D                ?BM0   P
F5504 98                 GOYES  hCPYXM         Not HP-IL!
                  *
                  * Source, destination are both HPIL...check if name given
                  *
F5506 871                ?ST=1  =sUNDEF        Names undefined?
F5509 4B                 GOYES  hCPY6.         Yes...copy tape to tape
                  *
                  * Named HPIL to HPIL transfer
                  *
F550B F7                 DSR    A              Shift address into D[X]
                  *
                  * Copy a file from HPIL to HPIL (may be same device)
                  *
                  * first find the source file
                  *
F550D 8E00               GOSUBL =FINDFL        Find the source file
      00
F5513 560                GONC   hCPY22         OK...continue
F5516 6392               GOTO   hCPY57         Error...set it, return!
                  *_
                  *_
                  *
                  * Now save starting sector, etc in R3
                  *
F551A 8E00 hCPY22  GOSUBL =CSRC5         Temp put # sectors in C[15:11]
      00
F5520 D6                 C=A    A              Copy starting sector to C[A]
F5522 74B6               GOSUB  Calc10         Put # of sectors in C[9:5]
F5526 DB                 C=D    A              Copy device address to C[A]
F5528 10B                R3=C                  Save all in R3!
                  *
                  * Now R3[A] is device address, [9:5] is # sectors, [14:10] is
                  * first sector address
                  *
                  * Now check the file type for private, copy code, unknown, etc
                  *
F552B 7B77               GOSUB  GETTYP         Read in file type & check it
F552F 460                GOC    hCPY23         OK...found it!
F5532 6CB2 hCPYtP  GOTO   hCPYtp         Illegal (unrecognized) type
                  *_
                  *_
F5536      hCPY23
                  *
                  * B[S] is offset into type table, B[A],C[A] point to entry,
                  * A[A] is file type
                  *
F5536 135                D1=C                  Set D1 @ table start
F5539 A4D                B=B-1  S              Convert to base zero entry
F553C AC2                C=0    S
F553F B46                C=C+1  S              C[S] is now max non-private type
F5542 B49                C=C-B  S              If carry, then private
```

```
 962 F5545 560            GONC   hCPY24        OK...not private
 963 F5548 6997           GOTO   hPURSC        Illegal type (private)
 964                *-
 965                *-
 966                *
 967                * Type is acceptable to copy!!
 968                *
 969                * (Chose the FIRST type...not secure or private)
 970                *
 971 F554C 17F  hCPY24  D1=D1+ 16             Point to UN type
 972 F554F 15B3           A=DAT1 4             Read the type
 973 F5553 7C37           GOSUB  D1=S20        Position to TYPE in SCRTCH
 974 F5557 1593           DAT1=A 4             Write it out for now
 975                *
 976                * Now set up with destination name, etc for NEWFIL
 977                *
 978 F555B 8EC8           GOSUBL hRNMsd        Read dest, convert to UC, etc
           80
 979                *
 980                * Now A[W], R0[3:0] is filename, D[A] is unchanged, R1 is dest
 981                * address
 982                *
 983                * Check if destination device is (not specified) or (HPIL)
 984                *
 985 F5561 119            C=R1
 986 F5564 816            CSRC                 Rotate into C[S], [X]
 987 F5567 B46            C=C+1  S
 988 F556A 440            GOC    hCPY25        Not specified...go on!
 989                *
 990                * Address is specified...put it in D!
 991                * (To get here, destination address had to be specified)
 992                *
 993 F556D D7             D=C    A
 994 F556F 120  hCPY25  AR0EX                Put first 8 chars in R0...
 995 F5572 8E00           GOSUBL =ASRC4        ...move last two to A[15:12]...
           00
 996 F5578 104            R4=A                 ...and put in R4[15:12]!
 997                *
 998                * New name is now set up...set up type and size
 999                *
1000 F557B 7417           GOSUB  D1=S20        Point to file type
1001 F557F AF2            C=0    W             Preclear high nibbles!
1002 F5582 15F3           C=DAT1 4             Read the type (written above!)
1003 F5586 113            A=R3                 Get back # sectors to A[9:5]
1004                *
1005                * SOURCE info:
1006                *
1007                * A[A] is device addr, A[9:5] is # sectors, A[14:10] is sector
1008                *   address of data
1009                *
1010 F5589 7F07           GOSUB  D0=FR0        Set D0=FUNCR0
1011 F558D 1507           DAT0=A W             Save R3 contents in FUNCR0
1012 F5591 8E00           GOSUBL =ASRC5        # sectors to A[A]
           00
1013 F5597 741F           GOSUB  Cslc5         File type to C[8:5]
```

```
F559B D6              C=A    A             Copy # sectors
F559D F2              CSL    A             # sectors*16
F559F BF2             CSL    W             # sectors*256 (# bytes) in C[5:0]
F55A2 109             R1=C                 R1 is now set up for NEWFIL!
F55A5 1D00            D1=(2) (=SCRTCH)+56  Point to implementation bytes
F55A9 15F7            C=DAT1 8
F55AD 10A             R2=C                 R2 is set up for NEWFIL
F55B0 DB              C=D    A             Copy address to C[A]
F55B2 8E00            GOSUBL =TSAV2C       Save source address in STMTR1
      00
                *
                * Now set up to call NEWFIL to create the file
                *
F55B8 840             ST=0   =sOVERW       Do NOT overwrite the file!
F55BB 8E00            GOSUBL =NEWFI+       START, Create the file
      00
F55C1 426             GOC    hCPYer        Error
                *
                * Now R3 is B[W] contents from NEWFIL, FUNCR1 is unchanged
                *
F55C4 8E00            GOSUBL =TRES2C       Restore source address to C[A]
      00
F55CA 109             R1=C                 Store address in dest field
F55CD 7BC6            GOSUB  D0=FR0        Set D0 to FUNCR0
F55D1 1567            C=DAT0 W             Recall source file info to C[W]
F55D5 10A             R2=C                 Store address in source field
F55D8 7B86            GOSUB  Csrc10        Get source sector addr to C[A]
F55DC D5              B=C    A             Sector address of source
F55DE 113             A=R3
F55E1 8E00            GOSUBL =ASRC3        Get file start into A[4:1]
      00
F55E7 F4              ASR    A             (Clear high nibble of A[A])
F55E9 11A             C=R2                 Recall # of sectors to C[9:5]
F55EC D6              C=A    A             Get sector # of destination
F55EE 10B             R3=C                 R3 is now set up for MOVEFL
                *
                * Now set up for MOVEFL
                *
F55F1 8E00            GOSUBL =MOVEFL       Move the file between devices
      00
F55F7 4C2             GOC    hCPYer        Error
                *
                * Now clean up the tape(s) (rewind, etc)
                *
F55FA 11A             C=R2                 Get source addr from R2[A]
F55FD D7        hCPY28 D=C   A             Save in D[A]
F55FF 8E00            GOSUBL =CHKBIT       Check if HP82161 tape
      00
F5605 521             GONC   hCPY29        Not a HP82161...try next device
F5608 8E00            GOSUBL =FNDMB+       Find that mailbox
      00
F560E 451             GOC    hCPYer        Error if carry
F5611 7316            GOSUB  Endtap        HP82161...clean up (rewind,etc)
F5615 4E0             GOC    hCPYer        Error if carry
F5618           hCPY29
```

```
F5618 119              C=R1                     Get dest addr from R1[A]
F561B 937              ?C#D    X                Is this a new device?(addr,loop#)
F561E FD               GOYES   hCPY28           Yes...clean it up also
F5620 6E51             GOTO    RtnXMO           Done...exit
                *-
                *-
F5624 6296      hCPYer GOTO    Error            Error...set C[3:0] to code
                *-
                *-
F5628           hCPY30
                *
                * Code to set up mainframe to loop copy
                *
                * First find the source file in the mainframe
                *
                * Filename is already in A[W]...shift D[A] around for FINDF
                *
                * (If filename is undefined i.e. zero, FINDF will error out)
                *
F5628 817              DSRC                     Put D[0] into D[S]...
F562B 8F00             GOSBVL =FINDF            Find the file
      000
F5632 3300             LC(4)   =eFnFND          File not found
      00
F5638 400              RTNC                     Return with error in C[3:0]
                *
                * D1 points to the start of file now
                *
                * Get the info about the file and put it in R1-R2
                *   (size, type, data start address, implementation bytes)
                *
F563B 17F              D1=D1+ =oFTYPh           Skip name
F563E 173              D1=D1+ =oFLAGh           Skip type
                *
                * Now pointing to the flag field...read protection, copy code
                *
F5641 14B              A=DAT1 B                 Flags (bit 0=SE,bit 1=PR)
F5644 17B              D1=D1+ (oFLENh)-(oFLAGh) Leave D1 @ file length
F5647 302              LCHEX  2                 Privacy bit
F564A 0E02             C=C&A  P                 (Could be A for code space)
F564E 90A              ?C=0   P
F5651 60               GOYES  hCPY31            Not private...continue
                *
                * Attempt to copy a private file...error!
                *
F5653 6E86             GOTO   hPURSC            Protection error
                *-
                *-
F5657           hCPY31
                *
                * File is legal to copy...check copy code
                *
F5657 F4               ASR    A                 A[0] is now copy code
                *
                * Following instruction clears C[A] - used below this!
```

```
                  *
F5659 D2                  C=0     A
F565B A86                 C=A     P                Read copy code into C[0]
F565E AF0                 A=0     W                Clear A[W]
F5661 143                 A=DAT1  A                Pre-read file length into A[W]!
F5664 25                  P=      =1FLENh          Skip length of length field
F5666 80F0                CPEX    0
F566A EA                  A=A-C   A
F566C 80F0                CPEX    0                Restore copy code
F5670 20                  P=      0                Reset P=0
                  *
                  * Decode what the copy code is!
                  *
F5672 90A                 ?C=0    P                Is this copy code 0?
F5675 42                  GOYES   hCPY33           Yes...do it
F5677 A06                 C=C+C   P                Unknown type? (CC=8)
F567A 4A1                 GOC     hCPY32           Yes...can't handle it
F567D A06                 C=C+C   P                ASCII text file? (CC=4)
F5680 560                 GONC    hCPY3a           No...keep checking
F5683 6580                GOTO    hCPY34           Yes...do it
                  *-
                  *-
F5687 A06         hCPY3a  C=C+C   P                HP41C data file? (CC=2)
F568A 560                 GONC    hCPY3b           No...HP-71 data file
F568D 6580                GOTO    hCPY36           Yes...do it
                  *-
                  *-
                  *
                  * HP-71 fixed length data file (CC=1)
                  *
F5691 6FA0        hCPY3b  GOTO    hCPY38
                  *-
                  *-
F5695             hCPY32
                  *
                  * Unknown file type...exit or poll?
                  *
F5695 672E                GOTO    hCPYXM           I give up!
                  *-
                  *-
F5699             hCPY33
                  *
                  * Mainframe executable file (COPY CODE = 0)
                  * D1 points to file length field
                  * A[W] is file length in nibbles (data + subheader)
                  *
F5699 102                 R2=A                     Set implementation bytes<==length
                  *
                  * D1 is pointing at FLENh, A[W] is length in bytes, C[A] is 5.
                  *
F569C 101         hCPY3-  R1=A                     Put file len in nibs in R1[5:0]
                  *
                  * Now get actual file start address
                  *
F569F 305                 LC(1)   =1FLENh          Offset to data for mainframe
```

```
F56A2 133  hCPY3+  AD1EX
F56A5 131          D1=A                  Copy D1==>A
F56A8 CA           A=A+C  A              Add offset to data start
F56AA 8E00         GOSUBL =ASLC4         Rotate into A[8:4]
      00
           *
           * Now get the file type (from the source)
           *
F56B0 1CF          D1=D1- (oFLENh)-(oFTYPh) Move to file type
F56B3 15B3         A=DAT1 4              Read it
           *
           * check if BASIC file...if so, set flag "BASIC"
           *
           Basic   EQU    0
F56B7 840          ST=0   Basic
F56BA 3341         LC(4)  =fBASIC
      2E
F56C0 23           P=     3
F56C2 916          ?A#C   WP
F56C5 50           GOYES  hCPY3f
F56C7 850          ST=1   Basic          Set Basic flag
F56CA      hCPY3f
           *
           * Rotate file type into A[9:6], file start into A[14:10]
           *
F56CA 8E00         GOSUBL =ASLC6
      00
F56D0 119          C=R1                  Read back the length...
F56D3 E6           C=C+1  A              ...add 1 to round UP...
F56D5 81E          CSRB                  ...convert to bytes!
F56D8 DA           A=C    A              (NOT WP: nibble 5 is always zero)
F56DA 101          R1=A                  Now size, type, and start are set
F56DD 860          ?ST=0  Basic          Is this NOT a BASIC file?
F56E0 52           GOYES  hCPY3g         Not BASIC...continue
           *
           * This is a BASIC file...chain it first!
           *
F56E2 8E00         GOSUBL =ASRC10        File start ==> A[A]
      00
F56E8 20           P=     0
F56EA D2           C=0    A
F56EC 3113         LC(2)  (=oFLENh)+(oBSsod)
F56F0 EA           A=A-C  A
           *
           * Now A[A] is the start of the file header
           *
F56F2 11A          C=R2
F56F5 10B          R3=C                  Save R2 in R3 for now...
F56F8 8F00         GOSBVL =CHAIN-        Chain the file
      000
F56FF 11B          C=R3
F5702 10A          R2=C                  Restore R2 from R3!
F5705 6A50 hCPY3g  GOTO   hCPY39         Get the destination name, do it!
           *-
           *-
```

```
F5709           hCPY34
                *
                * Handler for ASCII (TYPE=1) text files (COPY CODE = 4)
                *
                * D1 points to FLENh, A[W] is file length in nibbles
                *
F5709 AF2               C=0     W
F570C 10A               R2=C                    Clear implementation bytes
F570F 6C8F              GOTO    hCPY3-          Continue at common code
                *-
                *-
F5713           hCPY36
                *
                * Handler for HP41C data file (COPY CODE = 2)
                * D1 points to file length field, A[W] is file length in nibbles
                *
F5713 101               R1=A                    Save file length in R1[5:0](nibs)
F5716 AF2               C=0     W               Check if it fits...
F5719 D6                C=A     A               C[W] is file length
F571B 972               ?A=C    W               Contained in [A] field?
F571E 60                GOYES   hCPY37          OK...continue
F5720 68B0              GOTO    hCPY5!          Too big...size error
                *-
                *-
F5724 8E00      hCPY37  GOSUBL  =CSRC5          Rotate high byte to C[15:14]
      00
F572A AB6               C=A     X               Copy low byte (ignore low nibble)
F572D F6                CSR     A
F572F 8E00              GOSUBL  =CSLC2          C[B] is high byte, C[3:2] is low
      00
F5735 10A               R2=C                    Set up implementation bytes!
F5738 D2                C=0     A
F573A 305               LC(1)   =o41sod         Offset for 41C data file
F573D 646F              GOTO    hCPY3+
                *-
                *-
F5741           hCPY38
                *
                * Handler for fixed length data files (COPY CODE = 1)
                * D1 points to file length field, A[W] is file length in nibbles
                *
F5741 308               LC(1)   8               Subtract impl bytes from length
F5744 EA                A=A-C   A
F5746 101               R1=A                    Save actual file length in nibs
F5749 174               D1=D1+  =lFLENh         Skip to implementation fields
F574C 15B7              A=DAT1  8               Read them...
F5750 102               R2=A                    Set up implementation field in R2
F5753 111               A=R1                    Get file length back for hCPY3+
F5756 1C4               D1=D1-  =lFLENh         Move back to FLENh
F5759 30D               LC(1)   (=lFLENh)+8     Point past implementation field
F575C 654F              GOTO    hCPY3+          Finish up
                *-
                *-
F5760           hCPY39
F5760 72F4              GOSUB   Rdinfd          Read the info from SAVSTK
```

```
 1273                *
 1274                * Now A is first 8 chars, R0 is last 2 chars, D is device info
 1275                *
 1276 F5764 817             DSRC                    Shift device info...addr->D[A]
 1277 F5767 120             AR0EX                   Put first 8 chars in R0
 1278 F576A 8E00            GOSUBL =ASLC12          Rotate last 2 chars to A[15:12]
            00
 1279 F5770 104             R4=A                    Now last 2 chars in R4[15:12]
 1280                *
 1281                * Do the actual transfer now
 1282                *
 1283                * (Get the mailbox back - NEWFI+ does START, NEWFIL)
 1284                *
 1285 F5773 850             ST=1   =sOVERW          Allow overwriting existing file
 1286 F5776 8E00            GOSUBL =NEWFI+          Create a new file on the tape
            00
 1287 F577C 436             GOC    hCPY5a           Error...set it up!
 1288 F577F 821      RtnXM0 XM=0                    No error...return CC, XM=0
 1289 F5782 03              RTNCC
 1290                *-
 1291                *-
 1292 F5784 8E00   =CKBITL GOSUBL =CHKBIT           Check if bit for HP82161 is set
            00
 1293 F578A 501             GONC   CKHPIx           No carry...set XM (not HP82161)
 1294 F578D ACB   =CKHPIL C=D    S
 1295 F5790 A46   =CKHPI+ C=C+C  S                  Check if external
 1296 F5793 570             GONC   CKHPIx           Not external...don't handle
 1297 F5796 94A             ?C=0   S                HPIL?
 1298 F5799 00              RTNYES                  Yes...return, set carry
 1299 F579B 00      CKHPIx  RTNSXM                  Carry clear, XM=1
 1300                *-
 1301                *-
 1302 F579D 6F1D hCPYxm  GOTO   hCPYXM
 1303                *-
 1304                *-
 1305 F57A1       hCPY50
 1306                *
 1307                * Copy from loop to main
 1308                *
 1309                * A[W] is first 8 chars, R0[3:0] is last 2 chars
 1310                * D[A] is device of source
 1311                *
 1312 F57A1 817             DSRC                    Shift device back to normal
 1313 F57A4 8E00            GOSUBL =FINDFL          Save first 8, START,FINDFx
            00
 1314 F57AA 06      hCPY5?  RSTK=C                  Save (possible) error message
 1315                *
 1316                * Found the file (A[3:0] is start, C[3:0] is length, D1->type)
 1317                * (If this is LOOP, then may have a bad name, but rest is OK)
 1318                *
 1319 F57AC 7FFC            GOSUB  Calc5            Save length in [9:5]
 1320 F57B0 D6              C=A    A                Start in [A]
 1321 F57B2 79FC            GOSUB  Calc5            Start to [9:5], length to [14:10]
 1322 F57B6 10C             R4=C
 1323 F57B9 11A             C=R2                    C[A] is destination type
```

```
F57BC D7              D=C    A
F57BE 817             DSRC                 Rotate device into correct place!
F57C1 07              C=RSTK               Restore (possible) error message
            *
            * Now R4[14:10] is length, R4[9:5] is start,
            * D1 points to file type
            *
F57C3 502             GONC   hCPY51        Found it!
F57C6 880             ?P#    0             NOT "Device mode error, tape"?
F57C9 71              GOYES  hCPY5a        No...error exit!
F57CB D0              A=0    A             Set A[A]=0 (# left to read)
F57CD 102             R2=A                 Set R2[A]=0
F57D0 300             LC(1)  =eNFILE       "File not found"
F57D3 20              P=     =eTAPE        Set P value for "File not found"
F57D5 6143            GOTO   hCPYeL        Go clean up (or exit)
            *-
            *-
F57D9 20    hCPY5!    P=     0
F57DB 300             LC(1)  =eTSIZE
F57DE 20    hCPY5t    P=     =eTAPE        Size error!
F57E0 634E  hCPY5a    GOTO   hCPYer
            *-
            *-
F57E4       hCPY51
F57E4 72C4            GOSUB  GETTYP        Read file type & get type entry
F57E8 401             GOC    hCPY52        OK...type in A[A]
            *
            * Unrecognized type...error
            *
            * Clean up the loop (check for LOOP or non-MS source)
            *
F57EB 7673  hCPYt-    GOSUB  hCPYel        Error...check for copy from loop
F57EF 20    hCPYtp    P=     0             Guarantee P=0 here
F57F1 3300            LC(4)  =eFTYPE       Illegal (Unrecognized) type
      00
F57F7 02              RTNSC
            *-
            *-
F57F9 D8    hCPY52    B=A    A             Copy file type to B[A]
F57FB 101             R1=A                 Save file type in R1 for CRTF
            *
            * Now B[S] is position of file type within entry
            * C[A] points to start of entry
            *
F57FE 135             D1=C                 Set D1 to start of entry
F5801 1574            C=DAT1 S             Read the create code for the file
            *
F5805 A4D             B=B-1  S             Convert entry # to base zero
F5808 114             A=R4
F580B AC0             A=0    S
F580E B44             A=A+1  S
F5811 BCC             A=-A-1 S             A[S]="1110" (binary)
F5814 0E40            A=A&B  S             A[S] is new security code (not
            *                                secure!)
F5818 104             R4=A                 Save security code in R4[S]
```

```
                    *
                    * C[S] is create code for this file.
                    * B[A] is file type for this file.
                    *
F581B 1F00                  D1=(5) (=SCRTCH)+56  Point to implementation bytes
      000
F5822 94A                   ?C=0   S             Check if mainframe type
F5825 17                    GOYES  hCPY56        Yes...set it up
F5827 A46                   C=C+C  S             Check if external...
F582A 560                   GONC   hCPY5j        ...no...keep checking
F582D 6AA0                  GOTO   hCPY5-        ...yes...will be set up in CRTF
                    *-
                    *-
F5831 A46           hCPY5j  C=C+C  S             Check if create type is LIF1
F5834 4C0                   GOC    hCPY53        Yes...set it up
F5837 A46                   C=C+C  S             Check if type is 41C data file
F583A 454                   GOC    hCPY55        Yes...set it up
                    *                            Type is HP-71 data file...
F583D 6820                  GOTO   hCPY54        ...set it up
                    *-
                    *-
                    *
                    * LIF1 file type
                    *
F5841 23            hCPY53  P=     3
F5843 1D00                  D1=(2) (=SCRTCH)+32  Length field
F5847 AF2                   C=0    W
F584A 7000                  GOSUB  =GETBYT       Read 4 bytes @ length
F584E BF2                   CSL    W
F5851 BF2                   CSL    W             Convert to BYTES!
F5854 10A                   R2=C                 Store in R2
                    *
                    * Check if "reasonable" size
                    *
F5857 D2                    C=0    A             Clear low end!
F5859 97A                   ?C=0   W             Bigger than 1M bytes?
F585C C7                    GOYES  hCPY5-        No...do it!
F585E 7303 hCPY5X           GOSUB  hCPYel        Check for more bytes to read
F5862 667F                  GOTO   hCPY5!        Yes...size error
                    *-
                    *-
F5866               hCPY54
                    *
                    * HP-71 data file type
                    *
F5866 AF0                   A=0    W             Clear high nibble first
F5869 173                   D1=D1+ 4             Point to record length
F586C 15B3                  A=DAT1 4             Read record length...
F5870 103                   R3=A                 ...and save in R3
F5873 1C3                   D1=D1- 4             Point back to # of records
F5876 15B3                  A=DAT1 4             Read # of records
F587A 102           hCPY5b  R2=A                 Put into R2
F587D 5A5                   GONC   hCPY5-        Go always...finish it up
                    *-
                    *-
```

```
F5880 AF0  hCPY55  A=0    W
F5883 103          R3=A              R3[4] must be zero for CRTF
F5886 14B          A=DAT1 B          Read high byte of size
F5889 F0           ASL    A
F588B F0           ASL    A
F588D 171          D1=D1+ 2
F5890 14B          A=DAT1 B          Read low byte of size
F5893 56E          GONC   hCPY5b     Go always
                *-
                *-
                *
                * This is a mainframe create code!
                *
F5896           hCPY56               D1<=start of implementation bytes
                *
                * First read in offset to data from @ C[A]+3 (set up by FTYPF#)
                *
F5896 137          CD1EX
F5899 172          D1=D1+ 3
F589C DA           A=C    A          Start of implementation bytes
F589E AF2          C=0    W
F58A1 14F          C=DAT1 B          Offset to data in C[W]
F58A4 131          D1=A
F58A7 15B5         A=DAT1 6          Read in the file length
F58AB 25           P=     5
F58AD 81A          A=A-C  WP         Subtract off offset to data
F58B0 20           P=     0
F58B2 3150         LC(2)  =lFLENh    Length of file length field
F58B6 25           P=     5
F58B8 A1A          A=A+C  WP         (Add this back to length)
                *
                * Now A[5:0] contains the length of data portion of the file
                *
F58BB 102          R2=A              Save in R2 for future use...
F58BE 90C          ?A#0   P
F58C1 D9           GOYES  hCPY5X     Error...size
                *
                * Check if this size is reasonable...
                *
F58C3 11C          C=R4
F58C6 7D93         GOSUB  Csrc10     Get length into C[A]
F58CA BF2          CSL    W
F58CD BF2          CSL    W          Convert to bytes...
F58D0 A76          C=C+C  W          ...now to nibbles...
F58D3 996          ?A>C   WP         ...check if bigger (corrupt!!!)
F58D6 88           GOYES  hCPY5X     Error...file size
                *
                * Passed reasonability test
                *
                * R2 contains # of nibbles for copy code 0, # of logical
                * records for other codes; R3 contains the record size in
                * bytes (If create code is 8, none of these are defined yet)
                *
F58D8           hCPY5-
F58D8 7853         GOSUB  GETDST     Read source info back
```

```
                 *
                 * D[A] is destination info, A[W],R0[3:0] is dest. filename,
                 * B[A] is the file type number, B[S] is the security nibble,
                 * R2 contains # of nibbles/bytes/records as per file type,
                 * R3 is record size in bytes
                 * D1 is destroyed (Points at device info now)
                 *
F58DC 8E00              GOSUBL =BLANKC
      00
F58E2 37B6              LCASC  \syek\        Check if keys
      5697
      37
F58EC 976               ?A#C   W
F58EF 21                GOYES  hCPY5x        Not keys...OK
F58F1 34C0              LC(5)  =fKEY         Is the type "KEYS"?
      2E0
F58F8 8A1               ?B=C   A
F58FB 60                GOYES  hCPY5x        Yes...OK
                 *
                 * Error...file name is keys, type is NOT keys
                 *
F58FD 6DEE              GOTO   hCPYt-        Error...Illegal File Type
                 *-
                 *-
F5901            hCPY5x
                 *
                 * Save R2, R3[A] (R3[15:5]=0), R4[15:5] in FUNCRx RAM
                 * Save R1[A] (type) in FUNCD0
                 *
F5901 7793              GOSUB  D0=FR0        Set D0=(5) =FUNCR0
F5905 11A               C=R2
F5908 1547              DAT0=C W             Save R2 in FUNCR0
F590C 16F               D0=D0+ 16
F590F 123               AR3EX
F5912 11C               C=R4
F5915 D6                C=A    A             Save R4[15:5], R3[A] in FUNCR1
F5917 113               A=R3                 Restore A[W] (Name)
F591A 1547              DAT0=C W             (FUNCR1)
F591E 16F               D0=D0+ 16            (FUNCD0)
F5921 119               C=R1
F5924 144               DAT0=C A             Save R1[A] in FUNCD0
                 *
                 * Now ready to call FINDF:A[W] is filename, D[S],[B] is device
                 *
F5927 8F00              GOSBVL =FINDF        Find the file in main RAM
      000
                 *
                 * Now restore R2,R3[A],R4[15:5],R1[A] WITHOUT changing carry
                 *
F592E 146               C=DAT0 A             (FUNCD0)
F5931 109               R1=C                 Restore R1[A] (type)
F5934 1900              D0=(2) =FUNCR1       (D0=D0- 16 clears carry)
F5938 1567              C=DAT0 W             Read R4[15:5],R3[A] (FUNCR1)
F593C 10C               R4=C                 Restore R4[15:5]
F593F AF0               A=0    W
```

```
F5942 DA                A=C    A               A[W] is now R3 value
F5944 103               R3=A
F5947 1900              D0=(2) =FUNCR0         (D0=D0- 16 clears carry)
F594B 1567              C=DAT0 W
F594F 10A               R2=C                   Restore R2[W]
              *
              * Now check if the file already exists in main RAM
              *
F5952 4A0               GOC    hCPY5y          Not found...OK
              *
              * File exists now...error
              *
F5955 7C02              GOSUB  hCPYel          Read any remaining data
F5959 6044              GOTO   hRNMfx          File exists error
              *-
              *-
F595D         hCPY5y
              *
              * Read back the destination info from SAVSTK
              *
F595D 7302              GOSUB  GETDST
              *
              * Create the destination file now
              *
              * First save 1 RSTK level in FUNCR0 (D0 now at SCRTCH),
              * status bits in FUNCR0+5
              *
F5961 07                C=RSTK
F5963 7533              GOSUB  D0=FR0
F5967 144               DAT0=C A               Save stack level in FUNCR0
F596A 164               D0=D0+ 5
F596D 09                C=ST                   Save status bits...
F596F 15C2              DAT0=C 3               ...write out status bits
F5973 8F00              GOSBVL =CRTF           Create the file in RAM
      000
F597A 7E13              GOSUB  D0=FR0
F597E 142               A=DAT0 A               Restore stack level from FUNCD1
F5981 DE                ACEX   A               Save error code in A[A]
F5983 06                RSTK=C
F5985 1900              D0=(2) (=FUNCR0)+5     (D0=D0+5 will destroy carry)
F5989 15E2              C=DAT0 3               Read in old status bits...
F598D 0A                ST=C                   ...restore status bits
F598F 571               GONC   hCPY5d          No error if no carry
              *
              * Save the error code in (FUNCR0)+5 for now
              *
F5992 1583              DAT0=A 4               Write out 4 nibs of error code
              *
              * Now clean up the loop (if needed)
              *
F5996 7BC1              GOSUB  hCPYel
              *
              * Recall the error # from (FUNCR0)+5
              *
F599A 1B00              D0=(5) (=FUNCR0)+5
```

```
           000
F59A1 15E3          C=DAT0 4
F59A5 02            RTNSC                   Error! (Set up in C[3:0])
              *-
              *-
              *
              * Now D[S] is device code, D[X] is device address, R1 is start
              * of file header in memory, D1 points to start of data in file
              *
F59A7 111     hCPY5d  A=R1
F59AA D2            C=0     A
F59AC 3141          LC(2)   =oFLAGh         Offset to flags...
F59B0 CA            A=A+C   A
F59B2 133           AD1EX                   Save start of data in A[A]
              *
              * Now D1 points to the flag nibble
              *
F59B5 11C           C=R4
F59B8 1554          DAT1=C S                Write out the protection nibble
F59BC 1F00          D1=(5) (=STMTR1)+14     Go to create code
           000
F59C3 1574          C=DAT1 S                Read into C[S]
F59C7 131           D1=A                    Restore start of data
              *
              * Now get data length back from R2[A] (nibbles)
              *
F59CA 112           A=R2
              *
              * A[A] is now data length in nibbles, C[S] is create code
              *
F59CD 80DF          P=C     15
F59D1 D2            C=0     A               Clear high nibbles
F59D3 881           ?P#     1               HP-71 data file?
F59D6 90            GOYES   hCPY5,          No...continue
F59D8 20            P=      0
F59DA 308           LC(1)   (=oDAsod)-5     Amount of offset
F59DD EA            A=A-C   A
F59DF 20      hCPY5,  P=    0
F59E1 305           LC(1)   =lFLENh         Length of length field
F59E4 EA            A=A-C   A
F59E6 822           SB=0                    Clear flag for extra nibble
F59E9 25            P=      5
F59EB A80           A=0     P               Clear nibble...
F59EE 81C           ASRB                    ...for bit shift
F59F1 20            P=      0
              *
              * A[A] is now data length in bytes, SB is 1 if extra nibble
              *
F59F3 821           XM=0                    Convert XM to SB value
F59F6 832           ?SB=0
F59F9 60            GOYES   hCPY58
F59FB 7EBA          GOSUB   hCPYXM          Set XM bit
F59FF 102     hCPY58  R2=A                  Save back in R2 for now
F5A02 843           ST=0    =sDEST
F5A05 7052          GOSUB   Rdinfo          Get source info back (addr)
```

```
F5A09 817            DSRC                    Rotate address into D[X]
F5A0C 751A           GOSUB  Getmbx           Get mailbox address back
F5A10 870            ?ST=1  =sLoop?          Is this LOOP or non-MS device?
F5A13 B1             GOYES  hCPY5f           Yes...skip SEEKA, DDT
F5A15 114            A=R4
F5A18 8E00           GOSUBL =ASRC5           Get starting address of file
      00
F5A1E 7C02           GOSUB  Seeka            Seek that record
F5A22 473            GOC    hCPYER           Error
               *
               * Now at the correct record...read the record, check status
               *
F5A25 8E00           GOSUBL =DdtRd           Read tape
      00
F5A2B 4E2            GOC    hCPYER
               *
               * First set D1 to correct location:
               *
               * Type: 8 - Start of header + oIMPLh + osod (from POLL)
               *       4 - Start of header + oIMPLh        (LIF1 file)
               *       2 - Start of header + oIMPLh        (41C data file)
               *       1 - Start of header + oIMPLh + 8    (HP-71 data file)
               *       0 - Start of header + oIMPLh        (BASIC, KEYS, etc)
               *
F5A2E 111      hCPY5f A=R1                   Start of file header in memory
F5A31 D2             C=0    A
F5A33 3152           LC(2)  =oIMPLh
F5A37 CA             A=A+C  A                Skip first part of header
F5A39 D2             C=0    A
F5A3B 1F00           D1=(5) (=STMTR1)+14     Create code...
      000
F5A42 1574           C=DAT1 S                ...into C[S]
F5A46 94A            ?C=0   S                Mainframe?
F5A49 32             GOYES  hCPY59           Yes...
F5A4B A46            C=C+C  S                Implementation (OEM)?
F5A4E 5E0            GONC   hCPY58           No...
F5A51 1C8            D1=D1- 9                Point to offset field
F5A54 14F            C=DAT1 B                Read it
F5A57 541            GONC   hCPY59           Go always
               *-
               *-
F5A5A 4C1      hCPYER GOC   hCPYE5           Go always...purge the file, error
               *-
               *-
F5A5D A46      hCPY58 C=C+C S                ASCII file?
F5A60 4B0            GOC    hCPY59           Yes...
F5A63 A46            C=C+C  S                41C data file?
F5A66 450            GOC    hCPY59           Yes...
               *
               * HP-71 data file
               *
F5A69 308            LC(1)  (=oDAsod)-5      Offset to start of data - link
               *
F5A6C CA       hCPY59 A=A+C A                A[A] points to start of data area
F5A6E 131            D1=A                    Point D1 to start of data area
```

```
                *
                * Set terminate modes to none before copy
                *
F5A71 8E00              GOSUBL =CLMODE       Clear terminate modes
      00
F5A77 4A6       hCPYE5  GOC    hCPYEL        Error clearing modes
                *
                * Now ready to copy the data area of the file
                *
F5A7A 112               A=R2                 Read back file length from R2
F5A7D 8A8               ?A=0   A             Is the length zero?
F5A80 11                GOYES  hCPY5z        Yes...don't call READSU (sends SDA)
F5A82 7F81              GOSUB  hCPY5s        Set up send data/set frame count
                *
F5A86 D6                C=A    A             ...limit is A[A] bytes
F5A88 8E00              GOSUBL =READSU       Read that many bytes to @ D1
      00
F5A8E 435               GOC    hCPYEL        Error during read
F5A91 831       hCPY5z  ?XM=0                Need 1 more nibble?
F5A94 22                GOYES  hCPY5+        No...continue
F5A96 7B71              GOSUB  hCPY5s        Set up send data/set frame count
                *
F5A9A D2                C=0    A
F5A9C E6                C=C+1  A             Read 1 byte to get last nibble
F5A9E DA                A=C    A             Needed for hCPYel (if error)
F5AA0 8E00              GOSUBL =PUTE
      00
F5AA6 4B3               GOC    hCPYEL        Error
F5AA9 8E00              GOSUBL =GETD         Read the data byte (nibble)
      00
F5AAF 423               GOC    hCPYEL        Error
F5AB2 15D0              DAT1=C 1             Write the one nibble out to RAM
F5AB6 860       hCPY5+  ?ST=0  =sLoop?       Is this a mass storage transfer?
F5AB9 22                GOYES  hCPY5i        Yes...go on
                *
                * For hCPYeL to return, P must be zero!
                *
F5ABB 20                P=     0
F5ABD D0                A=0    A             A[A]=0 (have read all bytes)
F5ABF 7450              GOSUB  hCPYeL        No...read the rest of the data
F5AC3 8E00              GOSUBL =GETDev       Am I controller?
      00
F5AC9 4D0               GOC    hCPY5m        No...skip cleanup
F5ACC 96B               ?D=0   B             Is this "LOOP"?
F5ACF 80                GOYES  hCPY5m        Yes...skip cleanup
F5AD1 8E00              GOSUBL =UTLEND       Yes...clean up the loop
      00
F5AD7 6801      hCPY5m  GOTO   hCPY51        Go check error, etc
                *-
                *-
F5ADB 7941      hCPY5i  GOSUB  Endtap        Clean up tape business, Loop
F5ADF 57F               GONC   hCPY5m        no error...continue
F5AE2           hCPYEL
                *
                * Entry to purge mainframe file, then hCPYeL
```

```
                  *
                  * First save A[A], P, C[0] in R3
                  *
F5AE2 816                 CSRC                    C[S] is C[0]
F5AE5 80FE                CPEX    14              C[14] is P
F5AE9 D6                  C=A     A
F5AEB 10B                 R3=C
F5AEE 7241                GOSUB   GETDST          Read destination info
                  *
                  * Now D[S] is correct for this file, A[W] is filename
                  *
F5AF2 119                 C=R1                    Get file header start
F5AF5 135                 D1=C
F5AF8 17F                 D1=D1+ 16               Position to file type
F5AFB D2                  C=0     A
F5AFD 15D3                DAT1=C 4                Make sure type is not LEX
F5B01 1CF                 D1=D1- 16               Set D1 back at start of file
F5B04 8F00                GOSBVL =PRGFMF          Purge the file (partial) file
      000
F5B0B 11B                 C=R3
F5B0E DA                  A=C     A
F5B10 80DE                P=C     14
F5B14 812                 CSLC
F5B17             hCPYeL
                  *
                  * Entry for P, C[0] = error message, R2[A] is # to have been
                  * read, A[A] is number NOT read yet of R2 count, R4[14:10] is
                  * number of sectors to be read (total)
                  *
F5B17 80C1                C=P     1
F5B1B 8E00                GOSUBL =TSAV2C          Save error stuff in FUNCR1
      00
                  *
                  * Set up R4[14:10] to reflect the number of sectors LEFT,
                  * A[A] the number of bytes within the current sector, XM=1 if
                  * R2[A] is one byte short of real count
                  *
F5B21 D8                  B=A     A               Save A[A] in B[A]
F5B23 112                 A=R2                    Get count to A[A]
F5B26 E0                  A=A-B   A               Now A[A] is # actually read
F5B28 831                 ?XM=0
F5B2B 40                  GOYES   hCPYe0          No extra byte
F5B2D E4                  A=A+1   A               Extra byte!
F5B2F D8          hCPYe0  B=A     A               Save count read in B[A]
F5B31 F4                  ASR     A
F5B33 F4                  ASR     A               Now A[A] is # sectors
F5B35 11C                 C=R4
F5B38 7B21                GOSUB   Csrc10
F5B3C E2                  C=C-A   A
F5B3E 431                 GOC     hCPYex
F5B41 D0                  A=0     A
F5B43 B60                 A=A-B   B               Now A[A] is # bytes to read
F5B46 8AC                 ?A#0    A               Is it non-zero?
F5B49 50                  GOYES   hCPYe+          Yes...OK as is
F5B4B B24                 A=A+1   XS              No...full sector
```

```
F5B4E 7320 hCPYe+  GOSUB   hCPYe.         Read then
F5B52 8E00 hCPYex  GOSUBL  =TRES2C        Restore the error stuff
      00
F5B58 80D1         P=C     1
F5B5C 890          ?P=     0              If P=0, return (not error)
F5B5F 00           RTNYES
F5B61 62CA hCPYeR  GOTO    hCPYer
           *-
           *-
F5B65 7CB8 hCPYel  GOSUB   Getmbx         Set D0 back to the mailbox
F5B69 D0   hCPYe-  A=0     A
F5B6B B24          A=A+1   XS             Set A[A]=#100 (256)
F5B6E 11C          C=R4
F5B71 72F0         GOSUB   Csrc10         Get # of sectors into C[A]
           *
           * Check if not loop or non-MS device...if so, return
           *
F5B75 860  hCPYe.  ?ST=0   =sLoop?
F5B78 44           GOYES   hCPYe4         Set P=0, return
F5B7A CE           C=C-1   A              Decrement by 1
F5B7C 7A50         GOSUB   Cslc10         Put it back
F5B80 10C          R4=C
F5B83 483          GOC     hCPYe4         If carry, done with reads
F5B86 7B98         GOSUB   Getmbx         Get the mailbox back
F5B8A 7780 hCPYe1  GOSUB   hCPY5s         Set up send data/set frame count
           *
F5B8E D6           C=A     A              Get count into C[A] (frame count)
F5B90 8E00         GOSUBL  =PUTE          Send it to start conversation
      00
F5B96 452          GOC     hCPYe4         Error if carry
F5B99 8A8  hCPYe2  ?A=0    A
F5B9C DC           GOYES   hCPYe-
F5B9E 8E00         GOSUBL  =GETX          Read the data
      00
F5BA4 582          GONC    hCPYe3         Got a data byte...process it
F5BA7 880          ?P#     0              Is this a EOT?
F5BAA 21           GOYES   hCPYe4         Definitely not...error!
F5BAC 8E00         GOSUBL  =FRAME-        Check for EOT
      00
F5BB2 890          ?P=     =pTERM         Is it terminator match? (possible)
F5BB5 5D           GOYES   hCPYe1         Yes...restart it
F5BB7 890          ?P=     =pEOT          Is it specifically EOT?
F5BBA 0D           GOYES   hCPYe1         Yes...restart it
F5BBC 20   hCPYe4  P=      0              Common exit code
F5BBE 8E00         GOSUBL  =GETDev        Check if device or controller
      00
F5BC4 500          RTNNC                  If controller:return, carry clear
F5BC7 8C00         GOLONG  =TER/LF        Terminate on LF/end frame
      00
           *-
           *-
F5BCD CC   hCPYe3  A=A-1   A
F5BCF 4CE          GOC     hCPYe4         Error (too many)
F5BD2 0D           P=P-1                  Decrement # of bytes
F5BD4 58F          GONC    hCPYe3         More yet
```

```
F5BD7 41C          GOC    hCPYe2        Done with this one...go on
           *-
           *-
F5BDA 8C00 =Cslc10 GOLONG =CSLC10
      00
           *-
           *-
           *
           * Check if this is a lex file...if so, add it to LEX tables
           *
F5BE0 111  hCPY5l  A=R1                 Get back start of file
F5BE3 102          R2=A                 Save in R2, in case call LEXBF+
F5BE6 20           P=     0
F5BE8 D2           C=0    A             Clear the high nibbles first
F5BEA 3101         LC(2)  =oFTYPh       Offset of TYPE in header
F5BEE CA           A=A+C  A
F5BF0 131          D1=A
F5BF3 D0           A=0    A             Clear high nibble
F5BF5 15B3         A=DAT1 4
F5BF9 3380         LC(4)  =fLEX         LEX file type
      2E
F5BFF 8A6          ?A#C   A             Is this LEX?
F5C02 F0           GOYES  hCPY5e        No...exit
F5C04 8F00         GOSBVL =LEXBF+       Yes...update the LEX buffers
      000
F5C0B 11A          C=R2
F5C0E 109          R1=C                 Restore start of file from R2
F5C11 6D6B hCPY5e  GOTO   RtnXM0        Clear XM for sure to finish
           *-
           *-
F5C15 25   =hCPY5s P=     5
F5C17 300          LC(1)  =mSDA@5       Assume controller mode...
F5C1A 8E00         GOSUBL =GETDev       Sets carry if device
      00
F5C20 500          RTNNC                (controller...done)
F5C23 300          LC(1)  =mSFC@5       Device mode...set frame count
F5C26 03           RTNCC                Force carry clear
           *-
           *-
F5C28 8C00 =Endtap GOLONG =ENDTAP
      00
           *-
           *-
F5C2E 8C00 =Seeka  GOLONG =SEEKA
      00
           *-
           *-
F5C34 7E10 GETDST  GOSUB  Rdinfd        Get destination information first
F5C38 1B00         D0=(5) =SCRTCH
      000
F5C3F 97C          ?A#0   W             Filename defined?
F5C42 60           GOYES  GETDS1        Yes...check device type
F5C44 1527         A=DAT0 W             No...read source name
F5C48 817  GETDS1  DSRC                 Rotate device into D[S]
F5C4B B47          D=D+1  S             Check if device is specified...
```

```
F5C4E 400            RTNC                ...no...return with mainframe
F5C51 A4F            D=D-1  S            Specified...restore it
F5C54 03             RTNCC
           *-
           *-
F5C56 853  Rdinfd   ST=1   =sDEST
F5C59 8C00 Rdinfo   GOLONG =RDINFO
      00
           *-
           *-
F5C5F D2   Gt2zer   C=0    A             Clear high nibs of C before call
F5C61 8C00 Gt2byt   GOLONG =GT2BYT
      00
           *-
           *-
F5C67 8C00 Csrc10   GOLONG =CSRC10
      00
           *-
           *-
F5C6D 8C00 =Findf+ GOLONG =FINDF+
      00
           *-
           *-
F5C73 20   =DdlPwr P=      =PWrite
F5C75 7410          GOSUB  Ddl
F5C79 400           RTNC
F5C7C 8E00          GOSUBL =TSTAT
      00
F5C82 400           RTNC
F5C85 8C00 Mtyl     GOLONG =MTYL
      00
           *-
           *-
F5C8B 20   DdlWrt   P=     =Write
F5C8D 8C00 Ddl      GOLONG =DDL
      00
           *-
           *-
F5C93 1F00 =D1=S20 D1=(5) (=SCRTCH)+20
      000
F5C9A 01            RTN
           *-
           *-
F5C9C 1B00 =D0=FRO D0=(5) =FUNCRO
      000
F5CA3 01            RTN
           ***************************************************************
           ***************************************************************
           **
           ** Name:         hPURGE - PURGE statement POLL handler (HPIL)
           **
           ** Category:     POLL
           **
           ** Purpose:
           **        Handle the PURGE statement POLL if HPIL device
```

```
                 **
                 ** Entry:
                 **      Name in A[W], R0[3:0]
                 **      Device in D[S], D[X]
                 **      P=0,HEXMODE
                 **      Destination info on SAVSTK (under POLLSV)
                 **
                 ** Exit:
                 **      P=0
                 **      Carry set: Error (C[3:0] is error number)
                 **      Carry clear:
                 **        XM=0: handled...FIB file start zeroed, file purged
                 **              ST[8]=0 (Current file not purged)
                 **        XM=1: not handled (not HPIL/not HP82161)
                 **      SAVSTK unchanged from entry
                 **
                 ** Calls:      CKBITL,FINDF+,DATST+,SAVDIR,CHKSEC,fPROT,D1=S20,
                 **             hPUTDR,ENDTAP,I/OFND
                 **
                 ** Uses.......
                 **  Inclusive: A-D,R0-R3,D0,D1,P,ST[8,5:0],SCRTCH
                 **
                 ** Stk lvls:   6 (FINDF+)
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **  --------   ----------    ---------------------------------
                 **  01/12/83      NZ         Updated documentation
                 **
                 *************************************************************
                 *************************************************************
F5CA5 D9         SAVDIR  C=B    A             Save directory pointer in R3
F5CA7 108                R3=C
F5CAA 71BF       GETTYP  GOSUB  Gt2zer        Read the file type
                 *
                 * Now C[A] is the file type...check security!
                 *
F5CAE DA                 A=C    A
F5CB0 8D00       =fTYPFN GOVLNG =FTYPFN
      000
                 *-
                 *-
F5CB7            hPURER
F5CB7 8C00       =Error  GOLONG =ERROR        Set up error, return w/carry set
      00
                 *-
                 *-
F5CBD            =hPURGE
F5CBD 73CA               GOSUB  CKBITL
F5CC1 500                RTNNC                If no carry, not (HPIL&HP82161)
                 *
                 * This IS an HPIL purge!
                 *
                 * Save filename in R0, R1, START,CHKMAS,FINDFx
```

```
                *
F5CC4 75AF              GOSUB  Findf+
                *
                * If file not found, carry will be set...Error, not warning!
                *
F5CC8 4EE               GOC    hPURER
                *
                * Save file information in R2 (to clean up FIB)
                * R2[6:4] is device address, R2[3:0] is data start address
                *
F5CCB 8E2D              GOSUBL DATST+
      4F
F5CD1 10A               R2=C                  Save it in R2
                *
                * Save the directory information in R1 now
                *
F5CD4 7DCF              GOSUB  SAVDIR         Save dir pointer in R3, get type
F5CD8 573               GONC   hPUR20         If no carry, didn't find type
                *
                * Found it...check if secure (if so, error...can't purge it)
                *
F5CDB 7C00              GOSUB  CHKSEC         Check if secure
F5CDF 603               GONC   hPUR20         Not secure...ok to purge
                *
                * This is a secure file...can't purge it
                *
F5CE2 8E00 hPURSC       GOSUBL =fPROT         Protected file error (P, C[0])
      00
F5CE8 4EC               GOC    hPURER         Go always (set up error, RTNSC)
                *-
                *-
F5CEB A4D  =CHKSEC B=B-1  S                   Convert to base zero
F5CEE AC9          C=B    S
F5CF1 80DF         P=C    15
F5CF5 891          ?P=    1
F5CF8 00           RTNYES                     Secure
F5CFA 893          ?P=    3
F5CFD 00           RTNYES                     Secure, private
F5CFF 03           RTNCC
                *-
                *-
F5D01 11B  hPUTDR  C=R3
F5D04 816          CSRC
F5D07 AD2          C=0    M                   Clear all unneeded nibbles
F5D0A 8C00         GOLONG =PUTDRM             Write the entry from SCRTCH
      00
                *-
                *-
F5D10      hPUR20
                *
                * OK to purge it
                *
F5D10 7F7F         GOSUB  D1=S20              Set D1= (=SCRTCH)+20
F5D14 D2           C=0    A
F5D16 15D3         DAT1=C 4                   Set file type = 0
```

```
                 *
                 * Now record # in C[A], directory entry # in C[S]
                 *
F5D1A 73EF               GOSUB  hPUTDR        Write the entry from SCRTCH
F5D1E 489                GOC    hPURER        Error during write
                 *
                 * Now clean up the tape, etc
                 *
F5D21 730F               GOSUB  Endtap        Clean up tape (rewind, etc)
F5D25 419                GOC    hPURER        Error during clean-up
F5D28 848                ST=0   8             Current file was not purged
F5D2B 3230               LC(3)  =bFIB
      8
F5D30 8E00               GOSUBL =i/OFND
      00
F5D36 11A                C=R2
                 *
                 * Entry to purge an FIB entry (D1 @ FIB buffer, C is pointer)
                 *
F5D39 26         =PURFIB P=     6
F5D3B 14B         FNDENT A=DAT1 B
F5D3E 968                ?A=0   B
F5D41 72                 GOYES  NOTFND
F5D43 17C                D1=D1+ =oFBEGb
F5D46 177                D1=D1+ (oDBEGb)-(oFBEGb)
F5D49 15B6               A=DAT1 7
F5D4D 912                ?A=C   WP
F5D50 E0                 GOYES  FIXIT
F5D52 17E                D1=D1+ (oRECLb)-(oDBEGb)
F5D55 17F                D1=D1+ (oRLENb)-(oRECLb)
F5D58 17A                D1=D1+ (lFIB)-(oRLENb)
F5D5B 5FD                GONC   FNDENT
                 *
F5D5E 1C7         FIXIT  D1=D1- (oDBEGb)-(oFBEGb)
F5D61 AF2                C=0    W
F5D64 15D5               DAT1=C 6
                 *
F5D68 20          NOTFND P=     0
F5D6A 641A               GOTO   RtnXMO
                 **************************************************************
                 **************************************************************
                 **
                 ** Name:        hRENAM - HPIL handler for the RENAME POLL
                 **
                 ** Category:    POLL
                 **
                 ** Purpose:
                 **      HPIL handler for RENAME execute POLL
                 **
                 **
                 ** Entry:
                 **      A[W] is first 8 chars of filename
                 **      R0[3:0] is last 2 chars
                 **      D[3:0],D[S] is source device information
                 **      P=0
```

```
                **      Source, destination info on SAVSTK (under POLLSV)
                **
                ** Exit:
                **      P=0
                **      Carry set: Error...error # in C[3:0]
                **      Carry clear:
                **        XM=0: handled
                **        XM=1: not handled
                **
                ** Calls:       CKBITL,hRNMsb,FINDF+,FINDFx,SAVDIR,D1=SCR,hPUTDR,
                **              ENDTAP
                **
                ** hRNMsb calls RDINFO
                **
                ** Uses.......
                **  Inclusive: A-D,R0,R1,R3,D0,D1,P,ST[8,5:0],SCRTCH
                **
                ** Stk lvls:   6 (FINDF+)
                **
                ** History:
                **
                **   Date      Programmer                Modification
                **  --------   ----------       --------------------------------
                **  06/02/83      NZ            Rewrote parts to pack code and
                **                              share routines with PURGE, SECURE
                **  01/13/83      NZ            Fixed bug in hRNMsb (setup for
                **                                FINDFx was incorrect)
                **                              Changed very first part of hRENAM
                **  01/12/83      NZ            Updated documentation
                **
                ***********************************************************
                ***********************************************************
 F5D6E 721A    =hRENAM GOSUB  CKBITL
 F5D72 500             RTNNC                    Not HPIL HP82161...returnCC, XM=1
                *
                * Source or destination is HPIL (D[A] is address)
                *
                * A[W] is first 8 chars of source name, R0[3:0] is last 2 char
                * D[X] is HPIL address, D[S] is "8"
                *
 F5D75 7470            GOSUB  hRNMsd
 F5D79 70FE            GOSUB  Findf+            Find the destination file
                *
                * If found, error (File exists already)
                *
 F5D7D 5C1             GONC   hRNMfx            Error...file exists already
                *
                * Check if error is "file not found" or something else
                *
 F5D80 880             ?P#    =eTAPE            Is it tape error?
 F5D83 E1              GOYES  hRNMER            No..."real" error
 F5D85 80D0            P=C    0
 F5D89 890             ?P=    =eNFILE           Is it "No file" (Not found)?
 F5D8C D1              GOYES  hRNM30
 F5D8E 501             GONC   hRNMeT            Go always - tape error
```

```
                 *-
                 *-
F5D91 0                 CON(1) =FIXSPC       9 nibbles available here
F5D92                   BSS    9-1
                 *-
                 *-
F5D9A 20         hRNMfx P=     0
F5D9C 300               LC(1)  =eEFILE       File already exists
F5D9F 20         hRNMeT P=     =eTAPE
F5DA1 651F       hRNMER GOTO   Error         Set up error code, RTNSC
                 *-
                 *-
F5DA5 67F9       hRNMXM GOTO   hCPYxm        Carry clear, XM=1
                 *-
                 *-
                 *
                 * Destination file not found...continue
                 *
F5DA9 843        hRNM30 ST=0   =sDEST
F5DAC 7040              GOSUB  hRNMsb
F5DB0 120               AR0EX                Put first 8 chars in R0...
F5DB3 101               R1=A                 ...and last 2 chars in R1
F5DB6 8E00              GOSUBL =FINDFx       Find the source file
      00
F5DBC 44E               GOC    hRNMER        Error
                 *
                 * Now the B[3:0] is the directory pointer for the file
                 *
F5DBF 72EE              GOSUB  SAVDIR        Save directory info, get file type
                 *                           (Ignore carry from FTYPF#)
                 *
                 * Now get the destination name back
                 *
F5DC3 7620              GOSUB  hRNMsd        Get back the destination info
                 *
                 * Now A[W] is the first 8 chars, R0 is the last 2 chars
                 *
F5DC7 8E00              GOSUBL =D1=SCR       Point D1 @ SCRTCH
      00
F5DCD 1517              DAT1=A W             Write out first 8 chars of name
F5DD1 17F               D1=D1+ 16            Position to last 2 chars location
F5DD4 110               A=R0
F5DD7 1593              DAT1=A 4             Write out last 2 chars of name
F5DDB 722F              GOSUB  hPUTDR        Write directory entry from SCRTCH
F5DDF 41C               GOC    hRNMER        Error
F5DE2 724E              GOSUB  Endtap        End the tape conversation
F5DE6 4AB               GOC    hRNMER        Error
F5DE9 6599              GOTO   RtnXM0        Return, indicate "handled"
                 *-
                 *-
F5DED 853        hRNMsd ST=1   =sDEST        Set destination first
F5DF0 DB         hRNMsb C=D    A
F5DF2 109               R1=C                 Save address in R1[A]
F5DF5 706E              GOSUB  Rdinfo
F5DF9 AFB               C=D    W             Save dest device & address in R1
```

```
F5DFC 129           CR1EX                       Restore old address, save new
F5DFF D7            D=C    A                    Restore address to D[A]
F5E01 03            RTNCC                       Carry clear
              ************************************************************
              ************************************************************
              **
              ** Name:        hFPROT - File protection handler (HPIL files)
              **
              ** Category:    POLL
              **
              ** Purpose:
              **       Execute the SECURE/PRIVATE command for an HPIL device
              **
              ** Entry:
              **       D[S] is the device type: if HPIL, then A[W] is first
              **       8 chars of filename, R0[3:0] is last 2 chars, D[X] is
              **       HPIL address of the device
              **       Destination info on SAVSTK (under POLLSV)
              **       (See detail also!)
              **
              ** Exit:
              **       Carry set: Error (C[3:0] is error number)
              **       Carry clear:
              **         XM=1: Not handled (not HPIL/not HP82161)
              **         XM=0: Handled (action taken)
              **
              ** Calls:       CKBITL,FINDF+,SAVDIR,CHKSEC,D1=S20,PT2BYT,
              **                      hPUTDR,ENDTAP
              **
              ** Uses.......
              **  Inclusive: A-D,R0,R1,R3,D0,D1,P,ST[8,5:0],SCRTCH
              **
              ** Stk lvls:    6 (FINDF+)
              **
              ** Detail:
              **       ST(sPRIVT) set if PRIVATE, clear if SECURE
              **       ST(sUNSEC) set if UNSECURE, clear if SECURE
              **
              ** History:
              **
              **   Date     Programmer              Modification
              **  --------  ----------     ---------------------------------
              **  06/02/83     NZ          Reworked to share much code with
              **                           PURGE and RENAME
              **  02/08/83     NZ          Changed to prevent PRIVATE on a
              **                             secure file (design change)
              **  01/12/83     NZ          Converted to single poll entry
              **  12/20/82     NZ          Added routine and documentation
              **
              ************************************************************
              ************************************************************
F5E03 7D79    =hFPROT GOSUB  CKBITL             Check if this is HPIL & HP82161
F5E07 500           RTNNC                       No...set XM (not handled)
              *
              * This is an HPIL device
```

```
                     *
F5E0A 7F5E                  GOSUB  Findf+          Save A in R0, R0>R1, START,FINDFx
F5E0E 4E7                   GOC    hSECer          Error
                     *
                     * Have found the file (D1 is at file type)
                     *
F5E11 709E                  GOSUB  SAVDIR          Save dir info in R3, check type
F5E15 460                   GOC    hSEC15          Found type entry...continue
F5E18 66D9 hSECft           GOTO   hCPYtp          Not found...error
                     *_
                     *_
                     *
                     * Found it...C[A], B[A] point to the entry, B[S] is position
                     * of the type within the entry
                     *
F5E1C 7BCE hSEC15           GOSUB  CHKSEC          Check if secure(leaves P=entry #)
F5E20 0B                    CSTEX
F5E22 80F0                  CPEX   0
F5E26 0B                    CSTEX                  Now ST[3:0] is the current pos
           sSEC             EQU    0               Bit for SECURE
           sPR              EQU    1               Bit for PRIVATE
F5E28 860                   ?ST=0  =sPRIVT         Is this PRIVATE statement?
F5E2B E0                    GOYES  hSEC20          No...must be secure
                     *
                     * PRIVATE statement
                     *
F5E2D 851                   ST=1   sPR             Make it private!
F5E30 860                   ?ST=0  sSEC            Is it OK (NOT secure)?
F5E33 41                    GOYES  hSEC30          Yes...write it back out
F5E35 6CAE                  GOTO   hPURSC          No...file secure
                     *_
                     *_
F5E39      hSEC20
                     *
                     * [UN]SECURE statement (need to determine which it is)
                     *
F5E39 860                   ?ST=0  =sUNSEC         UNSECURE?
F5E3C 80                    GOYES  hSEC25          No...must be SECURE statement
                     *
                     * This is the UNSECURE statement
                     *
F5E3E 840                   ST=0   sSEC            Clear the security bit
F5E41 550                   GONC   hSEC30          Go always
                     *_
                     *_
F5E44      hSEC25
                     *
                     * This is the SECURE statement
                     *
F5E44 850                   ST=1   sSEC
F5E47      hSEC30
                     *
                     * Now ST[3:0] is the desired entry #
                     *
F5E47 0B                    CSTEX
```

```
F5E49 80F0          CPEX    0             Restore ST[3:0] from P
F5E4D 0B            CSTEX
F5E4F 80CF          C=P     15            Set C[S] to desired security
             *
             * Now C[S] is the desired type #, C[A] is the entry address
             *
F5E53 135           D1=C
F5E56 17E           D1=D1+ 15             Point to # types
F5E59 1534          A=DAT1 S              Read it in...
F5E5D 9CA           ?A<=C  S              ...is the type I want available?
F5E60 8B            GOYES  hSECft         No...file type error
F5E62 1C4           D1=D1- 5              Position to (type-2)
F5E65 173    hSEC40 D1=D1+ 4              Go to next type
F5E68 A4E           C=C-1  S              Done yet?
F5E6B 59F           GONC   hSEC40         No...loop back
             *
             * Now D1 is at the desired file type
             *
F5E6E 15F5          C=DAT1 6              Read type into C[5:2]
F5E72 7D1E          GOSUB  D1=S20         Point to the type
F5E76 8E00          GOSUBL =PT2BYT        Write the new file type
      00
             *
             * Now get the pointer back from R3 and write the entry
             *
F5E7C 718E          GOSUB  hPUTDR         Write the entry from SCRTCH
F5E80 4C0           GOC    hSECer         Error
F5E83 71AD          GOSUB  Endtap         Clean up the loop
F5E87 821           XM=0                  Make sure XM=0 (handled)
F5E8A 500           RTNNC                 Return if no carry...done
             *
             * If fall through RTNNC, then error has occurred during ENDTAP
             *
F5E8D 692E   hSECer GOTO   Error          Return, carry set
F5E91               END
```

```
 A-MULT  Ext                    -   353
 ACES=0  Abs 1004290 #F5302 -   454   444   567
 ASLC12  Ext                    -  1278
 ASLC3   Ext                    -   334
 ASLC4   Ext                    -  1173
 ASLC6   Ext                    -  1193
 ASRC10  Ext                    -  1204
 ASRC3   Ext                    -  1040
 ASRC4   Ext                    -   995
 ASRC5   Ext                    -  1012  1649
 BLANKC  Ext                    -  1494
 Basic   Abs       0 #00000 -  1182  1183  1188  1199
 CHAIN-  Ext                    -  1214
 CHKASN  Ext                    -   660
 CHKBIT  Ext                    -  1055  1292
 CHKMAS  Ext                    -   259
=CHKSEC  Abs 1006827 #F5CEB -  2023  2014  2277
=CKBITL  Abs 1005444 #F5784 -  1292   115  1988  2131  2258
=CKHPI+  Abs 1005456 #F5790 -  1295   633
=CKHPIL  Abs 1005453 #F578D -  1294   253
 CKHPIx  Abs 1005467 #F579B -  1299  1293  1296
 CLMODE  Ext                    -  1699
 CRTF    Ext                    -  1570
 CRTF00  Abs 1003983 #F51CF -   261   258
 CRTF01  Abs 1003987 #F51D3 -   264   260
 CRTF05  Abs 1004004 #F51E4 -   272   267
 CRTF10  Abs 1004053 #F5215 -   300   286
 CRTF20  Abs 1004074 #F522A -   312   303
 CRTF30  Abs 1004114 #F5252 -   342   313
 CRTF35  Abs 1004134 #F5266 -   348   346
 CRTF4.  Abs 1004049 #F5211 -   297   301
 CRTF40  Abs 1004154 #F527A -   359   297   309   336
 CSLC10  Ext                    -  1850
 CSLC2   Ext                    -  1247
 CSLC3   Ext                    -   755
 CSLC4   Ext                    -   855
 CSLC6   Ext                    -   362
 CSLC7   Ext                    -   182
 CSLC9   Ext                    -   439
 CSRC10  Ext                    -  1908
 CSRC3   Ext                    -   763
 CSRC4   Ext                    -   343   371
 CSRC5   Ext                    -   765   936  1244
 CSRC9   Ext                    -   638
=Cslc10  Abs 1006554 #F5BDA -  1850   938  1817
 Cslc4   Abs 1004722 #F54B2 -   855   184   351
 Cslc5   Abs 1004719 #F54AF -   854   127   753  1013  1319  1321
 Csrc10  Abs 1006695 #F5C67 -  1908  1037  1472  1790  1810
 D0=FIB  Ext                    -   688
=D0=FRO  Abs 1006748 #F5C9C -  1930  1010  1034  1512  1565  1571
=D1=S20  Abs 1006739 #F5C93 -  1926   973  1000  2043  2336
 D1=SCR  Ext                    -  2190
 DATST+  Abs 1003939 #F51A3 -   183  2004
 DATSTR  Abs 1003921 #F5191 -   179   134
 DDL     Ext                    -  1923
 Ddl      Abs 1006733 #F5C8D -  1923  1915
*DdlPwr   Abs 1006707 #F5C73 -  1914
 DdlWrt   Abs 1006731 #F5C8B -  1922
 DdtRd    Ext                -  1655
 ENDTAP   Ext                -  1882
 ERROR    Ext                -  1984
 ERRORX   Ext                -   448
 ERror    Abs 1004000 #F51E0 -   269   138   256
*Endtap   Abs 1006632 #F5C28 -  1882   136  1059  1740  2054  2197  2343
*Error    Abs 1006775 #F5CB7 -  1984  1068  2163  2349
 Errorx   Abs 1004284 #F52FC -   448   426   432   443   502   552   559   566
                                 654
 FINDF    Ext                -  1082  1527
 FINDF+   Ext                -  1911
 FINDFL   Ext                -   928  1313
 FINDFx   Ext                -   119  2176
 FIXIT    Abs 1006942 #F5D5E -  2077  2071
 FIXSPC   Ext                -  2156
 FNDENT   Abs 1006907 #F5D3B -  2064  2075
 FNDMB+   Ext                -  1057
 FRAME-   Ext                -  1832
 FTYPF#   Ext                -  1980
 FUNCR0   Ext                -  1539  1575  1590  1930
 FUNCR1   Ext                -  1533
*Findf+   Abs 1006701 #F5C6D -  1911  1995  2140  2263
 GETBYT   Ext                -  1404
 GETD     Ext                -  1721
 GETDS1   Abs 1006664 #F5C48 -  1893  1891
 GETDST   Abs 1006644 #F5C34 -  1888  1486  1557  1752
 GETDev   Ext                -  1732  1838  1876
 GETMBX   Ext                -   682
 GETTYP   Abs 1006762 #F5CAA -  1975   947  1348
 GETX     Ext                -  1828
 GT2BYT   Ext                -  1905
*Getmbx   Abs 1004581 #F5425 -   682   563   583  1645  1806  1820
 Gt2byt   Abs 1006689 #F5C61 -  1905   181
 Gt2zer   Abs 1006687 #F5C5F -  1904  1975
 LEXBF+   Ext                -  1868
 MOVEFL   Ext                -  1048
 MTYL     Ext                -  1919
 Mtyl     Abs 1006725 #F5C85 -  1919
 NEWFI+   Ext                -  1027  1286
 NEWFIL   Ext                -   377
 NOTFND   Abs 1006952 #F5D68 -  2081  2066
 OUTPTt   Ext                -   741
 PILVER   Ext                -    63
 PLOTt    Ext                -   743
 PRGFMF   Ext                -  1762
 PRTIS+   Ext                -   759
 PT2BYT   Ext                -  2337
*PURFIB   Abs 1006905 #F5D39 -  2063
 PUTDR#   Ext                -  2036
 PUTE     Ext                -  1719  1824
 PWrite   Ext                -  1914
 RDINFO   Ext                -  1901
 RDNB10  Abs 1004371 #F5353 -   561   556
 READRW  Ext                -   431   565
 READSU  Ext                -  1710
 RSTOR+  Abs 1004252 #F52DC -   432   505
 RSTORE  Abs 1004255 #F52DF -   438   584
 Rdinfd  Abs 1006678 #F5C56 -  1900  1272  1888
 Rdinfo  Abs 1006681 #F5C59 -  1901  1643  2205
 RtnXMO  Abs 1005439 #F577F -  1288   458  1065  1871  2082  2199
 SAVDIR  Abs 1006757 #F5CA5 -  1973  2009  2181  2268
 SCRTCH  Ext                -  1018  1382  1402  1889  1926
 SEEKA   Ext                -  1885
 SNAPRS  Ext                -   445
 START   Ext                -   685
 STBUF+  Abs 1004436 #F5394 -   630   422   498   548
 STMTRO  Ext                -   780
 STMTR1  Ext                -   273   750   778  1609  1671
 STUP10  Abs 1004513 #F53E1 -   657   651
 STUP20  Abs 1004531 #F53F3 -   663   681
 STUPBF  Abs 1004471 #F53B7 -   642   562
=Seeka   Abs 1006638 #F5C2E -  1885  1650
 Start   Abs 1004587 #F542B -   685   117   255   425   501   551
 TER/LF  Ext                -  1840
 TRES2C  Ext                -   761  1032  1799
 TSAV2C  Ext                -   757  1022  1774
 TSAVD1  Ext                -   748
 TSTAT   Ext                -  1917
 UTLEND  Ext                -  1736
 Utlend  Ext                -   442
 WRITE#  Ext                -   504   558
 WRTADR  Abs 1004561 #F5411 -   676   427   503   553
 Write   Ext                -  1922
 bFIB    Abs    2051 #00803 -    13  2057
 d0=FIB  Abs 1004593 #F5431 -   688   454   630   642   676
 eEFILE  Ext                -  2161
 eFTYPE  Ext                -  1357
 eFnFND  Ext                -  1083
 eNFILE  Ext                -  1336  2151
 ePIL    Ext                -   653
 eRANGE  Ext                -   268
 eSYSer  Ext                -   652
 eTAPE   Ext                -  1337  1343  2148  2162
 eTSIZE  Ext                -  1342
 fBASIC  Abs   57876 #0E214 -    13  1184
 fKEY    Abs   57868 #0E20C -    13  1498
 fLEX    Abs   57864 #0E208 -    13  1865
 fPROT   Ext                -  2019
=fTYPF#  Abs 1006768 #F5CB0 -  1980
=hCOPYx  Abs 1004728 #F54B8 -   858
 hCPY10  Abs 1004739 #F54C3 -   872   860
 hCPY12  Abs 1004801 #F5501 -   908   893
 hCPY22  Abs 1004826 #F551A -   936   929
 hCPY23  Abs 1004854 #F5536 -   952   948
 hCPY24  Abs 1004876 #F554C -   971   962
 hCPY25  Abs 1004911 #F556F -   994   988
 hCPY28  Abs 1005053 #F55FD -  1054  1064
 hCPY29  Abs 1005080 #F5618 -  1061  1056
 hCPY3+  Abs 1005218 #F56A2 -  1170  1251  1268
 hCPY3-  Abs 1005212 #F569C -  1165  1228
 hCPY3.  Abs 1004786 #F54F2 -   897   876   879
 hCPY30  Abs 1005096 #F5628 -  1071   905
 hCPY31  Abs 1005143 #F5657 -  1108  1101
 hCPY32  Abs 1005205 #F5695 -  1148  1131
 hCPY33  Abs 1005209 #F5699 -  1155  1129
 hCPY34  Abs 1005321 #F5709 -  1220  1134
 hCPY36  Abs 1005331 #F5713 -  1231  1139
 hCPY37  Abs 1005348 #F5724 -  1244  1240
 hCPY38  Abs 1005377 #F5741 -  1254  1145
 hCPY39  Abs 1005408 #F5760 -  1271  1217
 hCPY3a  Abs 1005191 #F5687 -  1137  1133
 hCPY3b  Abs 1005201 #F5691 -  1145  1138
 hCPY3f  Abs 1005258 #F56CA -  1189  1187
 hCPY3g  Abs 1005317 #F5705 -  1217  1200
 hCPY5!  Abs 1005529 #F57D9 -  1341  1241  1415
 hCPY5%  Abs 1005662 #F585E -  1414  1467  1477
 hCPY5&  Abs 1006173 #F5A5D -  1685  1676
 hCPY5+  Abs 1006262 #F5AB6 -  1724  1713
 hCPY5,  Abs 1006047 #F59DF -  1626  1622
 hCPY5-  Abs 1005784 #F58D8 -  1485  1387  1413  1429
 hCPY5.  Abs 1004782 #F54EE -   894   891
 hCPY50  Abs 1005473 #F57A1 -  1305   894
 hCPY51  Abs 1005540 #F57E4 -  1347  1331
 hCPY52  Abs 1005561 #F57F9 -  1361  1349
 hCPY53  Abs 1005633 #F5841 -  1401  1391
 hCPY54  Abs 1005670 #F5866 -  1418  1395
 hCPY55  Abs 1005696 #F5880 -  1432  1393
 hCPY56  Abs 1005718 #F5896 -  1445  1384
 hCPY58  Abs 1006079 #F59FF -  1641  1639
 hCPY59  Abs 1006188 #F5A6C -  1694  1674  1679  1686  1688
 hCPY5?  Abs 1005482 #F57AA -  1314   930
 hCPY5a  Abs 1005536 #F57E0 -  1344  1287  1333
 hCPY5b  Abs 1005690 #F587A -  1428  1439
 hCPY5d  Abs 1005991 #F59A7 -  1599  1578
 hCPY5e  Abs 1006609 #F5C11 -  1871  1867
 hCPY5f  Abs 1006126 #F5A2E -  1666  1647
 hCPY5i  Abs 1006299 #F5ADB -  1740  1725
 hCPY5j  Abs 1005617 #F5831 -  1390  1386
 hCPY5l  Abs 1006560 #F5BE0 -  1856  1737
 hCPY5m  Abs 1006295 #F5AD7 -  1737  1733  1735  1741
*hCPY5s  Abs 1006613 #F5C15 -  1874  1707  1714  1821
 hCPY5t  Abs 1005534 #F57DE -  1343
 hCPY5x  Abs 1005825 #F5901 -  1507  1497  1500
 hCPY5y  Abs 1005917 #F595D -  1553  1545
 hCPY5z  Abs 1006225 #F5A91 -  1712  1706
 hCPY6.  Abs 1004733 #F54BD -   861   918
 hCPYE5  Abs 1006199 #F5A77 -  1700  1682
 hCPYEL  Abs 1006306 #F5AE2 -  1742  1700  1711  1720  1722
 hCPYER  Abs 1006170 #F5A5A -  1682  1651  1656
 hCPYXM  Abs 1004733 #F54BD -   867   261   770   873   884   904   913  1152
                               1302  1640
 hCPYe+  Abs 1006414 #F5B4E -  1798  1796
 hCPYe-  Abs 1006441 #F5B69 -  1807  1827
 hCPYe.  Abs 1006453 #F5B75 -  1814  1798
 hCPYeO  Abs 1006383 #F5B2F -  1786  1784
 hCPYe1  Abs 1006474 #F5B8A -  1821  1834  1836
 hCPYe2  Abs 1006489 #F5B99 -  1826  1847
 hCPYe3  Abs 1006541 #F5BCD -  1843  1829  1846
 hCPYe4  Abs 1006524 #F5BBC -  1837  1815  1819  1825  1831  1844
 hCPYeL  Abs 1006359 #F5B17 -  1767  1338  1731
 hCPYeR  Abs 1006433 #F5B61 -  1803
 hCPYel  Abs 1006437 #F5B65 -  1806  1355  1414  1549  1586
 hCPYer  Abs 1005092 #F5624 -  1068   269   379  1028  1049  1058  1060  1344
                               1803
 hCPYex  Abs 1006418 #F5B52 -  1799  1792
 hCPYt-  Abs 1005547 #F57EB -  1355  1504
 hCPYtP  Abs 1004850 #F5532 -   949
 hCPYtp  Abs 1005551 #F57EF -  1356   949  2270
 hCPYxn  Abs 1005469 #F579D -  1302  2166
=hCREAT  Abs 1003955 #F51B3 -   252
=hFINDF  Abs 1003859 #F5153 -   115
 hFNFer  Abs 1003917 #F518D -   138   118   120
=hFPROT  Abs 1007107 #F5E03 -  2258
 hPRTCO  Abs 1004619 #F544B -   748   742
 hPRTC1  Abs 1004693 #F5495 -   773   769
=hPRTCL  Abs 1004600 #F5438 -   734
 hPRTXM  Abs 1004689 #F5491 -   770   744
 hPUR20  Abs 1006864 #F5D10 -  2039  2010  2015
 hPURER  Abs 1006775 #F5CB7 -  1983  1999  2020  2050  2055
=hPURGE  Abs 1006781 #F5CBD -  1987
 hPURSC  Abs 1006818 #F5CE2 -  2019   963  1105  2291
 hPUTDR  Abs 1006849 #F5D01 -  2033  2049  2195  2341
=hRDCBF  Abs 1004228 #F52C4 -   422
=hRDNBF  Abs 1004335 #F532F -   548
=hRENAM  Abs 1006958 #F5D6E -  2131
 hRNM30  Abs 1007017 #F5DA9 -  2172  2152
 hRNMER  Abs 1007009 #F5DA1 -  2163  2149  2177  2196  2198
 hRNMXM  Abs 1007013 #F5DA5 -  2166
 hRNMeT  Abs 1007007 #F5D9F -  2162  2153
 hRNMfx  Abs 1007002 #F5D9A -  2160  1550  2144
 hRNMsb  Abs 1007088 #F5DF0 -  2203  2173
 hRNMsd  Abs 1007085 #F5DED -  2202   978  2139  2186
 hSEC15  Abs 1007132 #F5E1C -  2277  2269
 hSEC20  Abs 1007161 #F5E39 -  2294  2284
 hSEC25  Abs 1007172 #F5E44 -  2307  2299
 hSEC30  Abs 1007175 #F5E47 -  2312  2290  2304
 hSEC40  Abs 1007205 #F5E65 -  2329  2331
 hSECer  Abs 1007245 #F5E8D -  2349  2264  2342
 hSECft  Abs 1007128 #F5E18 -  2270  2327
=hVER$   Abs 1003803 #F511B -    53
 hVER$1  Abs 1003857 #F5151 -    65    59
=hWRCBF  Abs 1004307 #F5313 -   498
 i/OFND  Ext                -   650  2058
 lFIB    Abs      63 #0003F -    13  2074
 lFLENh  Abs       5 #00005 -    13  1120  1169  1262  1266  1267  1459  1627
 mSDA@5  Ext                -  1875
 mSFC@5  Ext                -  1878
 o41sod  Abs       5 #00005 -    13  1250
 oACCSb  Abs      11 #0000B -    13   455   568   643   648
 oBSsod  Abs      17 #00011 -    13  1207
 oCOPYb  Abs      10 #0000A -    13   657   658
 oCPOSb  Abs      40 #00028 -    13   569   666
 oDAsod  Abs      13 #0000D -    13  1624  1692
 oDBEGb  Abs      21 #00015 -    13   568   569   658   666   678  2068  2072
                               2077
 oDEVCb  Abs      12 #0000C -    13   631
 oFBEGb  Abs      13 #0000D -    13   677   678  2067  2068  2077
 oFBF#b  Abs       2 #00002 -    13   648   657
 oFLAGh  Abs      20 #00014 -    13  1092  1097  1601
 oFLENh  Abs      32 #00020 -    13  1097  1177  1207
 oFTYPh  Abs      16 #00010 -    13  1091  1177  1860
 oIMPLh  Abs      37 #00025 -    13  1668
 oRECLb  Abs      36 #00024 -    13  2072  2073
 oRLENb  Abs      52 #00034 -    13  2073  2074
 pEOT    Ext                -  1835
 pTERM   Ext                -  1833
 sCARD   Abs       2 #00002 -    13   872
 sDEST   Abs       3 #00003 -    13  1642  1900  2172  2202
 sEXTDV  Abs       0 #00000 -    13   859
 sLoop?  Ext                -  1646  1724  1814
=sMAPRS  Abs 1004277 #F52F5 -   445
 sOVERW  Ext                -   376  1026  1285
 sPR     Abs       1 #00001 -  2282  2288
 sPRIVT  Ext                -  2283
 sSEC    Abs       0 #00000 -  2281  2289  2303  2311
 sUNDEF  Abs       1 #00001 -    13   917
 sUNSEC  Ext                -  2298
```

```
Input Parameters

  Source file name is NZ&HND::MS

  Listing file name is NZ/HND:TI:ML::-1

  Object file name is NZ%HND:TI:MS::-1

                                          111111
                                0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                      TITLE  HPIL CAT <840301.1339>
  F5E91               ABS    #F5E91         TIXHP6 address (fixed)
            *
            *         N   N  ZZZZZ   &      CCC     A    TTTTT
            *         N   N      Z  & &    C   C   A A     T
            *         NN  N     Z   & &    C      A   A    T
            *         N N N    Z     &     C      A   A    T
            *         N  NN   Z     & & &  C      AAAAA    T
            *         N   N  Z      &  &   C   C  A   A    T
            *         N   N  ZZZZZ   && &   CCC   A   A    T
            *
            **************************************************************
            **************************************************************
            **
            ** Name:       hCAT - HPIL poll handler for the CAT statement
            **
            ** Category:   POLL
            **
            ** Purpose:
            **      Execute the CAT function for an HPIL device
            **
            ** Entry:
            **      File name in A[W], R0[3:0] (A[W]=0 if none specified)
            **      Device specifier in D[3:0], D[S]
            **      P=0
            **
            ** Exit:
            **      P=0
            **      Carry set: error (C[3:0] is error number)
            **      Carry clear:
            **        XM=0: handled (cat is finished)
            **        XM=1: not handled (not HPIL or not HP82161)
            **
            ** Calls:      CKBITL,FINDF+,SAVED1,SETCAT,BLDCAT,DSPCAT,BF2DSP,
            **             RESTD1,START,GETDR!,hCATsu,CK=ATn,UTLEND,POPBUF,
            **             RPTKY,SCRLLR,FINDA,D1=AVE,ENDTAP,hCTA+,hCTA-,
            **             CSRC10,NXTENT,hCTA=,CSRC5,LSTENT,CSLC10,CSLC5
            **
            ** Uses.......
            **  Inclusive: A,B,C,D,R0,R1,R2,R3,R4,D0,D1,P,STMTD0,ST[4:0],
            **             SCRTCH[63:0],3 RSTK save fields,FUNCD0,FUNCR1,
            **             F-R0-1
            **
            ** Stk lvls:   6 (FINDF+)(hCTA+)(hCTA-)(hCTA=)
            **
            ** Detail:
            **      R3 contains the pointers to the current drive:
            **             [A] is the # of entries remaining in directory
            **               (after the current one!), including any
            **               purged entries
            **             [9:5] is the current entry number (this is the
            **               number of entries to here in the directory,
            **               including the current entry and any purged
            **               entries)
            **             [13:10] is the physical directory pointer (3 nib
**                     record pointer, 1 nib offset pointer)
**                   [S] is the "valid" flag - indicates whether
**                     the physical directory pointer is where the
**                     drive really is pointing now (0 means valid)
**
** Algorithm:
**
**        hCAT:  IF (not HPIL) or (not HP82161) THEN
**                   RETURN carry clear, XM=1 -- Not handled
**               --
**               -- This is HPIL...continue
**               --
**               IF (filename not specified) THEN CATALL
**               --
**               -- This is a specific entry
**               --
**               Find the file (FINDF+)
**               IF error then set up error, RTNSC
**               --
**               -- File found (directory entry in SCRTCH)
**               --
**               Save device address in STMTD1
**               Reserve RAM on MTHSTK for building entry
**               --
**               BLDCAT -- Build the CAT string on the stack
**               --
**               DSPCAT -- Send the string to the display
**               ---
**               GOTO hCTA35 -- Collapse the MTHSTK, RTNCC
**        --------------------------------------------------
**        --------------------------------------------------
**        CATALL:Save device address in STMTD1
**               Display header line (NAME...TYPE...LEN...)
**               --
**               Restore device address
**               Get directory info and first entry from drive
**               --
**               Reserve RAM on MTHSTK for building entry
**               --
**        hCTA20:Check for ATTN key pressed (if so, exit)
**               Unaddress the device as listener
**               --
**               Build the catalog entry               (BLDCAT)
**               Display the catalog entry             (DSPCAT)
**               Goto hCTA22
**               ----------
**        hCTAct --
**               -- Continue with next key
**               --
**               Unaddress talkers/listeners           (UTLEND)
**               --
**        hCTA22 Pop key from buffer (Either entry or already used)
**               --
**               Repeat key if still down              (RPTKEY)
**               -
**                 If key not still down, get next key    (SCRLLR)
**                 --
**         hCTA35 Restore device address from STMTD1      (RESTD1)
**                 --
**                 Set up the loop and device again       (START )
**                 If error, goto hCTAer (clean up)
**                 --
**                 Set R2=R3 (R2 is temporary position)
**                 Check keycode                          (FINDA )
**                   Down  :goto hCTAdn
**                   Up    :goto hCTAup
**                   Bottom:goto hCTAbt
**                   Top   :goto hCTAtp
**                  Else continue
**                 --
**                 If keycode is not zero (CAT all) then
**                   inhibit display scrolling
**                 --
**         hCTA38 Release RAM from MTHSTK
**                 --
**         hCTA39 Rewind the drive, unaddress all         (ENDTAP)
**                 Return with carry clear, XM=0
**                 ----------
**         hCTAdn -- Down arrow
**                 --
**                 Get next non-purged directory entry    (hCTA+ )
**                 --
**         hCTAxx If not End_of_Directory, goto hCTAbl --Build disp
**                 else goto hCTAct  --Ignore the down arrow
**                 ----------
**         hCTAup -- Up arrow
**                 --
**                 Get previous non-purged directory entry (hCTA-)
**                 Goto hCTAxx
**                 ----------
**         hCTAbt -- gDown arrow (bottom)
**                 --
**                 Get next non-purged directory entry    (hCTA+ )
**                 If not End_of_Directory, goto hCTAbt --Get next
**                 --
**                 -- Reached End_of_Directory...
**                 -- ...Check if new record...if so, say not exact
**                 --
**                 Get the current entry                  (hCTA= )
**                 Goto hCTA20 --Build it, display it
**                 ----------
**         hCTAtp -- gUp arrow (top)
**                 --
**                 If already at top, then goto hCTA&& --Redisplay it
**                 Position to first non-purged directory entry
**                 Goto hCTA&&  --Redisplay it
**
** History:
**
**    Date      Programmer                  Modification
```

```
                 **  --------   ----------   --------------------------------
                 **  01/03/84       NZ       Changed RAM usage (added two RSTKBF
                 **                          levels in hCTA+c to fix bug)
                 **  10/25/83       NZ       Updated documentation
                 **  05/16/83       NZ       Changed CKHPIL to CKBITL, removed
                 **                          check for mass storage (done in
                 **                          CKBITL)
                 **  04/14/83       NZ       Added call to CHKMAS
                 **  01/14/83       NZ       Packed code (CKHPIL,FINDF+),fixed
                 **                          bug (CAT :<device>, no files on
                 **                          medium)
                 **  12/02/82       NZ       Wrote statement & documentation
                 **
                 ****************************************************************
                 ****************************************************************
 F5E91 7000 =hCAT    GOSUB  =CKBITL      Is this an HPIL CAT on HP82161?
 F5E95 500           RTNNC               No...return, XM set, carry clear
                 *
                 * This IS HPIL...is it for whole device or just one file?
                 *
 F5E98 978           ?A=0   W            Filename specified?
 F5E9B 62            GOYES  hCATAL       No...CAT ALL
                 *
                 * This is CAT for a specific file
                 *
 F5E9D 7000          GOSUB  =Findf+      Set up and find the file
 F5EA1 407           GOC    hCATer       Not found/error
                 *
                 * Now the directory entry is in SCRTCH
                 *
 F5EA4 DB            C=D    A
 F5EA6 135           D1=C
 F5EA9 8E00          GOSUBL =SAVED1      Save device address in STMTD1
       00
 F5EAF 7E73          GOSUB  SETCAT       Reserve the stack space for entry
 F5EB3 7ED4          GOSUB  BLDCAT       Build the CAT entry
 F5EB7 7B47          GOSUB  DSPCAT       Display the cat entry
 F5EBB D0            A=0    A            Clear A[B] ("keycode")
 F5EBD 69E0          GOTO   hCTA35       Exit after cleanup
                 *-
                 *-
 F5EC1           hCATAL
                 *
                 * This is a CAT ALL! (Device address in D[3:0])
                 *
 F5EC1 7E50          GOSUB  hCTA10       (GOSUB to get address on RSTK)
                 *-
                 *
                 * Header string here
                 *
 F5EC5 B1C3          NIBHEX B1C3         Cursor off - want non-readable
 F5EC9 0202          NIBASC \   NAME \     chars
       02E4
       14D4
       5402
```

```
F5ED9 0202          NIBASC \   S TYP\
      0235
      0245
      9505
F5EE9 5402          NIBASC \E   LEN \
      0202
      C454
      E402
F5EF9 0202          NIBASC \   DATE \
      0244
      1445
      5402
F5F09 0202          NIBASC \   TIME \
      0245
      9404
      5402
F5F19 D0A0          NIBHEX D0A0FF
      FF
            *-
            *-
F5F1F 6000 hCATer   GOTO   =Error        Return, set carry,err # in C[3:0]
            *-
            *-
F5F23 DB   hCTA10   C=D    A
F5F25 135           D1=C
F5F28 8E00          GOSUBL =SAVED1       Save address in STMTD1
      00
F5F2E 07            C=RSTK
F5F30 135           D1=C                 Position D1 @ string
F5F33 8F00          GOSBVL =BF2DSP       Send the header,build the display
      000
F5F3A 8E00          GOSUBL =RESTD1       (Don't care about D1 any more)
      00
F5F40 137           CD1EX
F5F43 D7            D=C    A             Restore address
F5F45 8E00          GOSUBL =START        Set up the loop, check modes
      00
F5F4B 430  hCATeR   GOC    hCATer        Error...set it up
F5F4E 8E00          GOSUBL =GETDR!       Get directory start, first entry
      00
F5F54 7162          GOSUB  hCATsu        Set up for directory
F5F58 42F           GOC    hCATeR        Error
F5F5B 8AE           ?C#0   A             Any entries?
F5F5E 60            GOYES  hCTA20        Yes...do them
F5F60 6680          GOTO   hCTAex        No...exit
            *-
            *-
            *
            * Now R3[A] is # ENTRIES remaining, R3[9:5] is current entry,
            * R3[13:10] is current entry address
            *
F5F64 8E00 hCTA20   GOSUBL =CK=ATn       Check if ATNFLG is set...
      00
F5F6A 531           GONC   hCTA21        ...yes it is...exit
F5F6D 8E00          GOSUBL =UTLEND       Unaddress the device...
```

```
           00
 F5F73 7E14         GOSUB  BLDCAT        ...Build the catalog entry...
 F5F77 7B86         GOSUB  DSPCAT        ...display the entry
 F5F7B 4E0          GOC    hCTA22        Go always
              *-
              *-
 F5F7E 5A7  hCTA21  GONC   hCTA38        Go always (jump out of range)
              *-
              *-
 F5F81 8E00 hCTAct  GOSUBL =UTLEND       Unaddress talkers/listeners
           00
 F5F87 443          GOC    hCTAeR        Error
              *
              * Pop the key, if any, out of the buffer
              *
 F5F8A 8F00 hCTA22  GOSBVL =POPBUF
           000
 F5F91 8F00 hCTA25  GOSBVL =RPTKY        Repeat the last key if still down
           000
 F5F98 490          GOC    hCTA30        (Key repeated if carry)
 F5F9B 8F00         GOSBVL =SCRLLR       Scroll left/right
           000
 F5FA2 968  hCTA30  ?A=0   B             Valid key?
 F5FA5 CE           GOYES  hCTA25        No...continue
 F5FA7 8E00 hCTA35  GOSUBL =RESTD1       Yes...process key
           00
 F5FAD 137          CD1EX
 F5FB0 D7           D=C    A             Restore device addr from STMTR1
 F5FB2 D8           B=A    A             Save keycode in B[B]
 F5FB4 8E00         GOSUBL =START        Set up the loop again
           00
 F5FBA D4           A=B    A             Restore keycode from B[B]
 F5FBC 495  hCTAeR  GOC    hCTAer        Error
 F5FBF 11B          C=R3
 F5FC2 10A          R2=C                 Use R2 as temporary position reg
              *
              * A[B] is the keycode of the key...check if valid CAT key
              *
 F5FC5 8F00         GOSBVL =FINDA
           000
 F5FCC 00           CON(2) =k#DOWN       Down
 F5FCE F50          REL(3) hCTAdn
 F5FD1 00           CON(2) =k#UP         Up
 F5FD3 A60          REL(3) hCTAup
 F5FD6 00           CON(2) =k#BOT        Bottom
 F5FD8 D60          REL(3) hCTAbt
 F5FDB 00           CON(2) =k#TOP        Top
 F5FDD B90          REL(3) hCTAtp
 F5FE0 00           CON(2) 0             End of table
              *
              * This is not a valid CAT key...exit
              *
 F5FE2 968          ?A=0   B             Is this a single entry CAT?
 F5FE5 41           GOYES  hCTA38        Yes...don't touch NEEDSC
 F5FE7      hCTAex
```

```
F5FE7 D0             A=0    A            Clear NEEDSC (CAT :<device>)
F5FE9 1F00           D1=(5) =NEEDSC
      000
F5FF0 1590           DAT1=A 1            Clear NEEDSC to inhibit scrolling
F5FF4 8AA            ?C=0   A            Exit for no files on medium?
F5FF7 41             GOYES  hCTA39       Yes.Don't release RAM-never reserved
F5FF9       hCTA38
F5FF9 8E00           GOSUBL =D1=AVE      Set D1 to AVMEME
      00
F5FFF 143            A=DAT1 A            Read (AVMEME)
F6002 79A0           GOSUB  LC40*2       Load C[A] with 40*2 (40 bytes)
F6006 CA             A=A+C  A
F6008 141            DAT1=A A            Write out updated AVMEME
F600B       hCTA39
F600B 7000           GOSUB  =Endtap      Clean up the loop
F600F 20             P=     0            Ignore error from ENDTAP
F6011 821            XM=0
F6014 03             RTNCC               Return, carry clear, XM=0
            *-
            *-
F6016 80C1  hCTAer   C=P    1            Save P in C[1]
F601A 06             RSTK=C
F601C 8F00           GOSBVL =POPBUF      Pop the key out of the buffer
      000
F6023 07             C=RSTK
F6025 80D1           P=C    1            Restore P from C[1]
F6029 65FE           GOTO   hCATer       Error exit
            *-
            *-
F602D       hCTAdn
            *
            * Down arrow
            *
F602D 7722           GOSUB  hCTA+        Get next entry
F6031 44E   hCTAxx   GOC    hCTAer       Error
F6034 8AE            ?C#0   A
F6037 D3             GOYES  hCTAbl       Not at end of directory...build it
F6039 674F           GOTO   hCTAct       End of directory...ignore key
            *-
            *-
F603D       hCTAup
            *
            * Up arrow
            *
F603D 7772           GOSUB  hCTA-        Get previous directory entry
F6041 6FEF           GOTO   hCTAxx       Finish it up (error if carry)
            *-
            *-
F6045       hCTAbt
            *
            * (g) Down arrow [bottom]
            *
F6045 7F02           GOSUB  hCTA+        Get next entry
F6049 4CC            GOC    hCTAer       Error...exit
F604C 8AE            ?C#0   A            End of directory yet?
```

```
F604F 6F            GOYES  hCTAbt        No...keep looking for end
           *
           * Check if crossed a record boundary - if so, need to re-seek
           *
F6051 11B           C=R3
F6054 94E           ?C#0   S             Already marked as "not current"?
F6057 61            GOYES  hCTA&&        Yes...skip unnecessary test
F6059 7D56          GOSUB  Csrc10
F605D 7566          GOSUB  Nxtent        Check if this crossed a boundary
F6061 5B0           GONC   hCTA&&        No...OK as is
F6064 11B           C=R3                 Yes...need to set C[S]="F"
F6067 A4E  hCTA&+   C=C-1  S             (Set "not current")
F606A 108           R3=C
           *
           * Get and build the entry now
           *
F606D 73B2 hCTA&&   GOSUB  hCTA=         Get this entry
F6071 44A           GOC    hCTAer        Error
F6074 6FEE hCTAbl   GOTO   hCTA20        Build it if no error
           *_
           *_
F6078      hCTAtp
           *
           * (g) Up arrow [top]
           *
F6078 11A           C=R2                 Read back pointers
F607B 7B26          GOSUB  Csrc5         Get entry # in C[A]
F607F DA            A=C    A             Save count in A[A]
F6081 CC            A=A-1  A             Adjust to zero-based count
F6083 CC            A=A-1  A             Check if this is first entry
F6085 47E           GOC    hCTA&&        Yes...already AT the top
F6088 7E16          GOSUB  Csrc5         Get pointer into C[3:0]
F608C 7C36 hCTAt1   GOSUB  Lstent        Back up an entry
F6090 7000          GOSUB  =Cslc10
F6094 E6            C=C+1  A             Increment "remaining" pointer
F6096 7026          GOSUB  Csrc10
F609A CC            A=A-1  A             Check if at start yet...
F609C 5FE           GONC   hCTAt1        ...not at start...loop back
F609F 7116          GOSUB  Cslc5         Set back to normal form...
F60A3 7906          GOSUB  C=1LC5        Set position to first record
F60A7 AC2           C=0    S
F60AA 5CB           GONC   hCTA&+        Go always...set NOT correct-->R3
           *_
           *_
F60AD D7   LC80**   D=C    A
F60AF 20   LC40*2   P=     0             Load C[A] with 80 (40*2)
F60B1 D2            C=0    A
F60B3 3105          LC(2)  40*2
F60B7 03            RTNCC                Carry clear on exit
           ****************************************************************
           ****************************************************************
           **
           ** Name:        hCAT$ - HPIL CAT$ function POLL handler
           **
           ** Category:    POLL
           **
           ** Purpose:
           **      Execute the CAT$ function for HPIL mass storage devices
           **
           ** Entry:
           **      F-RO-0 is the (saved) PC
           **      AVMEME is the pointer to the start of string header
           **        (The device string)
           **      The numeric expression is on the stack after the device
           **        string
           **
           ** Exit:
           **      F-RO-0 is unchanged
           **      Carry clear:
           **        XM=0:
           **          AVMEME points to the CAT$ string on the stack
           **        XM=1:
           **          Not HPIL/not Acc ID=16 device
           **      Carry set:
           **        Error (C[3:0] is error number)
           **
           ** Calls:      D1@AVE,POP1S,DEVPR$,CHKMAS,POP1N,D1=AVE,FLTDH,
           **             GETDR!,hCATsu,hCTA+,BLDCAT,D1@AVS,ENDTAP,<REV$>
           **
           ** Uses.......
           **  Inclusive: A-D,R0,R1,R2,R3,SCRTCH[63:0],S1[4:0],P,F-R0-1,
           **             FUNCD0,FUNCR1
           **
           ** Stk lvls:   5 (GETDR!)
           **
           ** History:
           **
           **   Date     Programmer              Modification
           **   --------  ----------     ----------------------------------
           **   01/04/84     NZ          Packed code in the vicinity of
           **                            GOSUBL =fLTDH call, hCAT$5, and
           **                            GOSUB =Endtap, changed RAM usage
           **   04/14/83     NZ          Added check for D=0 after DEVPR$
           **   12/13/82     NZ          Added routine and documentation
           **
           **************************************************************
           **************************************************************
F60B9 21   hCAT$x  P=     1          Return, set XM: not HPIL.
F60BB 0D           P=P-1             Clear carry, P=0
F60BD 00           RTNSXM            Set XM
           *-
           *-
F60BF      =hCAT$
           *
           * Is this an HPIL CAT$?
           *
F60BF 7DF5         GOSUB  D1@ave     Set D1 @ start of string
F60C3 8F00         GOSBVL =POP1S     Now A[A] is string len, D1@string
      000
           *
```

```
                * DEVPR$ leaves D0 at the mailbox if good device spec
                *
      F60CA 8E00        GOSUBL =DEVPR$       Get the device info
            00
      F60D0 501         GONC   hCAT$2        This is a GOOD device spec (D[A])
                *
                * Need to check if this is valid device spec...
                *
      F60D3 890         ?P=    =eDSPEC       Is this a device spec error?
      F60D6 3E          GOYES  hCAT$x        Yes...return, clear carry, XM=0
      F60D8 890         ?P=    =eRANGE       Is it out of range (device spec)?
      F60DB ED          GOYES  hCAT$x        Yes...return, clear carry, XM=0
      F60DD 6000 hCAT$e GOTO   =Error        No...error
                *-
                *-
      F60E1     hCAT$2
                *
                * If D[A] is zero, then device not found
                *
      F60E1 8A8         ?D=0   A
      F60E4 5D          GOYES  hCAT$x        Not found...return, not handled
                *
                * Now D[A] is the device address, D0 @ mailbox
                *
      F60E6 8E00        GOSUBL =CHKMAS       Check if this is mass storage
            00
      F60EC 4CC         GOC    hCAT$x        Not mass storage...don't handle
                *
                * Now know this is a mass storage device...find the start of
                * directory, set up for search
                *
                * D1 is now at the numeric value pointer -16
                *
      F60EF 17F         D1=D1+ 16            Point to the numeric value
      F60F2 8E00        GOSUBL =POP1N        Get the value
            00
                *
                * Now D1 is where the string should go -16
                *
      F60F8 17F         D1=D1+ 16
      F60FB 8E00        GOSUBL =aVE=D1       Write D1 value to AVMEME
            00
                *
                * A[W] is the numeric value
                *
      F6101 8E00        GOSUBL =fLTDH        Convert to HEX
            00
                *
                * If XM=1, then out of range, else negative (both are null
                * string)
                *
      F6107 533         GONC   hCAt$5        Either negative or out of range
                *
                * Now A[A] is the value
                *
```

```
F610A CC              A=A-1   A            Convert to base zero
F610C 436             GOC     hCAT$5       (Zero=null string)
F610F 101             R1=A                 Save value in R1[A]
             *
             * The following call cannot be in hCATsu because of RSTK lvls
             *
F6112 8E00            GOSUBL =GETDR!       Get the first entry
      00
F6118 7D90            GOSUB   hCATsu       Set up the drive (Position to 1st)
F611C 40C             GOC     hCAT$e       Error
F611F 8AA             ?C=0    A            No entries?
F6122 E4              GOYES   hCAT$5       No...exit, null string
F6124 111    hCAT$3   A=R1                 Recall count from R1
F6127 CC              A=A-1   A            Check if done
F6129 452             GOC     hCAT$4       Yes...build the string
F612C 101             R1=A                 Save count into R1 again
F612F 7521            GOSUB   hCTA+        Get next entry
F6133 49A             GOC     hCAT$e       Error,..exit
F6136 8AE             ?C#0    A            End of directory?
F6139 BE              GOYES   hCAT$3       No...continue
             *
             * End of directory
             *
F613B 543    hCAt$5   GONC    hCAT$5       Send null string
             *-
             *-
F613E 20     hCAT$m   P=      =eMORAM      Mem error
F6140 4C9             GOC     hCAT$e       Go always...error
             *-
             *-
F6143 0               CON(1) =FIXSPC       12 nibbles available here
F6144                 BSS     12-1
             *-
             *-
             *
             * Got a good entry...save device address, build entry
             *
F614F        hCAT$4
F614F 1F00            D1=(5) =F-R0-1       Address to save device address
      000
F6156 DB              C=D     A
F6158 145             DAT1=C  A
             *
F615B 7632            GOSUB   BLDCAT       Build the entry in memory
             *
             * Set D0 back to mailbox
             *
F615F 1F00            D1=(5) =F-R0-1       Address of device address
      000
F6166 147             C=DAT1  A            (LC80** does a D=C A)
F6169 704F            GOSUB   LC80**       String is 40 bytes (80 nibbles)
F616D 560             GONC    hCAT$6       Go always
             *-
             *-
F6170 D2     hCAT$5   C=0     A            Length=0 (Null string)
```

```
F6172 20              P=     0               Must set P=0 for A=A-1 P below
                *
                * Now C[A] is the length of the string, AVMEME is start
                *
F6174 AF0     hCAT$6  A=0    W
F6177 DA              A=C    A               Now A[A] is length in nibs
F6179 7345            GOSUB  D1@ave          Set D1 @ (AVMEME)
                *
                * Now A[A] is length in nibbles, D1 @ start
                *
F617D BF0             ASL    W
F6180 BF0             ASL    W
F6183 A0C             A=A-1  P               Set A[0]="F"
F6186 1CF             D1=D1- 16              Point to string header field
                *
                * D1 @ intended header destination
                *
F6189 137             CD1EX                  Pointer in C[A]
F618C 06              RSTK=C
F618E 8E00            GOSUBL =D1@AVS         Read (AVMEMS) into D1
      00
                *
                * RSTK @ intended header, D1 @ (AVMEMS)
                *
F6194 07              C=RSTK                 (AVMEME) into C[A]
                *
                * D1 @ (AVMEMS), C @ intended header
                *
F6196 133             AD1EX
                *
                * A[A] @ (AVMEMS), C[A] @ intended header
                *
F6199 8B6             ?A>C   A               Room?
F619C 2A              GOYES  hCAT$m          No...mem error
F619E 133             AD1EX                  Yes...OK to write it
                *
                * A[W] is intended header, C[A] @ intended header
                *
F61A1 135             D1=C                   Set D1 to start of header
                *
                * There is room to put this here
                *
F61A4 1517            DAT1=A W               Write the string header
                *
                * Now set AVMEME (pointed to by D1) to the new header
                *
F61A8 8E00            GOSUBL =aVE=D1         Write out new AVMEME
      00
                *
                * (Leave D1 @ AVMEME for REV$)
                *
                * Clean up the mass storage device now
                *
F61AE 795E            GOSUB  hCTA39          Unaddress Talker&listener,P=0,XM=0
F61B2 8D00    =rEV$   GOVLNG =REV$           Reverse the string
```

```
          000
                  ***************************************************************
                  ***************************************************************
                  **
                  ** Name:        hCATsu - Subroutine for hCAT routines
                  **
                  ** Category:    LOCAL
                  **
                  ** Purpose:
                  **      Set up for executing hCTA-, hCTA+ and BLDCAT routines
                  **
                  ** Entry:
                  **      Carry clear:
                  **        D[A] is drive address
                  **        AVMEME points to the top of the stack
                  **        D0 points to the HPIL mailbox
                  **      Carry set:
                  **        Error (will just RTNC)
                  **
                  ** Exit:
                  **      Carry clear:
                  **        C[A]=0:
                  **          No directory entries on medium
                  **        C[A]#0:
                  **          R3 contains the directory pointers (see hCAT)
                  **          AVMEME reflects the new top of stack (after reserving
                  **            RAM for CAT)
                  **
                  ** Calls:       CSRC5,CSRC10,CSLC5,CSLC10,TSAV2C,R<RST2,GDIRS+,
                  **              hCTA+C,RST2<R,TRES2C,GETMBX,SETCAT,D1=AVS,D1=AVE
                  **
                  ** Uses.......
                  **  Inclusive: A[W],B[W],C[W],R2,R3,D1,P,(3 RSTK save locations)
                  **
                  ** Stk lvls:   3 (hCTA+c) (3 levels saved by R<RST2)
                  **
                  ** History:
                  **
                  **    Date     Programmer               Modification
                  **  --------   ----------    --------------------------------
                  **  01/04/84       NZ        Reworked code around hCTA+C call
                  **                           to reduce the number of stack
                  **                           levels used (added R<RST2,RST2<R)
                  **  12/14/82       NZ        Added routine and documentation
                  **
                  ***************************************************************
                  ***************************************************************
     F61B9 400    hCATsu  RTNC                 Error! (Return at once)
                  *
                  * Now B[3:0] is pointer to first directory entry, D[8:5] is
                  * number of directory records, SCRTCH is first entry,
                  * D1 is at (=SCRTCH)+16
                  *
                  * Save # of directory ENTRIES remaining in R3[A], current
                  * ENTRY number in R3[9:5]
```

```
                    *
 F61BC AFB                C=0    W
 F61BF 77E4               GOSUB  Csrc5          Now C[3:0] is # of records
 F61C3 F2                 CSL    A              (# records times 8 is # ENTRIES)
 F61C5 81E                CSRB                  Now C[A] is # of ENTRIES
 F61C8 CE                 C=C-1  A              (We have the first one already)
 F61CA 7CE4               GOSUB  Csrc10
 F61CE D9                 C=B    A
 F61D0 7000               GOSUB  =Cslc10        C[13:10] is current dir location
 F61D4 10A                R2=C                  # of entries, current entry-->R2
 F61D7 10B                R3=C                  # of entries, current entry-->R3
                    *
                    * Check if the first entry is PURGED or EOD...if so, find the
                    * first non-purged entry
                    *
 F61DA 8F00               GOSBVL =R<RST2        Save 3 RSTK levels in RAM
       000
 F61E1 8E00               GOSUBL =GETMBX        Get the mailbox address back to D0
       00
 F61E7 7371               GOSUB  GDIRS+         Read file type, set P=3
 F61EB 72A0               GOSUB  hCTA+C         Check if PURGED, etc.
 F61EF 80CE               C=P    14             Save P value in C[14]
 F61F3 AC2                C=0    S
 F61F6 550                GONC   hCATs1         If carry is clear, leave C[S]=0
 F61F9 B46                C=C+1  S
 F61FC 8E00 hCATs1        GOSUBL =TSAV2C        Save C[W] in FUNCR1 for now
       00
 F6202 8F00               GOSBVL =RST2<R        Restore the RSTK levels
       000
 F6209 8E00               GOSUBL =GETMBX        Restore the mailbox addr to D0
       00
 F620F 8E00               GOSUBL =TRES2C        Restore C[W]
       00
 F6215 80DE               P=C    14             Restore P
 F6219 94E                ?C#0   S              Was carry set?
 F621C 00                 RTNYES                Yes...error
 F621E 8AA                ?C=0   A              Any valid entries?
 F6221 F2                 GOYES  hCATsx         No...exit
 F6223 11B                C=R3
 F6226 7084               GOSUB  Csrc5
 F622A 7284               GOSUB  C=1LC5         Set C[A]=1, CSLC5
 F622E 10B                R3=C                  This is the FIRST entry
                    *
 F6231            SETCAT
 F6231 7A7E               GOSUB  LC40*2         40 bytes = 80 nibbles
 F6235 D5                 B=C    A
 F6237 8E00               GOSUBL =D1=AVS        Check if room for 40 bytes
       00
 F623D 143                A=DAT1 A
 F6240 174                D1=D1+ 5              AVMEME is 5 nibbles after AVMEMS
 F6243 147                C=DAT1 A
 F6246 E9                 C=C-B  A              Now C[A] is proposed new AVMEME
 F6248 8B6                ?A>C   A
 F624B 70                 GOYES  SETenm         No memory
                    *
```

```
                 * There IS room for this
                 *
F624D 145                DAT1=C A               Write out the (temp) AVMEME
F6250 03         hCATsx  RTNCC                  Return, carry clear
                 *-
                 *-
F6252 8C00       SETenm  GOLONG =NORAMe         No memory
      00
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:        hCTA+ - Go forward 1 non-purged entry
                 **
                 ** Category:    LOCAL
                 **
                 ** Purpose:
                 **      Move one non-purged directory entry forward from
                 **      current position
                 **
                 ** Entry:
                 **      D0 points to the mailbox, D[X] is device address
                 **      R2 is current position pointers, R3 is old pointers
                 **
                 ** Exit:
                 **      Carry clear:
                 **        C[A]=0: No more directory entries
                 **        C[A]#0: R3 updated to current pointers
                 **      Carry set:
                 **        Error (P=error code)
                 **
                 ** Calls:       CSRC10,NXTENT,SEEKRD,CSRC5,GDIRSB
                 **
                 ** Uses.......
                 **  Exclusive:       C[W],R2,R3
                 **  Inclusive: A[A],C[W],R2,R3,D1,P
                 **
                 ** Stk lvls:    5 (GDIRSB)
                 **
                 ** History:
                 **
                 **    Date     Programmer              Modification
                 **  --------   ----------     -----------------------------
                 **  01/04/84       NZ         Packed to install bug fix for CAT
                 **                            on a medium with the first file
                 **                            purged
                 **  12/10/82       NZ         Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
F6258 11A        hCTA+   C=R2
                 *
                 * Down arrow key (C[W] is R2 contents)
                 *
F625B 8AA                ?C=0   A
F625E E4                 GOYES  hCTA+x          Exit...already at end of directory
```

```
                     *
                     * Have NOT reached EOD yet
                     *
F6260 94A                  ?C=0   S            Is the medium at that record?
F6263 41                   GOYES  hCTA+2       Yes...don't need to SEEK
                     *
                     * Need to position to that record
                     *
F6265 7154                 GOSUB  Csrc10       C[3:1] is record #, [0] is BP
F6269 7954                 GOSUB  Nxtent       Set to NEXT record
F626D 7CF0                 GOSUB  SEEKRD       Seek to the record & read it
F6271 400                  RTNC                Error
F6274 11A            hCTA+1  C=R2
                     *
                     * Now the medium is positioned at the record specified
                     *
F6277 8AA            hCTA+2  ?C=0   A          End of directory?
F627A 22                   GOYES  hCTA++       Yes...exit, mark end of directory
F627C CE                   C=C-1  A            No...decrement the count
F627E 7824                 GOSUB  Csrc5
F6282 7224                 GOSUB  C+1RC5       Increment current location
F6286 7C34                 GOSUB  Nxtent       Go to next entry
                     *
                     * GDIRSB sets R2 to C after CSLC10, C[S]=0
                     *
F628A 78B0                 GOSUB  GDIRSB       Get directory entry, set up
F628E 400                  RTNC                Error
                     *
                     * Now the entry is in SCRTCH, C[3:0] is type (byte-reversed)
                     *
F6291 91A            hCTA+C  ?C=0   WP         Purged entry?
F6294 0E                   GOYES  hCTA+1       Yes...get next one
F6296 B16                  C=C+1  WP
F6299 541                  GONC   hCTA+!       Done: P=3, carry clear
                     *
                     * End of directory...set count=0, position flag=false
                     *   (Set position=last good position from R3)
                     *
F629C 11B            hCTA++  C=R3              End of directory
F629F D2                   C=0    A
F62A1 AC2            hCTA&t  C=0    S
F62A4 A4E                  C=C-1  S            Set R3[S]#0 (not at current record)
F62A7 10B                  R3=C                Set # of entries remaining=0
F62AA D2                   C=0    A            (Needed for hCTA&t entry)
F62AC 03             hCTA+x  RTNCC             (Carry clear, C[A]=0)
                     *_
                     *_
F62AE 11A            hCTA+!  C=R2
F62B1 10B                  R3=C                Update the pointers
F62B4 E6                   C=C+1  A            Insure that C[A]#0 for exit cond
F62B6 03                   RTNCC
                     ************************************************************
                     ************************************************************
                     **
                     ** Name:         hCTA- - Move back one directory entry
```

```
                  ** Name:       hCTA= - Get the current directory entry
                  **
                  ** Category:   LOCAL
                  **
                  ** Purpose:
                  **      hCTA-:Move back one non-purged directory entry
                  **      hCTA=:Read in the current directory entry
                  **
                  ** Entry:
                  **      D0 points to the mailbox, D[X] is device address
                  **      R2 is current directory pointers, R3 is old pointers
                  **
                  ** Exit:
                  **      Carry clear:
                  **        C[A]=0: Beginning of directory reached
                  **        C[A]#0: SCRTCH[63:0] is the new entry
                  **                R3 is updated to current directory entry
                  **      Carry set:
                  **        Error (P=error code)
                  **
                  ** Calls:      CSRC5,CSLC5,NXTENT,LSTENT,SEEKRD,GDIRSB
                  **
                  ** Uses.......
                  **  Exclusive: A[A],C[W],R2,R3,D1,P
                  **  Inclusive: A[A],C[W],R2,R3,D1,P
                  **
                  ** Stk lvls:   5 (GDIRSB)
                  **
                  ** History:
                  **
                  **    Date      Programmer           Modification
                  **  --------    ----------    --------------------------------
                  **  01/04/84       NZ         Packed to install bug fix (see CAT)
                  **  01/03/84       NZ         Moved the RTNC after SEEKRD to be
                  **                            before the C=B A (Was destroying
                  **                            the error number in C[0])
                  **  01/24/83       NZ         Changed R2[A] to include purged
                  **                            entries
                  **  12/10/82       NZ         Added documentation
                  **
                  **************************************************************
                  **************************************************************
 F62B8 11A  hCTA-   C=R2
 F62BB 79E3         GOSUB  C+1RC5       Increment # of entries left
 F62BF CE           C=C-1  A            Decrement to previous entry
 F62C1 8AA          ?C=0   A            At top already?
 F62C4 A4           GOYES  hCTA-3       Yes...set R3 to first entry
 F62C6 70E3         GOSUB  Csrc5
 F62CA 10A          R2=C                Save counts in R2 for now
 F62CD 25           P=     15-10        Point to C[S], CSRC5'ed twice
 F62CF DA           A=C    A            Save entry in A[A]
 F62D1 90E          ?C#0   P            Is this the current position?
 F62D4 21           GOYES  hCTA-1       No...need to SEEK that record
 F62D6 7CE3         GOSUB  Nxtent       Check if this was the last entry
 F62DA 480          GOC    hCTA-1       Was last...need to SEEK
```

```
F62DD D6              C=A    A          Check if was FIRST entry
F62DF 79E3            GOSUB  Lstent     Go back 1 entry (record)
F62E3 5F0             GONC   hCTA-2     Still in same record
               *
F62E6 D6       hCTA-1 C=A    A          Get the entry location back again
F62E8 70E3            GOSUB  Lstent     Go back 1 entry (for position)
               *
               * Now C[3:1] is the correct record #
               *
               * Go to that record
               *
F62EC 7D70            GOSUB  SEEKRD     Seek to that record, read it
F62F0 400             RTNC              Error
F62F3          hCTA-2
               *
               * Now medium is positioned to the correct record
               *
F62F3 11A             C=R2
F62F6 72D3            GOSUB  Lstent     Set C[3:0] to the last entry
F62FA 7840            GOSUB  GDIRSB     Get directory entry, set P=3
F62FE 400             RTNC              Error
               *
               * D1 @ (=SCRTCH)+20, P=3, C[3:0] is type (byte-reversed)
               *
F6301 91A             ?C=0   WP         Purged?
F6304 4B              GOYES  hCTA-      Yes...try next entry
               *
               * Good entry (Cannot get EOD with up-arrow)
               *
F6306 11A             C=R2
F6309 10B             R3=C              Set R3 to the current pointer
F630C 03              RTNCC
               *-
               *-
F630E 11B      hCTA-3 C=R3
F6311 7593            GOSUB  Csrc5
F6315 CE              C=C-1  A
F6317 8AA             ?C=0   A
F631A 29              GOYES  hCTA+x     Started at beginning..leave as is
F631C 7093            GOSUB  C=1LC5     Indicate at FIRST entry in CAT
F6320 608F            GOTO   hCTA&t     Set R3[S]#0, continue
               *-
               *-
F6324 11B      hCTA=  C=R3
F6327 7F83            GOSUB  Csrc10     Get current entry into C[3:0]
F632B 25              P=     15-10      Point to R3[S], shifted 10
F632D 90A             ?C=0   P          Is it correct?
F6330 61              GOYES  GDIRSB     Yes...just read that entry
F6332 D5              B=C    A          (Save entry info in B[3:0])
F6334 7530            GOSUB  SEEKRD     No...SEEK to the record, read it
               *
               * Before restoring entry information to C[3:0], check for error
               *
F6338 400             RTNC              Error if carry set
F633B D9              C=B    A          (Restore entry info to C[3:0])
```

```
F633D 128           CR3EX                   Save C[3:0] in R3, fetch R3-->C
F6340 AC2           C=0     S               Current record is positioned
F6343 128           CR3EX                   Restore C[3:0], R3
              *
              * Fall through to GDIRSB
              *
              ************************************************************
              ************************************************************
              **
              ** Name:       GDIRSB - Subroutine to get a directory entry
              **
              ** Category:   LOCAL
              **
              ** Purpose:
              **        Save location, get directory entry, check file type
              **
              ** Entry:
              **        C[3:0] is the directory pointer
              **        D0 points to the mailbox
              **        D[X] is the device address
              **
              ** Exit:
              **        Carry clear:
              **          P=3, C[3:0]=file type (C[B] is high byte of type)
              **        Carry set:
              **          Error (P=error code)
              **
              ** Calls:      CSLC10,GETDR+
              **
              ** Uses.......
              **  Exclusive: A[A],C[W],R2,D1,P
              **  Inclusive: A[A],C[W],R2,D1,P
              **
              ** Stk lvls:   4 (GETDR+)
              **
              ** History:
              **
              **    Date      Programmer              Modification
              **  --------    ----------    --------------------------------
              **  01/04/84        NZ        Added GDIRS+ entry point
              **  12/09/82        NZ        Added routine & documentation
              **
              ************************************************************
              ************************************************************
              *
              * Code above falls into this routine
              *
F6346 DA      =GDIRSB A=C     A             Copy entry to A[A]
F6348 7000            GOSUB  =Cslc10        Restore R2 to correct orientation
F634C AC2             C=0     S             (At correct record)
F634F 10A             R2=C                  Set R2 again
              *
              * Now A[3:0] is the CORRECT pointer for this file
              *
F6352 814             ASRC
```

```
F6355 8E00          GOSUBL =GETDR+        Set byte pointer, read entry
      00
F635B 400           RTNC                  Error
F635E 1F00 GDIRS+   D1=(5) (=SCRTCH)+20   Position to TYPE bytes
      000
F6365 15F3          C=DAT1 4
F6369 23            P=     3
F636B 03            RTNCC                 Leave C[3:0]=type, P=3
                ************************************************************
                ************************************************************
                **
                ** Name:        SEEKRD - Seek to a record, then read it
                **
                ** Category:    PILI/O
                **
                ** Purpose:
                **      Seek a record on the mass memory device and read it
                **
                ** Entry:
                **      C[3:1] is the record # desired
                **      D0 points to the mailbox
                **      D[X] is the device address
                **
                ** Exit:
                **      Carry clear:
                **        P=0, record has been read into buffer 0 of device
                **      Carry set: Error (P=error #)
                **        Error (P,C[0] are the error code)
                **
                ** Calls:       TSTAT,SEEKA,DDT,TSTATA
                **
                ** Uses.......
                **  Exclusive: A[A],C[W],P
                **  Inclusive: A[A],C[W],P
                **
                ** Stk lvls:    3 (TSTAT)(SEEKA)(TSTATA)
                **
                ** History:
                **
                **    Date     Programmer              Modification
                **  --------   ----------    --------------------------------
                **  12/09/82      NZ         Added routine & documentation
                **
                ************************************************************
                ************************************************************
F636D           =SEEKRD
                *
                * Go to the record, but check status first
                *
F636D D0            A=0    A
F636F F6            CSR    A
F6371 ABA           A=C    X              A[A] is now record #
F6374 8E00          GOSUBL =TSTAT         Check device status first
      00
F637A 400           RTNC                  Error
```

```
F637D 7000        GOSUB  =Seeka        Go to that record
F6381 400         RTNC
F6384 20          P=     =Read
F6386 8E00        GOSUBL =DDT          Read the data from the device
      00
F638C 400         RTNC
F638F 8C00        GOLONG =TSTATA       (Device is already talker)
      00
            **************************************************************
            **************************************************************
            **
            ** Name:       BLDCAT - Build CAT text, given directory entry
            **
            ** Category:   LOCAL
            **
            ** Purpose:
            **      Build the CAT[$] string on the [MATH] stack, using the
            **      directory entry in SCRTCH[63:0]
            **
            ** Entry:
            **      SCRTCH contains the directory entry for the file
            **
            ** Exit:
            **      Carry clear, CAT text on stack, AVMEME at CAT text
            **
            ** Calls:      D1@AVE,TSAVDO,BLANKC,SWAP01,GT2BYT,FTYPF#,HTODX,
            **             WRTASC,GETBYT,GT2BYO,A-MULT,TRESDO
            **
            ** Uses.......
            **  Exclusive: A[W],B[W],C[W],D[S],RO,D1,P
            **  Inclusive: A[W],B[W],C[W],D[S],RO,D1,P,FUNCDO
            **
            ** Stk lvls:   3 (FTYPF#)
            **
            ** History:
            **
            **   Date     Programmer              Modification
            **  --------  ----------    --------------------------------
            **  12/06/82      NZ        Wrote routine and documentation
            **
            **************************************************************
            **************************************************************
F6395 7723 =BLDCAT GOSUB  D1@ave       Set D1 to start of string
            *
            * Now D1 is at start of CAT build area, SCRTCH contains the
            * directory entry for the desired CAT
            *
            * Save DO in FUNCDO (restore on exit)
            *
F6399 8E00        GOSUBL =TSAVDO
      00
F639F 1B00        DO=(5) =SCRTCH
      000
F63A6 1567        C=DAT0 W             Read in first 8 chars of name
F63AA 16F         DO=DO+ 16            Skip first 8 input chars
```

```
F63AD 1557          DAT1=C W            Write out the first 8 chars
F63B1 17F           D1=D1+ 16
F63B4 146           C=DAT0 A            Read last 2 chars
F63B7 163           D0=D0+ 4            Skip last 2 input chars
F63BA 15D3          DAT1=C 4            Write last 2 chars
F63BE 173           D1=D1+ 4
                 *
                 * Now the name is written...blank, security, blank next
                 *
F63C1 8E00          GOSUBL =BLANKC      Get blanks in C[W]
      00
                 *
                 * Blank out the rest of the text now
                 *
F63C7 133           AD1EX
F63CA 131           D1=A                Save D1 in A[A]
F63CD 2B            P=     16-5
F63CF 15DB BLDC10   DAT1=C 6*2          Clear the remaining 30 bytes
F63D3 17B           D1=D1+ 6*2            in chunks of 6 bytes
F63D6 0C            P=P+1
F63D8 56F           GONC   BLDC10
F63DB 131           D1=A                Restore D1
F63DE 175           D1=D1+ 6            Skip to file type field
                 *
                 * D1 points to the file type byte in header
                 *
                 * D0 is still at the file type in SCRTCH
                 *
F63E1 AF2           C=0    W            Must clear high nibs for HTODX
F63E4 7312          GOSUB  SWAP01       Swap D0, D1
F63E8 8E00          GOSUBL =GT2BYT      Read in 2 bytes (type) at D1
      00
F63EE 7902          GOSUB  SWAP01       Swap D0, D1
                 *
                 * D0 is now at start of start address field, D1 is still at
                 * text "type" field
                 *
F63F2 AFA           A=C    W            File type into A[A]
F63F5 7000          GOSUB  =FTYPF#      Read the file type
                 *
                 * If carry set, found the type; C[A], B[A] @ entry, B[S] = #
                 *
F63F9 4A2           GOC    BLDC30       Found a file type table with this
                 *
                 * This is an unknown type...leave security blank, print
                 * type in ASCII digits (Type is in A[W])
                 *
F63FC AC3           D=0    S            Use D[S] as the SIGN of file type
F63FF D6            C=A    A            Check if A[3:0] is #8000 or more
F6401 F2            CSL    A
F6403 C6            C=C+C  A            If carry, then this is negative
F6405 5A0           GONC   BLDC20       Non-negative...continue
                 *
                 * This is negative...change sign field to 1
                 *
```

```
F6408 B47            D=D+1  S
F640B 23             P=     3
F640D B98            A=-A   WP          Negative of file type
F6410 8E00 BLDC20    GOSUBL =HTODX      Convert to decimal
      00
F6416 24             P=     4           B[W]<=32768 to get here
F6418 7732           GOSUB  WRTASC      Write digits, suppress leading 0's
F641C D1             B=0    A           Set B[A]=0...type not known
F641E 171            D1=D1+ 2           Skip a blank between type, length
F6421 5B3            GONC   BLDC40      Go always...continue with length
           *-
           *-
F6424      BLDC30
           *
           * B[A] is pointer to file type, B[S] is the protection
           * D1 at file type text area
           *
F6424 A4D            B=B-1  S           Always at LEAST 1 from FTYPF#
           *
           * Now B[S] is the protection, base zero
           *
F6427 1C3            D1=D1- 4           Point to the protection byte
F642A AC9            C=B    S           Read protection type
F642D A46            C=C+C  S           Double it for bytes
F6430 BCA            C=-C   S           Negate it for offset from C[S]
F6433 80DF           P=C    15          Set P=offset from C[S]
F6437 3702           LCASC  \EPS \      C[B] gets proper value
      3505
      54
F6441 14D            DAT1=C B           Write out the security code
F6444 173            D1=D1+ 4           Back to file type text area
           *
           * Now ready to output the file type
           *
F6447 D9             C=B    A
F6449 137            CD1EX              D1-->type entry
F644C 174            D1=D1+ 5           Skip to ASCII for file type
F644F 15B9           A=DAT1 10          Read the type...
F6453 137            CD1EX              ...restore true D1...
F6456 1599           DAT1=A 10          ...and write the type
F645A 17B            D1=D1+ 12          (Skip to length field)
F645D      BLDC40
           *
           * Now continue at the length field
           *
F645D 8AD            ?B#0   A           Is the type known?
F6460 F1             GOYES  BLDC50      Yes...continue
           *
           * Type is unknown...use size in records
           *
F6462 167            D0=D0+ 8           Skip the start of file field
           *
           * D0 is at the length of file in records
           *
F6465 7291 BLDC45    GOSUB  SWAP01      Swap D0, D1 (D1 @ start of field)
```

```
F6469 24             P=      4
F646B AF2            C=0     W
F646E 8E00           GOSUBL =GETBYT       Read 5 bytes into C[9:0]
      00
F6474 AE2            C=0     B            Throw away low byte
             *
             * C[W] is now the file size in bytes (records * 256)
             *
F6477 7081           GOSUB   SWAP01       Restore D1 from D0
F647B 6590           GOTO    BLDC60       File size (bytes) in C[W]
             *-
             *-
F647F D9     BLDC50  C=B     A
F6481 E6             C=C+1   A            Skip create code
F6483 134            D0=C                 D0 points to start of entry
F6486 AF2            C=0     W
F6489 1564           C=DAT0 S             Read copy code from type table
F648D 161            D0=D0+ 2             Point to offset to data
F6490 14E            C=DAT0 B             Read offset to data value
F6493 AF5            B=C     W            Copy to B[W]
F6496 1B00           D0=(5) (=SCRTCH)+56  Point to implementation bytes
      000
F649D 94E            ?C#0    S            Copy code zero?
F64A0 42             GOYES   BLDC52       No...check further
             *
             * Copy code zero...length is (IMPL)-(oDATA)+(lFLEN)
             *
F64A2 15A5           A=DAT0 6             Read in the length field
F64A6 20             P=      0
F64A8 3100           LC(2)   =lFLENh      Length of FLEN field
F64AC 25             P=      5
F64AE A12            C=C+A   WP
F64B1 B19            C=C-B   WP           Subtract offset to data
F64B4 550            GONC    BLDC51
F64B7 AF2            C=0     W            If less than zero, set =0
F64BA        BLDC51
             *
             * Now C[W] is the length in nibbles
             *
F64BA B76            C=C+1   W            Add one to round UP if odd
F64BD 81E            CSRB                 Convert to bytes
F64C0 6050           GOTO    BLDC60       Done (size in C[W])
             *-
             *-
F64C4        BLDC52
             *
             * Check further on the copy code
             *
F64C4 A46            C=C+C   S            Copy code 8?
F64C7 550            GONC    BLDC54       Not copy code 8...continue
             *
             * Copy code 8...use length in records to display size
             *
F64CA 480            GOC     BLDC5?       Go always
             *-
```

```
           *-
F64CD A46  BLDC54  C=C+C  S                  Copy code 4 (LIF1)?
F64D0 5C0          GONC   BLDC56             No...keep checking
           *
           * This is LIF1...use length in records
           *
F64D3 1B00 BLDC57  D0=(5) (=SCRTCH)+32       Length in records
      000
F64DA 4A8          GOC    BLDC45             Go always (use record length)
           *-
           *-
F64DD A46  BLDC56  C=C+C  S                  Copy code 2 (41C data file)?
F64E0 591          GONC   BLDC58             No...must be HP-71 data file
           *
           * 41C (SDATA) data file
           *
F64E3 7411         GOSUB  SWAP01
F64E7 8E00         GOSUBL =GT2BYO            Read 2 bytes (size in registers)
      00
F64ED 7A01         GOSUB  SWAP01
F64F1 BF2          CSL    W
F64F4 81E          CSRB                      Multiply by 8 bytes/register
F64F7 591          GONC   BLDC60             Go always (Size in C[W])
           *-
           *-
F64FA      BLDC58
           *
           * HP-71 data file
           *
F64FA 15E3         C=DAT0 4                  Read # of records
F64FE 163          D0=D0+ 4                  Position to record length
F6501 AF0          A=0    W                  Clear high nibs of A[W]
F6504 15A3         A=DAT0 4                  Read record length
F6508 8E00         GOSUBL =A-MULT            Leaves result in A[W]
      00
           *
           * A[W] is now the length
           *
F650E AF6          C=A    W                  Copy to C[W]
F6511 AFA  BLDC60  A=C    W                  Copy size to A[W]
           *
           * Convert size to decimal...
           *
F6514 8E00         GOSUBL =HTODX             Result in B[W]
      00
F651A 2F           P=     15
F651C 90D  BLDC65  ?B#0   P
F651F 90           GOYES  BLDC70             Non-zero digit
F6521 0D           P=P-1
F6523 58F          GONC   BLDC65             Go unless B[W]=0
F6526 20           P=     0                  Indicate 1 digit
F6528      BLDC70
           *
           * Now B[WP] is the decimal value of size
           *
```

```
F6528 80CF          C=P    15
F652C AC5           B=C    S              Save (WP) in B[S]
F652F AC3           D=0    S              Set D[S]=0 (for WRTASC)
F6532 20            P=     0
F6534 3500          LC(6)  \MK\~0         C[B] is current mode
      B4D4
F653C 2F            P=     15
F653E 305           LC(1)  5
F6541 985   BLDC71  ?B<C   P              Are there more than 5 digits?
F6544 62            GOYES  BLDC75         No...continue
            *
            * More than 5 digits...
            *  ...if 5-8 digits, represent as xxxxK
            *  ...if >8 digits, represent as xxxxM
            *
F6546 BF6           CSR    W
F6549 F6            CSR    A              Shift next NO/K/M into C[B]
F654B BF5           BSR    W
F654E BF5           BSR    W
F6551 05            SETDEC
F6553 A05           B=B+B  P              Rounding digit
F6556 BF5           BSR    W
F6559 550           GONC   BLDC72
F655C B75           B=B+1  W              Add one for rounding
F655F 04    BLDC72  SETHEX
            *
            * For the case of >8 digits, this will execute this code a
            * third time.  The ?B<C  P test will fail, as B[12] will be
            * zero from BSR  W's that have been done the first 2 times
            *
F6561 2C            P=     15-3           Point to current length location
F6563 308           LC(1)  8              Are there more than 8 digits?
F6566 6ADF          GOTO   BLDC71         Check for more than 8 digits
            *-
            *-
F656A       BLDC75
            *
            * Now C[B] is the tail character, B[A] is the value, PWO
            *
F656A DA            A=C    A              Copy C[B] to A[B]
F656C 24            P=     4              5 digits unless C[B]#0, then 4
F656E 96A           ?C=0   B              Is the suffix (Null)?
F6571 40            GOYES  BLDC77         Yes...5 digits
F6573 0D            P=P-1                 No...4 digits
F6575 7AD0  BLDC77  GOSUB  WRTASC         Write the ASCII to the text area
F6579 968           ?A=0   B              Is suffix character zero?
F657C 80            GOYES  BLDC78         Yes...go on
F657E 149           DAT1=A B              No...write the suffix character
F6581 171           D1=D1+ 2              Skip suffix character
F6584 171   BLDC78  D1=D1+ 2              Point to date/time field
            *
            * Now D1 @ start of date field of text
            *
F6587 1B00          D0=(5) (=SCRTCH)+40  Point to time/date field
      000
```

```
            *
            * Next seven lines are to convert YYMMDD to MMDDYY
            *
F658E 15E5         C=DAT0 6            Read in YYMMDD
F6592 163          D0=D0+ 4            Point to DD
F6595 14C          DAT0=C B            Write out YY
F6598 183          D0=D0- 4
F659B BF6          CSR    W
F659E F6           CSR    A
F65A0 15C3         DAT0=C 4            Write out MM DD
            *
F65A4 20           P=     0
F65A6 AF2          C=0    W
F65A9 3103         LCASC  \0\          Set high nib of A[B] for digits
F65AD DA           A=C    A
F65AF 39F2         LCASC  \ : //\      Separator for MM/DD/YY HH:MM
      F202
      A302
F65B8 160   BLDC80 D0=D0+ 1
F65BE 15A0         A=DAT0 1            Read first digit
F65C2 149          DAT1=A B            Write first digit
F65C5 171          D1=D1+ 2
F65C8 180          D0=D0- 1            Point to second digit...
F65CB 15A0         A=DAT0 1            ...read it...
F65CF 161          D0=D0+ 2            (skip to next digit)
F65D2 149          DAT1=A B            ...and write second digit
F65D5 171          D1=D1+ 2
F65D8 14D          DAT1=C B            Write the separator
F65DB 171          D1=D1+ 2
F65DE BF6          CSR    W
F65E1 BF6          CSR    W            Shift in next separator
F65E4 96E          ?C#0   B            Done yet?
F65E7 4D           GOYES  BLDC80       No...continue
            *
            * Set D1 back to start of text...
            *
F65E9 2B           P=     16-5         Loop 5 times
F65EB 1CF   BLDC90 D1=D1- 16           (16*5 nibbles in text)
F65EE 0C           P=P+1
F65F0 5AF          GONC   BLDC90
F65F3 8E00         GOSUBL =TRESD0      Restore D0 from FUNCD0
      00
F65F9 03           RTNCC               Return with carry clear
            *_
            *_
F65FB 136   =SWAP01 CD0EX              Swap D0, D1
F65FE 137          CD1EX
F6601 136          CD0EX
F6604 01           RTN                 Don't change carry
            **************************************************************
            **************************************************************
            **
            ** Name:        DSPCAT - Display a CAT text string from @ D1
            **
            ** Category:    LOCAL
```

```
                  **
                  ** Purpose:
                  **      Send 40 bytes (starting at D1) to the display
                  **
                  ** Entry:
                  **      D1 @ start of data
                  **
                  ** Exit:
                  **      P=0
                  **
                  ** Calls:       DO=FRO,SWAP01,CKINF-,SEND20,CURSFL,CRLFND
                  **
                  ** Uses.......
                  **  Inclusive: A-D,RO,DO,D1,all FUNCxx except FUNCRO,STMTRO,P
                  **
                  ** Stk lvls:    5 (CURSFL)
                  **
                  ** History:
                  **
                  **    Date     Programmer             Modification
                  **  --------   ----------    ---------------------------------
                  **  12/06/82       MZ        Added code and documentation
                  **
                  **************************************************************
                  **************************************************************
F6606 20          =DSPCAT P=     0
F6608 8E00               GOSUBL =DO=FRO        Set DO=FUNCRO
      00
F660E 1527               A=DATO W
F6612 100                RO=A                  Save FUNCRO in RO
F6615 72EF               GOSUB  SWAP01         Save D1 in DO
F6619 8F00               GOSBVL =CKINF-        Set up display, check info
      000
F6620 77DF               GOSUB  SWAP01         Restore D1
F6624 110                A=RO                  Restore FUNCRO from RO to A[W]...
F6627 8E00               GOSUBL =DO=FRO        ...set DO @ FUNCRO...
      00
F662D 1507               DATO=A W              ...and write to FUNCRO
F6631 133                AD1EX                 Get D1 into A[A]
F6634 D2                 C=0    A
F6636 3182               LC(2)  40             Send 40 bytes
F663A DE                 ACEX   A              A[A]=length in bytes, C[A]=start
F663C D7                 D=C    A              D[A]=start of string
                  *
                  * D[A] is at start of string, A[A] is length
                  *
F663E 8F00               GOSBVL =SEND20        Send it, ignore width
      000
                  *
                  * Set no delay, cursor far left
                  *
F6645 8F00               GOSBVL =CURSFL        Cursor far left
      000
F664C 8D00               GOVLNG =CRLFND        Cr, Lf, no delay (builds display)
      000
```

```
                  **************************************************************
                  **************************************************************
                  **
                  ** Name:        WRTASC - Write out a decimal number in ASCII
                  **
                  ** Category:    GETUTL
                  **
                  ** Purpose:
                  **        Write a decimal number from B[WP] to RAM @ D1
                  **
                  ** Entry:
                  **        D1 at intended destination field (initialized to \ \)
                  **        P is the first digit location in B to be considered
                  **        B[WP] is the value
                  **        D[S] is sign of value (D[S]=0:positive; else negative)
                  **
                  ** Exit:
                  **        D1 past the last digit
                  **        P=1 (NOTE THIS!)
                  **        Carry clear
                  **
                  ** Calls:       None
                  **
                  ** Uses.......
                  **  Inclusive: C[S,WP],D1,P
                  **
                  ** Stk lvls:    0
                  **
                  ** Detail:
                  **        Write out the digits, starting with the first non-zero
                  **        digit (if B[W]=0, write a single zero out)
                  **
                  ** History:
                  **
                  **   Date     Programmer            Modification
                  **  --------  ----------   ---------------------------------
                  **  12/06/82      NZ       Added documentation
                  **
                  **************************************************************
                  **************************************************************
F6653 90D         =WRTASC ?B#0    P          Is leading digit non-zero?
F6656 F0                  GOYES   WRTA10     Yes...found a non-zero digit
F6658 171                 D1=D1+  2          No...skip to next text location
F665B 0D                  P=P-1              Decrement P (if zero, will carry)
F665D 55F                 GONC    WRTASC     Go unless B[WP] was zero
F6660 20                  P=      0          B[WP] was zero...output 1 digit
F6662 1C1                 D1=D1-  2          (Back up the last add)
                  *
F6665 94B         WRTA10  ?D=0    S          Check the sign field
F6668 51                  GOYES   WRTA20     Positive...NO sign output
F666A 137                 CD1EX              Negative...output a leading "-"
F666D 1DD2                D1=(2)  \-\        Put a "-" in C[B], leave P as is
F6671 137                 CD1EX
F6674 1C1                 D1=D1-  2
F6677 14D                 DAT1=C  B          Write the leading sign
```

```
F667A 171              D1=D1+ 2            Point back to first digit
F667D       WRTA20
            *
            * Now P is the first digit, D1 at text location for first digit
            *
F667D 80CF             C=P    15           Save the pointer in C[S]
            *
F6681 80DF  WRTA30     P=C    15           Get pointer to P again
F6685 A89              C=B    P            Copy B[P] to C[P]
F6688 890   WRTA40     ?P=    0
F668B A0               GOYES  WRTA50       Digit is in C[0] now
F668D B96              CSR    WP
F6690 0D               P=P-1
F6692 55F              GONC   WRTA40       Go always
            *_
            *_
F6695 21    WRTA50     P=     1
F6697 303              LCHEX  3            High nibble for ASCII #
F669A 140              DAT1=C B            Write the digit
F669D 171              D1=D1+ 2
F66A0 A4E              C=C-1  S            Check if more digits
F66A3 5DD              GONC   WRTA30       Not done yet...continue
            *
            * Have finished writing B[W] out in ASCII
            *
F66A6 03               RTNCC
            *_
            *_
F66A8 E6    C+1RC5     C=C+1  A            Add 1 to C[A], CSRC5
F66AA 8C00  Csrc5      GOLONG =CSRC5
      00
            *_
            *_
F66B0 D2    C=1LC5     C=0    A            Set C[A]=1, CSLC5
F66B2 E6               C=C+1  A
F66B4 8C00  Cslc5      GOLONG =CSLC5
      00
            *_
            *_
F66BA 8C00  Csrc10     GOLONG =CSRC10
      00
            *_
            *_
F66C0 8C00  D1@ave     GOLONG =D1@AVE
      00
            *_
            *_
F66C6 8C00  Nxtent     GOLONG =NXTENT
      00
            *_
            *_
F66CC 8C00  Lstent     GOLONG =LSTENT
      00
F66D2                  END
```

```
 A-MULT  Ext                  -  1284
 BF2DSP  Ext                  -   232
 BLANKC  Ext                  -  1104
 BLDC10  Abs 1008591 #F63CF -  1111  1114
 BLDC20  Abs 1008656 #F6410 -  1151  1144
 BLDC30  Abs 1008676 #F6424 -  1159  1135
 BLDC40  Abs 1008733 #F645D -  1186  1156
 BLDC45  Abs 1008741 #F6465 -  1199  1260
 BLDC50  Abs 1008767 #F647F -  1211  1191
 BLDC51  Abs 1008826 #F64BA -  1233  1231
 BLDC52  Abs 1008836 #F64C4 -  1242  1221
 BLDC54  Abs 1008845 #F64CD -  1254  1247
 BLDC56  Abs 1008861 #F64DD -  1263  1255
 BLDC58  Abs 1008890 #F64FA -  1276  1264
 BLDC5?  Abs 1008851 #F64D3 -  1259  1251
 BLDC60  Abs 1008913 #F6511 -  1289  1208  1239  1273
 BLDC65  Abs 1008924 #F651C -  1295  1298
 BLDC70  Abs 1008936 #F6528 -  1300  1296
 BLDC71  Abs 1008961 #F6541 -  1311  1335
 BLDC72  Abs 1008991 #F655F -  1327  1325
 BLDC75  Abs 1009002 #F656A -  1338  1312
 BLDC77  Abs 1009013 #F6575 -  1347  1345
 BLDC78  Abs 1009028 #F6584 -  1352  1349
 BLDC80  Abs 1009083 #F65BB -  1373  1387
 BLDC90  Abs 1009131 #F65EB -  1392  1394
=BLDCAT  Abs 1008533 #F6395 -  1084   200   253   552
 C+1RC5  Abs 1009320 #F66A8 -  1541   792   870
 C=1LC5  Abs 1009328 #F66B0 -  1545   391   704   921
 CHKMAS  Ext                  -   484
 CK=ATn  Ext                  -   250
 CKBITL  Ext                  -   181
 CKINF-  Ext                  -  1439
 CRLFND  Ext                  -  1457
 CSLC5   Ext                  -  1547
 CSRC10  Ext                  -  1550
 CSRC5   Ext                  -  1542
 CURSFL  Ext                  -  1456
 Calc10  Ext                  -   385   678   985
 Calc5   Abs 1009332 #F66B4 -  1547   390
 Csrc10  Abs 1009338 #F66BA -  1550   359   387   676   780   926
 Csrc5   Abs 1009322 #F66AA -  1542   378   383   672   703   791   874   917
 D0=FRO  Ext                  -  1435  1442
 D1=AVE  Ext                  -   306
 D1=AVS  Ext                  -   710
 D1@AVE  Ext                  -  1553
 D1@AVS  Ext                  -   582
 D1@ave  Abs 1009344 #F66C0 -  1553   458   569  1084
 DDT     Ext                  -  1047
 DEVPR$  Ext                  -   463
=DSPCAT  Abs 1009158 #F6606 -  1434   201   254
 Endtap  Ext                  -   312
 Error   Ext                  -   224   472
 F-R0-1  Ext                  -   548   556
 FINDA   Ext                  -   284
 FIXSPC  Ext                  -   540
 Findf+  Ext                    -   191
 GDIRS+  Abs 1008478 #F635E -   994   687
=GDIRSB  Abs 1008454 #F6346 -   984   797   901   929
 GETBYT  Ext                    -  1202
 GETDR!  Ext                    -   238   517
 GETDR+  Ext                    -   992
 GETMBX  Ext                    -   686   695
 GT2BYO  Ext                    -  1269
 GT2BYT  Ext                    -  1124
 HTODX   Ext                    -  1151  1293
 LC40*2  Abs 1007791 #F60AF -   397   308   708
 LC80**  Abs 1007789 #F60AD -   396   558
 LSTENT  Ext                    -  1559
 Lstent  Abs 1009356 #F66CC -  1559   384   883   887   900
 NEEDSC  Ext                    -   301
 NORAMe  Ext                    -   724
 NXTENT  Ext                    -  1556
 Nxtent  Abs 1009350 #F66C6 -  1556   360   781   793   880
 POP1N   Ext                    -   493
 POP1S   Ext                    -   459
 POPBUF  Ext                    -   266   320
 R<RST2  Ext                    -   685
 RESTD1  Ext                    -   233   272
 REV$    Ext                    -   615
 RPTKY   Ext                    -   267
 RST2<R  Ext                    -   694
 Read    Ext                    -  1046
 SAVED1  Ext                    -   198   229
 SCRLLR  Ext                    -   269
 SCRTCH  Ext                    -   994  1092  1219  1259  1356
=SEEKRD  Abs 1008493 #F636D -  1035   782   893   931
 SEND20  Ext                    -  1452
 SETCAT  Abs 1008177 #F6231 -   707   199
 SETenm  Abs 1008210 #F6252 -   724   716
 START   Ext                    -   236   276
=SWAP01  Abs 1009147 #F65FB -  1399  1123  1125  1199  1207  1268  1270  1438
                               1440
 Seeka   Ext                    -  1044
 TRES2C  Ext                    -   696
 TRESD0  Ext                    -  1395
 TSAV2C  Ext                    -   693
 TSAVD0  Ext                    -  1091
 TSTAT   Ext                    -  1042
 TSTATA  Ext                    -  1049
 UTLEND  Ext                    -   252   261
 WRTA10  Abs 1009253 #F6665 -  1506  1499
 WRTA20  Abs 1009277 #F667D -  1514  1507
 WRTA30  Abs 1009281 #F6681 -  1520  1534
 WRTA40  Abs 1009288 #F6688 -  1522  1526
 WRTA50  Abs 1009301 #F6695 -  1529  1523
=WRTASC  Abs 1009235 #F6653 -  1498  1153  1347  1502
 aVE=D1  Ext                    -   498   608
 eDSPEC  Ext                    -   468
 eNORAM  Ext                    -   536
 eRANGE  Ext                    -   470
 fLTDH   Ext                     -   502
 fTYPF#  Ext                     -  1131
=hCAT    Abs 1007249 #F5E91 -   181
=hCAT$   Abs 1007807 #F60BF -   454
 hCAT$2  Abs 1007841 #F60E1 -   475    464
 hCAT$3  Abs 1007908 #F6124 -   522    529
 hCAT$4  Abs 1007951 #F614F -   547    524
 hCAT$5  Abs 1007984 #F6170 -   562    512    521    533
 hCAT$6  Abs 1007988 #F6174 -   567    559
 hCAT$e  Abs 1007837 #F60DD -   472    519    527    537
 hCAT$n  Abs 1007934 #F613E -   536    595
 hCAT$x  Abs 1007801 #F60B9 -   449    469    471    480    485
 hCATAL  Abs 1007297 #F5EC1 -   206    187
 hCATeR  Abs 1007435 #F5F4B -   237    240
 hCATer  Abs 1007391 #F5F1F -   224    192    237    323
 hCATs1  Abs 1008124 #F61FC -   693    691
 hCATsu  Abs 1008057 #F61B9 -   662    239    518
 hCATsx  Abs 1008208 #F6250 -   721    701
 hCAt$5  Abs 1007931 #F613B -   533    507
 hCTA&&  Abs 1007725 #F606D -   368    358    361    382
 hCTA&+  Abs 1007719 #F6067 -   363    393
 hCTA&t  Abs 1008289 #F62A1 -   812    922
 hCTA+   Abs 1008216 #F6258 -   766    330    349    526
 hCTA+!  Abs 1008302 #F62AE -   819    805
 hCTA++  Abs 1008284 #F629C -   810    789
 hCTA+1  Abs 1008244 #F6274 -   784    803
 hCTA+2  Abs 1008247 #F6277 -   788    776
 hCTA+C  Abs 1008273 #F6291 -   802    688
 hCTA+x  Abs 1008300 #F62AC -   816    771    920
 hCTA-   Abs 1008312 #F62B8 -   869    341    907
 hCTA-1  Abs 1008358 #F62E6 -   886    879    881
 hCTA-2  Abs 1008371 #F62F3 -   895    884
 hCTA-3  Abs 1008398 #F630E -   916    873
 hCTA10  Abs 1007395 #F5F23 -   227    210
 hCTA20  Abs 1007460 #F5F64 -   250    242    370
 hCTA21  Abs 1007486 #F5F7E -   258    251
 hCTA22  Abs 1007498 #F5F8A -   266    255
 hCTA25  Abs 1007505 #F5F91 -   267    271
 hCTA30  Abs 1007522 #F5FA2 -   270    268
 hCTA35  Abs 1007527 #F5FA7 -   272    203
 hCTA38  Abs 1007609 #F5FF9 -   305    258    298
 hCTA39  Abs 1007627 #F600B -   311    304    614
 hCTA=   Abs 1008420 #F6324 -   925    368
 hCTAbl  Abs 1007732 #F6074 -   370    333
 hCTAbt  Abs 1007685 #F6045 -   345    290    352
 hCTAct  Abs 1007489 #F5F81 -   261    334
 hCTAdn  Abs 1007661 #F602D -   326    286
 hCTAeR  Abs 1007548 #F5FBC -   278    262
 hCTAer  Abs 1007638 #F6016 -   318    278    331    350    369
 hCTAex  Abs 1007591 #F5FE7 -   299    243
 hCTAt1  Abs 1007756 #F608C -   384    389
 hCTAtp  Abs 1007736 #F6078 -   373    292
 hCTAup  Abs 1007677 #F603D -   337    288
 hCTAxx  Abs 1007665 #F6031 -   331    342
 k#BOT   Ext                     -   289
 k#DOWN  Ext                  -   285
 k#TOP   Ext                  -   291
 k#UP    Ext                  -   287
 lFLENh  Ext                  -  1227
=rEV$    Abs 1008050 #F61B2 -   615
```

```
Input Parameters

  Source file name is NZ&CAT::MS

  Listing file name is NZ/CAT:TI:ML::-1

  Object file name is NZ%CAT:TI:MS::-1

                                         111111
                               0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                *
                *       N   N  ZZZZZ   &      III  00000  RRRR
                *       N   N      Z  & &      I   0   0  R   R
                *       NN  N     Z   & &      I   0   0  R   R
                *       N N N    Z     &       I   0   0  RRRR
                *       N  NN   Z     & & &    I   0   0  R R
                *       N   N  Z      &  &     I   0   0  R  R
                *       N   N  ZZZZZ   && &   III  00000  R   R
                *
                *
                        TITLE  I/O(NEW Mailbox)<840301.1356>
F66D2                   ABS    #F66D2          TI%HP6 address (fixed)
                *
                * Mailbox locations and bits
                *
                =oOUTST EQU    6
                =oOUTHS EQU    7
                MAV     EQU    0
                NRD     EQU    1
                *
                =oINHS  EQU    8
                =oINST  EQU    9
                *
                * Local handshake bits
                *
                sPUTX   EQU    0
                sGETX   EQU    0
                sCHKER  EQU    1                This MUST not be same bit as MAV!
                *
                * End of equates
                *
                ************************************************************
                ************************************************************
                **
                ** Name:        READIT,READSU - Read into RAM from loop
                **
                ** Category:    PILI/O
                **
                ** Purpose:
                **      Read data, given a buffer to put it into, and a count
                **      of how many bytes to enter
                **
                ** Entry:
                **      D0 points to mailbox
                **      D1 points to the input buffer
                **      A[A] is the number of bytes to read
                **      A[5] is the converstion type for I/O CPU
                **
                **      READSU: C[5:0] is start message and count
                **      READIT: the conversation is started
                **
                ** Exit:
                **      Carry clear: D1 points past the last character
                **                     A[A] is zero
                **      Carry set:   Error...A[A] is the number of bytes left
```

```
                 **                        in the buffer
                 **                      If P= =ePIL, C[6:0], [S] is status msg
                 **                        from I/O CPU ([S] has been doubled)
                 **                      Else C[W] is undefined
                 **
                 ** Calls:      PUTE,GETX,FRAME-
                 **
                 ** Uses.......
                 **  Exclusive: A[5:0],C[W],D1,P
                 **  Inclusive: A[5:0],C[W],D1,P,ST[3:0]
                 **
                 ** Stk lvls:   1 (FRAME-)(GETX)(PUTE)
                 **
                 ** Algorithm:
                 **      READSC:Save conversation descriptor in A[5:0]
                 **      READS+:Start the conversation              (PUTE)
                 **      READIT:If no more data to read (A[A]=0) then RTNCC
                 **             Get a message from I/O CPU          (GETX)
                 **             If not data, check the message:     (FRAME-)
                 **               If EOT or terminator match, GOTO READS+
                 **                  else error
                 **             (data)
                 **             If PWO then write out 3 data bytes
                 **               else write out 1 byte
                 **             Increment D1 past data just written
                 **             GOTO READIT
                 **
                 ** History:
                 **
                 **   Date      Programmer            Modification
                 **  --------   ----------   ---------------------------------
                 **  09/20/83      NZ        Updated documentation
                 **  04/07/83      NZ        Changed to handle EOT, terminator
                 **  11/23/82      NZ        Added documentation
                 **
                 *************************************************************
                 *************************************************************
                 *
                 * START THE CONVERSATION...
                 *
 F66D2 25        =READSU P=     5              Save start conversation in A[5]
 F66D4 A9A               A=C    WP
 F66D7 7A74      READS+  GOSUB  PUTE
 F66DB 400               RTNC
                 *
                 * ...READ THE DATA
                 *
 F66DE 8A8       =READIT ?A=0   A
 F66E1 26                GOYES  READI9         Done!
 F66E3 7E50              GOSUB  GETX
 F66E7 462               GOC    READER         Error if carry
 F66EA 890               ?P=    0
 F66ED 94                GOYES  READI3         Single byte transfer
                 * must be a triple-byte transfer
 F66EF 132               ADOEX
```

```
F66F2 182          D0=D0- 3
F66F5 132          AD0EX
F66F8 4C0          GOC    READI2       Read too many! (Can "never" be)
F66FB 15D5         DAT1=C 6
F66FF 175          D1=D1+ 6
F6702 5BD          GONC   READIT       GO ALWAYS...loop back for more
            *-
            * If fall through, ERROR!
            *-
F6705 20    READI2 P=     0            If here, A[A] is <0...too far!
F6707 300          LC(1)  =eUNEXP
F670A 20           P=     =ePIL
F670C 02           RTNSC
            *-
            *-
F670E 890   READER ?P=    =eABORT      Is this an ABORT?
F6711 00           RTNYES              Yes...error!
F6713 8E00         GOSUBL =FRAME-      Decode what it is
      00
F6719 890          ?P=    =pSTATE      Is this "Current state"?
F671C 21           GOYES  BADRD1       Yes...error in C[4]
F671E AF6          C=A    W            Can destroy C[W] now!
F6721 890          ?P=    =pEOT        Was it an EOT?
F6724 3B           GOYES  READS+       Yes...restart it
F6726 890          ?P=    =pTERM       Was it a terminator char?
F6729 EA           GOYES  READS+       Yes...reset count, continue
F672B 59D          GONC   READI2       No...error!
            *-
            *-
F672E 80D4  BADRD1 P=C    4            Fetch the error nibble...
F6732 6221         GOTO   GETST2       Go always (CPEX 0,P= ePIL,RTNSC)
            *-
            *-
F6736 CC    =READI3 A=A-1  A           Single byte transfer
            * can never carry...since A[A] was not zero!
F6738 14D          DAT1=C B
F673B 171          D1=D1+ 2
F673E 5F9          GONC   READIT       GO ALWAYS...Loop back for more
            *-
            *-
            * if fall through, than ERROR! (can "never" happen)
F6741 02           RTNSC
            *-
            *-
F6743 03    READI9 RTNCC
            ************************************************************
            ************************************************************
            **
            ** Name:       GETX - Fast DATA input routine
            **
            ** Category:   PILI/O
            **
            ** Purpose:
            **       Fast data input routine...read DATA bytes as quickly
            **       as possible
```

```
                **
                ** Entry:
                **      DO points to the mailbox
                **      Conversation is set up and started
                **
                ** Exit:
                **      If carry clear:
                **          P=0: C[B] is a data byte
                **          P=2: C[5:0] is three byte quantity; C[B] is first!
                **      If carry set:
                **          P=0: C[6:0] is message, C[S] is status*2
                **          P#0: Aborted (P= =eABORT)
                **
                ** Calls:       None
                **
                ** Uses.......
                **  Inclusive: C[W],P,ST[3:0]
                **
                ** Stk lvls:    0
                **
                ** History:
                **
                **   Date      Programmer               Modification
                **  --------   ----------    ---------------------------------
                **  09/20/83       NZ         Updated documentation
                **  04/07/83       NZ         Changed exit condition for not
                **                            data to P=0, carry set
                **  03/02/83       NZ         Changed to check for sERROR bit
                **  02/15/83       NZ         Changed error for ATTN to eABORT
                **  11/23/82       NZ         Added documentation
                **
                *************************************************************
                *************************************************************
 F6745 167     =GETX    DO=DO+ oINHS
 F6748 08      GETX1    CSTEX
 F674A 15E0             C=DAT0 1              Read handshake
 F674E 0B               CSTEX
 F6750 860              ?ST#1  MAV
 F6753 62               GOYES  GETXE          No message yet!
                * message available!
 F6755 160     GETX2    DO=DO+ (oINST)-(oINHS)
 F6758 15E6             C=DAT0 7
 F675C 816              CSRC                  Now C[S] is the status nibble
 F675F 188              DO=DO- oINST
 F6762 A46              C=C+C  S              Check if Three-byte transfer...
 F6765 560              GONC   GETX3          Not triple byte
 F6768 22               P=     2              Indicate triple byte!
 F676A 03               RTNCC
                *-
                *-
 F676C         GETX3
                *
                * Either single byte or not data!
                *
 F676C 80D2             P=C    2              Check opcode
```

```
F6770 888           ?P#     8               Data?
F6773 20            GOYES   GETX4           No...
F6775 20    GETX4   P=      0               YES!!!...flag it as 1 byte!
F6777 01            RTN                     Carry clear if OK, else set
            *-
            *-
            *
F6779 850   GETXE   ST=1    sGETX           This is GETX
F677C 851   GETx.   ST=1    sCHKER          DO check error bit
F677F       GETXNE
            *
            * First check for error bit set
            *
F677F 861           ?ST=0   sCHKER          Should I check error?
F6782 81            GOYES   GETx.N          No...check attn
F6784 160           D0=D0+ (oINST)-(oINHS) Point to error nib
F6787 15E0          C=DAT0 1                Read nibble into C[0]
F678B 180           D0=D0- (oINST)-(oINHS) Put it back where it was
F678E 0B            CSTEX
F6790 870           ?ST=1   =sERROR         Is the error bit set?
F6793 20            GOYES   GETx..          (Set carry if set)
F6795 0B    GETx..  CSTEX
F6797 432           GOC     GETxE           Error bit set...error!
            *
            * Now check if the Attn key has been pressed
            *
F679A 860   GETx.N  ?ST=0   =Attn
F679D 52            GOYES   GETX.           Not waiting for Attn...continue
            *
            * Check if "ATTN" key has been pressed TWICE
            *
F679F 136           CD0EX                   Save D0 in C[A]
F67A2 1B00          D0=(5) =ATNFLG
      000
F67A9 1564          C=DAT0 S
F67AD 134           D0=C
F67B0 94A           ?C=0    S
F67B3 F0            GOYES   GETX.           If not ATTN, keep trying
F67B5 B46           C=C+1   S               Check if hit more than once...
F67B8 490           GOC     GETX.           No...continue
F67BB 187   GETxE   D0=D0- oINHS            Yes...reset D0.
F67BE 20            P=      =eABORT         Aborted by ATTN key or error!
F67C0 02            RTNSC
            *-
            *-
F67C2 861   GETX.   ?ST=0   sCHKER          Is it GETNE?
F67C5 E0            GOYES   GETNO           This is GETNE
F67C7 860           ?ST=0   sGETX           Is it GETX or GET?
F67CA F1            GOYES   GET1            This is GET
F67CC 6B7F          GOTO    GETX1           This is GETX
            ****************************************************************
            ****************************************************************
            **
            ** Name:        GET - Get a message from I/O CPU
            ** Name:        GETNE - Get a message without checking error bit
```

```
                 **
                 ** Category:   PILI/O
                 **
                 ** Purpose:
                 **
                 ** Entry:
                 **      D0 points to the HPIL mailbox
                 **
                 ** Exit:
                 **      Carry clear:
                 **        Contents of mailbox in C[7:0]
                 **        Handshake nibble in ST[3:0]
                 **        Status nibble in C[S]
                 **      Carry set:
                 **        Error (P=error number)
                 **
                 ** Calls:      None
                 **
                 ** Uses.......
                 **  Inclusive: C[W],ST[3:0] (P only if error)
                 **
                 ** Stk lvls:   0
                 **
                 ** History:
                 **
                 **   Date     Programmer             Modification
                 **  --------  ----------   ---------------------------------
                 **  09/20/83     NZ        Updated documentation
                 **  03/07/83     NZ        Added GETNE
                 **  03/02/83     NZ        Modified to share code with GETX
                 **  11/23/82     NZ        Added documentation
                 **
                 *************************************************************
                 *************************************************************
 F67D0 167       =GETNE  D0=D0+ oINHS
 F67D3 0B        GETNO   CSTEX
 F67D5 15E0              C=DAT0 1           Read handshake
 F67D9 0B                CSTEX
 F67DB 841               ST=0   sCHKER      Clear the sCHKER bit for GETXNE
 F67DE 860               ?ST#1  MAV
 F67E1 E9                GOYES  GETXNE      No message, don't check error
 F67E3 521               GONC   GET2        Go always...message...get it!
                 *-
                 *-
 F67E6 167       =GET    D0=D0+ oINHS
                 *
 F67E9 0B        GET1    CSTEX
 F67EB 15E0              C=DAT0 1           READ HANDSHAKE NIBBLE
 F67EF 0B                CSTEX
 F67F1 860               ?ST#1  MAV         IS MESSAGE AVAILABLE?
 F67F4 11                GOYES  GET9        NO...CONTINUE WAITING
                 *
                 * A message is available
                 *
 F67F6 160       GET2    D0=D0+ (oINST)-(oINHS)
```

```
F67F9 15E6         C=DAT0 7            READ THE MESSAGE
F67FD 816          CSRC                Put the status nibble in C[S]
F6800 188          D0=D0- oINST
F6803 03           RTNCC
           *-
           *-
           *
           * Waiting for frame available...check Attn flag
           *
F6805 840  GET9    ST=0   sGETX        This is GET, not GETX
F6808 637F         GOTO   GETx.        Check if Attn set
           *************************************************************
           *************************************************************
           **
           ** Name:       GETHS2 - Get the second I/O CPU handshake nibble
           **
           ** Category:   PILI/O
           **
           ** Purpose:
           **     Get the software status nibble from the HPIL mailbox
           **
           ** Entry:
           **     D0 points to the HPIL mailbox
           **
           ** Exit:
           **     Software status nibble in ST[3:0], carry clear
           **
           ** Calls:      None
           **
           ** Uses.......
           **  Inclusive: ST[3:0]
           **
           ** Stk lvls:   0
           **
           ** History:
           **
           **    Date     Programmer             Modification
           **   --------  ----------     ---------------------------------
           **   11/23/82     NZ          Added documentation
           **
           *************************************************************
           *************************************************************
F680C 0B   =GETHS2 CSTEX               Save C[X] in ST[11:0]
F680E 168          D0=D0+ oINST
F6811 15E0         C=DAT0 1            Read software status in C[0]
F6815 188          D0=D0- oINST
           *
           * PIL info in ST[3:0], C unchanged
           *
F6818 0B           CSTEX
F681A 01           RTN
           *************************************************************
           *************************************************************
           **
           ** Name:       GETST  - Get status from I/O CPU
```

```
                 ** Name:        GETERR - Get error message from I/O CPU
                 ** Name:        GETST- - Read status message from mailbox with-
                 **                       out checking the error bit
                 **
                 ** Category:    PILI/O
                 **
                 ** Purpose:
                 **      Get status/error message from I/O CPU
                 **
                 ** Entry:
                 **      D0 points to the HPIL mailbox
                 **
                 ** Exit:
                 **      Carry clear: PIL status in C[X], error # in C[3]
                 **                   P=0
                 **      Carry set: Error (# in P,C[0])
                 **
                 ** Calls:       PUTC+N,GETNE,FRAME+
                 **
                 ** Uses.......
                 **  Exclusive: C[W],        P
                 **  Inclusive: C[W],ST[3:0],P
                 **
                 ** Stk lvls:    1 (PUTC+N)(GETNE)(FRAME+)
                 **
                 ** History:
                 **
                 **    Date      Programmer             Modification
                 **  --------    ----------    --------------------------------
                 **  09/20/83        NZ        Updated documentation
                 **  03/19/83        NZ        Changed both routines so that
                 **                            they wait for a status message to
                 **                            be sent by I/O CPU, instead of
                 **                            erroring out with P=ePIL,C=eUNEXP
                 **  03/07/83        NZ        Changed GETERR again...to use
                 **                            new routines PUTC+N and GETNE
                 **  03/04/83        NZ        Modified GETERR to wait for MAV
                 **                              before calling GET (otherwise
                 **                              GET will check the sERROR bit
                 **                              while waiting and abort out!)
                 **  02/03/83        NZ        Modified GETERR to return with
                 **                              error if I/O CPU error # is NO
                 **  11/23/82        NZ        Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
    F681C 20     =GETST  P=    0
    F681E 3100           LC(2) =nSTATS         Request status
    F6822 6900           GOTO  GETERO
                 *_
                 *_
    F6826 20     =GETERR P=    0
    F6828 3100           LC(2) =nERSTS
    F682C 7D43   GETERO  GOSUB PUTC+N          Write it
    F6830 400            RTNC
```

```
F6833 799F =GETST- GOSUB  GETNE         Get the message-don't check error
F6837 400          RTNC
F683A 8E00         GOSUBL =FRAME+
      00
F6840 880          ?P#    =pSTATE       Is it a current state?
F6843 0F           GOYES  GETST-        No...get another one
F6845 8004         P=C    4             Check if error # is zero
F6849 BB2          CSL    X             Move all status bits to C[3:1]
F684C 880          ?P#    0             Zero?
F684F 60           GOYES  GETER3        No...error!
F6851 F6           CSR    A             Move all status bits into C[X]
F6853 03           RTNCC                Done!
           *-
           *-
F6855      GETST2
F6855 80F0 GETER3  CPEX   0
F6859 20           P=     =ePIL         PIL Error
F685B 02           RTNSC
           ****************************************************************
           ****************************************************************
           **
           ** Name:       GETD - Get data message
           ** Name:       GETEND - Get EOT message
           **
           ** Category:   PILI/O
           **
           ** Purpose:
           **      Read a data/EOT message from I/O CPU
           **
           ** Entry:
           **      Expecting data/EOT from the mailbox
           **      D0 points to the mailbox
           **
           ** Exit:
           **      Carry clear:
           **        Frame in C[X]
           **        Frame type in C[S]
           **      Carry set:
           **        GETD: Not a data frame/aborted/error bit set
           **        GETEND: Not an EOT frame/aborted/error bit set
           **
           ** Calls:      GET,FRAME+
           **
           ** Uses.......
           **  Exclusive: C
           **  Inclusive: C,ST[3:0]  (P only if error)
           **
           ** Stk lvls:   1 (GET)(FRAME+)
           **
           ** History:
           **
           **    Date     Programmer          Modification
           **  --------   ----------   --------------------------------
           **  09/20/83       NZ       Updated documentation
           **  11/23/82       NZ       Added documentation
```

```
                **
                *****************************************************************
                *****************************************************************
F685D 758F =GETD   GOSUB  GET           Get frame
F6861 400          RTNC                 Error
F6864 8E00 =CHECKD GOSUBL =FRAME+       Check what kind of frame it is
      00
F686A 880          ?P#    =pDATA        DATA?
F686D 20           GOYES  GETD1         No...set carry
F686F 80FF  GETD1  CPEX   15            Yes...Carry clear!
F6873 500          RTNNC
F6876 6E8E         GOTO   READI2
                *-
                *-
F687A 786F =GETEND GOSUB  GET           Get frame
F687E 400          RTNC                 Error
F6881 8E00 =CHKEND GOSUBL =FRAME+       Decode frame
      00
F6887 880          ?P#    =pEOT         END?
F688A 5E           GOYES  GETD1         No...set carry
F688C 52E          GONC   GETD1         Yes...clear carry
                *****************************************************************
                *****************************************************************
                **
                ** Name:        GETID - Read 8 bytes data into A after YTMLL
                ** Name:        READRG - Read 8 bytes data into the A register
                ** Name:        GETID+ - Read 8 bytes data into A after YTML
                **
                ** Category:    PILI/O
                **
                ** Purpose:
                **      Read up to 8 bytes of data from a device and put it
                **      into A[W] (GETID and GETID+ strip Cr and trailing
                **      characters)
                **
                ** Entry:
                **      D[X] is address of the device
                **      D0 @ mailbox
                **
                **      READRG: Conversation is already set up
                **
                ** Exit:
                **      Carry clear:
                **        Up to 8 bytes in A[W], number of bytes in D[S]
                **        P=0
                **      Carry set:
                **        Error (other than device not ready)
                **        P,C[0]= Error #
                **
                ** Calls:       YTML(GETID+),YTMLL(GETID),PUTE,GETX,FRAME-
                **
                ** Uses.......
                **  Exclusive: A[W],C[W],D[S],D[13],P
                **  Inclusive: A[W],C[W],D[S],D[13],P
                **
```

```
                  ** Stk lvls:   2 (YTMLL)(YTML)  (READRG uses only 1 level)
                  **
                  ** History:
                  **
                  **    Date      Programmer              Modification
                  **  --------    ----------    --------------------------------
                  **  09/20/83        NZ        Updated documentation
                  **  09/01/83        NZ        Added check for P= =eABORT at GOC
                  **                            from GETX (fix of SPOLL&STANDBY
                  **                            bug)
                  **  03/09/83        NZ        Added check for not changing #
                  **                            bytes received if strip is false
                  **  03/03/83        NZ        Added check for READRG to not
                  **                            strip trailing Cr
                  **  11/23/82        NZ        Added documentation
                  **
                  ******************************************************************
                  ******************************************************************
 F688F 8E00 =GETID+ GOSUBL =YTML            D[X] is talker, I am listener
       00
 F6895 551          GONC   GETID0           If no errors
 F6898 02           RTNSC                   Error!
                  *-
                  *-
 F689A 2D   =READRG P=     13
 F689C A83          D=0    P                Clear "strip returns" flag
 F689F 6B10         GOTO   READRg
                  *-
                  *-
 F68A3 20   =GETID  P=     0
 F68A5 8E00         GOSUBL =YTMLL           D[X] is talker, I am listener
       00
 F68AB 3500 GETID0  LC(6)  (=mSDI)+8        Max of 8 characters
       0000
 F68B3 2D           P=     13               Set flag to indicate strip Cr
 F68B5 A83          D=0    P
 F68B8 A0F          D=D-1  P                D[13]="F"...strip returns
 F68BB 7692 READRg  GOSUB  PUTE
 F68BF 400          RTNC
 F68C2 AF0          A=0    W                Preclear A[W]
 F68C5 AC3          D=0    S                Clear D[S] (count)
 F68C8 797E GETID1  GOSUB  GETX             Get a message
 F68CC 487          GOC    GETID4           If carry, not data
 F68CF AEA  GETID2  A=C    B
 F68D2 814          ASRC
 F68D5 814          ASRC                    Rotate into A[15:14]
 F68D8 BF6          CSR    W                Shift next char into C[B]
 F68DB F6           CSR    A                (at most GETX returns 6 nibs)
 F68DD B47          D=D+1  S                Increment count
 F68E0 0D           P=P-1
 F68E2 5CE          GONC   GETID2           If no carry, more bytes
                  *
                  * If carry, P=15!
                  *
 F68E5 308          LC(1)  8
```

```
F68E8 9C7              ?D<C    S
F68EB DD               GOYES   GETID1          Get more bytes
F68ED 20               P=      0               Now remove any Cr,Lf!
F68EF 31D0 GETID3      LC(2)   13              Check for <Cr>
F68F3 2D               P=      13
F68F5 90F              ?D#0    P               Strip flag set?
F68F8 50               GOYES   GETIDs          Yes...strip <Cr>s
F68FA AE2              C=0     B               No...don't strip <Cr>s
F68FD 2F   GETIDs      P=      15
F68FF 96A  GETID*      ?C=0    B               Stripping trailing chars?
F6902 A0               GOYES   GETID-          No...continue
F6904 966              ?A#C    B               Yes...match?
F6907 50               GOYES   GETID-          No...continue
F6909 A90              A=0     WP              Yes...clear anything after <Cr>
F690C 814  GETID-      ASRC
F690F 814              ASRC
F6912 0D               P=P-1
F6914 0D               P=P-1
F6916 58E              GONC    GETID*          If no carry, continue
                *
                * Now remove any trailing zero bytes (decrement count)
                *
F6919 2D               P=      13              Check if strip flag set
F691B 90B              ?D=0    P
F691E 32               GOYES   GETID!          Not strip...exit
F6920 2F               P=      15
F6922 AC2              C=0     S               Preclear the count!
F6925 978              ?A=0    W               Is whole word zero?
F6928 61               GOYES   GETID%          Yes...set count=0!
F692A 90C  GETID^      ?A#0    P
F692D 70               GOYES   GETID#
F692F 0D               P=P-1
F6931 58F              GONC    GETID^          Go always
                *-
                *-
F6934 80FF GETID#      CPEX    15
F6938 81E              CSRB                    Now C[S] is # of characters-1
F693B B46              C=C+1   S               C[S] is # of characters
F693E AC7  GETID%      D=C     S               Reset count in D[S]
F6941 20   GETID!      P=      0               Reset P=0
F6943 03               RTNCC                   Done...exit
                *-
                *-
F6945 890  GETID4      ?P=     =eABORT         Is this an abort or error?
F6948 00               RTNYES                  Yes...tell caller
F694A 80FF             CPEX    15
F694E 8E00             GOSUBL  =FRAME-         Check what it IS
      00
F6954 890              ?P=     =pSTATE         Current state?
F6957 B0               GOYES   GETID5          Yes...justify, return-carry clear
F6959 890              ?P=     =pEOT           EOT?
F695C 60               GOYES   GETID5          Yes...justify, return-carry clear
                *
                * NOT state or EOT...error!
                *
```

```
F695E 66AD           GOTO   READI2          Unexpected frame
                *-
                *-
F6962 ACB   GETID5   C=D    S
F6965 80DF           P=C    15              P=count until justified!
F6969 890   GETID6   ?P=    0
F696C 38             GOYES  GETID3          Return, carry clear
F696E 810            ASLC
F6971 810            ASLC                   Shift one character
F6974 0D             P=P-1                  Decrement character count
F6976 52F            GONC   GETID6          Go always
                ***************************************************************
                ***************************************************************
                **
                ** Name:        INITFL - Initialize a file on external device
                **
                ** Category:    FILUTL
                **
                ** Purpose:
                **      Initialize an external file after creation
                **
                ** Entry:
                **      R1[S] = Create code of the file
                **      Tape is positioned at the start of the file data area
                **      R2[A] is # of sectors in the file
                **
                ** Exit:
                **      Carry clear:
                **        The file will be filled with zeros or all FF's
                **        Create code = 2 - filled with zeros
                **        Otherwise - filled with all FF's
                **      Carry set:
                **        Error...P, C[0] are error code
                **
                ** Calls:       SENDIT
                **
                ** Uses:
                **  Exclusive: A[W],C[W],D1,         FUNCR1[15:0],P
                **  Inclusive: A[W],C[W],D1,ST[3:0],FUNCR1[15:0],P
                **
                ** Stk lvls:   2 (SENDIT)
                **
                ** History:
                **
                **    Date      Programmer              Modification
                **  --------    ----------    ---------------------------------
                **  09/21/83       NZ         Updated documentation
                **  04/18/83       NZ         Modified entry conditions and
                **                            rewrote routine to save code and
                **                            fix several bugs
                **  01/25/83       NZ         Updated documentation, changed
                **                            code to cut 2B(hex) nibbles
                **  10/01/82       SC         Wrote routine
                **
                ***************************************************************
```

```
                  *************************************************************
F6979             =INITFL
F6979 1F00                D1=(5) =FUNCR1
      000
F6980 AF4                 A=B    W                 Get B[W] into A[W]
F6983 1517                DAT1=A W                 Save B[W] in FUNCR1
                  *
F6987 112                 A=R2                     Recall size in sectors
F698A F0                  ASL    A
                  *
                  * If the file size can exceed 1M bytes, the following shift
                  * will produce erroneous results!!!!
                  *
F698C F0                  ASL    A                 Multiply by 256 bytes/sector
                  *
F698E AF1                 B=0    W                 Clear B[W] (pattern)
F6991 119                 C=R1                     C(S)= CREATE CODE
F6994 80DF                P=C    15                Get CREATE code into P
F6998 892                 ?P=    2                 Create code=2?
F699B 50                  GOYES  INIT10            Yes...pattern is zero
F699D A7D                 B=B-1  W                 No...pattern is "FFFFF"
F69A0 20          INIT10  P=     0                 Reset P=0
F69A2 7E70                GOSUB  SENDIT            Now send the pattern!
F69A6 1537                A=DAT1 W                 D1 unchanged by SENDIT!
F69AA AF8                 B=A    W                 Restore B[W]
F69AD 01                  RTN                      Carry set if error, else clear
                  *************************************************************
                  *************************************************************
                  **
                  ** Name:        WRITIT - Write data from RAM to the mailbox
                  **
                  ** Category:    PILI/O
                  **
                  ** Purpose:
                  **      Output data to the I/O CPU, given a buffer of data in
                  **      RAM and a pointer (D1) to the buffer
                  **
                  ** Entry:
                  **      D0: I/O CPU mailbox
                  **      D1: Data buffer start
                  **      A[A]: Number of bytes of data to send from at D1
                  **      Loop is addressed, set up for this transfer
                  **      ST(=LoopOK) set if should abort on one ATTN, else clear
                  **
                  ** Exit:
                  **      Carry clear:
                  **        Transfer complete, D1 points past end of buffer,
                  **        A[A]="000FF", P unchanged from entry
                  **      Carry set: Error - P is the error number, A[A] is the
                  **        number of data bytes not sent (may be low by up to 3)
                  **        (If Attn key hit ONCE, then carry set, P=0)
                  **
                  ** Calls:       PUTX,PUTD,CK=ATN
                  **
                  ** Uses.......
```

```
                 **  Exclusive: A[A],C[W],D1
                 **  Inclusive: A[A],C[W],D1,ST[3:0]
                 **
                 ** Stk lvls:   1 (PUTX)(PUTD)(CK=ATN)
                 **
                 ** NOTE: this routine can be SLIGHTLY speeded up by calling
                 **   PUTX one statement later (after the CPEX 15)...at the
                 **   cost of setting P=0 unconditionally
                 **
                 ** History:
                 **
                 **    Date      Programmer              Modification
                 **  --------    ----------     ---------------------------------
                 **  09/27/83        NZ         Installed fix of SR for Memory
                 **                             Lost during OUTPUT and/or PRINT
                 **                             (The bug was that WRITIT did not
                 **                             check carry from PUTD, therefore
                 **                             would return with carry clear,
                 **                             but P= =eABORT or =ePIL)
                 **  09/21/83        NZ         Updated documentation
                 **  07/21/83        NZ         Added status for don't abort for
                 **                             single ATTN hit
                 **  03/15/83        NZ         Added P=0 if ATNFLG=F
                 **  11/24/82        NZ         Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
F69AF 870  =WRITIT ?ST=1  =Attn
F69B2 E1           GOYES  WRITI1        ATTN hit at least once...check!
F69B4 132  WRITI0  AD0EX
F69B7 182          D0=D0- 3             See if three bytes to send
F69BA 4F1          GOC    WRITI2        No...transfer remaining bytes
F69BD 132          AD0EX
                 *
                 * Have three bytes to send
                 *
F69C0 15F5         C=DAT1 6             Read three
F69C4 175          D1=D1+ 6             Point to next
F69C7 7CC0         GOSUB  PUTX          Send them
F69CB 53E          GONC   WRITIT        Go unless Attn hit more than once
F69CE 02           RTNSC                Error!
                 *-
                 *-
F69D0 7F20 WRITI1  GOSUB  CK=ATN
F69D4 4FD          GOC    WRITI0        Not ATTN key...continue

F69D7 572          GONC   P=0:SC        Go always (PACK 9/27/83 NZ)
                 *
                 *         P=     0             Attn key ONCE
                 *         RTNSC                Attn key interrupt...exit!
                 *-
                 *-
F69DA 162  WRITI2  D0=D0+ 3             Correct for over-subtracting
F69DD 132          AD0EX
F69E0 A6C  WRITI3  A=A-1  B             If carry, than done
```

```
F69E3 4D6            GOC    WRITI4         Done!
F69E6 14F            C=DAT1 B              Read it...
F69E9 171            D1=D1+ 2              Next byte...
F69EC 7351           GOSUB  PUTD           Send it!
           *
           * Following RTNC is bug fix on 9/27/83 by NZ
           *
F69F0 400            RTNC                  Error...set carry
           *
F69F3 860            ?ST=0  =Attn
F69F6 AE             GOYES  WRITI3         Loop back if not interrupt
F69F8 7700           GOSUB  CK=ATN
F69FC 43E            GOC    WRITI3         Loop back if not interrupt
F69FF 20   P=0:SC    P=     0              Attn key ONCE
F6A01 02             RTNSC                 Attn key interrupt...exit!
           *-
           *-
           *
           * Moved to location below by NZ on 9/27/83 as part of bug fix
           *
           *WRITI4 RTNCC                   Done...return with carry clear!
           *-
           *-
           *
           * CK=ATN will return with carry set if OK to continue, clear
           * if time to abort transmission
           *
F6A03 860  =CK=ATN ?ST=0  =LoopOK          Should I check ATNFLG?
F6A06 00             RTNYES                No...say OK
F6A08 136  =CK=ATn CDOEX                   Save D0 in C[A]
F6A0B 1B00           D0=(5) =ATNFLG
      000
F6A12 1564           C=DAT0 S
F6A16 134            D0=C                  Restore D0
F6A19 A4E            C=C-1  S              If carry, ATNFLG was zero
F6A1C 01             RTN
           ***************************************************************
           ***************************************************************
           **
           ** Name:        SENDIT - Send a 1 or 2 char sequence from B[W]
           ** Name:        SENDI+ - Find mailbox, send a sequence of chars
           **
           ** Category:    PILI/O
           **
           ** Purpose:
           **      Send a sequence of 1 or 2 characters (in B[7:0])
           **      Number of characters to send in A[A]
           **
           ** Entry:
           **      A[A]=count of characters
           **      B[7:0]=sequence (B[B]=first char, B[3:2]=second char,
           **        B[5:4]=first char, B[7:6]=second char)
           **      D0 points to mailbox
           **      ST(=LoopOK) set if abort on 1 ATTN, else clear
           **
```

```
                 ** Exit:
                 **      Carry set if Attn or error, else clear
                 **      If carry set and P=0, then ATTN key hit ONCE
                 **
                 ** Calls:       PUTX,PUTD,CK=ATN  (SENDI+ also calls GETMBX)
                 **
                 ** Uses.......
                 **  Exclusive: A[A],C[W]
                 **  Inclusive: A[A],C[W],ST[3:0]
                 **
                 ** Stk lvls:   1 (PUTX)(PUTD)(CK=ATN)(GETMBX)
                 **
                 ** NOTE: This routine can be speeded up SLIGHTLY...see WRITIT
                 ** documentation)
                 **
                 ** History:
                 **
                 **    Date      Programmer              Modification
                 **  --------    ----------     --------------------------------
                 **  09/27/83        NZ         Packed code (needed for WRITIT fix)
                 **  09/21/83        NZ         Updated documentation
                 **  03/15/83        NZ         Added P=0 for Attn key ONCE
                 **  11/24/82        NZ         Added documentation
                 **
                 ************************************************************
                 ************************************************************
F6A1E 8E00 =SENDI+ GOSUBL =GETMBX
      00
F6A24 870  =SENDIT ?ST=1  =Attn         Check if immediate exit
F6A27 C2           GOYES  SENDI1
F6A29 132  SENDIO  ADOEX
F6A2C 185          DO=DO- 6
F6A2F 4D2          GOC    SENDI2        Less than 6 left
F6A32 132          ADOEX
F6A35 AF9          C=B    W
F6A38 7B50         GOSUB  PUTX          Send first 3 chars
F6A3C 400          RTNC                 Attn
F6A3F AF9          C=B    W
F6A42 BF6          CSR    W
F6A45 BF6          CSR    W
F6A48 7B40         GOSUB  PUTX          Send next 3 chars
F6A4C 57D          GONC   SENDIT        Loop back!
F6A4F 02           RTNSC                Error!
                 *-
                 *-
F6A51 03   WRITI4  RTNCC                Moved here 9/27/83 by NZ
                 *-
                 *-
F6A53 7CAF SENDI1  GOSUB  CK=ATN
F6A57 41D          GOC    SENDIO        Not ATTN key...continue
F6A5A 54A  P=0:sc  GONC   P=0:SC        Packed 9/27/83 by NZ
                 *
                 *         P=     0      Attn key ONCE
                 *         RTNSC         Attn key interrupt...exit!
                 *-
```

```
                  *-
F6A5D 165   SENDI2  D0=D0+ 6
F6A60 132           AD0EX
F6A63 A6C   SENDI3  A=A-1  B
F6A66 4E2           GOC    SENDI4        Done if carry
F6A69 AE9           C=B    B
F6A6C 73D0          GOSUB  PUTD          Send first byte
F6A70 400           RTNC                 Attn
F6A73 A6C           A=A-1  B
F6A76 4E1           GOC    SENDI4        Done if carry
F6A79 D9            C=B    A
F6A7B F6            CSR    A
F6A7D F6            CSR    A
F6A7F 70C0          GOSUB  PUTD          Send second byte
F6A83 400           RTNC
F6A86 860           ?ST=0  =Attn
F6A89 AD            GOYES  SENDI3        Loop back if not interrupt
F6A8B 747F          GOSUB  CK=ATN
F6A8F 43D           GOC    SENDI3        Not ATTN key...continue
F6A92 57C           GONC   P=0:sc        Packed 9/27/83 by NZ
                  *
                  *        P=     0      Attn key ONCE
                  *        RTNSC         Attn key interrupt...exit!
                  *-
                  *-
F6A95 03    SENDI4  RTNCC                Done!
                  ******************************************************************
                  ******************************************************************
                  **
                  ** Name:        PUTX - Send 3 bytes of data from C[5:0] to loop
                  **
                  ** Category:    PILI/O
                  **
                  ** Purpose:
                  **      Output three bytes from C[5:0] to PIL
                  **
                  ** Entry:
                  **      C[5:0] is the three data bytes (C[B] is first byte)
                  **      D0: HPIL mailbox
                  **
                  ** Exit:
                  **      Carry clear: done
                  **      Carry set: error (P is error #)
                  **
                  ** Calls:       None
                  **
                  ** Uses.......
                  **  Inclusive: C[W],ST[3:0]
                  **
                  ** Stk lvls:    0
                  **
                  ** History:
                  **
                  **    Date      Programmer              Modification
                  **  --------    ----------      --------------------------------
```

```
                 **  03/15/83     NZ          Removed check for Attn at PUTX5
                 **                           to insure Error is always checked
                 **  03/07/83     NZ          Added flag to ignore error bit
                 **  03/04/83     NZ          Reordered code to check sERROR
                 **                           ONLY if ATNFLG is non-zero
                 **  03/02/83     NZ          Added check for sERROR if Attn is
                 **                           set
                 **  11/24/82     NZ          Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
F6A97 80FF  =PUTX   CPEX   15                 Save P in C[S]
F6A9B 26            P=     6
F6A9D 3181          LCHEX  18                 Long transfer bits...
F6AA1 166   PUTXx   D0=D0+ oOUTHS
F6AA4 80DF          P=C    15                 Restore P
F6AA8 870           ?ST=1  =Attn
F6AAB D1            GOYES  PUTX3              Check for immediate abort!
F6AAD 08    PUTX1   CSTEX
F6AAF 15E0          C=DAT0 1                  Read the handshake
F6AB3 0B            CSTEX
F6AB5 871           ?ST=1  NRD                NRD?
F6AB8 01            GOYES  PUTX3              Yes...wait!
F6ABA 870           ?ST=0  MAV
F6ABD B0            GOYES  PUTX3
F6ABF 186   PUTEx   D0=D0- oOUTHS
            *
            * Ready to send it now (coast is clear)
            *
F6AC2 15C7          DAT0=C 8
F6AC6 03            RTNCC
            *-
            *-
F6AC8 850   PUTX3   ST=1   sPUTX              Flag for return routine
            *
            * If here, not ready yet...check for ATTN
            *
F6ACB 851   PUTX4   ST=1   sCHKER             DO check error bit
F6ACE       PUTX5
            *
            * Check =ATNFLG in RAM...
            *
            * Save the message in C[12:5] to check ATNFLG
            *
F6ACE BF2           CSL    W
F6AD1 BF2           CSL    W
F6AD4 BF2           CSL    W
F6AD7 BF2           CSL    W
F6ADA BF2           CSL    W                  Now message in C[12:5]
F6ADD 136           CD0EX
F6AE0 1B00          D0=(5) =ATNFLG
      000
F6AE7 1564          C=DAT0 S
F6AEB 134           D0=C                      Restore D0
             *
```

```
F6AEE 161           D0=D0+ (oINST)-(oOUTHS)
F6AF1 15E0          C=DAT0 1              Read the status nibble &check err
F6AF5 181           D0=D0- (oINST)-(oOUTHS)
F6AF8 0B            CSTEX
F6AFA 870           ?ST=1  =sERROR
F6AFD 20            GOYES  PUTx0
F6AFF 0B    PUTx0   CSTEX                 Carry SET if error bit set
            *
F6B01 BF6           CSR    W              Restore message to C[7:0]
F6B04 BF6           CSR    W
F6B07 BF6           CSR    W
F6B0A BF6           CSR    W
F6B0D BF6           CSR    W              Now ATNFLG is in C[8]
F6B10 80FA          CPEX   10
F6B14 570           GONC   PUTx1          No carry...sERROR clear
F6B17 871           ?ST=1  sCHKER         Check error bit?
F6B1A C0            GOYES  PUTx.          Yes...error!
            *
            * If sCHKER=0, then ignore the error bit
            *
F6B1C 890   PUTx1   ?P=    0              ATTN key?
F6B1F E0            GOYES  PUTx3          No...continue
F6B21 0C            P=P+1
F6B23 490           GOC    PUTx3          Attn key, hit only ONCE
            *
            * ATTN key hit!
            *
F6B26 186   PUTx.   D0=D0- oOUTHS
F6B29 20            P=     =eABORT        Aborted by ATTN key
F6B2B 02            RTNSC
            *_
            *_
F6B2D 80FA  PUTx3   CPEX   10             Restore P!
F6B31 861   PUTX6   ?ST=0  sCHKER         Is this PUTN?
F6B34 B0            GOYES  PUTX7          Yes...loop
F6B36 860           ?ST#1  sPUTX
F6B39 C2            GOYES  PUTE1          Loop again
F6B3B 617F          GOTO   PUTX1          (Out of range)
            *_
            *_
F6B3F 6650  PUTX7   GOTO   PUTN1          Continue with PUTN
            ***************************************************************
            ***************************************************************
            **
            ** Name:        PUTD - Put a single data byte on the loop
            **
            ** Category:    PILI/O
            **
            ** Purpose:
            **      Send a single data byte on the loop (Check NRD first)
            **
            ** Entry:
            **      C[B] contains the data byte
            **      D0 points to the HPIL mailbox
            **
```

```
                  ** Exit:
                  **      Handshake nibble in ST[3:0]
                  **      Carry set if error, clear if OK
                  **
                  ** Calls:       None
                  **
                  ** Uses.......
                  **  Inclusive: C[W],ST[3:0]
                  **
                  ** Stk lvls:   0
                  **
                  ** History:
                  **
                  **   Date     Programmer            Modification
                  **  --------  ----------   ---------------------------------
                  **  02/18/83      NZ       Changed to share code with PUTX
                  **  11/24/82      NZ       Added documentation
                  **
                  ***************************************************************
                  ***************************************************************
F6B43 80FF  =PUTD   CPEX   15
F6B47 22            P=     2
F6B49 3500          LC(6)  #140000        This is a single data frame
      0041
F6B51 6F4F          GOTO   PUTXx          Continue with common code in PUTX
                  ***************************************************************
                  ***************************************************************
                  **
                  ** Name:        PUTE - Put extended message (6 nibbles)
                  ** Name:        PUTEX - Put extended message (6 nibs + 2 hs)
                  **
                  ** Category:    PILI/O
                  **
                  ** Purpose:
                  **      PUTE:Put extended mailbox message (given full 6 nibs)
                  **      PUTEX:Put a full message, INCLUDING HANDSHAKE!!!!
                  **
                  ** Entry:
                  **      PUTE: C[5:0] is message
                  **      PUTEX: C[7:0] is message
                  **      D0 points to the mailbox
                  **
                  ** Exit:
                  **      Carry clear: OK (P=0 for PUTX)
                  **      Carry set: error (P=error #)
                  **
                  ** Calls:       None
                  **
                  ** Uses.......
                  **  Inclusive: C,ST[3:0] (PUTE sets P=0)
                  **
                  ** Stk lvls:   0
                  **
                  ** History:
                  **
```

```
                **   Date      Programmer              Modification
                **  --------   ----------    --------------------------------
                **  02/18/83       NZ        Packed by sharing code with PUTX
                **  11/24/82       NZ        Added documentation
                **
                ***************************************************************
                ***************************************************************
     F6B55 26   =PUTE    P=     6
     F6B57 3101          LCHEX  10
     F6B5B 20            P=     0
     F6B5D      =PUTEX
     F6B5D 166           D0=D0+ oOUTHS
     F6B60 870           ?ST=1  =Attn
     F6B63 31            GOYES  PUTE2            Check for immediate abort
     F6B65 0B   PUTE1    CSTEX
     F6B67 15E0          C=DAT0 1                Read handshake nibble
     F6B6B 0B            CSTEX
     F6B6D 870           ?ST#0  MAV
     F6B70 60            GOYES  PUTE2
     F6B72 6C4F PUTEx.   GOTO   PUTEx            Can be GONC if it will reach!
                *_
                *_
                *
                * Looping...check ATTN flag
                *
     F6B76 840  PUTE2    ST=0   =PUTX
     F6B79 615F          GOTO   PUTX4            Check for ATTN flag, return:PUTE1
                ***************************************************************
                ***************************************************************
                **
                ** Name:        PUTEN - Put message in C[5:0], don't check error
                ** Name:        PUTCN - Put message in C[3:0], don't check error
                ** Name:        PUTC+N - Put message in C[B], don't check error
                **
                ** Category:    PILI/O
                **
                ** Purpose:
                **      Put a message without checking for the I/O CPU error
                **      bit (otherwise same as PUTE)
                **
                ** Entry:
                **      D0 points to the HPIL mailbox
                **
                **      PUTEN: Message in C[5:0]
                **      PUTCN: Message in C[3:0]
                **      PUTC+N: Message in C[B]
                **
                ** Exit:
                **      Carry clear:
                **        Handshake nibble in ST[3:0]
                **      Carry set:
                **        P=error #
                **
                ** Calls:       None
                **
                ** Uses.......
                **  Exclusive: C[W]
                **  Inclusive: C[W],ST[3:0]
                **
                ** Stk lvls:   0
                **
                ** History:
                **
                **    Date     Programmer              Modification
                **  --------   ----------    --------------------------------
                **  09/21/83       NZ        Added documentation
                **
                *************************************************************
                *************************************************************
F6B7D F2        =PUTC+N CSL    A             PUTC+ except don't check error
F6B7F F2                CSL    A
F6B81 F2        =PUTCN  CSL    A             PUTC except don't check error
F6B83 BF2               CSL    W
F6B86 26        =PUTEN  P=     6             PUTE except don't check error
F6B88 3101              LCHEX  10
F6B8C 20                P=     0
F6B8E 166               D0=D0+ oOUTHS
F6B91 870               ?ST=1  =Attn
F6B94 21                GOYES  PUTN2
F6B96 0B        PUTN1   CSTEX
F6B98 15E0              C=DAT0 1             Read handshake
F6B9C 0B                CSTEX
F6B9E 870               ?ST#0  MAV           Message available?
F6BA1 50                GOYES  PUTN2         No...wait loop
F6BA3 5EC               GONC   PUTEx.        Go always...jump to finish
                *-
                *-
F6BA6 841       PUTN2   ST=0   sCHKER        Don't check error!
F6BA9 642F              GOTO   PUTX5
                *************************************************************
                *************************************************************
                **
                ** Name:       PUTC+ - Put a command (1 byte) to the mailbox
                ** Name:       PUTC - Put a command (2 bytes) to the mailbox
                **
                ** Category:   PILI/O
                **
                ** Purpose:
                **       Put a command (1 or 2 bytes) to the mailbox
                **
                ** Entry:
                **       D0 points to the HPIL mailbox
                **       PUTC+: C[B] contains the command to send (1 byte)
                **       PUTC: C[3:0] contains the command to send (2 bytes)
                **
                ** Exit:
                **       Same as PUTE
                **
                ** Calls:      None
                **
```

```
                 ** Uses.......
                 **  Inclusive: C[W],ST[3:0],P
                 **
                 ** Stk lvls:   0
                 **
                 ** History:
                 **
                 **    Date     Programmer               Modification
                 **  --------   ----------    ---------------------------------
                 **  09/21/83      NZ         Updated documentation
                 **  11/24/82      NZ         Added documentation
                 **
                 **************************************************************
                 **************************************************************
 F6BAD F2        =PUTC+  CSL    A
 F6BAF F2                CSL    A
 F6BB1 F2        =PUTC   CSL    A
 F6BB3 BF2               CSL    W
 F6BB6 6E9F              GOTO   PUTE           Continue as if PUTE
                 **************************************************************
                 **************************************************************
                 **
                 ** Name:       DDT,DDL - Send a Device Dependent Command
                 **
                 ** Category:   PILI/O
                 **
                 ** Purpose:
                 **      Send a DDL/DDT as determined by P (these routines are
                 **      only good for DDL/DDT 0-15)
                 **
                 ** Entry:
                 **      P contains the DDL/DDT number desired
                 **      Loop is set up
                 **      DO @ mailbox
                 **
                 ** Exit:
                 **      Same as PUTE
                 **
                 ** Calls:      None
                 **
                 ** Uses.......
                 **  Inclusive: C[W],ST[3:0],P
                 **
                 ** Stk lvls:   0
                 **
                 ** History:
                 **
                 **    Date     Programmer               Modification
                 **  --------   ----------    ---------------------------------
                 **  11/24/82      NZ         Added documentation
                 **
                 **************************************************************
                 **************************************************************
 F6BBA 80F0      =DDL    CPEX   0
 F6BBE 21                P=     1
```

```
F6BC0 3200           LC(3)  (=mCMD3)+#A   DDL
      0
F6BC5 6BEF           GOTO   PUTC
            *-
            *-
F6BC9 80F0 =DDT      CPEX   0
F6BCD 21             P=     1
F6BCF 3200           LC(3)  (=mCMD3)+#C   DDT
      0
F6BD4 6CDF           GOTO   PUTC
F6BD8                END
```

```
 ATNFLG  Ext                    -   252   846  1029
 Attn    Ext                    -   246   788   825   897   939   995  1154  1219
 BADRD1  Abs 1009454 #F672E -   139   130
=CHECKD  Abs 1009764 #F6864 -   498
=CHKEND  Abs 1009793 #F6881 -   508
=CK=ATN  Abs 1010179 #F6A03 -   843   804   827   917   941
=CK=ATn  Abs 1010184 #F6A08 -   845
=DDL     Abs 1010618 #F6BBA -  1305
=DDT     Abs 1010633 #F6BC9 -  1311
 FRAME+  Ext                    -   441   498   508
 FRAME-  Ext                    -   128   644
 FUNCR1  Ext                    -   709
=GET     Abs 1009638 #F67E6 -   318   496   506
 GET1    Abs 1009641 #F67E9 -   320   267
 GET2    Abs 1009654 #F67F6 -   328   315
 GET9    Abs 1009669 #F6805 -   338   324
=GETD    Abs 1009757 #F685D -   496
 GETD1   Abs 1009775 #F686F -   501   500   510   511
=GETEND  Abs 1009786 #F687A -   506
 GETER0  Abs 1009708 #F682C -   437   432
 GETER3  Abs 1009749 #F6855 -   453   447
=GETERR  Abs 1009702 #F6826 -   435
=GETHS2  Abs 1009676 #F680C -   371
=GETID   Abs 1009827 #F68A3 -   574
 GETID!  Abs 1009985 #F6941 -   637   622
 GETID#  Abs 1009972 #F6934 -   633   628
 GETID%  Abs 1009982 #F693E -   636   626
 GETID*  Abs 1009919 #F68FF -   607   616
=GETID+  Abs 1009807 #F688F -   564
 GETID-  Abs 1009932 #F690C -   612   608   610
 GETID0  Abs 1009835 #F68AB -   576   565
 GETID1  Abs 1009864 #F68C8 -   584   599
 GETID2  Abs 1009871 #F68CF -   586   593
 GETID3  Abs 1009903 #F68EF -   601   658
 GETID4  Abs 1009989 #F6945 -   641   585
 GETID5  Abs 1010018 #F6962 -   655   646   648
 GETID6  Abs 1010025 #F6969 -   657   662
 GETID^  Abs 1009962 #F692A -   627   630
 GETIDs  Abs 1009917 #F68FD -   606   604
 GETMBX  Ext                    -   896
 GETNO   Abs 1009619 #F67D3 -   309   265
=GETNE   Abs 1009616 #F67D0 -   308   439
=GETST   Abs 1009692 #F681C -   430
=GETST-  Abs 1009715 #F6833 -   439   443
 GETST2  Abs 1009749 #F6855 -   452   140
=GETX    Abs 1009477 #F6745 -   198   105   584
 GETX.   Abs 1009602 #F67C2 -   264   247   256   258
 GETX1   Abs 1009480 #F6748 -   199   268
 GETX2   Abs 1009493 #F6755 -   205
 GETX3   Abs 1009516 #F676C -   215   210
 GETX4   Abs 1009525 #F6775 -   222   221
 GETXE   Abs 1009529 #F6779 -   227   203
 GETXNE  Abs 1009535 #F677F -   229   314
 GETx.   Abs 1009532 #F677C -   228   339
 GETx..  Abs 1009557 #F6795 -   241   240
 GETx.N  Abs 1009562 #F679A -   246   234
 GETxE   Abs 1009595 #F67BB -   259   242
 INIT10  Abs 1010080 #F69A0 -   727   725
=INITFL  Abs 1010041 #F6979 -   708
 LoopOK  Ext                -   843
 MAV     Abs       0 #00000 -    18   202   313   323  1002  1159  1224
 NRD     Abs       1 #00001 -    19  1000
 P=0:SC  Abs 1010175 #F69FF -   829   807   919
 P=0:sc  Abs 1010266 #F6A5A -   919   943
=PUTC    Abs 1010609 #F6BB1 -  1268  1308  1314
=PUTC+   Abs 1010605 #F6BAD -  1266
=PUTC+N  Abs 1010557 #F6B7D -  1211   437
=PUTCN   Abs 1010561 #F6B81 -  1213
=PUTD    Abs 1010499 #F6B43 -  1108   819   930   937
=PUTE    Abs 1010517 #F6B55 -  1149    98   580  1270
 PUTE1   Abs 1010533 #F6B65 -  1156  1069
 PUTE2   Abs 1010550 #F6B76 -  1167  1155  1160
=PUTEN   Abs 1010566 #F6B86 -  1215
=PUTEX   Abs 1010525 #F6B5D -  1152
 PUTEx   Abs 1010367 #F6ABF -  1004  1161
 PUTEx.  Abs 1010546 #F6B72 -  1161  1226
 PUTN1   Abs 1010582 #F6B96 -  1221  1073
 PUTN2   Abs 1010598 #F6BA6 -  1229  1220  1225
=PUTX    Abs 1010327 #F6A97 -   990   799   904   909
 PUTX1   Abs 1010349 #F6AAD -   997  1070
 PUTX3   Abs 1010376 #F6AC8 -  1012   996  1001  1003
 PUTX4   Abs 1010379 #F6ACB -  1016  1168
 PUTX5   Abs 1010382 #F6ACE -  1017  1230
 PUTX6   Abs 1010481 #F6B31 -  1066
 PUTX7   Abs 1010495 #F6B3F -  1073  1067
 PUTXx   Abs 1010337 #F6AA1 -   993  1111
 PUTx.   Abs 1010470 #F6B26 -  1060  1049
 PUTx0   Abs 1010431 #F6AFF -  1039  1038
 PUTx1   Abs 1010460 #F6B1C -  1053  1047
 PUTx3   Abs 1010477 #F6B2D -  1065  1054  1056
 READER  Abs 1009422 #F670E -   126   106
 READI2  Abs 1009413 #F6705 -   120   113   136   503   652
=READI3  Abs 1009462 #F6736 -   143   108
 READI9  Abs 1009475 #F6743 -   154   104
=READIT  Abs 1009374 #F66DE -   103   116   147
=READRG  Abs 1009818 #F689A -   569
 READRg  Abs 1009851 #F68BB -   580   571
 READS+  Abs 1009367 #F66D7 -    98   133   135
=READSU  Abs 1009362 #F66D2 -    96
=SENDI+  Abs 1010206 #F6A1E -   896
 SENDI0  Abs 1010217 #F6A29 -   899   918
 SENDI1  Abs 1010259 #F6A53 -   917   898
 SENDI2  Abs 1010269 #F6A5D -   925   901
 SENDI3  Abs 1010275 #F6A63 -   927   940   942
 SENDI4  Abs 1010325 #F6A95 -   949   928   933
=SENDIT  Abs 1010212 #F6A24 -   897   728   910
 WRITI0  Abs 1010100 #F69B4 -   790   805
 WRITI1  Abs 1010128 #F69D0 -   804   789
 WRITI2  Abs 1010138 #F69DA -   813   792
 WRITI3  Abs 1010144 #F69E0 -   815   826   828
 WRITI4  Abs 1010257 #F6A51 -   914   816
*WRITIT  Abs 1010095 #F69AF -   788   800
 YTML    Ext                -   564
 YTMLL   Ext                -   575
 eABORT  Ext                -   126   260   641  1061
 ePIL    Ext                -   122   454
 eUNEXP  Ext                -   121
 mCMD3   Ext                -  1307  1313
 mERSTS  Ext                -   436
 mSDI    Ext                -   576
 mSTATS  Ext                -   431
*oINHS   Abs       8 #00008 -    21   198   205   235   237   259   308   318
                                328
*oINST   Abs       9 #00009 -    22   205   208   235   237   328   331   372
                                374  1033  1035
*oOUTHS  Abs       7 #00007 -    17   993  1004  1033  1036  1060  1153  1218
*oOUTST  Abs       6 #00006 -    16
 pDATA   Ext                -   499
 pEOT    Ext                -   132   509   647
 pSTATE  Ext                -   129   442   645
 pTERM   Ext                -   134
 sCHKER  Abs       1 #00001 -    28   228   233   264   312  1016  1048  1066
                               1229
 sERROR  Ext                -   239  1037
 sGETX   Abs       0 #00000 -    27   227   266   338
 sPUTX   Abs       0 #00000 -    26  1012  1068  1167
```

```
Input Parameters

  Source file name is NZ&IOR::MS

  Listing file name is NZ/IOR:TI:ML::-1

  Object file name is NZ%IOR:TI:MS::-1

                                         111111
                               0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                  *
                  *       N   N  ZZZZZ   &     FFFFF  RRRR     A
                  *       N   N      Z  & &    F      R   R   A A
                  *       NN  N     Z   & &    F      R   R  A   A
                  *       N N N    Z     &     FFFF   RRRR   A   A
                  *       N  NN   Z     & & &  F      R R    AAAAA
                  *       N   N  Z      &  &   F      R  R   A   A
                  *       N   N  ZZZZZ   && &  F      R   R  A   A
                  *
                  *
                          TITLE  PIL Frame Routines<840301.1347>
   F6BD8                  ABS    #F6BD8        TIXHP6 address (fixed)
                  ***************************************************************
                  ***************************************************************
                  **
                  ** Name:        FRAMEE - Encode an HPIL frame from its mnemonic
                  **
                  ** Category:    PILUTL
                  **
                  ** Purpose:
                  **      HPIL frame encode (given the ASCII for the frame and a
                  **      value, produce the appropriate 11-bit frame)
                  **
                  ** Entry:
                  **      C[S] is length of ASCII character string
                  **      C[S:0] is the ASCII character string
                  **      A[B] is the value included with the frame (if none, 0)
                  **
                  ** Exit:
                  **      P=0
                  **      Carry clear: C[X] is the frame value
                  **                   B[B] is the mask value for the frame
                  **                   C[S] is WP length of name
                  **      Carry set: Error...not found
                  **
                  ** Calls:       None
                  **
                  ** Uses.......
                  **  Inclusive: B[W],C[W],P
                  **
                  ** Stk lvls:    1 (Internal push)
                  **
                  ** History:
                  **
                  **   Date     Programmer            Modification
                  **  --------  ----------   --------------------------------
                  **  09/26/83     NZ        Updated documentation
                  **
                  ***************************************************************
                  ***************************************************************
   F6BD8          =FRAMEE
                  *
                  * C[5:0] is the ASCII frame value now
                  *
   F6BD8 AF5            B=C    W                Copy the ASCII to B[W] for now
```

```
F6BDB 7000            GOSUB  FRAMSb
F6BDF 07      FRAMSb  C=RSTK                 Now C[A] has the address of FRAMSb
F6BE1 136             CDOEX                  ...now in DO.
F6BE4 06              RSTK=C                 Save DO on the stack...
              *
              * Swap value of frame # into DO, address of FRAMSb into A[A]...
              *
F6BE6 132             ADOEX
F6BE9 20              P=     0
F6BEB 346A            LC(5)  (FRAMET)-(FRAMSb)+#4  Offset to table + #4
      000
F6BF2 CA              A=A+C  A
F6BF4 132             ADOEX                  Restore A[A], set DO to table+4
              *
              * Now DO points to the frame table, A is the frame #
              *
F6BF7 1567 FRAME1     C=DAT0 W               Read the ASCII for the current frame
F6BFB 80D0            P=C    0
              *
              * Now P is the frame length
              *
F6BFF BF6             CSR    W               Shift off the length nibble
F6C02 890             ?P=    0               If length=0, not found...
F6C05 27              GOYES  FRAME9          Not found!
              *
              * Now have a valid ASCII string in C[5:0]
              *
F6C07 911             ?B=C   WP
F6C0A 11              GOYES  FRAME2          Found a match!
              *
              * This does not match...try again!
              *
F6C0C 164             D0=D0+ 5               Skip frame bits and text length
F6C0F 136             CDOEX
F6C12 809             C+P+1                  Add text length to DO
F6C15 136             CDOEX
F6C18 5ED             GONC   FRAME1          Go always
              *_
              *_
F6C1B         FRAME2
              *
              * When here, had an ASCII match!
              *
F6C1B 80FF            CPEX   15              Save length (P) in C[S]
              *
              * Preset B[X] to #FFF (For mask)
              *
F6C1F D1              B=0    A
F6C21 CD              B=B-1  A               B[X]=#FFF
F6C23 183             D0=D0- 4               Point to start of entry...
F6C26 15E3            C=DAT0 4               ...and read the frame value+info
F6C2A 23              P=     3               Point to the status nibble
F6C2C A06             C=C+C  P               Is this a command bits only frame?
F6C2F 5B0             GONC   FRAME3          No...continue
              *
```

```
                 * Copy the low 8 bits from A[B]!
                 *
F6C32 AE6               C=A     B                Clear low 8 bits of mask
F6C35 AE1               B=0     B                Clear low 8 bits of mask
F6C38 473               GOC     FRAME8           Exit, carry cleared by FRAME8
                 *-
                 *-
F6C3B A06        FRAME3 C=C+C   P                Is this a low 5 bits only?
F6C3E 532               GONC    FRAME4           No...continue
                 *
                 * Need to copy the low 5 bits of A[B] into C[B]
                 *
F6C41 D5                B=C     A                Temporary storage!
F6C43 20                P=      0
F6C45 320E              LCHEX   FE0              Mask for low 5 bits
      F
F6C4A 0EF1              B=B&C   A                Now B[X] is the high bits of frame
F6C4E FE                C=-C-1  A                One's complement of C[X]
F6C50 0EF2              C=A&C   A                Now C[X] is the low bits of frame
F6C54 0EF9              B=C!B   A                Now B[X] is the full frame
F6C58 320E              LCHEX   FE0              Mask value
      F
F6C5D DD                BCEX    A                Mask in B[X], Frame in C[X]
                 *
                 * C=-C-1 above cleared the carry unconditionally
                 *
F6C5F 501               GONC    FRAME8           Go always-exit, clear carry
                 *-
                 *-
F6C62 A06        FRAME4 C=C+C   P                Low 4 bits?
F6C65 5A0               GONC    FRAME8           No...full frame!
                 *
                 * This is a low 4 bits case...
                 *
F6C68 20                P=      0
F6C6A A86               C=A     P
F6C6D A81               B=0     P                Clear low 4 bits of mask
                 *
                 * Now C[X] is the frame...clear carry, then restore data
                 *
F6C70            FRAME8
F6C70 BED               B=-B-1  B                Set B[B] to mask for frame
F6C73 21                P=      1
F6C75 0D                P=P-1                    Now P=0, carry is clear
                 *
                 * Now restore the data
                 *
F6C77 136        FRAME9 CD0EX                    These instructions don't alter carry
F6C7A 07                C=RSTK                   Restore D0 value
F6C7C 136               CD0EX
F6C7F 01                RTN
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:       FRAMET - Frame table format
```

```
                **
                ** Category:   LOCAL
                **
                ** Purpose:
                **      Table of entries for frame encoding/decoding
                **      (ASCII vs frame value)
                **
                ** Detail:
                **      Format of entries as seen in RAM:
                **
                **      Length (nibbles)     Definition
                **      ----------------     ---------------------------------
                **             3             Frame value (least sig nib first)
                **             1             Control bits:
                **                             8: Command bits only
                **                             4: High 6 bits only
                **                             2: High 7 bits only
                **                             0: All bits meaningful
                **             1             Text length (WP value)
                **         (Length+1)        Text of frame
                **
                **      As read into the A register:
                **        A[<--Text-->,<--length-->,<--control-->,<--frame-->]
                **      nib:15.......5,4..........4,3...........3,2.........0
                **
                ***************************************************************
                ***************************************************************
F6C81           =FRAMET
                *
                Comand  EQU    8
                High6   EQU    4
                High7   EQU    2
                Allbit  EQU    0
                *
                * Frame classes (no subdivisions)
                *
F6C81 000               NIBHEX 000             DATA
F6C84 8                 CON(1) Comand
F6C85 7                 NIBHEX 7               Length of DATA
F6C86 4414              NIBASC \DATA\
      4514
                *
F6C8E 002               NIBHEX 002
F6C91 8                 CON(1) Comand
F6C92 5                 NIBHEX 5               Length of END
F6C93 54E4              NIBASC \END\           END
      44
                *
F6C99 006               NIBHEX 006
F6C9C 8                 CON(1) Comand
F6C9D 5                 NIBHEX 5               Length of IDY
F6C9E 9444              NIBASC \IDY\           IDY
      95
                *
                * CoMmanD class...
                *
F6CA4 F34             NIBHEX F34
F6CA7 0               CON(1) Allbit
F6CA8 5               NIBHEX 5           Length of UNL
F6CA9 55E4            NIBASC \UNL\       UNL
      C4
                *
F6CAF 024             NIBHEX 024
F6CB2 4               CON(1) High6
F6CB3 B               NIBHEX B           Length of LISTEN
F6CB4 C494            NIBASC \LISTEN\    LISTEN
      3545
      54E4
                *
F6CC0 F54             NIBHEX F54
F6CC3 0               CON(1) Allbit
F6CC4 5               NIBHEX 5           Length of UNT
F6CC5 55E4            NIBASC \UNT\       UNT
      45
                *
F6CCB 044             NIBHEX 044
F6CCE 4               CON(1) High6
F6CCF 7               NIBHEX 7           Length of TALK
F6CD0 4514            NIBASC \TALK\      TALK
      C4B4
                *
F6CD8 064             NIBHEX 064
F6CDB 4               CON(1) High6
F6CDC 5               NIBHEX 5           Length of SAD
F6CDD 3514            NIBASC \SAD\       SAD
      44
                *
F6CE3 0A4             NIBHEX 0A4
F6CE6 4               CON(1) High6
F6CE7 5               NIBHEX 5           Length of DDL
F6CE8 4444            NIBASC \DDL\       DDL
      C4
                *
F6CEE 0C4             NIBHEX 0C4
F6CF1 4               CON(1) High6
F6CF2 5               NIBHEX 5           Length of DDT
F6CF3 4444            NIBASC \DDT\       DDT
      45
                *
                * CoMmanD class continues below...
                *
                * ReaDY class...
                *
F6CF9 005             NIBHEX 005
F6CFC 8               CON(1) Comand
F6CFD 5               NIBHEX 5           Length of RDY
F6CFE 2544            NIBASC \RDY\       RDY
      95
                *
                * End of ReaDY class!
```

```
                 *
                 * At this point, only CoMmanD frames are left...
                 *
    F6D04 094          NIBHEX 094
    F6D07 0            CON(1) Allbit
    F6D08 5            NIBHEX 5         Length of IFC
    F6D09 9464         NIBASC \IFC\     IFC
          34
                 *
    F6D0F B94          NIBHEX B94
    F6D12 0            CON(1) Allbit
    F6D13 5            NIBHEX 5         Length of LPD
    F6D14 C405         NIBASC \LPD\     LPD
          44
                 *
    F6D1A 104          NIBHEX 104
    F6D1D 0            CON(1) Allbit
    F6D1E 5            NIBHEX 5         Length of GTL
    F6D1F 7445         NIBASC \GTL\     GTL
          C4
                 *
    F6D25 404          NIBHEX 404
    F6D28 0            CON(1) Allbit
    F6D29 5            NIBHEX 5         Length of SDC
    F6D2A 3544         NIBASC \SDC\     SDC
          34
                 *
                 * End of all defined commands
                 *
    F6D30 004          NIBHEX 004
    F6D33 8            CON(1) Comand
    F6D34 5            NIBHEX 5         Length of CMD
    F6D35 34D4         NIBASC \CMD\     CMD
          44
                 *
                 * Following are special case, ASCII search match only!!!!
                 * (Will never match on any other search because high bit set)
                 *
    F6D3B 20F          NIBHEX 20F
    F6D3E 0            CON(1) Allbit
    F6D3F 5            NIBHEX 5         Length of MLA
    F6D40 D4C4         NIBASC \MLA\     MLA (My listen address)
          14
                 *
    F6D46 40F          NIBHEX 40F
    F6D49 0            CON(1) Allbit
    F6D4A 5            NIBHEX 5         Length of MTA
    F6D4B D445         NIBASC \MTA\     MTA (My talk address)
          14
                 *
                 * Now all frame types should be complete...put a null entry
                 * to end a text search
                 *
    F6D51 000          NIBHEX 000
    F6D54 0            CON(1) Allbit
```

```
F6D55 0            NIBHEX 0             Length of last entry (0)
           *
           * End of the table!
           *
F6D56              END
```

```
 Allbit  Abs       0 #00000 -   195   217   227   265   270   275   280   295
                                300   308
 Comand  Abs       8 #00008 -   192   200   205   210   256   287
 FRAME1  Abs 1010679 #F6BF7 -    71    91
 FRAME2  Abs 1010715 #F6C1B -    94    83
 FRAME3  Abs 1010747 #F6C3B -   117   108
 FRAME4  Abs 1010786 #F6C62 -   137   118
 FRAME8  Abs 1010800 #F6C70 -   148   114   134   138
 FRAME9  Abs 1010807 #F6C77 -   155    78
=FRAMEE  Abs 1010648 #F6BD8 -    51
=FRAMET  Abs 1010817 #F6C81 -   190    65
 FRAMSb  Abs 1010655 #F6BDF -    57    56    65
 High6   Abs       4 #00004 -   193   222   232   237   242   247
 High7   Abs       2 #00002 -   194
```

```
Input Parameters

  Source file name is NZ&FRA::MS

  Listing file name is NZ/FRA:TI:ML::-1

  Object file name is NZ%FRA:TI:MS::-1

                                        111111
                              0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
          *
          *       N   N  ZZZZZ   &     L     00000  W   W
          *       N   N      Z  & &    L     0   0  W   W
          *       NN  N     Z   & &    L     0   0  W   W
          *       N N N    Z     &     L     0   0  W W W
          *       N  NN   Z     & & &  L     0   0  W W W
          *       N   N  Z      &  &   L     0   0  WW WW
          *       N   N  ZZZZZ   && &  LLLLL 00000  W   W
          *
          *
                  TITLE  Low-level USER HP-IL <840301.1358>
F6D56             ABS    #F6D56        TI%HP6 address (fixed)
          ***************************************************************
          ***************************************************************
          **
          ** Name:       FLOAT!,FLOAT+ - Convert a hex value to floating
          **
          ** Category:   CONVRT
          **
          ** Purpose:
          **      Converts a hex number into a floating point #
          **
          ** Entry:
          **      FLOAT!: C[W] is the hex value
          **      FLOAT+: A[W] is the hex value
          **
          ** Exit:
          **      Carry set if value is zero, else clear
          **      C[W] is the floating number
          **
          ** Calls:      HTODX
          **
          ** Uses.......
          **  Exclusive: A[W],     C[W],P
          **  Inclusive: A[W],B[W],C[W],P
          **
          ** Stk lvls:   1 (HTODX)
          **
          ** Algorithm:
          **      FLOAT!:Copy C[W] to A[W]
          **      FLOAT+:Convert A[W] to decimal                  (HTODX)
          **             If result is zero, then return, carry set
          **             Set exponent value (P) to 15 initially
          **      FLOAT1:Shift result one digit left
          **             Decrement exponent
          **             If most significant digit of result = 0 then
          **               goto FLOAT1
          **             Shift result right one digit (most sig = 0)
          **             Put exponent in C[0]
          **             Return, carry clear (non-zero)
          **
          ** History:
          **
          **   Date      Programmer              Modification
          **  --------   ----------   --------------------------------
```

```
               **  11/19/82      NZ         Added documentation
               **
               ****************************************************************
               ****************************************************************
   F6D56 AFA   =FLOAT! A=C    W
   F6D59 8E00  =FLOAT+ GOSUBL =MTODX        Result in B
         00
   F6D5F AF9           C=B    W
   F6D62 97A   =FLOAT- ?C=0   W             Is initial value 0?
   F6D65 00            RTNYES               Yes...done!
   F6D67 2F            P=     15            Initialize exponent to 15
   F6D69 BF2   FLOAT1  CSL    W             Shift result left one digit
   F6D6C 0D            P=P-1                Decrement exponent
   F6D6E 94A           ?C=0   S             Is most significant digit zero?
   F6D71 8F            GOYES  FLOAT1        Yes...loop back for more
   F6D73 BF6           CSR    W             No...undo last shift (C[S]=0)
   F6D76 AB2           C=0    X             Clear exponent field
   F6D79 80F0          CPEX   0             Set C[0] to exponent value
   F6D7D 20            P=     0             (Unnecessary instruction)
   F6D7F 03            RTNCC                Return, carry clear (non-zero)
               ****************************************************************
               ****************************************************************
               **
               ** Name:       POP1N - Pop one numeric value from MTHSTK
               **
               ** Category:   GETUTL
               **
               ** Purpose:
               **      (Same as mainframe POP1N)
               **
               ** Entry:
               **      D1 points to top of stack
               **
               ** Exit:
               **      DECIMAL MODE!!!
               **      P=0
               **      If not numeric, jumps to ERRORX
               **      A[W] is real part, R0 is imaginary (if complex)
               **      Carry clear if real, carry set if complex
               **
               ** Calls:      None
               **
               ** Uses.......
               **  Inclusive: A[W],B[0],R0,D1,P
               **
               ** Stk lvls:   0
               **
               ** History:
               **
               **    Date     Programmer            Modification
               **  --------   ----------   --------------------------------
               **  11/19/82      NZ        Added documentation
               **
               ****************************************************************
               ****************************************************************
```

```
F6D81 05    =POP1N  SETDEC
F6D83 20            P=      0
F6D85 A81           B=0     P
F6D88 A0D           B=B-1   P              Set B[0]=9
F6D8B 1537          A=DAT1  W              Read the item
F6D8F 980           ?A>B    P
F6D92 40            GOYES   POP1NN         Check if complex or otherwise
F6D94 03            RTNCC
            *-
            *-
F6D96 04    POP1NN  SETHEX
F6D98 B04           A=A+1   P
F6D9B B04           A=A+1   P
F6D9E 96C           ?A#0    B              Check if complex (0E)
F6DA1 71            GOYES   POP1NE         Error...type conflict
F6DA3 171           D1=D1+  2
F6DA6 1537          A=DAT1  W              Read in imaginary part
F6DAA 17F           D1=D1+  16
F6DAD 100           R0=A                   Save in part in R0
F6DB0 1537          A=DAT1  W              Read in real part
F6DB4 05            SETDEC
F6DB6 02            RTNSC                  Return with carry SET
            *-
            *-
F6DB8 20    POP1NE  P=      =eNNUMR        Not numeric
F6DBA 8C00  Errorx  GOLONG  =ERRORX
      00
            ***************************************************************
            ***************************************************************
            **
            ** Name:        RESET - Reset the HPIL I/O processor
            **
            ** Category:    STEXEC
            **
            ** Purpose:
            **      Reset an HPIL mailbox (I/O CPU), set up default parms
            **
            ** Entry:
            **      None
            **
            ** Exit:
            **      Through NXTSTM
            **
            ** Calls:       GTYPRM,GETLOP,FNDMB-,GETERR,CHKST+
            **
            ** Uses.......
            **  Exclusive: A,  C,                         P
            **  Inclusive: A,B,C,D,R0,R1,R2,R3,R4,D0,D1,P,ST[11:0],FUNCxx
            **
            ** Stk lvls:    6 (GTYPRM)
            **
            ** History:
            **
            **    Date      Programmer              Modification
            **  --------   ----------    ------------------------------
```

```
                  **  09/26/83      NZ          Updated documentation
                  **  06/24/83      NZ          Changed to wake up I/O CPU and
                  **                            REPORT any errors it found
                  **  11/19/82      NZ          Added documentation
                  **
                  ***************************************************************
                  ***************************************************************
 F6DC0 0000              REL(5) =RESETd
       0
 F6DC5 0000              REL(5) =RESETp
       0
 F6DCA            =RESET
 F6DCA AC2               C=0    S               Clear C[S]
 F6DCD 14A               A=DAT0 B               Check if a loop # given
 F6DD0 3100              LC(2)  =tCOMMA
 F6DD4 962               ?A=C   B
 F6DD7 11                GOYES  RESET0          Not loop expression...skip it
 F6DD9 8E00              GOSUBL =GTYPRM         Get (type) loop # from RAM
       00
 F6DDF 453               GOC    Resete          If out of range, error
 F6DE2 8E00              GOSUBL =GETLOP         Get loop # into C[S]
       00
 F6DE8            RESET0
 F6DE8 8E00              GOSUBL =FNDMB-         Clear DISPLAY, etc; FNDMBX
       00
 F6DEE 462               GOC    Resete          If not found, error!
 F6DF1 AF2               C=0    W
 F6DF4 27                P=     7
 F6DF6 308               LCHEX  8               Reset I/O CPU
 F6DF9 15C8              DAT0=C 9               Clear the NRD bit, too!
 F6DFD 7000              GOSUB  =GETERR         Check if any errors
 F6E01 431               GOC    Resete          Errors!
 F6E04 8E00              GOSUBL =CHKST+         Set up parameters for I/O CPU
       00
 F6E0A 4A0               GOC    Resete          Error
 F6E0D 8C00 Nxtstm       GOLONG =nXTSTM         Next BASIC statement
       00
                  *-
                  *-
 F6E13 20   Resetr       P=     =eRANGE         (Unnecessary instruction)
 F6E15 64AF Resete       GOTO   Errorx
 F6E19                   END
 CHKST+  Ext                    -   191
 ERRORX  Ext                    -   135
 Errorx  Abs 1011130 #F6DBA -   135   197
=FLOAT!  Abs 1011030 #F6D56 -    60
=FLOAT+  Abs 1011033 #F6D59 -    61
=FLOAT-  Abs 1011042 #F6D62 -    63
 FLOAT1  Abs 1011049 #F6D69 -    66    69
 FNDMB-  Ext                    -   183
 GETERR  Ext                    -   189
 GETLOP  Ext                    -   181
 GTYPRM  Ext                    -   179
 HTODX   Ext                    -    61
 Nxtstm  Abs 1011213 #F6E0D -   193
=POP1N   Abs 1011073 #F6D81 -   110
 POP1NN  Abs 1011094 #F6D96 -   120   116
 POP1NE  Abs 1011128 #F6DB8 -   134   124
=RESET   Abs 1011146 #F6DCA -   173
 RESETO  Abs 1011176 #F6DE8 -   182   178
 RESETd  Ext                    -   171
 RESETp  Ext                    -   172
 Resete  Abs 1011221 #F6E15 -   197   180   184   190   192
 Resetr  Abs 1011219 #F6E13 -   196
 eNNUMR  Ext                    -   134
 eRANGE  Ext                    -   196
 nXTSTM  Ext                    -   193
 tCOMMA  Ext                    -   176
```

```
Input Parameters

  Source file name is HZ&LOW::MS

  Listing file name is HZ/LOW:TI:ML::-1

  Object file name is HZXLOW:TI:MS::-1

                                   111111
                         0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
                *
                *
                *       N   N  ZZZZZ   &     FFFFF  X   X   QQQ
                *       N   N     Z   & &    F      X   X  Q   Q
                *       NN  N    Z    & &    F       X X   Q   Q
                *       N N N   Z      &     FFFF     X    Q   Q
                *       N  NN  Z     & & &   F       X X   Q Q Q
                *       N   N Z      &  &    F      X   X  Q  Q
                *       N   N ZZZZZ   && &   F      X   X   QQ Q
                *
                *
                        TITLE  File Execution <840301.1348>
   F6E19                ABS    #F6E19       TIXMP6 address (fixed)
                *************************************************************
                *************************************************************
                **
                ** Name:        GETDID - Get device ID (specifier)
                ** Name:        GETDIX - Get device ID (String expr on stack)
                **
                ** Category:    FILUTL
                **
                ** Purpose:
                **      GETDID fetches a device ID, given D0 pointing to the
                **      ID in program memory
                **
                ** Entry:
                **      D0 points to the ID in program memory
                **
                ** Exit:
                **      Carry clear: Address/type in D[X], device type/ID in B
                **        If D[X]=0, then device id = "" OR *
                **        P=0
                **        FUNCD0 contains the D0 value after evaluating ID
                **      Carry set: error, P=error number
                **
                ** Calls:       GETSTR,PROCLT,NXTCHR,BAKCHR,PROCST,TSAVD0,START
                **
                ** Uses.......
                **  Inclusive: A-D,R0-R4,D0,D1,P,STMTD1[3:0],STMTR1,FUNCxx,
                **              ST[11:0],all RAM that EXPEXC is permitted to use
                **
                ** Stk lvls:    GETDID: 6 (GETSTR)
                ** Stk lvls:    GETDIX: 4 (PROCST)
                **
                ** History:
                **
                **   Date      Programmer            Modification
                **
                **  --------   ----------     --------------------------------
                **  05/02/83      NZ          Added flag for colon/semicolon
                **                            required to GETDIX, added GETDI+
                **  03/18/83      NZ          Changed GETDIX to use NXTCHR,
                **                            removed SaveD0 code
                **  03/17/83      NZ          Changed register usage (+STMTD1,
                **                            remove STMTR0)
                **  03/15/83      NZ          Returned exit conditions to those
```

```
                 **                              originally given (D[A])
                 **  03/01/83      NZ            Changed GETDIX to use PROCLT
                 **  11/04/82      NZ            Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
                 TermRq  EQU    0                Status bit for terminator required
                 *
   F6E19 8E00 =GETDID GOSUBL =GETSTR             Get string/literal-sets =ST(sSTK)
         00
   F6E1F 400          RTNC                       If carry, ERROR
   F6E22 870          ?ST=1  =sSTK
   F6E25 D0           GOYES  GETDI1              String expression
                 *
                 * Literal expression in memory
                 *
   F6E27 7834         GOSUB  PROCLT              Process literal
   F6E2B D7           D=C    A                   Put device type into D[A]
   F6E2D 555          GONC   GETDI5              If no carry, finish it up
   F6E30 02           RTNSC                      If carry, error
                 *-
                 *-
   F6E32         GETDI1
                 *
                 * This is a string expression
                 * (Start of string in D1, D[A] @ end of string)
                 *
   F6E32 8A8          ?A=0   A
   F6E35 C4           GOYES  GETDI4              Null string
   F6E37 840  =GETDIX ST=0   TermRq              Terminator (colon/semic) optional
   F6E3A 7B56 GETDI+  GOSUB  Nxtchr              Read the first char
   F6E3E 4E3          GOC    GETDI3              End of string...error
                 *
                 * Is it a ":"?
                 *
   F6E41 31A3         LCASC  \:\
   F6E45 962          ?A=C   B                   Is it a colon?
   F6E48 41           GOYES  GETDI0              Yes...Nxtchr was OK
   F6E4A 31E2         LCASC  \.\                 No...check volume label
   F6E4E 962          ?A=C   B                   Is it a volume label?
   F6E51 31           GOYES  GETDI2              Yes...process volume label
   F6E53 870          ?ST=1  TermRq              Was a terminator required?
   F6E56 72           GOYES  GETDI3              Yes...bad device spec
   F6E58 7276         GOSUB  Bakchr              No...back it up
   F6E5C 70F0 GETDI0  GOSUB  PROCST              Process string entry point
   F6E60 6700         GOTO   GETDCK
                 *-
                 *-
   F6E64 7B91 GETDI2  GOSUB  PRSTvl              Yes...process volume label
                 *
                 * Fall into GETDCK
                 *
   F6E68 400  GETDCK  RTNC                       If carry, error
   F6E6B 7A26         GOSUB  Nxtchr              Check to be sure no more data
   F6E6F D7           D=C    A                   Put address in D[A]
```

```
F6E71 411              GOC    GETDI5         If carry, end of string
F6E74 3102             LCASC  \ \
F6E78 962              ?A=C   B              Is the next char a blank?
F6E7B 80               GOYES  GETDI5         Yes...accept it
F6E7D 20      GETDI3   P=     =eDSPEC        Illegal device id
F6E7F 02               RTNSC
              *-
              *-
F6E81 D3      GETDI4   D=0    A
F6E83 8E00    GETDI5   GOSUBL =TSAVDO        Save D0 in FUNCD0
      00
F6E89 850              ST=1   =sDevOK        If here, device is OK
F6E8C 8AB              ?D=0   A
F6E8F EE               GOYES  GETDI3         If D=0, then "", "*", or *
F6E91 8E00             GOSUBL =START         Find out the tape address
      00
F6E97 400              RTNC                  Error
F6E9A 8C00             GOLONG =SETUP         Arrange the info from START
      00
              **************************************************************
              **************************************************************
              **
              ** Name:        GETPIL - Evaluate an HPIL file specifier
              ** Name:        GETPI+ - Get an HPIL file specifier from stack
              **
              ** Category:    FILUTL
              **
              ** Purpose:
              **      This routine extracts the file name and the device
              **      and returns with the device type/device ID in B[W],
              **      address/type in D[X]
              **
              ** Entry:
              **      D0 points to the file specifier in program memory
              **
              ** Exit:
              **      ST(sDevOK) set if device spec was ok, else clear
              **      Carry clear:
              **        Filename in R0, R4[15:12]
              **        Device type in B[X]/B[W], address in D[X]
              **        If address = X00, then this is a * or a ""
              **        AVMEME collapsed back to starting point
              **      Carry set:
              **        Error (P,C[0] are error code)
              **
              ** Calls:       GETSTR,FXQPIL,NXTCHR,PROCLT,PROCST,ASRC4,D1=AVS,
              **              D1@AVE,CSRC12,GETDI5,ASLC12
              **
              ** Uses.......
              **  Inclusive: A-D,R0-R4,D0,D1,P,STMTD1[3:0],STMTR1,ST[11:0],
              **              FUNCxx,all RAM that EXPEXC is permitted to use
              **
              ** Stk lvls:    6 (GETSTR)
              **
              ** History:
                   **
                   **   Date     Programmer            Modification
                   **  --------  ----------   --------------------------------
                   **  05/01/83      NZ       Changed GOSUB GETDIX to GETDI+,
                   **                         added ST=1 TermRq
                   **  03/17/83      NZ       Changed STMT usage (+D1, -R0)
                   **  03/01/83      NZ       Changed GOYES GETDI2 to GETDIX,
                   **                         added call to GETDCK
                   **  11/04/82      NZ       Added documentation
                   **
                   ***************************************************************
                   ***************************************************************
 F6EA0 8E00 =GETPIL GOSUBL =GETSTR        Get string/literal
       00
 F6EA6 400          RTNC                  Error
 F6EA9 7735 =GETPI+ GOSUB  FXQPIL
                   *
                   * FXQPIL returns with filename (blank-filled) in R0,A[3:0]
                   * (If carry set, A,R0 are zeroed out)
                   *
                   * ST(sSTK) is set if reading from the stack, clear if prog mem
                   *
                   * Now the filename is in A and R0
                   *
                   * Move the last two characters to A[15:12], than to R4
                   *
 F6EAD 8E00         GOSUBL =ASRC4
       00
 F6EB3 11C          C=R4
 F6EB6 2B           P=     11
 F6EB8 A9E          ACEX   WP
 F6EBB 104          R4=A
                   *
                   * If sSTK is 1, then reading from the stack...process stack
                   *
 F6EBE 20           P=     0
 F6EC0 840          ST=0   =sDevOK       Device spec NOT ok until shown so
 F6EC3 860          ?ST=0  =sSTK         Stack?
 F6EC6 90           GOYES  GETPI1        No...continue...
 F6EC8 850          ST=1   TermRq        Terminator (:;) required
 F6ECB 6E6F         GOTO   GETDI+        Read it from the stack
                   *-
                   *-
                   *
                   * Need to save filename on stack to protect from PROCLT
                   *
 F6ECF 8E00 GETPI1  GOSUBL =D1=AVS       Set D1 = AVMEMS
       00
 F6ED5 143          A=DAT1 A             A[A] is @ AVMEMS
 F6ED8 D2           C=0    A
 F6EDA 3141         LC(2)  20            20 nibs for the filename
 F6EDE D5           B=C    A             Save in B[A] for now
 F6EE0 8E00         GOSUBL =D1@AVE       Set D1 @ AVMEME, C[A] = AVMEME
       00
 F6EE6 137          CD1EX                D1=AVMEME,C[A] @ AVMEME
```

```
F6EE9 E9              C=C-B  A           C[A] is proposed new AVMEME
F6EEB 8B6             ?A>C   A           Enough memory?
F6EEE A5              GOYES  GETPIm      No...insufficient memory
F6EF0 145             DAT1=C A           Yes...write out new AVMEME
F6EF3 135             D1=C               Set D1 @ AVMEME
F6EF6 118             C=R0
F6EF9 1557            DAT1=C W           Write out first 8 chars of name
F6EFD 17F             D1=D1+ 16
F6F00 11C             C=R4
F6F03 8E00            GOSUBL =CSRC12
      00
F6F09 15D3            DAT1=C 4           Write out last 2 chars of name
               *
               * Done saving name on stack
               *
F6F0D 7253            GOSUB  PROCLT      Process literal
F6F11 400             RTNC               Error (leaves info on MTHSTK)
F6F14 D7              D=C    A           Put device type into D[A]
F6F16 796F            GOSUB  GETDIS      Check it and set it up
F6F1A 400             RTNC
               *
               * Now restore the filename from stack
               *
F6F1D 06              RSTK=C             Save C[A] on RSTK
F6F1F 8E00            GOSUBL =D1@AVE     (C[A] = AVMEME)
      00
F6F25 1537            A=DAT1 W
F6F29 17F             D1=D1+ 16
F6F2C 100             R0=A               Restore first 8 chars to R0
F6F2F 143             A=DAT1 A
F6F32 8E00            GOSUBL =ASLC12     Put last 2 chars in R4[15:12]
      00
F6F38 104             R4=A
F6F3B 173             D1=D1+ 4
F6F3E 137             CD1EX              Set D1 = AVMEME
F6F41 145             DAT1=C A           Write out new AVMEME (pop 20)
F6F44 07              C=RSTK             Restore C[A]
               *
               * Done restoring levels now
               *
F6F46 03              RTNCC
               *_
               *_
F6F48 20       GETPIm P=     =eNORAM
F6F4A 02              RTNSC              Error...no memory
               ****************************************************************
               ****************************************************************
               **
               ** Name:        PROCST - Process string device specifier
               **
               ** Category:    FILUTL
               **
               ** Purpose:
               **      Process a device specifier from a string expression
               **
```

```
                ** Entry:
                **      ST(sSTK)=1
                **      R0[W], R4[15:12] are filename
                **      D1 points to next item of string
                **      D[A] is the end of the string
                **      HEXMODE
                **
                ** Exit:
                **      Carry set if error (P,C[0] are error number)
                **      Carry clear:
                **              P=0
                **              Device type/device id in B[X]/B[W]
                **              IF device type="*", *, or "" THEN C[X]=0
                **              ELSEIF address, THEN C[X] is address+loop*1024
                **              ELSEIF LOOP, THEN C[X] is "9F"+loop*4096
                **              ELSEIF NULL, THEN C[B] is "7F"
                **              ELSEIF volume label THEN C[X] is "5F"+loop*4096
                **              ELSEIF device type THEN C[X] is "3F"+loop*4096
                **              ELSEIF device id THEN C[X] is "1F"+loop*4096
                **
                ** Calls:       NXTCHR,BAKCHR,UCRANG,GETDVW,PROCDW,GTYPST,GADRST
                **
                ** Uses.......
                **  Exclusive: A[W],B[W],C[W],R1,R2,   P
                **  Inclusive: A[W],B[W],C[W],R1,R2,D1,P
                **
                ** Stk lvls:    3 (GETDVW)
                **
                ** History:
                **
                **    Date      Programmer            Modification
                **  --------    ----------    --------------------------------
                **  11/04/82       NZ         Added documentation
                **
                ***************************************************************
                ***************************************************************
F6F4C 20        PRSTed P=     =eDSPEC         Error...device spec
F6F4E 02               RTNSC
                *_
                *_
F6F50           =PROCST                       Process string device spec
F6F50 7545             GOSUB  Nxtchr
F6F54 47F              GOC    PRSTed          No device spec
F6F57 7C95             GOSUB  Ucrang          Convert upper case, check [A-Z]
F6F5B 497              GOC    PRST30          Not in [A-Z]
                *
                * Character IS in [A-Z]...continue
                *
                * Assign word, reserved word, or device id
                *
F6F5E 7C65             GOSUB  Bakchr          Back past the character
F6F62 7262             GOSUB  GETDVW          Get device word
F6F66 45E              GOC    PRSTed          Bad device word (Error)
F6F69 78A2             GOSUB  PROCDW          Process device word
F6F6D 460              GOC    PRST10          If carry, takes a seq number
```

```
F6F70 6F90         GOTO   PRST90         If no carry, does NOT take seq #
           *-
           *-
           *
           * Now process sequence #
           *
F6F74 109  PRST10  R1=C                  Save type in R1
F6F77 AF9          C=B    W
F6F7A 10A          R2=C                  Save type/ID in R2
           *
           * Get sequence #
           *
F6F7D 7815         GOSUB  Nxtchr
F6F81 4A3          GOC    PRST25         No sequence number...continue
F6F84 20           P=     0
F6F86 3182         LCASC  \(\
F6F8A 966          ?A#C   B
F6F8D B2           GOYES  PRST20         No sequence #...back up, continue
           *
           * This has a sequence number...get it
           *
F6F8F 75F0         GOSUB  GTYPST         Get type
F6F93 400          RTNC                  Error
F6F96 7FF4         GOSUB  Nxtchr
F6F9A 41B          GOC    PRSTed         No closing ")"...error
           *
           * Check for closing parenthesis
           *
F6F9D 3192         LCASC  \)\
F6FA1 966          ?A#C   B
F6FA4 8A           GOYES  PRSTed         Error...no closing ")"
           *
           * Closed properly...check its range
           *
           * First convert to zero-based count
           *
F6FA6 D9           C=B    A              Copy 2 digits to C[A]
F6FA8 CE           C=C-1  A              convert to zero-based
F6FAA 490          GOC    PRSTeR         Range error
F6FAD 21           P=     1              Check that C[1]=0
F6FAF 90A          ?C=0   P
F6FB2 C0           GOYES  PRST27         Go always...continue
           *
F6FB4 20   PRSTeR  P=     =eRANGE
F6FB6 02           RTNSC
           *-
           *-
F6FB8 7215 PRST20  GOSUB  Bakchr         Back up 1 character
F6FBC D2   PRST25  C=0    A
           *
           * Now C[B] is sequence #
           *
F6FBE 112  PRST27  A=R2                  Recall type/ID
F6FC1 AF8          B=A    W
F6FC4 111          A=R1
```

```
F6FC7 F2               CSL    A
F6FC9 F2               CSL    A              Sequence # is in C[XS] now
F6FCB AE6              C=A    B              Type/ID in C[B] now
F6FCE 21               P=     1
F6FD0 00               P=P-1                 Clear the carry...
F6FD2 5D3              GONC   PRST90         Done
            *-
            *-
F6FD5 31A2  PRST30     LCASC  \*\
F6FD9 966              ?A#C   B              Is this a "*"?
F6FDC 70               GOYES  PRST40         No...continue
            *
            * Device spec is "*"
            *
F6FDE D2               C=0    A              Yes...continue with C[A]=0
F6FE0 5F2              GONC   PRST90         Go always...carry clear
            *-
            *-
F6FE3 3152  PRST40     LCASC  \%\
F6FE7 966              ?A#C   B              Is this a device type?
F6FEA D0               GOYES  PRST50         No...must be address
            *
            * Device type
            *
F6FEC 7890             GOSUB  GTYPST         Get type from stack
F6FF0 4F1              GOC    PRST90         If carry, error
F6FF3 608F             GOTO   PRST10         Process sequence #
            *-
            *-
F6FF7       PRST50
            *
            * Address...back up to first character
            *
F6FF7 73D4             GOSUB  Bakchr         Back up 1 character
F6FFB 7AF0             GOSUB  GADRST         Get address from stack
F6FFF 6010             GOTO   PRST90         Carry indicates status
            *-
            *-
            *
            * Process string volume spec
            *
F7003 71C1  PRSTvl     GOSUB  GETDVW         Get volume word (get device word)
F7007 400              RTNC                  Carry if error
F700A D2               C=0    A              Clear high nibbles of C[A]
F700C 3100             LC(2)  =VolLbl        Volume label identifier
            *
            * Check if a loop spec here...
            *
F7010 400   PRST90     RTNC                  If carry, error in C[0], P
F7013 109              R1=C                  Save address/type in R1
F7016 AF9              C=B    W
F7019 10A              R2=C                  Save device in R2
F701C 7974             GOSUB  Nxtchr
F7020 4C5              GOC    PROCex         Exit...done
F7023 31A3             LCASC  \:\
F7027 966           ?ANC   B
F702A F4            GOYES  PROCeX        Not a loop spec...exit
              *
              * Have a loop spec
              *
              * Process string loop spec
              *
F702C 7850          GOSUB  GTYPST        Get type from stack
F7030 400           RTNC                 Error (Bad loop #)
              *
              * Now loop # is in B[A]
              *
F7033 3130          LC(2)  3             ...maximum value is 3
F7037 9E1           ?B>C   B
F703A 90            GOYES  PRSTer        Out of range
F703C D9            C=B    A             Copy back to C[B]
F703E CE            C=C-1  A             Convert to zero-based count
F7040 560           GONC   PRSTEX        If no carry, all OK
              *
              * If carry, out of range
              *
F7043 20      PRSTer P=    =eRANGE
F7045 02            RTNSC
              *_
              *_
              *
              * Now integrate loop spec with device spec
              *
F7047 112     PRSTEX A=R2
F704A AF8           B=A    W             Restore device ID
F704D 111           A=R1                 Recall type
F7050 816           CSRC                 Save loop # in C[S]
F7053 310E          LCHEX  E0            Check if not address
F7057 0E6A          C=A!C  B
F705B B66           C=C+1  B             If carry, not address
F705E 812           CSLC
F7061 F2            CSL    A
F7063 F2            CSL    A
F7065 4C0           GOC    PROCna        Not address
              *
              * Address...multiply times 4
              *
F7068 C6            C=C+C  A
F706A C6            C=C+C  A
F706C 0E3A          C=C!A  X             Now C[X] is loop #, address
F7070 03            RTNCC
              *_
              *_
F7072 F2      PROCna CSL   A
F7074 A06           C=A    X             Loop # in C[3], device in C[X]
F7077 03            RTNCC
              *_
              *_
F7079 7154    PROCeX GOSUB Bakchr        Back up last character fetch
F707D 11A     PROCex C=R2                Recall device
```

```
F7080 AF5          B=C    W
F7083 119          C=R1                    Recall type/address
F7086 03           RTNCC                   Done
           *************************************************************
           *************************************************************
           **
           ** Name:       GTYPST - Get type from stack
           **
           ** Category:   FILUTL
           **
           ** Purpose:
           **      Given a pointer to the start of the type, return the
           **      numeric value of the type
           **
           ** Entry:
           **      D1 @ first digit of type
           **      D[A] @ end of specifier
           **
           ** Exit:
           **      Carry clear:
           **        Type in B[X], D1 @ first unused item
           **        C[X]=(=DevTyp)
           **        P=0
           **      Carry set:
           **        error (P, C[0] are error code)
           **
           ** Calls:      NXTCHR,BAKCHR,DTOH,RANGEN
           **
           ** Uses.......
           **  Exclusive: A[W],B[W],C[W],   P
           **  Inclusive: A[W],B[W],C[W],D1,P
           **
           ** Stk lvls:   1 (NXTCHR)(BAKCHR)(DTOH)(RANGEN)
           **
           ** History:
           **
           **   Date      Programmer              Modification
           **  --------   ----------     ---------------------------------
           **  11/04/82       NZ         Added documentation
           **
           *************************************************************
           *************************************************************
F7088 AF1  =GTYPST B=0    W                Clear B[W] (where total is built)
F708B 7A04 GTYPS1  GOSUB  Nxtchr           Get next character
F708F 405          GOC    GTYPS5           End of string
F7092 7234         GOSUB  Rangen           Check if in [0-9]
F7096 401          GOC    GTYPS3           No...done?
           *
           * New digit...add it in
           *
F7099 F1           BSL    A
F709B A88          B=A    P                Append new digit here
F709E 959          ?B=0   M                If non-zero, too big
F70A1 AE           GOYES  GTYPS1           Zero...continue
           *
```

```
                * Out of range
                *
F70A3 20        GTYPS2  P=      =eRANGE
F70A5 02                RTNSC
                *-
                *-
F70A7 31E2 GTYPS3  LCASC   \.\
F70AB 966               ?A#C    B
F70AE E2                GOYES   GTYPS4          Not a period...exit
                *
                * Got a period...continue
                *
F70B0 75E3              GOSUB   Nxtchr
F70B4 4B2               GOC     GTYPS5          End of string
F70B7 7D04              GOSUB   Rangen          Check if in [0-9]
F70BB 402               GOC     GTYPS4          No...exit
F70BE 05                SETDEC
F70C0 A04               A=A+A   P               Check if round UP
F70C3 550               GONC    GTYPS.          No...exit
F70C6 B35               B=B+1   X
F70C9 04        GTYPS.  SETHEX                  (jump to here has carry CLEAR!)
F70CB 47D               GOC     GTYPS2          Error...overflow
                *
                * Loop to skip trailing digits
                *
F70CE 77C3 GTYPSd  GOSUB   Nxtchr
F70D2 4D0               GOC     GTYPS5          End of string
F70D5 7FE3              GOSUB   Rangen          Check if digit
F70D9 54F               GONC    GTYPSd          Yes...continue
                *
F70DC 7EE3 GTYPS4  GOSUB   Bakchr          Back up past the last character
F70E0 AF4  GTYPS5  A=B     W               Convert it to HEX now
F70E3 8E00              GOSUBL  =DTOH
      00
                *
                * Now the type is in C (in HEX)
                *
F70E9 D1                B=0     A               Check if in [0,255]
F70EB AED               BCEX    B               (B[A] is value if C=0)
F70EE 8AE               ?C#0    A
F70F1 2B                GOYES   GTYPS2          Out of range
                *
                * C[A] is zero to get here
                *
F70F3 3100              LC(2)   =DevTyp         Device type
F70F7 03                RTNCC
                ****************************************************************
                ****************************************************************
                **
                ** Name:        GADRST - Get address from stack
                **
                ** Category:    FILUTL
                **
                ** Purpose:
                **      Similar to GTYPST, except that the first 2 digits
                **      after the decimal point, if any, are used as the
                **      secondary address
                **
                ** Entry:
                **      D1 @ first character
                **      D(A) @ end of spec
                **
                ** Exit:
                **      Carry clear:
                **        C[X] is address
                **        D1 @ first unused character
                **        Skips trailing digits
                **        P=0
                **      Carry set:
                **        P, C[0] are error code
                **
                ** Calls:      NXTCHR,BAKCHR,RANGEN,DTOH,CSRC2
                **
                ** Uses.......
                **  Exclusive: A,B,C,   P
                **  Inclusive: A,B,C,D1,P
                **
                ** Stk lvls:   1 (NXTCHR)(BAKCHR)(RANGEN)(DTOH)(CSRC2)
                **
                ** Algorithm:
                **      Read a number from the stack until non-digit OR full;
                **      Check if "."...if not, return
                **      Get another number from the stack (2 digits)
                **      Combine the two numbers as one address, return
                **
                ** History:
                **
                **   Date      Programmer              Modification
                **   --------  ----------    ---------------------------------
                **   12/21/83      NZ        Changed order of BSL A, ?B=0 XS
                **                           test at GADRS4 to fix a bug which
                **                           got into an infinite loop.  If the
                **                           device spec contained a ".000x",
                **                           where "x" is not a digit, the
                **                           code at GADRS4 would end up with
                **                           B[X]=0, which caused an infinite
                **                           assembly code loop.
                **   11/04/82      NZ        Added documentation
                **
                ***************************************************************
                ***************************************************************
    F70F9 AF1   =GADRST B=0     W            Clear B[W] to start
    F70FC 7993  GADRS1  GOSUB   Nxtchr       Get first item
    F7100 442           GOC     GADRS.       End of string...continue process
    F7103 71C3          GOSUB   Rangen       Check if in [0-9]
    F7107 401           GOC     GADRS2       No...check further
    F710A F1            BSL     A
    F710C A88           B=A     P            Copy this digit in
    F710F 929           ?B=0    XS           Overflow?
    F7112 AE            GOYES   GADRS1       No...continue
```

```
F7114 20    GADRSo  P=     =eRANGE
F7116 02            RTNSC
                *-
                *-
F7118       GADRS2
                *
                * Got a non-digit...if not a decimal point, done
                *
F7118 31E2          LCASC  \.\
F711C 962           ?A=C   B
F711F 60            GOYES  GADRS.        "."...continue
                *
F7121 79A3          GOSUB  Bakchr        Back up for next step
                *
                * Decimal point...get secondary address
                *
F7125 AF4   GADRS.  A=B    W
F7128 8E00          GOSUBL =DTOH         Convert primary address to hex
      00
                *
                * Hex value in C[B] now
                *
F712E 8E00          GOSUBL =CSRC2        Use C[15:14] as temp storage
      00
                *
                * Primary address in C[15:14] now
                *
F7134 AF5           B=C    W             Copy to B[15:14]
F7137 D1            B=0    A             Clear B[0]
F7139 E5            B=B+1  A             Set B[0]=1 (Flag for 2 digits)
F713B 7A53  GADRS3  GOSUB  Nxtchr        Get next character
F713F 434           GOC    GADRS4        End...manipulate it
F7142 7283          GOSUB  Rangen        Check if in [0-9]
F7146 483           GOC    GADRSb        No...back up, manipulate it
F7149 F1            BSL    A
F714B A88           B=A    P             Copy to B
F714E 929           ?B=0   XS            Done yet?
F7151 AE            GOYES  GADRS3        No...continue
                *
                * Reached here by reading 2 digits after decimal point
                *
F7153 7243          GOSUB  Nxtchr        Get next digit for rounding
F7157 493           GOC    GADRS6        No next digit...continue
F715A 7A63          GOSUB  Rangen        Check if in [0-9]
F715E 4E2           GOC    GADRS5        Not a digit...back it up
F7161 05            SETDEC
F7163 A04           A=A+A  P             Check if rounding needed
F7166 550           GONC   GADRSs        Skip other digits
F7169 B65           B=B+1  B             Round UP
F716C 04    GADRSs  SETHEX
F716E 45A           GOC    GADRSo        Out of range (If B=B+1 carry)
F7171 7423          GOSUB  Nxtchr        Read next character
F7175 4B1           GOC    GADRS6        (End of string)
F7178 7C43          GOSUB  Rangen        Check if a digit
F717C 5FE           GONC   GADRSs        Yes...skip the next one
```

```
                *                              No...fall through to GADRSb
F717F 7B43 GADRSb  GOSUB  Bakchr          Back up the last NXTCHR
F7183      GADRS4
                *
                * Reached here before two digits
                *
                * B[X] cannot be zero to get here...at least one digit of B[X]
                * must be 1 (from flag set before GADRS3)
                *
F7183 92D          ?BWO   XS              Done yet?
F7186 B0           GOYES  GADRS6          Yes
F7188 F1           BSL    A               Shift in a zero
F718A 58F          GONC   GADRS4          Go always
                *-
                *-
F718D 7D33 GADRS5  GOSUB  Bakchr          Back up the last NXTCHR
F7191      GADRS6
                *
                * Now B[B] is secondary address in decimal...convert to hex
                *
F7191 D0           A=0    A
F7193 AE4          A=B    B
F7196 8E00         GOSUBL =DTOH
      00
F719C AE5          B=C    B
                *
                * Now B[B] is secondary address in hex, B[15:14] is primary
                *
F719F 31F1         LC(2)  31
F71A3 9E1          ?B>C   B               >31?
F71A6 6C           GOYES  GADRSs          Too big for secondary!(Jump jump)
F71A8 811          BSLC
F71AB 811          BSLC                   Now B[B] is primary address
F71AE 9E9          ?B>=C  B               >30?
F71B1 BB           GOYES  GADRSs          Too big for primary! (Jump jump)
F71B3 969          ?B=0   B
F71B6 6B           GOYES  GADRSs          Zero is NOT a legal primary addr
                *
                * B[B] is primary, B[3:2] is secondary
                *
F71B8 D2           C=0    A               Clear C[XS]
F71BA AED          CBEX   B               Copy primary to C[B], zero B[B]
F71BD F5           BSR    A               Secondary in B[2:1]
F71BF A35          B=B+B  X               Secondary*2 in B[2:1]
F71C2 0E3D         C=C!B  X               Primary, secondary in C[X]
                *
                * Now address is in C[A]
                *
F71C6 03           RTNCC
                ***************************************************************
                ***************************************************************
                **
                ** Name:        GETDVW - Get device word
                **
                ** Category:    FILUTL
```

```
                  **
                  ** Purpose:
                  **      Get a device word, given a pointer to the word
                  **
                  ** Entry:
                  **      ST(=sSTK)=0:
                  **         D0 points to first letter of device word in memory
                  **      ST(=sSTK)=1:
                  **         D1 points to first letter of device word on stack
                  **         D(A) points to the end of the specifier
                  **
                  ** Exit:
                  **      Carry clear:
                  **        Device word in B[W], zero-filled, first letter in B[B]
                  **        P=0, carry clear if no error
                  **        D0/D1 @ next character
                  **      Carry set:
                  **        Error (P, C[0] are error code)
                  **
                  ** Calls:      NXTCHR,BAKCHR,UCRANG,RANGEN
                  **
                  ** Uses.......
                  **  Exclusive:      B[W],          P
                  **  Inclusive: A[A],B[W],C[A],D0,D1,P (sSTK=0: D0; sSTK=1: D1)
                  **
                  ** Stk lvls:   2 (UCRANG)
                  **
                  ** History:
                  **
                  **    Date     Programmer              Modification
                  **  --------   ----------    ----------------------------------
                  **  11/04/82      NZ         Added documentation
                  **
                  ***********************************************************
                  ***********************************************************
 F71C8 AF1        =GETDVW B=0    W
 F71CB 7AC2               GOSUB  Nxtchr         Read first character
 F71CF 4E2                GOC    GETDV2         Should NEVER happen...
                  *
                  * First character MUST be in [A-Z] or [a-z]
                  *
 F71D2 7123 GETDV0        GOSUB  Ucrang         Convert to upper case&check [A-Z]
 F71D6 432                GOC    GETDV-         Done (not in [A-Z])
 F71D9 AE8  GETDV1        B=A    B              Copy to B[B]...
 F71DC 815                BSRC                  ...rotate to B[15:14]...
 F71DF 815                BSRC
 F71E2 96D                ?B#0   B              ...and check if room for more
 F71E5 31                 GOYES  GETDVr         No room...done
 F71E7 7EA2               GOSUB  Nxtchr         Get next character
 F71EB 421                GOC    GETDV2         Done...justify it
 F71EE 76D2               GOSUB  Rangen         Check if this is numeric...
 F71F2 56E                GONC   GETDV1         ...yes...save it
 F71F5 4CD                GOC    GETDV0         Go always (Check if in [A-Z])
                  *-
                  *-
```

```
F71F8 03   GETDVr  RTNCC                   Return, carry clear
           *-
           *-
F71FA 70D2 GETDV-  GOSUB  Bakchr           Back up this character
F71FE 97D  GETDV2  ?BWO   W                If whole word is zero, Error
F7201 60           GOYES  GETDV3           Not zero...continue
F7203 20           P=     =eDSPEC          Bad device word
F7205 02           RTNSC
           *-
           *-
F7207 96D  GETDV3  ?BWO   B                If B[B] is non-zero, done
F720A EE           GOYES  GETDVr           Return, clear carry
           *
           * If blank-filling is desired, do LCASC \ \; B=C B here
           *
F720C 815          BSRC
F720F 815          BSRC
F7212 54F          GONC   GETDV3           Go always
           **************************************************************
           **************************************************************
           **
           ** Name:        PROCDW - Process device word
           **
           ** Category:    FILUTL
           **
           ** Purpose:
           **      Given a device word in B[W], figure out what it is
           **      (ASSIGN WORD, RESERVED WORD, NULL, LOOP, DEVICE ID)
           **
           ** Entry:
           **      B[W] contains the device word
           **
           ** Exit:
           **      P=0
           **      Carry set if sequence number is permissable after this
           **      Carry clear if sequence number is not permissable
           **
           ** Calls:       CHKAIO,ROMTYP,(PRDWsb)
           **
           ** Uses.......
           **  Exclusive:            C[W],P
           **  Inclusive: A[A],B[B],C[W],P
           **
           ** Stk lvls:   2 (CHKAIO)(ROMTYP)
           **
           ** Detail:
           **      Try in following order: ASSIGN WORD, RESERVED WORD,
           **        NULL,LOOP,(other=DEVICE ID)
           **
           ** History:
           **
           **   Date     Programmer            Modification
           **  --------  ----------   --------------------------------
           **  04/28/83      NZ       Changed LOOP and NULL to check
           **                         all 8 characters
```

```
                 **  11/04/82      NZ          Added documentation
                 **
                 *************************************************************
                 *************************************************************
F7215 8E00 =PROCDW GOSUBL =CHKAIO       Check if ASSIGNIO
      00
F721B 500          RTNNC                If carry clear, found it
F721E 8E00         GOSUBL =ROMTYP       Check if reserved word
      00
                 *
                 * Carry indicates whether found or not (If not, ID)
                 *
F7224 533          GONC   PRDW30        Found...return, set carry
F7227 AF2          C=0    W             Clear high nibbles of C first
F722A 37E4         LCASC  \LLUN\        Check if device type="NULL"
      55C4
      C4
F7234 7220         GOSUB  PRDWsb        (Check for match)
                 *
                 * If carry clear, this is "NULL"
                 *
F7238 3100         LC(2)  =Null         This is the "NULL" device?
F723C 500          RTNNC                If no carry, NULL
F723F 37C4         LCASC  \POOL\        Check if device type="LOOP"
      F4F4
     .05
F7249 7D00         GOSUB  PRDWsb        (Check for match)
F724D 3100         LC(2)  =Loop
F7251 560          GONC   PRDW30        If no carry, this is LOOP
F7254 3100         LC(2)  =DevID        C[4:2] is zero
F7258 02   PRDW30  RTNSC
                 *-
                 *-
F725A 975  PRDWsb  ?BWC   W
F725D 20           GOYES  PRDWs1
F725F D2   PRDWs1  C=0    A
F7261 01           RTN
                 *************************************************************
                 *************************************************************
                 **
                 ** Name:        PROCLT - Process literal device spec
                 **
                 ** Category:    FILUTL
                 **
                 ** Purpose:
                 **      Given a pointer to a device spec in memory, process it
                 **
                 ** Entry:
                 **      DO @ device spec
                 **
                 ** Exit:
                 **      Carry clear:
                 **        P=0
                 **        Device type/device id in B[X]/B[W]
                 **        IF device type"*", *, or "" THEN C[X]=0
```

```
           **        ELSEIF address THEN C[X] is address+loop*1024
           **        ELSEIF LOOP then C[X] is "9F"+loop*4096
           **        ELSEIF NULL then C[B] is "7F"
           **        ELSEIF volume label THEN C[X] is "5F"+loop*4096
           **        ELSEIF device type THEN C[X] is "3F"+loop*4096
           **        ELSEIF device ID THEN C[X] is "1F"+loop*4096
           **      Carry set:
           **        Error (P, C[0] are error code)
           **
           ** Calls:      NXTCHR,BAKCHR,GETDVW,PROCDW,SAVEAC,EXPEX+,
           **             GHEXBT,GADRR+,RESTST,SAVE2C,RESTD1,REST2C
           **
           ** Uses.......
           **  Exclusive: A,B,C,     R1,R2,     D0,   P
           **  Inclusive: A,B,C,D,R0,R1,R2,R3,R4,D0,D1,P,STMTD1[3:0],STMTR1,
           **             FUNCxx, all RAM available to FCNS
           **
           ** Stk lvls:   4 (EXPEX+ {saves a level on GOSUB stack first})
           **
           ** History:
           **
           **    Date     Programmer             Modification
           **  --------   ----------   ---------------------------------
           **  09/28/83      NZ        Updated documentation
           **  04/12/83      NZ        Fixed loop # processing
           **  03/17/83      NZ        Changed to use STMTD1, not STMTR0
           **  03/01/83      NZ        Reworked volume label code
           **  02/07/83      NZ        Added status save in EXPEX+ call
           **  11/04/82      NZ        Added documentation
           **
           *************************************************************
           *************************************************************
F7263 7232 =PROCLT GOSUB  Nxtchr
           *
           * Should have carry ONLY if next token is EOL (Error)
           *
F7267 400          GOC    PRLT05
F726A 20           P=     0             (This P=0 is not needed-NXTCHR)
F726C 3100         LC(2)  =tCOLON
F7270 962          ?A=C   B             Is this a ":"?
F7273 60           GOYES  PROCld        Yes...continue
F7275 6E31 PRLT05  GOTO   PRLTer        Error
           *-
           *-
           *
           * Process literal device spec
           *
F7279 14A  PROCld  A=DAT0 B             Read it directly (can be tSEMIC)
F727C 161          D0=D0+ 2             Skip it
F727F 3100         LC(2)  =tLITRL
F7283 962          ?A=C   B             Is this a literal?
F7286 60           GOYES  PRLT12        Yes...get device word
F7288 6470         GOTO   PRLT50        No...continue checking
           *-
           *-
```

```
                 *
                 * Literal device spec
                 *
F728C 783F PRLT12  GOSUB  GETDVW        Get device word
F7290 400          RTNC                 Error
F7293 7E7F         GOSUB  PROCDW        Process device word
F7297 450          GOC    PRLT15        Sequence number IS acceptable
F729A 5E5          GONC   PRLT9.        Go always...NOT acceptable
                 *-
                 *-
                 *
                 * Now save it, get sequence #
                 *
F729D 7221 PRLT15  GOSUB  SAVEAC        Save C[3:0] in STMTD1,B in STMTR1
                 *
                 * Process literal sequence number
                 *
F72A1 74F1         GOSUB  Nxtchr
F72A5 453          GOC    PRLT25        No next character...exit
F72A8 3100         LC(2)  =tCOLON
F72AC 966          ?A#C   B
F72AF 82           GOYES  PRLT20        Back up...not a sequence #
                 *
                 * Sequence # found
                 *
F72B1 7F12         GOSUB  Expex+        Get the type expression
F72B5 76E1         GOSUB  Restst        Restore status bits
F72B9 8E00         GOSUBL =GHEXBT       Get type (sequence) from RAM
      00
F72BF 400          RTNC                 Error
                 *
                 * Now B[A] is the sequence #
                 *
F72C2 CD           B=B-1  A             If carry, error
F72C4 4E0          GOC    PRLteR        Error (zero)
F72C7 21           P=     1
F72C9 90D          ?B#0   P
F72CC 70           GOYES  PRLteR        Error (too big)
F72CE 20           P=     0
F72D0 5C0          GONC   PRLT30        Go always
                 *-
                 *-
F72D3 20   PRLteR  P=     =eRANGE
F72D5 02           RTNSC
                 *-
                 *-
F72D7 73F1 PRLT20  GOSUB  Bakchr
F72DB D1   PRLT25  B=0    A             Put sequence # in B[A](=0)
                 *
                 * Now B[A] is sequence #
                 *
F72DD 133  PRLT30  AD1EX
F72E0 8E00         GOSUBL =RESTD1       Restore type/address...
      00
F72E6 133          AD1EX                ...to A[A]
```

```
                  *
                  * Now A[A] is type, B[B] is sequence #
                  *
F72E9 8E00                GOSUBL =REST2C        Restore acc/dev ID to C[W]
      00
F72EF AFD                 BCEX   W              Seq # to C[A], acc/dev ID to B[W]
                  *
                  * Now A[A] is type; B[W] is acc/dev ID; C[A] is seq #
                  *
F72F2 F2                  CSL    A
F72F4 F2                  CSL    A              Sequence # in C[XS] now
F72F6 AE6                 C=A    B              Restore type
F72F9 6C50 PRLT9.         GOTO   PRLT90         Check for loop spec now
                  *-
                  *-
F72FD             PRLT50
                  *
                  * Not a literal...check for volume label
                  *
F72FD 3100                LC(2)  =tSEMIC
F7301 966                 ?A#C   B
F7304 21                  GOYES  PRLT60
                  *
                  * This is a volume label
                  *
F7306 7EBE                GOSUB  GETDVW         Get volume label (Get device word)
F730A 400                 RTNC                  If carry, error
F730D D2                  C=0    A
F730F 3100                LC(2)  =VolLbl        Indicate volume label
F7313 524                 GONC   PRLT90         Go always...check for loop spec
                  *-
                  *-
F7316 3100 PRLT60         LC(2)  =t%            Check if device type
F731A 966                 ?A#C   B
F731D 71                  GOYES  PRLT70         Not device type...check "*"
                  *
                  * Type...get it
                  *
F731F 71B1                GOSUB  Expex+         Get the type expression from RAM
F7323 7871                GOSUB  Restst         Restore status bits
F7327 8E00                GOSUBL =GHEXBT        Get HEX byte from RAM
      00
F732D 400                 RTNC                  Error
F7330 6C6F                GOTO   PRLT15         Finish it up
                  *-
                  *-
F7334 3100 PRLT70         LC(2)  =t*
F7338 966                 ?A#C   B
F733B 60                  GOYES  PRLT75
F733D D2                  C=0    A              This is "*"
F733F 03                  RTNCC
                  *-
                  *-
F7341 7981 PRLT75         GOSUB  Bakchr         Back up to start of expression
                  *
```

```
                * Address
                *
F7345 7B81              GOSUB  Expex+        Get address expression from RAM
F7349 7251              GOSUB  Restst        Restore status bits
F734D 8E00              GOSUBL =GADRR+       Get address from RAM
      00
F7353 400               RTNC                 Carry indicates error state
                *
                * Entry point to check for literal loop spec
                *
F7356 14A       PRLT90  A=DAT0 B             Read next character directly
                *
                * Before LC, save C[A] on RSTK (C[A] is device spec info)
                *
F7359 06                RSTK=C               Save C[A] on RSTK
F735B 3100              LC(2)  =tSEMIC       Is it a tSEMIC (loop number)?
F735F 966               ?A#C   B
F7362 20                GOYES  PRLT95        Exit after restoring C
F7364 07        PRLT95  C=RSTK               Restore C (if carry, done!)
F7366 415               GOC    PRLTex        Exit (Done)
F7369 161               D0=D0+ 2             Skip the tSEMIC
                *
                * Need to save B and C from EXPEX+
                *
F736C 7350              GOSUB  SAVEAC        Save C[3:0] in STMTD1,B in STMTR1
                *
                * Process literal loop spec
                *
F7370 7061              GOSUB  Expex+        Get loop # expression from RAM
F7374 7721              GOSUB  Restst        Restore status bits
F7378 8E00              GOSUBL =GHEXBT       Get HEX byte from RAM
      00
F737E 400               RTNC                 Error
                *
                * Now B[A] is the loop # + 1
                *
F7381 3130              LC(2)  3
F7385 9E1               ?B>C   B
F7388 90                GOYES  PRLLer        Error...too big
F738A D9                C=B    A             Return loop # in C[0]
F738C CE                C=C-1  A             Offset for zero-based count
F738E 560               GONC   PRLTxx        If carry, zero (error-too small)
F7391 20        PRLLer  P=     =eRANGE
F7393 02                RTNSC
                *-
                *-
F7395 10A       PRLTxx  R2=C                 Save loop # in R2
F7398 137               CD1EX
F739B 8E00              GOSUBL =RESTD1       Restore type/address
      00
F73A1 137               CD1EX
F73A4 109               R1=C                 Type in R1
F73A7 8E00              GOSUBL =REST2C
      00
F73AD 12A               CR2EX                Device ID in R2, loop # in C[0]
```

```
F73B0 669C          GOTO   PRSTEX        Finish it up
           *-
           *-
F73B4 20   PRLTer   P=     =eDSPEC       Device spec error
F73B6 02            RTNSC
           *-
           *-
F73B8 10A  PRLTex   R2=C                 Save C[W] in R2...
F73BB AF9           C=B    W             Put B[W] into R2[W] also
F73BE 12A           CR2EX                ...restore C[W], set R2=B[W]
F73C1 03            RTNCC
           *-
           *-
F73C3      SAVERC
           *
           * Preserve STMTD1[4]
           *
F73C3 137           CD1EX                Save C[A] in D1
F73C6 06            RSTK=C               Save D1 on RSTK
F73C8 137           CD1EX                Restore C[A]
F73CB 1F00          D1=(5) =STMTD1
      000
F73D2 15D3          DAT1=C 4             Write out the low 4 nibs ONLY
F73D6 07            C=RSTK               Restore D1 from RSTK...
F73D8 135           D1=C                 ...done
F73DB AF9           C=B    W
F73DE 8C00          GOLONG =SAVE2C       Save B[W] in STMTR1
      00
           **************************************************************
           **************************************************************
           **
           ** Name:       FXQPIL - Get a file name from memory (file spec)
           **
           ** Category:   FILUTL
           **
           ** Purpose:
           **      Fetch a filename from program memory
           **
           ** Entry:
           **      Exit conditions from GETSTR
           **      (ST[sSTK]=0: literal in memory, =1:string on stack)
           **      (P=0)
           **
           ** Exit:
           **      D0/D1 set to first non-character item
           **      Carry clear (filename found):
           **        R0[W] is the first 8 chars, A[3:0] the last 2
           **        (Both are blank-filled)
           **      Carry set (no filename found):
           **        A,R0 are zeroed
           **
           ** Calls:      FXQPnm,FXQPn+
           **
           ** Uses.......
           **  Exclusive: A[W],    C[W],R0,     P
           **  Inclusive: A[W],B[W],C[W],R0,D0,D1,P
           **
           ** Stk lvls:   3 (FXQPnn)
           **
           ** Algorithm:
           **      Check if literal and no file name; if so, return zero
           **      Get the first 8 chars; put in R0; if reached end, set
           **        A[3:0]=\  \, return
           **      Get last 2 chars; put in A[3:0]; return
           **
           ** History:
           **
           **   Date     Programmer          Modification
           **  --------  ----------   ---------------------------------
           **  11/04/82      NZ       Added documentation
           **
           ************************************************************
           ************************************************************
F73E4 AF2  =FXQPIL C=0    W
F73E7 108          R0=C                 Preclear file name (for null str)
F73EA 860          ?ST=0  =sSTK         String expression?
F73ED 70           GOYES  FXQP30        No...literal
           *
           * Check if this is a null string...if so, return
           *
F73EF 8A8          ?A=0   A
F73F2 33           GOYES  FXQP50        Null string
           *
           * Now get the characters of the name until not in [A-Z]
           * or string length exhausted (Build the string in B[W])
           *
           * This is also the entry point for reading from program memory
           *
F73F4 2F   FXQP30  P=     15
F73F6 308          LC(1)  8             C[S] is character counter
F73F9 7E20         GOSUB  FXQPnn        Get the name until B is full
           *                              or END is reached or bad char
F73FD AF4          A=B    W
F7400 100          R0=A
F7403 4F0          GOC    FXQP40        Carry if END or bad char
           *
           * A[B],B[W] contain first 8 chars...copy to R0
           *
F7406 2F           P=     15
F7408 302          LC(1)  2             Two more characters MAX
F740B 7F10         GOSUB  FXQPn+        Get the last 2 chars of name
F740F D4           A=B    A             Copy characters to A[3:0]
           *
           * Have a FULL filename now! (Next char better be ":")
           * (D1 is at next character)
           *
F7411 03           RTNCC                Return with it all set up
           *-
           *-
F7413      FXQP40
```

```
                 *
                 * Filename with less than 8 chars in A[W], B[W]
                 *
F7413 3302               LCASC  \ \
      02
F7419 DA                 A=C    A               Set last 2 characters to blanks
F741B 118                C=R0                   Get back first 8 chars to test
F741E 8AA                ?C=0   A
F7421 40                 GOYES  FXQP50          Yes...zero it all
F7423 03                 RTNCC                  Next character @ D1
                 *-
                 *-
F7425            FXQP50
                 *
                 * No chars in name...set full name equal to zero
                 *
F7425 D0                 A=0    A               Clear the last 2 chars
F7427 20                 P=     =eDSPEC         Bad device spec
F7429 02                 RTNSC
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:        FXQPnm - Read chars from memory/stack (count)
                 **
                 ** Category:    FILUTL
                 **
                 ** Purpose:
                 **      Read characters from either the stack or program
                 **      memory until either a count is exceeded or an end is
                 **      reached
                 **
                 ** Entry:
                 **      C[S] is byte count
                 **      sSTK is set for STACK, clear for literal
                 **      If ST[=sSTK]=1, D1 points to string, D[A] is end
                 **      If ST[=sSTK]=0, D0 points to the literal
                 **
                 ** Exit:
                 **      B[W] contains the filename (IF sFirst=1 AND bad char,B=0)
                 **      Carry set if reached END or bad char, clear if count
                 **      D0/D1 set to first character not used
                 **      A[S] is the original byte count
                 **      P=0
                 **
                 ** Calls:       NXTCHR,BAKCHR,UCRANG,RANGEN,BLANKC
                 **
                 ** Uses.......
                 **  Exclusive: A[X],B[W],C[W],      P,ST[sFirst]
                 **  Inclusive: A[W],B[W],C[W],D0,D1,P,ST[sFirst]
                 **
                 ** Stk lvls:   2 (UCRANG)
                 **
                 ** Detail:
                 **      Reads characters until either:
                 **      1) Count is reached
```

```
                **      2) A character NOT in [A-Z] is found
                **
                ** History:
                **
                **    Date     Programmer             Modification
                **  --------   ----------      --------------------------------
                **  04/29/83       NZ          Changed GOC after NXTCHR @ FXQPn1
                **                             to skip the BAKCHR @ FXQPn3
                **  03/19/83       NZ          Changed FXQPnm and FXQPn+ so that
                **                             FXQPnm sets =sFirst, FXQPn+ does
                **                             not change =sFirst
                **  11/04/82       NZ          Added documentation
                **  01/20/83       NZ          Added check for sFirst AND bad ch
                **
                ***************************************************************
                ***************************************************************
F742B 850  =FXQPnm ST=1   =sFirst      Entry for first char
F742E ACA  =FXQPn+ A=C    S            Save count in A[S]
F7431 8E00         GOSUBL =BLANKC      Initially blanks
      00
F7437 AF5          B=C    W
F743A AC6          C=A    S            Use count in C[S], Save in A[S]
F743D 7850 FXQPn1  GOSUB  Nxtchr       Get next character in A[B]
F7441 433          GOC    FXQPn-       END
F7444 7FA0         GOSUB  Ucrang       Convert to upper case
F7448 5E0          GONC   FXQPn2       If carry clear, IS in [A-Z]
                *
                * Character not in [A-Z]...if this is First, Error
                *
F744B 870          ?ST=1  =sFirst
F744E 32           GOYES  FXQPn3       Error! (Bad first character)
F7450 7470         GOSUB  Rangen       Check if this is a digit
F7454 4C1          GOC    FXQPn3       Not a digit...error
                *
                * Have a valid character here
                *
F7457 840  FXQPn2  ST=0   =sFirst      Clear for later chars
F745A AE8          B=A    B            Save in B[B]...
F745D 815          BSRC
F7460 815          BSRC                Rotate the character to B[15:14]
F7463 A4E          C=C-1  S            Do more?
F7466 94E          ?C#0   S
F7469 4D           GOYES  FXQPn1       Yes...loop back
                *
                * Count reached
                *
                * Use A[XS] to indicate carry/no carry on exit
                *
F746B AA0          A=0    XS
F746E 541          GONC   FXQPn4       Go always
                *-
                *-
F7471      FXQPn3
                *
                * Reached END/bad char
```

```
                  *
     F7471 7950          GOSUB   Bakchr        Back up to last character
     F7475 AA0    FXQPn- A=0     XS
     F7478 A2C           A=A-1   XS            Set A[XS]="F"
     F747B 860           ?ST=0   =sFirst       Is this the first char?
     F747E 50            GOYES   FXQPn4        No...continue
     F7480 AF1           B=0     W             Yes...set B[W]=0
     F7483 942    FXQPn4 ?A=C    S
     F7486 E0            GOYES   FXQPn5        Done
     F7488 811           BSLC
     F748B 811           BSLC
     F748E B46           C=C+1   S
     F7491 51F           GONC    FXQPn4        Go always
                  *-
                  *-
     F7494 B24    FXQPn5 A=A+1   XS            Set carry with A[XS]
     F7497 01            RTN
                  *-
                  *-
     F7499 8C00   Nxtchr GOLONG  =NXTCHR
           00
                  *-
                  *-
     F749F 8E00   Restst GOSUBL  =TSAVDO       Save D0 in function scratch
           00
     F74A5 8F00          GOSBVL  =POPUPD       Pop GOSUB stack into D[A]
           000
     F74AC 07            C=RSTK
     F74AE DF            CDEX    A
     F74B0 06            RSTK=C                Restore second level
     F74B2 DB            C=D     A
     F74B4 06            RSTK=C                Restore calling level
     F74B6 8E00          GOSUBL  =D1@AVE       Set D1 at AVMEME
           00
     F74BC 8E00          GOSUBL  =TRESDO       Restore D0 from function scratch
           00
     F74C2 8C00          GOLONG  =RESTST
           00
                  *-
                  *-
     F74C8 8C00   Rangen GOLONG  =RANGEN
           00
                  *-
                  *-
     F74CE 8C00   Bakchr GOLONG  =BAKCHR
           00
                  *-
                  *-
     F74D4 07     Expex+ C=RSTK                Save calling level in A[A]
     F74D6 DA            A=C     A
     F74D8 07            C=RSTK                Pop second level to C[A]
     F74DA DE            ACEX    A             Second level to A[A], call to C[A]
     F74DC 06            RSTK=C                Push calling level back on stack
     F74DE 8E00          GOSUBL  =TSAVDO       Save D0 first
           00
```

```
1389 F74E4 8F00        GOSBVL =PSHMCR      Push microcode return on GOSUB
           000
1390 F74EB 8E00        GOSUBL =TRESD0      Restore D0
           00
1391 F74F1 8C00        GOLONG =EXPEX+
           00
1392             *-
1393             *-
1394 F74F7 8C00 =Ucrang GOLONG =UCRANG
           00
1395 F74FD              END
```

```
 ASLC12  Ext                    -   241
 ASRC4   Ext                    -   187
 BAKCHR  Ext                    -  1380
 BLANKC  Ext                    -  1307
 Bakchr  Abs 1012942 #F74CE -  1380    98   315   367   408   483   570   661
                                    703   717   814  1015  1074  1344
 CHKAIO  Ext                    -   870
 CSRC12  Ext                    -   222
 CSRC2   Ext                    -   670
 D1=AVS  Ext                    -   206
 D1@AVE  Ext                    -   211   236  1372
 DTOH    Ext                    -   572   666   724
 DevID   Ext                    -   889
 DevTyp  Ext                    -   583
 EXPEX+  Ext                    -  1391
 Expex+  Abs 1012948 #F74D4 -  1383   995  1060  1078  1103
 FXQP30  Abs 1012724 #F73F4 -  1213  1201
 FXQP40  Abs 1012755 #F7413 -  1234  1219
 FXQP50  Abs 1012773 #F7425 -  1246  1206  1242
=FXQPIL  Abs 1012708 #F73E4 -  1198   176
=FXQPn+  Abs 1012782 #F742E -  1306  1225
 FXQPn-  Abs 1012853 #F7475 -  1345  1311
 FXQPn1  Abs 1012797 #F743D -  1310  1330
 FXQPn2  Abs 1012823 #F7457 -  1324  1313
 FXQPn3  Abs 1012849 #F7471 -  1340  1318  1320
 FXQPn4  Abs 1012867 #F7483 -  1350  1337  1348  1355
 FXQPn5  Abs 1012884 #F7494 -  1358  1351
=FXQPnm  Abs 1012779 #F742B -  1305  1215
 GADRR+  Ext                    -  1080
 GADRS.  Abs 1012005 #F7125 -   665   642   659
 GADRS1  Abs 1011964 #F70FC -   641   648
 GADRS2  Abs 1011992 #F7118 -   653   644
 GADRS3  Abs 1012027 #F713B -   677   684
 GADRS4  Abs 1012099 #F7183 -   704   678   714
 GADRS5  Abs 1012109 #F718D -   717   691
 GADRS6  Abs 1012113 #F7191 -   718   689   699   712
=GADRST  Abs 1011961 #F70F9 -   640   409
 GADRSb  Abs 1012095 #F717F -   703   680
 GADRSo  Abs 1011988 #F7114 -   649   697
 GADRSs  Abs 1012076 #F716C -   696   694   701   731   735   737
 GETDCK  Abs 1011304 #F6E68 -   107   100
 GETDI+  Abs 1011258 #F6E3A -    85   200
 GETDIO  Abs 1011292 #F6E5C -    99    92
 GETDI1  Abs 1011250 #F6E32 -    77    67
 GETDI2  Abs 1011300 #F6E64 -   103    95
 GETDI3  Abs 1011325 #F6E7D -   114    86    97   122
 GETDI4  Abs 1011329 #F6E81 -   118    83
 GETDI5  Abs 1011331 #F6E83 -   119    73   110   113   230
=GETDID  Abs 1011225 #F6E19 -    64
=GETDIX  Abs 1011255 #F6E37 -    84
 GETDV-  Abs 1012218 #F71FA -   814   798
 GETDVO  Abs 1012178 #F71D2 -   797   808
 GETDV1  Abs 1012185 #F71D9 -   799   807
 GETDV2  Abs 1012222 #F71FE -   815   793   805
 GETDV3  Abs 1012231 #F7207 -   821   816   828
```

```
*GETDVW  Abs 1012168 #F71C8 -   791   316   416   973  1047
 GETDVr  Abs 1012216 #F71F8 -   811   803   822
*GETPI+  Abs 1011369 #F6EA9 -   176
 GETPI1  Abs 1011407 #F6ECF -   206   198
*GETPIL  Abs 1011360 #F6EA0 -   174
 GETPIm  Abs 1011528 #F6F48 -   253   215
 GETSTR  Ext                -    64   174
 GHEXBT  Ext                -   997  1062  1105
 GTYPS.  Abs 1011913 #F70C9 -   560   558
 GTYPS1  Abs 1011851 #F708B -   528   538
 GTYPS2  Abs 1011875 #F70A3 -   542   561   579
 GTYPS3  Abs 1011879 #F70A7 -   546   531
 GTYPS4  Abs 1011932 #F70DC -   570   548   555
 GTYPS5  Abs 1011936 #F70E0 -   571   529   553   566
*GTYPST  Abs 1011848 #F7088 -   527   341   399   437
 GTYPSd  Abs 1011918 #F70CE -   565   568
 Loop    Ext                -   887
 NXTCHR  Ext                -  1362
 Null    Ext                -   883
 Nxtchr  Abs 1012889 #F7499 -  1362    85   108   306   332   343   427   528
                                552   565   641   677   688   698   792   804
                                947   987  1310
 POPUPD  Ext                -  1366
 PRDW30  Abs 1012312 #F7258 -   890   876   888
 PRDWs1  Abs 1012319 #F725F -   895   894
 PRDWsb  Abs 1012314 #F725A -   893   879   886
 PRLLer  Abs 1012625 #F7391 -  1116  1112
 PRLT05  Abs 1012341 #F7275 -   956   951
 PRLT12  Abs 1012364 #F728C -   973   966
 PRLT15  Abs 1012381 #F729D -   983   976  1064
 PRLT20  Abs 1012439 #F72D7 -  1015   991
 PRLT25  Abs 1012443 #F72DB -  1016   988
 PRLT30  Abs 1012445 #F72DD -  1020  1008
 PRLT50  Abs 1012477 #F72FD -  1037   967
 PRLT60  Abs 1012502 #F7316 -  1054  1043
 PRLT70  Abs 1012532 #F7334 -  1067  1056
 PRLT75  Abs 1012545 #F7341 -  1074  1069
 PRLT9.  Abs 1012473 #F72F9 -  1034   977
 PRLT90  Abs 1012566 #F7356 -  1085  1034  1051
 PRLT95  Abs 1012580 #F7364 -  1093  1092
 PRLTer  Abs 1012660 #F7384 -  1130   956
 PRLTex  Abs 1012664 #F7388 -  1134  1094
 PRLTxx  Abs 1012629 #F7395 -  1120  1115
 PRLteR  Abs 1012435 #F72D3 -  1011  1003  1006
*PROCDW  Abs 1012245 #F7215 -   870   318   975
*PROCLT  Abs 1012323 #F7263 -   947    71   227
*PROCST  Abs 1011536 #F6F50 -   305    99
 PROCeX  Abs 1011833 #F7079 -   483   431
 PROCex  Abs 1011837 #F707D -   484   428
 PROCld  Abs 1012345 #F7279 -   962   955
 PROCna  Abs 1011826 #F7072 -   478   468
 PRST10  Abs 1011572 #F6F74 -   326   319   401
 PRST20  Abs 1011640 #F6FB8 -   367   337
 PRST25  Abs 1011644 #F6FBC -   368   333
 PRST27  Abs 1011646 #F6FBE -   372   361
 PRST30  Abs 1011669 #F6FD5 -   383   309
 PRST40  Abs 1011683 #F6FE3 -   393   385
 PRST50  Abs 1011703 #F6FF7 -   404   395
 PRST90  Abs 1011728 #F7010 -   423   320   380   390   400   410
 PRSTEX  Abs 1011783 #F7047 -   458   447  1127
 PRSTeR  Abs 1011636 #F6FB4 -   363   358
 PRSTed  Abs 1011532 #F6F4C -   301   307   317   344   350
 PRSTer  Abs 1011779 #F7043 -   451   444
 PRSTvl  Abs 1011715 #F7003 -   416   103
 PSHMCR  Ext                -  1389
 RANGEN  Ext                -  1377
 REST2C  Ext                -  1026  1125
 RESTD1  Ext                -  1021  1122
 RESTST  Ext                -  1374
 ROMTYP  Ext                -   872
 Rangen  Abs 1012936 #F74C8 -  1377   530   554   567   643   679   690   700
                                806  1319
 Restst  Abs 1012895 #F749F -  1365   996  1061  1079  1104
 SAVE2C  Ext                -  1152
 SAVEAC  Abs 1012675 #F73C3 -  1140   983  1099
 SETUP   Ext                -   125
 START   Ext                -   123
 STMTD1  Ext                -  1147
 TRESDO  Ext                -  1373  1390
 TSAVDO  Ext                -   119  1365  1388
 TermRq  Abs       0 #00000 -    62    84    96   199
 UCRANG  Ext                -  1394
*Ucrang  Abs 1012983 #F74F7 -  1394   308   797  1312
 VolLbl  Ext                -   419  1050
 eDSPEC  Ext                -   114   301   817  1130  1251
 eNORAM  Ext                -   253
 eRANGE  Ext                -   363   451   542   649  1011  1116
 sDevOK  Ext                -   120   196
 sFirst  Ext                -  1305  1317  1324  1347
 sSTK    Ext                -    66   197  1200
 tX      Ext                -  1054
 t*      Ext                -  1067
 tCOLON  Ext                -   953   989
 tLITRL  Ext                -   964
 tSEMIC  Ext                -  1041  1090
```

```
Input Parameters

  Source file name is NZ&FXQ::MS

  Listing file name is NZ/FXQ:TI:ML::-1

  Object file name is NZXFXQ:TI:MS::-1

                                          111111
                               0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
             *
             *        N   N  ZZZZZ   &      PPPP     A    RRRR
             *        N   N      Z  & &     P   P   A A   R   R
             *        NN  N     Z   & &     P   P  A   A  R   R
             *        N N N    Z     &      PPPP   A   A  RRRR
             *        N  NN   Z     & & &   P      AAAAA  R R
             *        N   N  Z     &   &    P      A   A  R  R
             *        N   N  ZZZZZ  && &    P      A   A  R   R
             *
                      TITLE  NZ'S PARSE ROUTINES <840301.1359>
   F74FD              ABS    #F74FD        TIXHP6 address (fixed)
             *
             * Status bits for Parse routines
             *
             * Global (BASIC System)
             *
             =InvalE EQU    0              Invalid expression if set
             =Digit  EQU    1              Digit found (CATCHR)
             =SpChar EQU    2              Special char found (CATCHR)
             =NumExp EQU    3              Numeric expression if set
             *
             * LOCAL (Used only in HPIL)
             *
             * ST(10) MUST be clear for any error exits! (Implied LET error)
             *
             =StarOK EQU    10             "*" OK (in device parse)
             =StrOK  EQU    StarOK         String OK (FRAme SPec parse)
             =ExprOK EQU    8              Expression OK (SEND parse)
             =EolOK  EQU    9              EOL OK (in SEND parse)
             =OptDev EQU    8              Device Spec is optional (Dev parse)
             ***************************************************************
             ***************************************************************
             **
             ** Name:        PRNTSp - Parse the PRINTER IS statement
             **
             ** Category:    STPARS
             **
             ** Purpose:
             **      Parse the PRINTER IS (and DISPLAY IS) statement
             **
             ** Entry:
             **      D1 points to the ASCII character string
             **      D0 points to the location where the tokens go
             **      D[A] is the end of available memory
             **      P=0
             **
             ** Exit:
             **      D0 positioned past the last token output by this routine
             **      D1 positioned past the last character accepted
             **      P=0
             **      Exits through ERRORP if error
             **
             ** Calls:      NTOKEN,<DVCPy*>
             **
             ** Uses.......
```

```
                  **  Inclusive: A,B,C,D[15:5],R0,R1,R2,D0,D1,P,ST[11,10,8,7,3:0],
                  **             FUNCD0,PRMCNT[0]
                  **
                  ** Stk lvls:   5 (DVCPy*)
                  **
                  ** History:
                  **
                  **   Date     Programmer              Modification
                  **  --------  ----------    ---------------------------------
                  **  11/23/83     NZ         Added documentation
                  **
                  ***************************************************************
                  ***************************************************************
F74FD 7F36 =PRNTSp GOSUB  Ntoken          Get next token
F7501 3100         LC(2)  =tIS            "IS" token
F7505 966          ?A#C   B               Was the next token "IS"?
F7508 36           GOYES  PRNTPE          No..."IS" missing...error
F750A 6CA4         GOTO   DVCPy*          Yes...device spec, "*" permitted
                  ***************************************************************
                  ***************************************************************
                  **
                  ** Name:       OUTPp - Parse the OUTPUT statement
                  ** Name:       ENTERp - Parse the ENTER statement
                  **
                  ** Category:   STPARS
                  **
                  ** Purpose:
                  **
                  **
                  ** Entry:
                  **      D1 points to the ASCII character string
                  **      D0 points to the location where the tokens go
                  **      D[A] is the end of available memory
                  **      P=0
                  **
                  ** Exit:
                  **      D1 positioned past last token output by this routine
                  **      D1 positioned past last character accepted
                  **      P=0
                  **      Exits through ERRORP if error
                  **
                  ** Calls:      DVCPn*,OUTpCK,OUTBYT,USINGp,<DISPP>,<READP5>
                  **
                  ** Uses.......
                  **  Inclusive: A,B,C,D[15:5],R0-R2,D0,D1,P,ST[11,10,8,7,3:0],
                  **             FUNCD0,PRMCNT[0]
                  **
                  ** Stk lvls:   6 (DVCPn*)
                  **
                  ** History:
                  **
                  **   Date     Programmer              Modification
                  **  --------  ----------    ---------------------------------
                  **  11/23/83     NZ         Added documentation
                  **
```

```
                **************************************************************
                **************************************************************
                *
                * OUTPUT parse
                *
 F750E 7E94 =OUTPp  GOSUB  DVCPn*         Parse device, "*" not permitted
 F7512 7130         GOSUB  OUTpCK         See what is following...
 F7516 8D00         GOVLNG =DISPP         Continue with DISPLAY parse
       000
                *-
                *-
                *
                * ENTER parse
                *
 F751D 7F84 =ENTERp GOSUB  DVCPn*         Parse device, "*" not permitted
 F7521 7220         GOSUB  OUTpCK         See what is following...
 F7525 8F00         GOSBVL =USINGp        Try to parse USING
       000
 F752C 450          GOC    ENTR10         Parsed USING...don't change D1
 F752F 171          D1=D1+ 2              No USING...skip semicolon
 F7532 3100 ENTR10  LC(2)  =tSEMIC        Output tSEMIC
 F7536 7185         GOSUB  OUTBYT
 F753A 858          ST=1   8
 F753D 849          ST=0   9
 F7540 8D00         GOVLNG =READP5
       000
                *-
                *-
                *
                * OUTPUT and ENTER share a common syntax for device spec; both
                * must be followed by one of the following:
                *  1. USING
                *  2. Semicolon
                *  3. End of line
                *
 F7547 75F5 OUTpCK  GOSUB  Ntoken         Get next token
 F754B 3100         LC(2)  =tUSING
 F754F 962          ?A=C   B              Is it tUSING?
 F7552 D0           GOYES  chkOK          Yes...accept it
 F7554 3100         LC(2)  =tSEMIC
 F7558 962          ?A=C   B              Is it tSEMIC?
 F755B 40           GOYES  chkOK          Yes...accept it
                *
                * Not USING or Semicolon; if not EOL, then excess chars
                *
 F755D 07           C=RSTK                Return to main parse driver
                *
 F755F 3100 chkOK   LC(2)  =t@            Output a t@ to terminate the
 F7563 7455         GOSUB  OUTBYT           device specifier
 F7567 63B5         GOTO   RESPTR         Restore the pointer (NTOKEN)
                *-
                *-
 F756B 20   PRNTPE  P=     =eSYNTx        "IS" token missing
 F756D 6051         GOTO   Errorp         Syntax error (restore pointer)
                **************************************************************
                ****************************************************************
                **
                ** Name:        INITp - Parse the INITIALIZE statement
                **
                ** Category:    STPARS
                **
                ** Purpose:
                **      Parse the INITIALIZE statement
                **
                ** Entry:
                **      D1 points to the ASCII character string
                **      D0 points to the location where the tokens go
                **      D[A] is the end of available memory
                **      P=0
                **
                ** Exit:
                **      D0 positioned past last token output by this routine
                **      D1 positioned past last character accepted
                **      P=0
                **      Exits through ERRORP if error
                **
                ** Calls:       CONWUC,FILSp,NTOKEN,?A=CM+,CKNUM,<RESPTR>,
                **              <ERROR!>,<ERRORP>
                **
                ** Uses.......
                **  Inclusive: A,B,C,D[15:5],R0-R4,D0,D1,P,ST[11,7,3:0],FUNCD0,
                **              PRMCNT[0]
                **
                ** Stk lvls:    6 (FILSp)
                **
                ** History:
                **
                **   Date      Programmer             Modification
                **  --------   ----------    --------------------------------
                **  11/28/83       NZ        Added documentation
                **
                ****************************************************************
                ****************************************************************
F7571 7756 =INITp  GOSUB  CONWUC         Convert word to upper case
F7575 AF6          C=A    W
F7578 3594         LCASC  \EZI\          End of INITIAL(IZE) keyword
      A554
F7580 976          ?A#C   W
F7583 44           GOYES  INITp1         "IZE" missing - ERROR...
F7585 175          D1=D1+ 6              Skip IZE
                *
                * Now have "INITIALIZE"
                *
F7588 7BC2         GOSUB  FILSp          Parse filespec (with string?)
F758C 580          GONC   INITP.         No error...continue
F758F 8C00 Error!  GOLONG =ERROR!        Error with FILSp
      00
                *-
                *-
F7595 831  INITP.  ?XM=0
```

```
F7598 80            GOYES  INITPO         OK
F759A 20    MSGPAR  P=     =eMSPAr        Missing parameter
F759C 6121          GOTO   Errorp         Error
            *-
            *-
F75A0 7C95  INITPO  GOSUB  Ntoken         Next TOKEN
F75A4       INITP2
F75A4 8E00          GOSUBL =?A=CM+
      00
F75AA 5D0           GONC   INITPR         No comma token...rtn, carry clear
F75AD 7D05          GOSUB  oUT1TK         Comma token...output it
            *
            * Entry for <XWORD> <numeric expression>
            *
F75B1       =XWRD1p
F75B1 72B4          GOSUB  CKNUM          Check numeric expression
F75B5 4D0           GOC    INITPE         Error jump
F75B8 6265  =INITPR GOTO   RESPTR         Restore parse pointer
            *-
            *-
            *
            * Entry for <XWORD> <Expr> [, <Expr>]
            *
F75BC       =STANp+
F75BC 77A4          GOSUB  CKNUM          Check numeric expression
F75C0 53E           GONC   INITP2         Valid numeric...continue
F75C3 6AF0  INITPE  GOTO   Errorp         Parse error
            *-
            *-
F75C7 20    INITp1  P=     =eSYNTx        Syntax error (No IZE)
F75C9 64F0          GOTO   Errorp         Parse error
            ***************************************************************
            ***************************************************************
            **
            ** Name:       STANDp - Parse the STANDBY statement
            **
            ** Category:   STPARS
            **
            ** Purpose:
            **       Parse the STANDBY statement
            **
            ** Entry:
            **       D1 points to the ASCII character string
            **       D0 points to the location where the tokens go
            **       D[A] is the end of available memory
            **       P=0
            **
            ** Exit:
            **       D0 positioned past last token output by this routine
            **       D1 positioned past last character accepted
            **       P=0
            **       Exits through ERRORP if error
            **
            ** Calls:      LOOPWp,WRDSCN,CKNUM,<RESPTR>
            **
```

```
                ** Uses.......
                **  Inclusive: A,B,C,D[15:5],R0-R3,D0,D1,P,ST[11,7,3:0],FUNCD0,
                **             PRMCNT[0]
                **
                ** Stk lvls:   6 (LOOP#p)
                **
                ** History:
                **
                **   Date      Programmer              Modification
                ** --------    ----------     --------------------------------
                **  11/28/83      NZ          Added documentation
                **
                ****************************************************************
                ****************************************************************
F75CD 7B61      =STANDp GOSUB  LOOP#p         Parse optional loop #
F75D1 7EB5              GOSUB  wrdscn         Check for ON/OFF
F75D5 00                CON(2) =tON
F75D7 7D3               REL(3) RTNCC          ON...done
F75DA 00                CON(2) =tOFF
F75DC 2D3               REL(3) RTNCC          OFF...done
F75DF 00                CON(2) 0              Neither ON nor OFF...get num expr
F75E1 7635              GOSUB  RESPTR         (Restore input pointer first)
F75E5 66DF              GOTO   STANp+         Parse 1 or 2 expressions
                ****************************************************************
                ****************************************************************
                **
                ** Name:       LOCALp - Parse the LOCAL [LOCKOUT] statement
                **
                ** Category:   STPARS
                **
                ** Purpose:
                **      Parse the LOCAL or LOCAL LOCKOUT statement
                **
                ** Entry:
                **      D1 points to the ASCII character string
                **      D0 points to the location where the tokens go
                **      D[A] is the end of available memory
                **      P=0
                **
                ** Exit:
                **      D0 positioned past last token output by this routine
                **      D1 positioned past last character accepted
                **      P=0
                **      Exits through ERRORP if error
                **
                ** Calls:      NTOKEN,OUT3TK,SVD0D1,CKNUM,RSD0D1,RESPTR,
                **             <CLEARp>,<OUTBYT>
                **
                ** Uses.......
                **  Inclusive: A,B,C,D[15:5],R0-R3,D0,D1,P,ST[11,7,3:0],FUNCD0,
                **             PRMCNT[0]
                **
                ** Stk lvls:   5 (CKNUM)(<CLEARp>)
                **
                ** History:
```

```
                **
                **   Date     Programmer              Modification
                **  --------  ----------   --------------------------------
                **  11/28/83     NZ        Added documentation
                **
                ****************************************************************
                ****************************************************************
F75E9           =LOCALp
F75E9 7355              GOSUB  Ntoken
F75ED AF6               C=A    W               Set high nibbles for compare
                ***
                *       LC(6)  (=tLOCKO)~(=LEXPIL)~(=tXWORD)
                *
F75F0 35                NIBHEX 35              LC(6)
F75F2 00                CON(2) =tXWORD         ...
F75F4 00                CON(2) =LEXPIL         ..
F75F6 00                CON(2) =tLOCKO         .
                *
                ***
F75F8 976               ?A#C   W               Is it LOCAL LOCKOUT?
F75FB F1                GOYES  LOCLp1          No...restore, use REMOTE parse
                *
                * This is LOCAL LOCKOUT...output the token, check for loop #
                *
F75FD 7EC4              GOSUB  oUT3TK          Output 3 byte token
F7601 7E84 Loopp        GOSUB  SVD0D1          Save D0, D1 in R2
F7605 7E64              GOSUB  CKNUM           Check if numeric expr follows
F7609 20                P=     0               Regardless of carry, want P=0
F760B 5CA               GONC   INITPR          If good expr, done after RESPTR
F760E 7894              GOSUB  RSD0D1          Restore D0, D1 from R2
                *
                * Not a loop expression...put out a tCOMMA instead
                *
F7612 3100              LC(2)  =tCOMMA
F7616 64A4              GOTO   OUTBYT          Don't restore D1 (already correct)
                *_
                *_
F761A 7DF4 LOCLp1       GOSUB  RESPTR          Restore token pointer
                *
                * Fall into CLEARp
                *
                ****************************************************************
                ****************************************************************
                **
                ** Name:        CLEARp - Parse the CLEAR statement
                ** Name:        REMOTp - Parse the REMOTE statement
                ** Name:        TRIGp - Parse the TRIGGER statement
                **
                ** Category:    STPARS
                **
                ** Purpose:
                **      Parse CLEAR/REMOTE/TRIGGER/LOCAL statement
                **
                ** Entry:
                **      D1 points to the ASCII character string
```

```
               **      D0 points to the location where the tokens go
               **      D[A] is the end of available memory
               **      P=0
               **
               ** Exit:
               **      D0 positioned past last token output by this routine
               **      D1 positioned past last character accepted
               **      P=0
               **      Exits through ERRORP if error
               **
               ** Calls:       EXPPAR
               **
               ** Uses.......
               **  Inclusive: A,B,C,D[15:5],R0,R1,D0,D1,P,ST[11,7,3:0],FUNCD0,
               **             PRMCNT[0]
               **
               ** Stk lvls:
               **
               ** History:
               **
               **    Date     Programmer              Modification
               **  --------   ----------    ---------------------------------
               **  11/28/83       NZ        Added documentation
               **
               ****************************************************************
               ****************************************************************
               *
               * Code above falls into this routine
               *
 F761E         =CLEARp
 F761E         =REMOTp
 F761E         =TRIGp
 F761E 858           ST=1    OptDev        Device spec not required
 F7621 84A           ST=0    =StarOK       No "*" allowed
 F7624 6893          GOTO    DVCSPc        Device address parse
               ****************************************************************
               ****************************************************************
               **
               ** Name:        RESETp - Parse the RESET HPIL statement
               **
               ** Category:    STPARS
               **
               ** Purpose:
               **      Parse the RESET HPIL statement
               **
               ** Entry:
               **      D1 points to the ASCII character string
               **      D0 points to the location where the tokens go
               **      D[A] is the end of available memory
               **      P=0
               **
               ** Exit:
               **      D0 positioned past last token output by this routine
               **      D1 positioned past last character accepted
               **      P=0
```

```
                 **      Exits through ERRORP if error
                 **
                 ** Calls:       BLANK,CONWUC,<Loopp>
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,D[15:5],R0-R3,D0,D1,P,ST[11,7,3:0],FUNCD0,
                 **              PRMCNT[0]
                 **
                 ** Stk lvls:    5 (<Loopp>)
                 **
                 ** History:
                 **
                 **    Date      Programmer              Modification
                 **  --------    ----------    ---------------------------------
                 **  11/28/83       NZ         Added documentation
                 **
                 **************************************************************
                 **************************************************************
 F7628 7EF4      =RESETp GOSUB  BLANK
 F762C 7C96              GOSUB  CONWUC         Convert word to upper case
 F7630 AF6               C=A    W              Copy upper nibs for compare
 F7633 3784              LCASC  \LIPH\
       0594
       C4
 F763D 976               ?A#C   W
 F7640 A2                GOYES  Errorx
                 *
                 * HPIL...leave as HPIL "RESET"
                 *
 F7642 177               D1=D1+ 8
 F7645 5B8               GONC   Loopp          Go always...check for loop #
                 **************************************************************
                 **************************************************************
                 **
                 ** Name:        OFFp - Parse OFF INTR/OFF IO
                 **
                 ** Category:    STPARS
                 **
                 ** Purpose:
                 **      Parse the tokens following tOFF (HPIL) for INTR or IO
                 **
                 ** Entry:
                 **      D1 points to the ASCII character string
                 **      D0 points to the location where the tokens go
                 **      D[A] is the end of available memory
                 **      P=0
                 **
                 ** Exit:
                 **      D0 positioned past last token output by this routine
                 **      D1 positioned past last character accepted
                 **      P=0
                 **      Exits through REST* if error
                 **
                 ** Calls:       WRDSCN
                 **
```

```
                ** Uses.......
                **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[11,3:0]
                **
                ** Stk lvls:   4 (WRDSCN)
                **
                ** History:
                **
                **    Date     Programmer             Modification
                **  --------   ----------    -------------------------------
                **  11/28/83      NZ         Added documentation
                **
                ****************************************************************
                ****************************************************************
F7648 7745 =OFFIOp GOSUB  wrdscn
F764C 00             CON(2) =tXWORD
F764E 00             CON(2) =LEXPIL
F7650 00             CON(2) =tINTRR
F7652 420            REL(3) IOp20
F7655 00             CON(2) 00
                *
                * If is not OFF INTR try OFF IO...
                *
F7657 70C4           GOSUB  RESPTR
                *
                * Fall into IOp
                *
                ****************************************************************
                ****************************************************************
                **
                ** Name:        IOp - Parse "IO" token
                **
                ** Category:    PARUTL
                **
                ** Purpose:
                **      Accept the "IO" token from the input stream (used for
                **      OFF IO, RESTORE IO, ASSIGN IO)
                **
                ** Entry:
                **      D1 points to the ASCII character string
                **      D0 points to the location where the tokens go
                **      D(A) is the end of available memory
                **      P=0
                **
                ** Exit:
                **      D0 positioned past last token output by this routine
                **      D1 positioned past last character accepted
                **      P=0
                **      Exits through REST* if error
                **
                ** Calls:       WRDSCN,<REST*>
                **
                ** Uses.......
                **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[11,3:0]
                **
                ** Stk lvls:   4 (WRDSCN)
```

```
                 **
                 ** History:
                 **
                 **    Date      Programmer                Modification
                 **  --------   ----------    ---------------------------------
                 **  11/28/83       NZ        Added documentation
                 **
                 *************************************************************
                 *************************************************************
                 *
                 * Code above falls into this routine
                 *
F765B 7435 =IOp     GOSUB  wrdscn         Get next token
F765F 00            CON(2) =tXWORD
F7661 00            CON(2) =LEXPIL
F7663 00            CON(2) =tIO
F7665 E00           REL(3) IOp10
F7668 00            CON(2) 00
F766A 20   Errorx   P=     0
F766C 8D00          GOVLNG =REST*         Restart parse as if never matched
      000
                 *_
                 *_
F7673 185  IOp10    D0=D0- 6              Return (Don't output the token)
F7676 03   IOp20    RTNCC
                 *************************************************************
                 *************************************************************
                 **
                 ** Name:        ONINTp - Parse the ON INTR GOTO/GOSUB statement
                 **
                 ** Category:    STPARS
                 **
                 ** Purpose:
                 **      Parse the ON INTR GOTO/GOSUB statement
                 **
                 ** Entry:
                 **      D1 points to the ASCII character string
                 **      D0 points to the location where the tokens go
                 **      D[A] is the end of available memory
                 **      P=0
                 **
                 ** Exit:
                 **      D0 positioned past last token output by this routine
                 **      D1 positioned past last character accepted
                 **      P=0
                 **      Exits through REST* if error
                 **
                 ** Calls:       WRDSCN,NTOKEN,<REST*>
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[11,3:0]
                 **
                 ** Stk lvls:   4 (WRDSCN)
                 **
                 ** History:
```

```
           **
           **   Date      Programmer               Modification
           **  --------   ----------    --------------------------------
           **  11/28/83      NZ         Added documentation
           **
           ***************************************************************
           ***************************************************************
F7678 7715 =ONINTp GOSUB  wrdscn
F767C 00           CON(2) =tXWORD
F767E 00           CON(2) =LEXPIL
F7680 00           CON(2) =tINTRR
F7682 900          REL(3) ONINp1
F7685 00           CON(2) 00
F7687 62EF         GOTO   Errorx
           *-
           *-
F768B 185  ONINp1  D0=D0- 6                 Don't output the INTR token
F768E 7EA4         GOSUB  Ntoken
F7692 858          ST=1   8                 Set ON ERROR flag (single branch)
F7695 8D00         GOVLNG =ONP40
      000
           ***************************************************************
           ***************************************************************
           **
           ** Name:        ASGNp - Parse the ASSIGN IO statement
           **
           ** Category:    STPARS
           **
           ** Purpose:
           **      Parse the ASSIGN IO statement
           **
           ** Entry:
           **      D1 points to the ASCII character string
           **      D0 points to the location where the tokens go
           **      D[A] is the end of available memory
           **      P=0
           **
           ** Exit:
           **      D0 positioned past last token output by this routine
           **      D1 positioned past last character accepted
           **      P=0
           **      Exits through ERRORP if error
           **
           ** Calls:       IOp,CKSTR,NTOKEN,OUTBYT,<RESPTR>,<ERRORP>
           **
           ** Uses.......
           **  Inclusive: A,B,C,D[15:5],R0,R1,R2,D0,D1,P,ST[11,7,3:0],
           **             FUNCD0,PRMCNT[0]
           **
           ** Stk lvls:   5 (CKSTR)(IOp)
           **
           ** History:
           **
           **   Date     Programmer               Modification
           **  --------  ----------    --------------------------------
```

```
                 **  11/28/83      NZ         Added documentation
                 **
                 ****************************************************************
                 ****************************************************************
 F769C 7B8F =ASGNp  GOSUB  IOp            First check for "IO"
                 *
                 * If IOp returns, found "IO"
                 *
 F76A0 70E3         GOSUB  CKSTR          Check for valid string (carry=NO)
 F76A4 5F1          GONC   ASGNp2         Valid...restore pointer, done
 F76A7 7594         GOSUB  Ntoken         Get the token
 F76AB 3100         LC(2)  =t*
 F76AF 966          ?A#C   B
 F76B2 A0           GOYES  ASGNp1         Error...illegal parameter
 F76B4 7C05         GOSUB  OUT:           ASSIGN IO *...output the tCOLON,
 F76B8 6204         GOTO   OUTBYT         Output the t*, return, carry clear
                 *-
                 *-
 F76BC 20   ASGNp1  P=     =eILPAr        Illegal parameter
 F76BE 8C00 Errorp  GOLONG =ERRORP        Error...restore pointer, exit
       00
                 *-
                 *-
 F76C4 6654 ASGNp2  GOTO   RESPTR
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:         SENDp - Parse the SEND statement
                 **
                 ** Category:     STPARS
                 **
                 ** Purpose:
                 **        Parse the SEND statement
                 **
                 ** Entry:
                 **        D1 points to the ASCII character string
                 **        D0 points to the location where the tokens go
                 **        D[A] is the end of available memory
                 **        P=0
                 **
                 ** Exit:
                 **        D0 positioned past last token output by this routine
                 **        D1 positioned past last character accepted
                 **        P=0
                 **        Exits through ERRORP if error
                 **
                 ** Calls:        LOOPWp,FRASPp,ST!NOp,?A=CM+,RESPTR,BLANK,CONWUC,
                 **               OUTBYT,OUTNBS
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,D[15:5],R0-R3,D0,D1,P,ST[11:7,3:0],FUNCD0,
                 **               PRMCNT[0]
                 **
                 ** Stk lvls:     6 (LOOPWp)
                 **
```

```
** Algorithm:
**      SENDp: Parse optional loop #                     (LOOP#p)
**
**      SENDP1:Attempt to parse a frame spec             (FRASPp)
**             If successful frame spec, goto SENDP1
**
**             If expression is not permitted here, goto SENDP5
**             Attempt to parse a string or number       (ST!NOp)
**             If unsucessful, goto SENDP5
**
**      SENDP2:Check if a comma follows (more expr)      (?A=CM+)
**             If no comma, goto SENDP3 (check for EOL)
**             Attempt to parse a string or number       (ST!NOp)
**             If successful, goto SENDP2
**
**      SENDlp:While character is a blank, back up one char
**             Goto SENDP5
**
**      SENDP3:Restore input pointer                     (RESPTR)
**             Get next character                        (BLANK )
**
**             If EOL is permitted here, then
**               Read next 3 characters
**               If characters = "EOL" then output "EOL"
**               Get next character
**               endif
**
**      SENDP4:Attempt to parse a frame spec             (FRASPp)
**             If successful, goto SENDP1
**
**      SENDP5:Clear ST[10] (Implied LET flag)
**             RTNCC
**
** History:
**
**   Date     Programmer             Modification
**  --------  ----------   --------------------------------
**  11/28/83     NZ        Updated documentation
**
*****************************************************************
*****************************************************************
*
* Syntax:
*   SEND [<loop #>;] { <keyword> [ <num expr> | <str expr> [ ,
*     <num expr> | <str expr> ]* ] }*
*
*      (num expr is not be allowed for some of the keywords)
*      (str expr is not be allowed for some of the keywords)
*
*   Definitions:
*      <keyword> ::= DATA | END | IDY | UNL | LISTEN | UNT |
*             TALK | SAD | DDL | DDT | RDY | IFC | LPD | GTL |
*             SDC | CMD | MLA | MTA
*      <num expr> ::= numeric expression
*      <str expr> ::= string expression
```

```
                *       <loop #> ::= numeric expression in the range [1,3]
                *
F76C8           =SENDp
                *
                * LOOP#p compiles either <nothing> or <tSEMIC><num expr><tCOMMA>
                * It also calls BLANK, leaving the next char in A[B]
                *
F76C8 7070              GOSUB  LOOP#p        Parse loop number, if any
                *
                * ST(8) (=ExprOK) is clear from the entry to SEND parse
                *
                * FRASPp compiles <tCOLON><text string>. If not a valid frame,
                * returns with D0 restored, carry SET.
                * A[B] is the next item, D1 points to the next item
                * If carry is CLEAR, FRASPp sets/clears ST(StrOK), ST(EolOK).
                * If carry is SET, FRASPp does not alter ST(StrOK),ST(EolOK).
                *
F76CC 7990 SENDP1  GOSUB  FRASPp        Frame spec parse
F76D0 5BF          GONC   SENDP1        If valid frame spec, try another
                *
                * ST(ExprOK) indicates if an expression makes sense here. If
                * it is not set and FRASPp returned with carry set, this is
                * a parse error!! (Expression following a frame spec that does
                * not take an expression)
                *
F76D3 868               ?ST=0  =ExprOK       Does an expression make sense?
F76D6 16                GOYES  SENDP5        No...exit! (Anything else: error)
                ********
                *
                * ST!NOp compiles {<tCOMMA> followed by <str expr>|<num expr>}
                * if no error has been detected; a string expresion is
                * accepted only if ST(StrOK) is SET, else errors on string.
                * An EOL is accepted if and only if ST(EolOK) is true.
                * An expression is accepted if and only if ST(ExprOK) is true.
                * A[B] is next token on return from ST!NOp; carry indicates
                * status (Carry set=error; carry clear=accepted, compiled)
                *
F76D8 7051              GOSUB  ST!NOp        Parse initial string | number
F76DC 4A5               GOC    SENDP5        No expression specified...done
                *
                * One expression given...check if another expression follows
                *
F76DF 7000 SENDP2  GOSUB  =?A=CM+
F76E3 571               GONC   SENDP3        No comma follows...check EOL
                *
                * Found a comma...MUST find another expression!
                *
F76E6 7241              GOSUB  ST!NOp        Parse string | number
F76EA 54F               GONC   SENDP2        Valid...check for another!
                *
                * Didn't find a valid expression...back up to the comma
                *
                * (ST!NOp leaves C[B]=\ \)
                *
F76ED 1C1  SENDlp  D1=D1- 2
```

```
F76F0 148          A=DAT1 B
F76F3 962          ?A=C   B
F76F6 7F           GOYES  SEND1p
F76F8 5E3          GONC   SENDP5        Go always
                *-
                *-
F76FB 7C14 SENDP3  GOSUB  RESPTR        Restore pointer...
F76FF 7724         GOSUB  BLANK         ...Skip blanks, read in character
F7703 869          ?ST=0  =EolOK        Is EOL permitted here?
F7706 A2           GOYES  SENDP4        No...continue
                *
                * Check if this is EOL (If so, output it and get next frame)
                *
F7708 70C4         GOSUB  CONWUC        Convert to upper case
F770C AF6          C=A    W             (To facilitate compare)
F770F 3554         LCASC  \LOE\         EOL
      F4C4
F7717 976          ?A#C   W
F771A 61           GOYES  SENDP4        Not EOL...continue
F771C 175          D1=D1+ 6             Skip EOL
F771F 71A4         GOSUB  OUT:          Output 1 byte from C[B]
F7723 AEE          ACEX   B
F7726 25           P=     5
F7728 7DA3         GOSUB  oUTNBS        Output 6 nibbles from A[5:0]
F772C 7AF3         GOSUB  BLANK         Skip to next token
                *
                * If here, MUST have another frame spec, else error!
                *
F7730 7530 SENDP4  GOSUB  FRASPp
F7734 579          GONC   SENDP1        Found frame spec...continue
                *
                * NOT a frame spec...unrecognized type
                *
                * Fall through to return to parse driver
                *
F7737 84A  SENDP5  ST=0   =StrOK        Clear this bit for LINE PARSE
F773A 03           RTNCC
                *************************************************************
                *************************************************************
                **
                ** Name:        LOOP#p - Parse an optional HPIL loop specifier
                **
                ** Category:    PARUTL
                **
                ** Purpose:
                **      Parse an optional loop number...if one present, output
                **      the tokens for it
                **
                ** Exit:
                **      A[B] is next char, D1 points at next character
                **      If <loop #> found, compiled code generated
                **
                ** Entry:
                **      D1 points to the ASCII character string
                **      D0 points to the location where the tokens go
```

```
             **      D[A] is the end of available memory
             **      P=0
             **
             ** Exit:
             **      A[B] is next character (at D1)
             **      D0 positioned past last token output by this routine
             **      D1 positioned past last character accepted
             **      P=0
             **      Carry clear
             **
             ** Calls:      SVD0D1,OUTBYT,CKNUM,OUT1TK,RSD0D1,BLANK
             **
             ** Uses.......
             **  Inclusive: A,B,C,D[15:5],R0-R3,D0,D1,P,ST[11,7,3:0],FUNCD0,
             **             PRMCNT[0]
             **
             ** Stk lvls:   5 (CKNUM)
             **
             ** History:
             **
             **    Date     Programmer             Modification
             **  --------   ----------    ---------------------------------
             **  11/28/83      NZ         Updated documentation
             **
             ***************************************************************
             ***************************************************************
             *
             * Syntax:
             *   Input stream: [ <num expr> ; ]
             *   Compiled code: [ <tSEMIC> <num expr> <tSEMIC> ]
             *
F773C 7353   =LOOPWp GOSUB  SVD0D1        Save D0, D1
F7740 20             P=     0
F7742 3100           LC(2)  =tSEMIC
F7746 7173           GOSUB  OUTBYT        Output the semicolon in case OK
F774A 7913           GOSUB  CKNUM         Check numeric expression
F774E 421            GOC    LOOPW1        Not good...restore,nchar, return
             *
             * This was a valid numeric expression (B[B] is ntoken)
             *
             * Check for trailing semicolon...
             *
F7751 3100           LC(2)  =tSEMIC
F7755 966            ?A#C   B
F7758 90             GOYES  LOOPW1        Not semicolon...don't accept!
             *
             * Output a trailing tSEMIC!
             *
F775A 7063           GOSUB  oUT1TK        (tSEMIC in A[B] now)
F775E 560            GONC   LOOPW2        Go always...get next char
             *_
             *_
F7761        LOOPW1
             *
             * Restore D0, D1; then get next char
```

```
           *
F7761 7543         GOSUB  RSD0D1        Restore D0, D1
F7765 64C3 LOOPM2  GOTO   BLANK         Get next character
           ************************************************************
           ************************************************************
           **
           ** Name:        FRASPp - Parse an HPIL frame specifier
           **
           ** Category:    PARUTL
           **
           ** Purpose:
           **       Frame spec parse for HPIL frame descriptors
           **
           ** Entry:
           **       A[B] is next character (at D1)
           **       D1 points to the ASCII character string
           **       D0 points to the location where the tokens go
           **       D[A] is the end of available memory
           **       P=0
           **
           ** Exit:
           **       A[B] is next item (at D1)
           **       If carry set, not valid input (D0,D1 restored)
           **       If carry clear, output <tCOLON><text string>.
           **           ST(StrOK) is set if string OK next, clear if not
           **           ST(EolOK) is set if EOL is OK next, else clear
           **           ST(ExprOK) is set if expression makes sense next
           **       D0 positioned past last token output by this routine
           **       D1 positioned past last character accepted
           **       P=0
           **
           ** Calls:       UCRANG,OUTBYT,FRAMEE,OUTNBS,<BLANK>
           **
           ** Uses.......
           **  Inclusive: A,B,C,R0,R1,P
           **
           ** Stk lvls:   2 (UCRANG)(OUTBYT)(FRAMEE)(OUTNBS)
           **
           ** History:
           **
           **   Date     Programmer            Modification
           **  --------  ----------   ---------------------------------
           **  11/28/83      NZ       Updated documentation
           **
           ************************************************************
           ************************************************************
           *
           * Syntax:
           *   Input stream: <alpha text string>
           *   Token output: <tCOLON> <validated text string>
           *
F7769 7000 =FRASPp GOSUB  =Ucrang      Check if valid input...
F776D 400          RTNC                If carry, not valid input!
F7770 7054         GOSUB  OUT:         Output a tCOLON before frame spec
F7774 AEE          ACEX   B            (OUTBYT does ACEX B)
```

```
F7777 133           AD1EX
F777A 101           R1=A                    Save input pointer in R1
F777D 133           AD1EX                   (A,D1 unchanged)
                  *
                  * A[B] is first character...continue until not in [A-Z]
                  * D1 points at first character
                  *
F7780 AC2           C=0     S               Count in C[S]
F7783 814   FRASP1  ASRC
F7786 814           ASRC                    Save characters in high nibbles
F7789 B46           C=C+1   S
F778C 171           D1=D1+ 2                Point to next character
F778F 14B           A=DAT1  B
F7792 7000          GOSUB   =Ucrang         Check if in [A-Z]
F7796 5CE           GONC    FRASP1          Yes...continue
                  *
                  * Got a character NOT in [A-Z]...rotate text, check it
                  *
F7799 80DF          P=C     15              Use P for the character count!
F779D 0D            P=P-1                   Decrement for base zero carry
F779F 810   FRASP2  ASLC
F77A2 810           ASLC                    Shift one character
F77A5 0D            P=P-1
F77A7 57F           GONC    FRASP2          If no carry, not done shifting
                  *
                  * Now A[W] is the text, C[S] is the length in bytes
                  *
F77AA A46           C=C+C   S
F77AD A4E           C=C-1   S               Offset for zero-based count
F77B0 80DF          P=C     15
F77B4 A96           C=A     WP              C[W] is now set up for FRAMEE
F77B7 108           R0=C                    Save text in R0
F77BA D0            A=0     A               Clear A[B] for FRAMEE
F77BC 8E00          GOSUBL  =FRAMEE
      00
F77C2 4E5           GOC     FRASP3          Error...not a valid frame
                  *
                  * C[S] is the length of the frame
                  *
                  * Valid frame...write it out, return
                  *
F77C5 110           A=R0
F77C8 ACA           A=C     S               Write out only the specified nibs
                  *
                  * Set D1 past the last ACCEPTED character
                  *
F77CB 80DF          P=C     15              Set P=WP value of length
F77CF 119           C=R1                    Set the input pointer past frame
F77D2 809           C+P+1                   Skip the chars
F77D5 135           D1=C                    Set D1 just past the characters
                  *
F77D8 AF6           C=A     W               Copy high nibbles of A[W] to C[W]
F77DB 84A           ST=0    =StrOK          String NOT ok unless CMD/DATA
F77DE 849           ST=0    =EolOK          EOL NOT ok except after DATA
F77E1 848           ST=0    =ExprOK         Expression not OK unless maskNO
```

```
F77E4 969            ?B=0   B
F77E7 50             GOYES  FRASPx          Mask IS zero...expression not OK
F77E9 858            ST=1   =ExprOK         Non-zero mask...expression OK
F77EC 2F     FRASPx  P=     15
F77EE 3653           LC(7)  (\DMC\)*16+5  C[S]=5, C[5:0]="CMD" (reversed)
      4D44
      4
F77F7 972            ?A=C   W
F77FA 51             GOYES  FRASPy          Match...StrOK
             *
             * Following instruction is too big for LC(x)
             *       LC(9)  (\ATAD\)*16+7 C[S]=7, C[7:0]="DATA" (reversed)
F77FC 387            NIBHEX 387             LC(9)..7
F77FF 4414           NIBASC \DATA\
      4514
             *
F7807 976            ?A#C   W
F780A 80             GOYES  FRASPn
F780C 859            ST=1   =EolOK          EOL is OK here
F780F 85A    FRASPy  ST=1   =StrOK          String expression OK here
F7812 AC6    FRASPn  C=A    S
F7815 80DF           P=C    15
F7819 7CB2           GOSUB  oUTNBS          Output the nibbles in A[WP]
F781D 6C03           GOTO   BLANK           Skip to next non-blank char
             *-
             *-
F7821        FRASP3
             *
             * Restore D0, D1
             *
F7821 181            D0=D0- 2               Back up over tCOLON
F7824 119            C=R1                   Restore D1 (Input pointer)...
F7827 135            D1=C                   ...from R1
F782A 02             RTNSC                  Return with carry SET (bad frame)
             *************************************************************
             *************************************************************
             **
             ** Name:        ST!NOp - Parse a string or numeric expression
             **
             ** Category:    PARUTL
             **
             ** Purpose:
             **      Parse either a string or numeric expression (String OK
             **      only if ST(StrOK) is set
             **
             ** Entry:
             **      D1 points to the ASCII character string
             **      D0 points to the location where the tokens go
             **      D[A] is the end of available memory
             **      P=0
             **
             ** Exit:
             **      Next token in A[B] if carry clear, next char if set
             **      Carry clear if accepted; <tCOMMA><expr> compiled
             **      Carry set if error; pointers restored
```

```
                **      D0 positioned past last token output by this routine
                **      D1 positioned past last character accepted
                **      P=0
                **
                ** Calls:       SVD0D1,OUTBYT,EXPPAR,RSD0D1,BLANK
                **
                ** Uses.......
                **  Inclusive: A,B,C,D[15:5],R0-R2,D0,D1,P,ST[11,7,3:0],FUNCD0,
                **             PRMCNT[0]
                **
                ** Stk lvls:   4 (EXPPAR)
                **
                ** History:
                **
                **   Date      Programmer               Modification
                **  --------   ----------   ---------------------------------
                **  11/28/83       NZ       Updated documentation
                **
                ***************************************************************
                ***************************************************************
                *
                * Syntax:
                *   Input stream: <num expr> | <str expr>
                *   Token output: <tCOMMA> <legal expr>
                *
F782C           =ST!NOp
                *
                * First save D0,D1 in R2,R3
                *
F782C 7362             GOSUB  SVD0D1          Save D0, D1
F7830 3100             LC(2)  =tCOMMA
F7834 7382             GOSUB  OUTBYT          Output the Comma token
F7838 7422             GOSUB  Exppar          Check if expression
F783C 870              ?ST=1  InvalE          Is it invalid?
F783F E0               GOYES  ST!NO2          Invalid...restore
F7841 873              ?ST=1  NumExp          Is it valid numeric?
F7844 70               GOYES  ST!NO1          Yes...accept it!
                *
                * String...check if StrOK...if OK, accept; if not, restore
                *
F7846 86A              ?ST=0  =StrOK
F7849 40               GOYES  ST!NO2          Not OK...restore
F784B           ST!NO1
                *
                * Accept it all now (The ntoken is in A[B])
                *
F784B 03               RTNCC                  Carry clear=accepted
                *_
                *_
F784D           ST!NO2
                *
                * Not accepted...restore and return with next char in A[B]
                *
F784D 7952             GOSUB  RSD0D1          Restore D0, D1
F7851 75D2             GOSUB  BLANK           Skip blanks, read next character
```

```
F7855 02          RTNSC                Return, carry SET
         *****************************************************************
         *****************************************************************
         **
         ** Name:        FILSPp - Parse an HPIL file specifier
         ** Name:        FILSp - Parse an HPIL file specifier (string OK)
         ** Name:        DEVSPp - Parse an HPIL device specifer (got :)
         ** Name:        DVSPp - Parse an HPIL device specifer (* OK)
         **
         ** Category:    PARUTL
         **
         ** Purpose:
         **      Routine to parse a file and/or device specifier
         **
         ** Entry:
         **      D1 points to the ASCII character string
         **      D0 points to the location where the tokens go
         **      D[A] is the end of available memory
         **      P=0
         **
         ** Exit:
         **      D0 positioned past last token output by this routine
         **      D1 positioned past last character accepted
         **      P=0
         **      Carry set if error (C[3:0] is error #)
         **          (D1 points at the erroneous item)
         **      Carry clear if OK (D1 points past file spec, A is next
         **          token, D0 is set properly,A[S]#0 if filename found)
         **
         ** Calls:       CKSTR,OUTBYT,NAMEpb,OUT2TC,NAMEp,NTOKEN,OUT1TK,
         **              CKNUM+,CKNUM-,RESPTR,SVD0D1,CATCH+,RSD0D1
         **
         ** Uses.......
         **  Inclusive: A,B,C,D[15:5],R0-R4,D0,D1,P,ST[11,10,7,3:0],
         **              FUNCD0,PRMCNT[0]
         **
         ** Stk lvls:   FILSPp: 5 (CKNUM)
         ** Stk lvls:   FILSp:  5 (CKSTR)(CKNUM)
         ** Stk lvls:   DEVSPp: 4 (CKNUM+)(NAMEp)
         ** Stk lvls:   DVSPp:  4 (CKNUM+)(NAMEp)
         **
         ** History:
         **
         **    Date     Programmer              Modification
         **  --------   ----------    ---------------------------------
         **  11/28/83      NZ         Updated documentation
         **
         *****************************************************************
         *****************************************************************
         *
         * File specifier syntax:
         *   Input stream:
         *      <string expression>
         *   or  [ <file name> ] : <device specifier>
         *   or  [ <file name> ] . <volume label>
```

```
           *   Token output:
           *       <string expression>
           *   or  <tLITRL> [ <file name> ] <tCOLON> <device specifier>
           *   or  <tLITRL> [ <file name> ] <tSEMIC> <volume label>
           *
           * Device specifier syntax:
           *   Input stream:
           * 1)    <string expression>                     (DEVSPp only)
           * 2) or : <address>                             (DEVSPp only)
           * 3) or : <device word> [ (<seq num>) ]         (DEVSPp only)
           * 4) or : % <device type> [ (<seq num>) ]       (DEVSPp only)
           * 5) or : <assign word>                         (DEVSPp only)
           * 6) or : <device ID> [ (<seq num>) ]           (DEVSPp only)
           * 7) or [ : ] *                                 (DEVSPp only)
           * 2) or <address>
           * 3) or <device word> [ (<seq num>) ]
           * 4) or % <device type> [ (<seq num>) ]
           * 5) or <assign word>
           * 6) or <device ID> [ (<seq num>) ]
           *
           *   Token output:
           * 1)    <string expression>
           * 2) or <tCOLON> <num expr>
           * 3) or <tCOLON> <tLITRL> <device word> [ <tCOLON> <num expr> ]
           * 4) or <tCOLON> <t%> <num expr> [ <tCOLON> <num expr> ]
           * 5) or <tCOLON> <tLITRL> <assign word>
           * 6) or <tCOLON> <tLITRL> <device ID> [ <tCOLON> <num expr> ]
           * 7) or <tCOLON> <t*>
           *
           ******************************
           *
           * Check for string expression first (Save state for restore)
           *
F7857 7922 =FILSp  GOSUB  CKSTR          Check if string (Carry = NO)
F785B 460          GOC    FILSPp         Not string...try literal
F785E 6541         GOTO   FILSp8
           *-
           *-
F7862      =FILSPp
F7862 20           P=     0
F7864 3100         LC(2)  =tLITRL        Literal token (File specifier)
F7868 7F42         GOSUB  OUTBYT         Output it!
           *
           * Now D1 points to the first char of the file spec (or blanks)
           *
F786C 2F           P=     15
F786E 30A          LC(1)  10             10 characters max!
F7871 74B1         GOSUB  NAMEpb         Parse the name (If carry, error)
           *
           * If carry is set, A[B] is the next char: could be bad first
           * char (digit) OR too long. I can't do either one...RTNSXM!
           *
F7875 453          GOC    FILSpn         Not anything I understand
           *
           * Have parsed the name...check next character
```

```
                  *
F7878 104                R4=A                        Save A[S] in R4[S]
F787B 31A3               LCASC  \:\
F787F 962                ?A=C   B                    Is it a colon?
F7882 D2                 GOYES  FILSp0               Yes...continue
F7884 31E2               LCASC  \.\
F7888 966                ?A#C   B                    Is it a "."?
F788B 02                 GOYES  FILSpn               No...return, set XM, clear carry
                  *
                  * Have a volume label...same rules as NAMES (alpha, alpha-digit)
                  *
F788D 171         =DVLBp D1=D1+ 2                    Skip the "."
                  ****
                  *
                  *      LC(4)  (=tSEMIC)~(=tCOLON)
F7890 33                 NIBHEX 33
F7892 00                 CON(2) =tCOLON
F7894 00                 CON(2) =tSEMIC
                  *
                  ****
F7896 7B22               GOSUB  oUT2TC
F789A 2F                 P=     15
F789C 306                LC(1)  6                    Max of 6 characters in volume lbl
F789F 7A81               GOSUB  NAMEp
F78A3 470                GOC    FILSpn               Bad first char OR too long..exit
                  *
                  * Check that at LEAST one char accepted
                  *
F78A6 94C                ?A#0   S                    Any characters accepted?
F78A9 F6                 GOYES  FILSp!               Yes...check for loop #
                  *
                  * If here, had either a first char that was not a letter or
                  * a colon OR had a name too long...either one is not HPIL.
                  *
F78AB 62F0  FILSpn GOTO   FILSpX                     Return, set XM, clear carry
                  *-
                  *-
F78AF 171   FILSp0 D1=D1+ 2                          Skip the colon
                  *
                  * Entry for Device parse (AFTER the colon)
                  *
F78B2 84A   =DEVSPp ST=0  =StarOK                    FILE:* is NOT OK for this entry
F78B5 7B03  =DVSPp GOSUB  OUT:                       Output the colon token
F78B9 7382         GOSUB  Ntoken                     Get next token...
F78BD 3100         LC(2)  =t*
F78C1 966          ?A#C   B                          Is this a "*"?
F78C4 71           GOYES  FILSp1                     No...continue checking
                  *
                  * Found a "*"...is it permitted here?
                  *
F78C6 20           P=     =eILPAr                    Illegal parameter
F78C8 86A          ?ST=0  =StarOK
F78CB C0           GOYES  FILSpx                     Error if StarOK=0
                  *
                  * OK...output the token
```

```
                   *
F78CD 20                   P=     0
F78CF 78E1                 GOSUB  OUTBYT         Output the t* token
F78D3 64D0                 GOTO   FILSp9         Done...exit
                   *-
                   *-
F78D7 66C0 FILSpx  GOTO   FILSpX
                   *-
                   *-
F78DB      FILSp1
                   *
                   * Not "*"...check if device type ("%")
                   *
F78DB 3100                 LC(2)  =t%
F78DF 966                  ?A#C   B              Is it device type?
F78E2 A5                   GOYES  FILSp4         No...continue checking
                   *
                   * Device type (Syntax  %<num expr> [ (<num expr>) ] )
                   *
F78E4 76D1                 GOSUB  oUT1TK         Output one token (t%)
                   *
                   * Following two lines are for stack levels (ENTERp,...)
                   *
F78E8 7B61                 GOSUB  CKNUM+         Save info, call EXPPAR
F78EC 7B71                 GOSUB  CKNUM-         Check results of EXPPAR
F78F0 46E                  GOC    FILSpx         Error if carry (string/no expr)
F78F3 3182 FILSp2  LCASC  \(\
F78F7 966                  ?A#C   B              Is there a sequence #?
F78FA 22                   GOYES  FILSp3         No...check for loop #
                   *
                   * Sequence # found
                   *
F78FC 74C2                 GOSUB  OUT:           Output the "(" (kludge)
F7900 7351                 GOSUB  CKNUM+         Call EXPPAR (for stack levels)
F7904 7361                 GOSUB  CKNUM-         Check numeric expression
F7908 4EC                  GOC    FILSpx         Error if carry
                   *
                   * Check for closing paren now
                   *
F790B 3192                 LCASC  \)\
F790F 20                   P=     =eMSPAr        Missing parameter
F7911 966                  ?A#C   B
F7914 3C                   GOYES  FILSpx         Error...no closing ")"
F7916 20                   P=     0
F7918 7422 FILSp!  GOSUB  Ntoken         Get next token first
                   *
                   * Now check for loop #
                   *
F791C 31A3 FILSp3  LC(2)  \:\
F7920 966                  ?A#C   B              Is there a loop #?
F7923 51                   GOYES  FILsp8         No...exit after restoring D1
                   *
                   * Loop # found
                   *
F7925 3100                 LC(2)  =tSEMIC        Internal representation
```

```
F7929 7E81           GOSUB  OUTBYT        Output the semicolon token...
F792D 7621           GOSUB  CKNUM+        Call EXPPAR (for stack levels)
F7931 7631           GOSUB  CKNUM-        Check numeric expression
F7935 486            GOC    FILSpX        Error if carry
F7938 6B60 FILsp8    GOTO   FILSp8        Exit after restore
           *-
           *-
F793C      FILSp4
           *
           * Not a device type...check further (Device word or address)
           *
           * First try address (if parses, then check for chars following)
           *
F793C 7BD1           GOSUB  RESPTR        Restore pointer back to start
F7940 7F41           GOSUB  SVDOD1        Save D0, D1
F7944 7F01           GOSUB  CKNUM+        Call EXPPAR (for stack levels)
F7948 7F11           GOSUB  CKNUM-        Check if numeric expression
F794C 4A2            GOC    FILSp6        Not numeric...try device word
           *
           * Iff it is clearly a value expression (1,A+2,etc), then XM=1
           * (This means that any device ID's which begin with a numeric
           * function may need to be quoted)
           *
F794F 831            ?XM=0
F7952 50             GOYES  FILSp5        Not value expression...check more
F7954 57C            GONC   FILSp3        Go always...this is an address
           *-
           *-
           *
           * If the next token is in [A-Z][0-9] and the previous char is
           * not a blank, then this must be a device ID
           *
F7957 70C1 FILSp5    GOSUB  RESPTR        Back up to last token start
F795B 14B            A=DAT1 B             Read the ASCII of the token
F795E 72B1           GOSUB  cATCH+        Check if letter or digit next
F7962 55B            GONC   FILSp!        No...this is address (check loop)
F7965 1C1            D1=D1- 2
F7968 14B            A=DAT1 B
F796B 171            D1=D1+ 2
F796E 3102           LC(2)  \ \           Check for a preceding blank
F7972 962            ?A=C   B
F7975 3A             GOYES  FILSp!        Blank...this is an address
           *
           * This is not an address...check if this is device word
           *
F7977 7F21 FILSp6    GOSUB  RSDOD1        Restore D0, D1
F797B 20             P=     0
F797D 3100           LC(2)  =tLITRL
F7981 7631           GOSUB  OUTBYT        Output the literal token first
F7985 2F             P=     15
F7987 308            LC(1)  8             Max of eight chars in device word
F798A 7F90           GOSUB  NAMEp         Parse it
F798E 4F0            GOC    FILSpX        Excess characters...error
           *
           * Check that at LEAST one character accepted
```

```
                   *
F7991 948                ?A=0   S              Any valid characters?
F7994 A0                 GOYES  FILSpX         No valid characters...error
F7996 76A1               GOSUB  Ntoken         Get next token
F799A 685F               GOTO   FILSp2         OK...check if sequence #
                   *-
                   *-
F799E 21           FILSpX P=     1
F79A0 0D                 P=P-1                 Clear carry
F79A2 00                 RTNSXM
                   *-
                   *-
F79A4 7371         FILSp8 GOSUB  RESPTR         Restore pointer
F79A8 821          FILSp9 XM=0                  Clear XM...
F79AB 114                A=R4                  Restore A[S] from R4[S]
                   *
                   * Entry for XWORD parse
                   *
F79AE              =XWORDp
F79AE 03           =RTNCC  RTNCC               Return with carry clear
                   *************************************************************
                   *************************************************************
                   **
                   ** Name:       DVCSPp - Parse a device specifier (: optional)
                   **
                   ** Category:   STPARS
                   **
                   ** Purpose:
                   **      Device spec parse...string expr, *, and [:] OK
                   **
                   ** Entry:
                   **      D1 points to the ASCII character string
                   **      D0 points to the location where the tokens go
                   **      D[A] is the end of available memory
                   **      P=0
                   **
                   ** Exit:
                   **      D0 positioned past last token output by this routine
                   **      D1 positioned past last character accepted
                   **      Carry clear
                   **      P=0
                   **      Exits through ERRORP if error
                   **
                   ** Calls:      EOLCK,RESPTR,OUTBYT,CKSTR,BLANK,DVSPp,DVLBp
                   **
                   ** Uses.......
                   **  Inclusive: A,B,C,D[15:5],R0-R3,D0,D1,P,ST[11,10,8,7,3:0],
                   **             FUNCD0,PRMCNT[0]
                   **
                   ** Stk lvls:   5 (CKSTR)(DVSPp)
                   **
                   ** History:
                   **
                   **   Date     Programmer              Modification
                   **  --------  ----------    ------------------------------
```

```
                  **  11/28/83      NZ          Updated documentation
                  **
                  *****************************************************************
                  *****************************************************************
                  *
                  * Syntax:
                  *   Input stream: <string expression>  or
                  *        [ : ] <device specifier>  or
                  *        [ : ] {*}  or
                  *        . <volume label>
                  *   Token output: <string expression>  or
                  *        <tCOLON> <device specifier>  or
                  *        <tCOLON> <t*>  or
                  *        <tCOLON> <tSEMIC> <volume label>
                  *
     F79B0        =PACKp
     F79B0 84A    =DVCPn* ST=0    =StarOK
     F79B3 6600           GOTO    DVCSPp
                  *-
                  *-
     F79B7 85A    =DVCPy* ST=1    =StarOK         "*" OK
     F79BA 848    =DVCSPp ST=0    =OptDev         Device specifier required
                  *
     F79BD 8F00 DVCSPc   GOSBVL =EOLCK           Check if is EOL, @, !, ELSE
           000
     F79C4 5B1            GONC    DVCP05          If not, restore ptr and cont.
     F79C7 878            ?ST=1   =OptDev         Is device spec. optional ?
     F79CA 60             GOYES   DVCSPr          If so, we are done
     F79CC 6DC8           GOTO    MSGPAR          Otherwise say, Missing Parm.
                  *-
                  *-
     F79D0 7741 DVCSPr    GOSUB   RESPTR          Restore  pointer for device parse
     F79D4 20             P=      0               Load dummy comma token into C
     F79D6 3100           LC(2)   =tCOMMA
     F79DA 7DD0           GOSUB   OUTBYT          Output the comma token
     F79DE 03             RTNCC                   Already restored input pointer
                  *-
                  *-
     F79E0 7731 DVCP05    GOSUB   RESPTR          Restore pointer
     F79E4 7C90           GOSUB   CKSTR           Check if string (Carry=NO)
     F79E8 460            GOC     DVCP10          No...try literal
     F79EB 6F21           GOTO    RESPTR          Yes...restore pointer, return
                  *-
                  *-
     F79EF 7731 DVCP10    GOSUB   BLANK           Read in the character
     F79F3 31E2           LCASC   \.\             Check first for volume label
     F79F7 962            ?A=C    B               Is this a volume label?
     F79FA 22             GOYES   DVCP40          Yes...volume label
     F79FC 31A3           LCASC   \:\
     F7A00 966            ?A#C    B               Is there a colon?
     F7A03 50             GOYES   DVCP30          No...continue
                  *
                  * Colon is present...skip it
                  *
     F7A05 171            D1=D1+ 2                Skip to next item
```

```
F7A08 79AE DVCP30  GOSUB  DVSPp         Device spec parse
F7A0C 4B0  DVCP35  GOC    DVCP65        If carry, error (can't happen)
F7A0F 831          ?XM=0                OK?  Processed as is?
F7A12 21           GOYES  DVCP70        Yes...return with carry clear
F7A14 62B8         GOTO   INITp1        If not, say "Syntax"
           *-
           *-
F7A18 667B DVCP65  GOTO   Error!        Parse error, already set up
           *-
           *-
F7A1C      DVCP40
           *
           * Volume label
           *
F7A1C 7D6E         GOSUB  DVLBp         Device volume label parse
F7A20 6BEF         GOTO   DVCP35        Go check for error
           *-
           *-
F7A24 84A  DVCP70  ST=0   10            ST(10) MUST be zero (Implied LET)
F7A27 03           RTNCC
           ************************************************************
           ************************************************************
           **
           ** Name:        NAMEpb - Skip leading blanks, parse device word
           ** Name:        NAMEp - Parse a device word (C[S] is # chars)
           **
           ** Category:    PARUTL
           **
           ** Purpose:
           **      Parse a device word: <letter > {<letter> | <digit >} ^n
           **
           ** Entry:
           **      C[S] is max number of characters to accept
           **      D1 points to the ASCII character string
           **      D0 points to the location where the tokens go
           **      D[A] is the end of available memory
           **
           ** Exit:
           **      First character not used in A[B] (char @ D1)
           **      Carry set if length exceeded or first char is a digit
           **      A[S]=0 if no chars, #F if characters
           **      D0 positioned past last character output by this routine
           **      D1 positioned past last character accepted
           **      P=0
           **
           ** Calls:       BLANK,CATC++,OUT1TK
           **
           ** Uses.......
           **  Inclusive: A[S,B],C[S,B],P,D0,D1,ST[2:1]
           **
           ** Stk lvls:    3 (CATC++)
           **
           ** History:
           **
           **    Date     Programmer                 Modification
```

```
                **  --------    ----------      ----------------------------
                **  11/28/83       NZ          Updated documentation
                **
                ************************************************************
                ************************************************************
                *
                * Syntax:
                *   Input stream: [ <letter> [ <letter> | <digit> ] *n ]
                *   Token output: Same as input (with all letters converted to
                *       upper case)
                *
F7A29 7DF0 =NAMEpb GOSUB  BLANK           Skip any leading blanks!
F7A2D 20   =NAMEp  P=     0
F7A2F AC0          A=0    S               Clear "char" flag
F7A32 7BD0         GOSUB  CATC++          Read first char, set statuses
F7A36 500          RTNNC                  Not letter or digit...return, CC
F7A39 871          ?ST=1  Digit           Is this a digit?
F7A3C 00           RTNYES                 Yes...not permitted here-Set Carry
F7A3E A4C          A=A-1  S               Set A[S]="F"
F7A41 A4E  NAMEp1  C=C-1  S               Decrement count
F7A44 400          RTNC                   Error...too long! (Set Carry)
F7A47 7370         GOSUB  oUT1TK          Output the token
F7A4B 171          D1=D1+ 2               Increment to next token
F7A4E 7FB0         GOSUB  CATC++          Read it, check it out
F7A52 4EE          GOC    NAMEp1          Letter or digit...OK!
F7A55 03           RTNCC                  Carry clear = OK!
                ************************************************************
                ************************************************************
                **
                ** Name:        CKNUM - Check for a numeric expr (output it)
                ** Name:        CKNUM+ - Save D1 in R3, goto EXPPAR
                ** Name:        CKNUM- - Check EXPPAR exit conditions for number
                **
                ** Category:    LOCAL
                **
                ** Purpose:
                **       Check for a numeric expression and output the tokens
                **       for that expression
                **
                ** Entry:
                **       D1 points to the ASCII character string
                **       D0 points to the location where the tokens go
                **       D[A] is the end of available memory
                **       P=0
                **
                ** Exit:
                **       Carry set if not numeric (P is error number for parse,
                **         D1 points to the error)
                **       Carry clear if OK (tokens output, D0,D1 set to next
                **         items, P=0)
                **       D0 positioned past last token output by this routine
                **       D1 positioned past last character accepted
                **
                ** Calls:       EXPPAR
                **
```

```
           ** Uses.......
           **  Inclusive: A,B,C,D[15:5],R0,R1,R3,D0,D1,P,ST[11,7,3:0],
           **             FUNCD0,PRMCNT[0]
           **
           ** Stk lvls:   CKNUM:  4 (CKNUM+)
           ** Stk lvls:   CKNUM+: 3 (<EXPPAR>)
           ** Stk lvls:   CKNUM-: 0
           **
           ** History:
           **
           **    Date     Programmer              Modification
           **  --------   ----------    ---------------------------------
           **  11/28/83      NZ         Updated documentation
           **
           ***************************************************************
           ***************************************************************
F7A57 137  CKNUM+  CD1EX
F7A5A 108          R3=C                 Save input pointer for case of
F7A5D 135          D1=C                   string (to set error pointer)
F7A60 8D00 Exppar  GOVLNG =EXPPAR
      000
           *-
           *-
F7A67 7CEF CKNUM   GOSUB  CKNUM+        Call EXPPAR after save
           *
F7A6B 873  CKNUM-  ?ST=1  NumExp        Is it numeric?
F7A6E B0           GOYES  CKNUM1        Yes...OK
F7A70 11B          C=R3
F7A73 135          D1=C                 Restore input pointer
F7A76 590          GONC   CKNUM2        Go always
           *-
           *-
F7A79 870  CKNUM1  ?ST=1  InvalE        Invalid?
F7A7C 40           GOYES  CKNUM2        Yes...error
F7A7E 03           RTNCC                No...all OK
           *-
           *-
F7A80 20   CKNUM2  P=     =eILEXp       Illegal expression
F7A82 02           RTNSC
           ***************************************************************
           ***************************************************************
           **
           ** Name:       CKSTR - Parse a string expression
           **
           ** Category:   LOCAL
           **
           ** Purpose:
           **      CKSTR tries to parse a string expression non-destructivel
           **
           ** Entry:
           **      D1 points to the ASCII character string
           **      D0 points to the location where the tokens go
           **      D[A] is the end of available memory
           **      P=0
           **
```

```
                  ** Exit:
                  **      Carry set if not string (D0, D1 restored)
                  **      Carry clear if string (tokens output)
                  **      D0 positioned past last token output by this routine
                  **      D1 positioned past last character accepted
                  **      P=0
                  **      Exits through ERRORP if error
                  **
                  ** Calls:       SVD0D1,EXPPAR,<RSD0D1>
                  **
                  ** Uses.......
                  **  Inclusive: A,B,C,D[15:5],R0-R2,D0,D1,P,ST[11,7,3:0],FUNCD0,
                  **             PRMCNT[0]
                  **
                  ** Stk lvls:   4 (EXPPAR)
                  **
                  ** History:
                  **
                  **    Date     Programmer              Modification
                  **  --------   ----------    ---------------------------------
                  **  11/28/83       NZ        Updated documentation
                  **
                  **************************************************************
                  **************************************************************
     F7A84 7B00 =CKSTR  GOSUB  SVD0D1         Save D0 and D1 in R2
     F7A88 74DF         GOSUB  Exppar
     F7A8C 873          ?ST=1  NumExp         Valid numeric? (set unless string)
     F7A8F B1           GOYES  RSD0D1         Yes...not string
     F7A91 03           RTNCC                 Return (valid string)
                  **************************************************************
                  **************************************************************
                  **
                  ** Name:        SVD0D1 - Save D0 and D1 in R2
                  ** Name:        RSD0D1 - Restore D0 and D1 from R2
                  **
                  ** Category:    STPARS
                  **
                  ** Purpose:
                  **      Save/restore D0 and D1 in/from R2
                  **
                  ** Entry:
                  **      SVD0D1: none
                  **      RSD0D1: R2 contains D0 and D1 (from SVD0D1)
                  **
                  ** Exit:
                  **      SVD0D1: R2 contains D0 and D1 values
                  **      RSD0D1: D0 and D1 are restored from R2
                  **      P,Carry unchanged from input
                  **
                  ** Calls:       CSLC5,CSRC5
                  **
                  ** Uses.......
                  **  Inclusive: C[W],R2
                  **
                  ** Stk lvls:   1 (CSLC5)(CSRC5)
```

```
                 **
                 ** History:
                 **
                 **    Date     Programmer               Modification
                 **  --------   ----------   ----------------------------------
                 **  11/28/83       NZ        Added documentation
                 **
                 *****************************************************************
                 *****************************************************************
     F7A93 137   =SVDOD1 CD1EX
     F7A96 135           D1=C
     F7A99 8E00          GOSUBL =CSLC5         Save D1 in R2[9:5]
           00
     F7A9F 136           CD0EX
     F7AA2 134           D0=C                  Save D0 in R2[A]
     F7AA5 10A           R2=C
     F7AA8 01            RTN
                 *-
                 *-
     F7AAA 11A   =RSDOD1 C=R2
     F7AAD 134           D0=C                  Restore D0
     F7AB0 8E00          GOSUBL =CSRC5
           00
     F7AB6 135           D1=C                  Restore D1
     F7AB9 01            RTN
                 *****************************************************************
                 *
                 * These routines are identical to the mainframe routines by the
                 * same names
                 *
                 *****************************************************************
     F7ABB AEE   =OUTBYT ACEX   B
     F7ABE 8D00  =oUT1TK GOVLNG =OUT1TK
           000
                 *-
                 *-
     F7AC5 8D00  =oUT2TC GOVLNG =OUT2TC
           000
                 *-
                 *-
     F7ACC AFA   =OUT3TC A=C    W
     F7ACF 8D00  =oUT3TK GOVLNG =OUT3TK
           000
                 *-
                 *-
     F7AD6 AFA   =OUTNBC A=C    W
     F7AD9 8D00  =oUTNBS GOVLNG =OUTNBS
           000
                 *-
                 *-
                 *****************************************************************
                 *****************************************************************
                 **
                 ** Name:       NUMCK+ - Restore input pointer, check num expr
                 ** Name:       NUMCK - Check for a valid numeric expression
```

```
                   **
                   ** Purpose:
                   **      Check for a valid numeric expression. If not found,
                   **      then exit to ERRORR
                   **
                   ** Entry:
                   **      D1 points to the ASCII character string
                   **      D0 points to the location where the tokens go
                   **      D[A] is the end of available memory
                   **      P=0
                   **
                   ** Exit:
                   **      D0 positioned past last token output by this routine
                   **      D1 positioned past last character accepted
                   **      P=0
                   **      Carry clear
                   **      Exits through ERRORR if error
                   **
                   ** Calls:       RESPTR,EXPPAR
                   **
                   ** Uses.......
                   **  Inclusive: A,B,C,D[15:5],R0,R1,R3,D0,D1,P,ST[11,7,3:0],
                   **             FUNCD0,PRMCNT[0]
                   **
                   ****************************************************************
                   ****************************************************************
F7AE0 7730 =NUMCK+ GOSUB  RESPTR
F7AE4 11B  =NUMCK  C=R3                     Preserve upper part of R3
F7AE7 137          CD1EX
F7AEA 135          D1=C                     Save for case of string expression
F7AED 10B          R3=C
F7AF0 7C6F         GOSUB  Exppar            Mainframe jump to EXPPAR
F7AF4 873          ?ST=1  NumExp            Numeric?
F7AF7 B0           GOYES  NUMCK1            Yes...check if valid
F7AF9 11B          C=R3                     No...restore D1 (string expr)
F7AFC 135          D1=C
F7AFF 590          GONC   NUMCK2            Go always
                   *-
                   *-
F7B02 870  NUMCK1  ?ST=1  InvalE            Invalid expression?
F7B05 40           GOYES  NUMCK2            Yes...error
F7B07 03           RTNCC                    No...valid numeric expression
                   *-
                   *-
F7B09 20   NUMCK2  P=     =eILEXp           Illegal expression
F7B0B 8C00         GOLONG =ERRORR           Don't restore D1 (already set)
      00
                   *
                   * More duplicates of mainframe routines
                   *
F7B11 14B  =CATC++ A=DAT1 B
F7B14 8D00 =cATCH+ GOVLNG =CATCH+
      000
                   ****************************************************************
                   ****************************************************************
```

```
                 **
                 ** Name:       RESPTR - Restore D1 from LEXPTR
                 **
                 ** Category:   LOCAL
                 **
                 ** Purpose:
                 **      Restore the input pointer from LEXPTR
                 **
                 ** Entry:
                 **      None
                 **
                 ** Exit:
                 **      D1 restored from LEXPTR
                 **      Carry clear
                 **
                 ** Calls:      None
                 **
                 ** Uses.......
                 **  Inclusive: A[A],D1
                 **
                 ** Stk lvls:   0
                 **
                 ** History:
                 **
                 **    Date     Programmer            Modification
                 **  --------   ----------    ---------------------------------
                 **  11/28/83      NZ         Added documentation
                 **
                 **************************************************************
                 **************************************************************
F7B1B 1F00 =RESPTR D1=(5) =LEXPTR
      000
F7B22 143          A=DAT1 A
F7B25 131          D1=A
F7B28 03           RTNCC
                 **************************************************************
                 **************************************************************
                 **
                 ** Name:       BLANK - Skip blanks, return first non-blank char
                 **
                 ** Category:   PARUTL
                 **
                 ** Purpose:
                 **      Skip blanks in the input stream
                 **
                 ** Entry:
                 **      D1 points to the input stream
                 **
                 ** Exit:
                 **      A[B] contains the next character
                 **      D1 points to the character in A[B]
                 **
                 ** Calls:      None
                 **
                 ** Uses.......
```

```
                ** Inclusive: A[B],C[B],P,D1 (D1 only if leading blanks)
                **
                ** Stk lvls:   0
                **
                ** History:
                **
                **   Date     Programmer              Modification
                **  --------  ----------   ---------------------------------
                **  11/28/83     NZ        Updated documentation
                **
                ***************************************************************
                ***************************************************************
 F7B2A 20       =BLANK  P=     0
 F7B2C 3102             LCASC  \ \
 F7B30 1C1              D1=D1- 2
 F7B33 171      Skip    D1=D1+ 2
 F7B36 14B      =SKIP   A=DAT1 B
 F7B39 962              ?A=C   B
 F7B3C 7F               GOYES  Skip
 F7B3E 01               RTN
                *-
                *-
 F7B40 8D00     Ntoken  GOVLNG =NTOKEN
       000
                ***************************************************************
                ***************************************************************
                **
                ** Name:        ENABLp - Parse the ENABLE INTR statement
                **
                ** Category:    STPARS
                **
                ** Purpose:
                **      Parse the ENABLE INTR statement
                **
                ** Entry:
                **      D1 points to the ASCII character string
                **      D0 points to the location where the tokens go
                **      D[A] is the end of available memory
                **      P=0
                **
                ** Exit:
                **      D0 positioned past last token output by this routine
                **      D1 positioned past last character accepted
                **      P=0
                **      Exits through ERRORP if error
                **
                ** Calls:       WRDSCN,<REQSTp>
                **
                ** Uses.......
                **  Inclusive: A,B,C,D[15:5],R0,R1,R2,D0,D1,P,ST[11,7,3:0],
                **             FUNCD0,PRMCNT[0]
                **
                ** Stk lvls:   5 (<REQSTp>)
                **
                ** History:
                 **
                 **    Date      Programmer              Modification
                 **  --------    ----------    ---------------------------------
                 **  11/28/83        NZ        Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
F7B47 7840       =ENABLp GOSUB  wrdscn
F7B4B 00                 CON(2) =tXWORD
F7B4D 00                 CON(2) =LEXPIL
F7B4F 00                 CON(2) =tINTRR
F7B51 900                REL(3) ENBLp1
F7B54 00                 CON(2) 00
F7B56 607A               GOTO   INITp1          Syntax error
                 *_
                 *_
F7B5A 185        ENBLp1  D0=D0- 6               Don't output the INTR token
                 *
                 * Fall into REQUEST parse (ENABLE and REQUEST match after INTR)
                 *
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:        REQSTp - Parse the REQUEST statement
                 **
                 ** Category:    STPARS
                 **
                 ** Purpose:
                 **       Parse the REQUEST statement
                 **
                 ** Entry:
                 **       D1 points to the ASCII character string
                 **       D0 points to the location where the tokens go
                 **       D[A] is the end of available memory
                 **       P=0
                 **
                 ** Exit:
                 **       D0 positioned past last token output by this routine
                 **       D1 positioned past last character accepted
                 **       P=0
                 **       Exits through ERRORP if error
                 **
                 ** Calls:       LOOPWp,ST!NOp,<RESPTR>
                 **
                 ** Uses.......
                 **  Inclusive:  A,B,C,D[15:5],R0,R1,R2,D0,D1,P,ST[11,7,3:0],
                 **              FUNCD0,PRMCNT[0]
                 **
                 ** Stk lvls:    6 (LOOPWp)
                 **
                 ** History:
                 **
                 **    Date      Programmer              Modification
                 **  --------    ----------    ---------------------------------
                 **  11/28/83        NZ        Added documentation
```

```
                **
                ****************************************************************
                ****************************************************************
                *
                * ENABLE parse falls into REQUEST parse
                *
F7B5D 7B0B =REQSTp GOSUB  LOOPMp
F7B61 84A          ST=0   =StrOK
F7B64 74CC         GOSUB  ST'NOp         Check for a string or number
F7B68 460          GOC    REQp10         Error if carry
F7B6B 6FAF         GOTO   RESPTR         Restore pointer if OK
                *-
                *-
F7B6F 699F REQp10  GOTO   NUMCK2
                ****************************************************************
                ****************************************************************
                **
                ** Name:       PASSp - Parse the PASS CONTROL statement
                **
                ** Category:   STPARS
                **
                ** Purpose:
                **      Parse the PASS CONTROL statement
                **
                ** Entry:
                **      D1 points to the ASCII character string
                **      D0 points to the location where the tokens go
                **      D[A] is the end of available memory
                **      P=0
                **
                ** Exit:
                **      D0 positioned past last token output by this routine
                **      D1 positioned past last character accepted
                **      P=0
                **      Exits through ERRORP if error
                **
                ** Calls:      WRDSCN,<DVCSPc>
                **
                ** Uses.......
                **  Inclusive: A,B,C,D[15:5],R0-R4,D0,D1,P,ST[11:7,3:0],
                **             FUNCDO,PRMCNT[0]
                **
                ** Stk lvls:   5 (<DVCSPc>)
                **
                ** History:
                **
                **   Date     Programmer              Modification
                **  --------  ----------   --------------------------------
                **  11/28/83      NZ       Added documentation
                **
                ****************************************************************
                ****************************************************************
F7B73 7C10 =PASSp  GOSUB  wrdscn
F7B77 00           CON(2) =tXWORD
F7B79 00           CON(2) =LEXPIL
```

```
F7B7B 00              CON(2) =tCNTRL
F7B7D 900             REL(3) PASp10        ADDRESS FOR MATCHING
F7B80 00              CON(2) 00
F7B82 671A PASpER     GOTO   MSGPAR        Missing parameter
           *-
           *-
F7B86 185  PASp10     D0=D0- 6             Don't need the tCNTRL
F7B89 84A             ST=0   =StarOK       "*" is not OK here
F7B8C 858             ST=1   =OptDev       Device spec is optional
F7B8F 6D2E            GOTO   DVCSPc
           *-
           *-
F7B93 8D00 wrdscn     GOVLNG =WRDSCN
      000
           ***************************************************************
           ***************************************************************
           **
           ** Name:       CNTRLp - Parse the CONTROL ON/OFF statement
           ** Name:       RESTp - Parse the RESTORE IO statement
           **
           ** Category:   STPARS
           **
           ** Purpose:
           **      Parse the CONTROL ON/OFF or RESTORE IO statement
           **
           ** Entry:
           **      D1 points to the ASCII character string
           **      D0 points to the location where the tokens go
           **      D[A] is the end of available memory
           **      P=0
           **
           ** Exit:
           **      D0 positioned past last token output by this routine
           **      D1 positioned past last character accepted
           **      P=0
           **      If no error, carry clear
           **      Exits through ERRORP if error
           **
           ** Calls:      WRDSCN,EOLCK,NUMCK+,<RESPTR>
           **
           ** Uses.......
           **  Inclusive: A,B,C,D[15:5],R0-R2,R3[A],D0,D1,P,ST[11,7,3:0],
           **             FUNCD0,PRMCNT[0]
           **
           ** Stk lvls:   5 (NUMCK+)
           **
           ** History:
           **
           **    Date     Programmer               Modification
           **  --------   ----------   ----------------------------------
           **  11/28/83      NZ        Added documentation
           **
           ***************************************************************
           ***************************************************************
F7B9A 75FF =CNTRLp GOSUB  wrdscn
```

```
F7B9E 00              CON(2) =tON
F7BA0 210             REL(3) CNTROL          CONTROL ON
F7BA3 00              CON(2) =tOFF
F7BA5 D00             REL(3) CNTROL          CONTROL OFF
F7BA8 00              CON(2) 00
F7BAA 670F            GOTO   PASpER          "Missing Parameter"
                *-
                *-
F7BAE 79AA =RESTp     GOSUB  IOp             First parse "IO"
                *
                * Check for optional numeric expression
                *
F7BB2 8F00 CNTROL     GOSBVL =EOLCK          See if reached end-of-statement
      000
F7BB9 460             GOC    Resptr          Yes...done
F7BBC 702F            GOSUB  NUMCK+          Must be a numeric expr
F7BC0 6A5F Resptr     GOTO   RESPTR
                *-
                *-
F7BC4 3100 OUT:       LC(2)  =tCOLON
F7BC8 62FE            GOTO   OUTBYT
                **************************************************************
                **************************************************************
                **
                ** Name:        CONWUC - Convert A[W] to upper case
                **
                ** Category:    PILUTL
                **
                ** Purpose:
                **      Convert A[W] to upper case
                **
                ** Entry:
                **      P=0
                **      D1 points at the letters and digits to convert
                **
                ** Exit:
                **      A[W] in upper case
                **      P=0
                **      Carry clear
                **
                ** Calls:       <CNVWUC>
                **
                ** Uses.......
                **  Inclusive: A[W],C[W]
                **
                ** Stk lvls:    1 <CNVWUC>
                **
                ** History:
                **
                **    Date      Programmer            Modification
                **  --------    ----------    --------------------------------
                **  09/07/83        NZ        Changed entry to read data at D1
                **                            first, then convert to upper case
                **  09/06/83        NZ        Changed to goto mainframe routine
                **  01/03/83        NZ        Updated documentation
```

```
                 **
                 ******************************************************************
                 ******************************************************************
     F7BCC 8D00  =CONWUC GOVLNG =CNVWUC       Convert to upper case (mainframe)
           000
     F7BD3               END
```

```
 ?A=CM+   Ext                    -   223   802
=ASGMp    Abs 1013404 #F769C -   655
 ASGMp1   Abs 1013436 #F76BC -   669   664
 ASGMp2   Abs 1013444 #F76C4 -   673   660
=BLANK    Abs 1014570 #F7B2A -  1911   453   822   838   926  1053  1139  1513
                                1590
=CATC++   Abs 1014545 #F7B11 -  1841  1593  1602
 CATCH+   Ext                -  1842
 CKNUM    Abs 1014375 #F7A67 -  1656   230   239   351   904
 CKNUM+   Abs 1014359 #F7A57 -  1650  1328  1338  1361  1375  1656
 CKNUM-   Abs 1014379 #F7A6B -  1658  1329  1339  1362  1376
 CKNUM1   Abs 1014393 #F7A79 -  1665  1659
 CKNUM2   Abs 1014400 #F7A80 -  1670  1662  1666
=CKSTR    Abs 1014404 #F7A84 -  1712   659  1228  1508
=CLEARp   Abs 1013278 #F761E -   409
=CNTRLp   Abs 1014682 #F7B9A -  2116
 CNTROL   Abs 1014706 #F7BB2 -  2129  2118  2120
 CNVWUC   Ext                -  2174
=CONWUC   Abs 1014732 #F7BCC -  2174   201   454   828
 CSLC5    Ext                -  1754
 CSRC5    Ext                -  1763
=DEVSPp   Abs 1013938 #F78B2 -  1291
 DISPP    Ext                -   118
 DVCP05   Abs 1014240 #F79E0 -  1507  1494
 DVCP10   Abs 1014255 #F79EF -  1513  1509
 DVCP30   Abs 1014280 #F7A08 -  1524  1519
 DVCP35   Abs 1014284 #F7A0C -  1525  1539
 DVCP40   Abs 1014300 #F7A1C -  1534  1516
 DVCP65   Abs 1014296 #F7A18 -  1531  1525
 DVCP70   Abs 1014308 #F7A24 -  1542  1527
=DVCPn*   Abs 1014192 #F79B0 -  1486   116   124
=DVCPy*   Abs 1014199 #F79B7 -  1490    73
 DVCSPc   Abs 1014205 #F79BD -  1493   414  2072
=DVCSPp   Abs 1014202 #F79BA -  1491  1487
 DVCSPr   Abs 1014224 #F79D0 -  1500  1496
=DVLBp    Abs 1013901 #F788D -  1261  1538
=DVSPp    Abs 1013941 #F78B5 -  1292  1524
=Digit    Abs       1 #00001 -    18  1595
=ENABLp   Abs 1014599 #F7B47 -  1960
 ENBLp1   Abs 1014618 #F7B5A -  1969  1964
=ENTERp   Abs 1013021 #F751D -   124
 ENTR10   Abs 1013042 #F7532 -   129   127
 EOLCK    Ext                -  1493  2129
 ERROR'   Ext                -   212
 ERRORP   Ext                -   670
 ERRORR   Ext                -  1837
 EXPPAR   Ext                -  1653
=EolOK    Abs       9 #00009 -    29   823  1031  1048
 Error'   Abs 1013135 #F758F -   212  1531
 Errorp   Abs 1013438 #F76BE -   670   161   218   241   245
 Errorx   Abs 1013354 #F766A -   561   458   610
 Exppar   Abs 1014368 #F7A60 -  1653  1117  1713  1823
=ExprOK   Abs       8 #00008 -    28   785  1032  1035
=FILSPp   Abs 1013858 #F7862 -  1233  1229
=FILSp    Abs 1013847 #F7857 -  1228   210
```

```
 FILSp'  Abs 1014040 #F7918 -  1349  1279  1395  1401
 FILSp0  Abs 1013935 #F78AF -  1287  1254
 FILSp1  Abs 1013979 #F78DB -  1314  1296
 FILSp2  Abs 1014003 #F78F3 -  1331  1419
 FILSp3  Abs 1014044 #F791C -  1353  1333  1385
 FILSp4  Abs 1014076 #F793C -  1367  1320
 FILSp5  Abs 1014103 #F7957 -  1392  1384
 FILSp6  Abs 1014135 #F7977 -  1405  1377
 FILSp8  Abs 1014180 #F79A4 -  1427  1230  1364
 FILSp9  Abs 1014184 #F79A8 -  1428  1308
 FILSpX  Abs 1014174 #F799E -  1422  1284  1311  1363  1412  1417
 FILSpn  Abs 1013931 #F78AB -  1284  1247  1257  1274
 FILSpx  Abs 1013975 #F78D7 -  1311  1302  1330  1340  1347
 FILsp8  Abs 1014072 #F7938 -  1364  1355
 FRAMEE  Ext                -  1012
 FRASP1  Abs 1013635 #F7783 -   987   993
 FRASP2  Abs 1013663 #F779F -   999  1002
 FRASP3  Abs 1013793 #F7821 -  1056  1013
 FRASPn  Abs 1013778 #F7812 -  1050  1047
=FRASPp  Abs 1013609 #F7769 -   975   777   842
 FRASPx  Abs 1013740 #F77EC -  1036  1034
 FRASPy  Abs 1013775 #F780F -  1049  1039
 INITP.  Abs 1013141 #F7595 -   215   211
 INITP0  Abs 1013152 #F75A0 -   221   216
 INITP2  Abs 1013156 #F75A4 -   222   240
 INITPE  Abs 1013187 #F75C3 -   241   231
=INITPR  Abs 1013176 #F75B8 -   232   224   353
=INITp   Abs 1013105 #F7571 -   201
 INITp1  Abs 1013191 #F75C7 -   244   205  1528  1966
=IOp     Abs 1013339 #F765B -   555   655  2125
 IOp10   Abs 1013363 #F7673 -   565   559
 IOp20   Abs 1013366 #F7676 -   566   505
=InvalE  Abs       0 #00000 -    17  1118  1665  1831
 LEXPIL  Ext                -   340   503   557   606  1962  2062
 LEXPIR  Ext                -  1875
=LOCALp  Abs 1013225 #F75E9 -   332
 LOCLp1  Abs 1013274 #F761A -   362   345
 LOOP#1  Abs 1013601 #F7761 -   921   905   913
 LOOP#2  Abs 1013605 #F7765 -   926   918
=LOOP#p  Abs 1013564 #F773C -   900   284   767  2014
 Loopp   Abs 1013249 #F7601 -   350   463
 MSGPAR  Abs 1013146 #F759A -   217  1497  2066
=NAMEp   Abs 1014317 #F7A2D -  1591  1273  1411
 NAMEp1  Abs 1014337 #F7A41 -  1598  1603
=NAMEpb  Abs 1014313 #F7A29 -  1590  1242
 NTOKEN  Ext                -  1921
=NUMCK   Abs 1014500 #F7AE4 -  1819
=NUMCK+  Abs 1014496 #F7AE0 -  1818  2131
 NUMCK1  Abs 1014530 #F7B02 -  1831  1825
 NUMCK2  Abs 1014537 #F7B09 -  1836  1828  1832  2021
 Ntoken  Abs 1014592 #F7B40 -  1921    69   143   221   333   614   661  1293
                               1349  1418
=NumExp  Abs       3 #00003 -    20  1120  1658  1714  1824
=OFFIOp  Abs 1013320 #F7648 -   501
=ONINTp  Abs 1013368 #F7678 -   604
```

```
 ONINp1  Abs 1013387 #F768B -   613   608
 ONP40   Ext                -   616
 OUT1TK  Ext                -  1773
 OUT2TC  Ext                -  1776
=OUT3TC  Abs 1014476 #F7ACC -  1779
 OUT3TK  Ext                -  1780
 OUT:    Abs 1014724 #F7BC4 -  2135   665   834   977  1292  1337
=OUTBYT  Abs 1014459 #F7ABB -  1772   130   156   359   666   903  1116  1236
                               1307  1360  1408  1503  2136
=OUTNBC  Abs 1014486 #F7AD6 -  1783
 OUTNBS  Ext                -  1784
=OUTPp   Abs 1013006 #F750E -   116
 OUTpCK  Abs 1013063 #F7547 -   143   117   125
=OptDev  Abs       8 #00008 -    30   412  1491  1495  2071
=PACKp   Abs 1014192 #F79B0 -  1485
=PASSp   Abs 1014643 #F7B73 -  2060
 PASp10  Abs 1014662 #F7B86 -  2069  2064
 PASpER  Abs 1014658 #F7B82 -  2066  2122
 PRNTPE  Abs 1013099 #F756B -   160    72
=PRNTSp  Abs 1012989 #F74FD -    69
 READP5  Ext                -   133
=REMOTp  Abs 1013278 #F761E -   410
=REQSTp  Abs 1014621 #F7B5D -  2014
 REQp10  Abs 1014639 #F7B6F -  2021  2017
=RESETp  Abs 1013288 #F7628 -   453
=RESPTR  Abs 1014555 #F7B1B -  1875   157   232   291   362   510   673   821
                               1373  1392  1427  1500  1507  1510  1818  2018
                               2132
 REST*   Ext                -   562
=RESTp   Abs 1014702 #F7BAE -  2125
=RSDOD1  Abs 1014442 #F7AAA -  1761   354   925  1138  1405  1715
=RTNCC   Abs 1014190 #F79AE -  1434   287   289
 Resptr  Abs 1014720 #F7BC0 -  2132  2130
 SENDP1  Abs 1013452 #F76CC -   777   778   843
 SENDP2  Abs 1013471 #F76DF -   802   808
 SENDP3  Abs 1013499 #F76FB -   821   803
 SENDP4  Abs 1013552 #F7730 -   842   824   832
 SENDP5  Abs 1013559 #F7737 -   849   786   798   818
 SENDlp  Abs 1013485 #F76ED -   814   817
=SENDp   Abs 1013448 #F76C8 -   762
=SKIP    Abs 1014582 #F7B36 -  1915
 ST!NO1  Abs 1013835 #F784B -  1127  1121
 ST!NO2  Abs 1013837 #F784D -  1134  1119  1126
=ST!NOp  Abs 1013804 #F782C -  1110   797   807  2016
=STANDp  Abs 1013197 #F75CD -   284
=STANp+  Abs 1013180 #F75BC -   238   292
=SVDOD1  Abs 1014419 #F7A93 -  1752   350   900  1114  1374  1712
 Skip    Abs 1014579 #F7B33 -  1914  1917
=SpChar  Abs       2 #00002 -    19
=StarOK  Abs      10 #0000A -    26    27   413  1291  1301  1486  1490  2070
=StrOK   Abs      10 #0000A -    27   849  1030  1049  1125  2015
=TRIGp   Abs 1013278 #F761E -   411
 USINGp  Ext                -   126
 Ucrang  Ext                -   975   992
 WRDSCN  Ext                -  2075
```

```
=XWORDp  Abs 1014190 #F79AE -  1433
=XWRD1p  Abs 1013169 #F75B1 -   229
=cATCH+  Abs 1014548 #F7B14 -  1842  1394
 chkOK   Abs 1013087 #F755F -   155   146   149
 eILEXp  Ext                -  1670  1836
 eILPAr  Ext                -   669  1300
 eMSPAr  Ext                -   217  1345
 eSYNTx  Ext                -   160   244
=oUT1TK  Abs 1014462 #F7ABE -  1773   225   917  1324  1600
=oUT2TC  Abs 1014469 #F7AC5 -  1776  1270
=oUT3TK  Abs 1014479 #F7ACF -  1780   349
=oUTNBS  Abs 1014489 #F7AD9 -  1784   837  1052
 tX      Ext                -  1318
 t*      Ext                -   662  1294
 t@      Ext                -   155
 tCNTRL  Ext                -  2063
 tCOLON  Ext                -  1266  2135
 tCOMMA  Ext                -   358  1115  1502
 tINTRR  Ext                -   504   607  1963
 tIO     Ext                -   558
 tIS     Ext                -    70
 tLITRL  Ext                -  1235  1407
 tLOCKO  Ext                -   341
 tOFF    Ext                -   288  2119
 tON     Ext                -   286  2117
 tSEMIC  Ext                -   129   147   902   911  1267  1359
 tUSING  Ext                -   144
 tXWORD  Ext                -   339   502   556   605  1961  2061
 wrdscn  Abs 1014675 #F7B93 -  2075   285   501   555   604  1960  2060  2116
```

```
Input Parameters

  Source file name is NZ&PAR::MS

  Listing file name is NZ/PAR:TI:ML::-1

  Object file name is NZ%PAR:TI:MS::-1

                                          111111
                                0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
               *
               *       N   N  ZZZZZ   &     DDDD   EEEEE   CCC
               *       N   N      Z  & &     D  D  E      C   C
               *       NN  N     Z   & &     D  D  E      C
               *       N N N    Z     &      D  D  EEEE   C
               *       N  NN   Z     & & &   D  D  E      C
               *       N   N  Z      &  &    D  D  E      C   C
               *       N   N  ZZZZZ   && &  DDDD   EEEEE   CCC
               *
               *
                       TITLE  PIL DECOMPILE ROUTINES<840301.1342>
 F7BD3                 ABS    #F7BD3         TIXHP6 address (fixed)
               ***********************************************************
               ***********************************************************
               **
               ** Name:       PRNTSD - PRINTER IS decompile routine
               ** Name:       PACKd  - PACK decompile (device spec,OUTELA)
               **
               ** Category:   STDCMP
               **
               ** Purpose:
               **      Decompile the PRINTER IS/PACK statements
               **
               ** Entry:
               **      D1 points to tokenized device spec
               **      D0 points to output buffer
               **      D[A] is end of available memory, P=0
               **
               ** Exit:
               **      Exits through OUTELA
               **      Carry clear, P=0
               **
               ** Calls:      OUT3TC,?A=CLN,PILDC,?A=CMA,OUTCMA,EXPRDC
               **
               ** Uses.......
               **  Exclusive: A,  C
               **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
               **
               ** Stk lvls:   6 (PILDC)
               **
               ** Detail:
               **      Decompiles 1 or more device specs (separated by
               **        commas)
               **
               ** History:
               **
               **   Date     Programmer               Modification
               **  --------  ----------   ---------------------------------
               **  12/22/82      NZ       Updated documentation
               **
               ***********************************************************
               ***********************************************************
 F7BD3         =PRNTSd
 F7BD3 3594            LCASC  \ SI\          "IS "
       3502
```

```
F7BDB 7000          GOSUB  =OUT3TC       Output 3 tokens!
           *
           * Device decompile
           *
F7BDF 148  =PACKd  A=DAT1 B              Read in the token (OUT3TC kills)
F7BE2 7003          GOSUB  ?A=CLN        Is this a colon?
F7BE6 571           GONC   PACKD6        No...string expression
           *
           * D1 points to tCOLON of a device specifier
           *
F7BE9 7BB1          GOSUB  PILDC         Decompile the device specifier
F7BED 77E2          GOSUB  ?A=CMA        Is there a comma?
F7BF1 501           GONC   PACKD9        No...exit
F7BF4 171           D1=D1+ 2             Yes...skip it,
F7BF7 7ED1          GOSUB  Outcma          output it, continue
F7BFB 53E           GONC   PACKd         Go always!
           *_
           *_
F7BFE 7F62 PACKD6   GOSUB  Exprdc        String expression specifier
F7C02 6850 PACKD9   GOTO   Outela        Output End-Of-Line
           ***************************************************************
           ***************************************************************
           **
           ** Name:        OUTPd - OUTPUT decompile routine
           **
           ** Category:    STDCMP
           **
           ** Purpose:
           **      Decompile the OUTPUT statement
           **
           ** Entry:
           **      D0 points to the output buffer
           **      D1 points to the input buffer (tokens)
           **      D[A] is the end of available memory
           **      P=0
           **
           ** Exit:
           **      D0 at next position in output buffer
           **      D1 at next character in input buffer
           **      P=0
           **
           ** Calls:       ?A=CLN,PILDC,?A=CMA,OUTCMA,OUTBLK,EXPRDC
           **
           ** Uses.......
           **  Exclusive: A,  C,           D1
           **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
           **
           ** Stk lvls:   6 (PILDC)
           **
           ** History:
           **
           **    Date      Programmer            Modification
           **   --------   ----------   ---------------------------------
           **   12/22/82       NZ       Updated documentation
           **
```

```
                 ****************************************************************
                 ****************************************************************
    F7C06        =OUTPd
    F7C06 7CD2            GOSUB  ?A=CLN
    F7C0A 572             GONC   OUTPd4         Not COLON: must be string expr
    F7C0D 7791 OUTPd1     GOSUB  PILDC          Decompile the device spec
    F7C11        OUTPd2
    F7C11 73C2            GOSUB  ?A=CMA         A=DAT1 B; LC(2) =tCOMMA
    F7C15 171             D1=D1+ 2              Skip this token (tCOMMA or t@)
    F7C18 966             ?A#C   B              Match?
    F7C1B 90              GOYES  OUTPd3         No...go to DISPDC
    F7C1D 78B1            GOSUB  Outcma         Yes...output the comma, loop back
    F7C21 5BE             GONC   OUTPd1         Go always
                 *-
                 *-
                 *
                 * Now have a non-comma token...must be the t@ I added
                 *
    F7C24 79A1 OUTPd3     GOSUB  Outblk         Output a trailing blank
    F7C28 14B             A=DAT1 B              Read the next char for DISPDC
    F7C2B 8D00            GOVLNG =DISPDC        Continue at DISP decompile
          000
                 *-
                 *-
    F7C32 7B32 OUTPd4     GOSUB  Exprdc         Output the expression
    F7C36 6ADF            GOTO   OUTPd2         (Token is t@...never comma)
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:        INITd - Decompile INITIALIZE statement
                 **
                 ** Category:    STDCMP
                 **
                 ** Purpose:
                 **      Decompile the INITIALIZE statement
                 **
                 ** Entry:
                 **      D0 points to the output buffer
                 **      D1 points to the input buffer
                 **      D(A) is the end of available memory
                 **      P=0
                 **      A(B)=data pointed to by D1
                 **
                 ** Exit:
                 **      D0,D1 positioned after the INITIALIZE statement
                 **      P=0
                 **
                 ** Calls:       OUTNBC,FILDC*,?A=CMA,OUTCMA,EXPRDC
                 **
                 ** Uses.......
                 **  Exclusive: A,  C,             D1,P
                 **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
                 **
                 ** Stk lvls:    6 (FILDC*)
                 **
```

```
                  ** History:
                  **
                  **    Date     Programmer              Modification
                  **  --------   ----------    --------------------------------
                  **  12/22/82       NZ        Updated documentation
                  **
                  ****************************************************************
                  ****************************************************************
F7C3A             =INITd
F7C3A 3794               LCASC  \ EZI\          "IZE " OF INITIAL IZE
      A554
      02
                  *
                  * Back up the output pointer ("INITIAL " is out already)
                  *
F7C44 27                 P=     7               Output 8 nibbles (IZE )
F7C46 181                D0=D0- 2               Back up over the blank...
F7C49 7000               GOSUB  =OUTNBC         Output P+1 nibbles
F7C4D 8F00               GOSBVL =FILDC*         Output the file specifier
      000
F7C54             INITDO
F7C54 7082               GOSUB  ?A=CMA          Is there a tCOMMA?
F7C58 4C0                GOC    INITD3          Yes...decompile the expression
F7C5B             Outela
F7C5B 14B         =XWORDd A=DAT1 B              (Could change to GOVLNG =OUTEL1)
F7C5E 8D00               GOVLNG =OUTELA         Output end of line
      000
                  *_
                  *_
                  *
                  * Found an optional parameter expression
                  *
F7C65 171         INITD3  D1=D1+ 2              Skip the comma token
F7C68 7D61               GOSUB  Outcma          OUTPUT COMMA
                  *
                  * Entry for <XWORD> <Expression> [, <Expression> ]*
                  *
F7C6C             =STANd+
F7C6C 7102        =INITD2 GOSUB  Exprdc         Decompile the expression
F7C70 63EF               GOTO   INITDO          Check if more follows
                  ****************************************************************
                  ****************************************************************
                  **
                  ** Name:         STANDd - STANDBY decompile
                  **
                  ** Category:     STDCMP
                  **
                  ** Purpose:
                  **       Decompile the STANDBY statement
                  **
                  ** Entry:
                  **       D1 points to the tokenized statement
                  **       D0 points to the output buffer
                  **       D[A] is the end of available memory
                  **       P=0
```

```
                 **
                 ** Exit:
                 **      D0, D1 updated past statement contents
                 **      P=0
                 **
                 ** Calls:      LOOP#d,<INITD2>
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
                 **
                 ** Stk lvls:   5 (EXPRDC)
                 **
                 ** History:
                 **
                 **   Date      Programmer              Modification
                 **  --------   ----------    ----------------------------------
                 **  02/25/83      NZ         Added documentation
                 **
                 ****************************************************************
                 ****************************************************************
F7C74 77C0 =STANDd GOSUB  LOOP#d         Decompile optional loop #
F7C78 3100         LC(2)  =tON
F7C7C 962          ?A=C   B              Is this STANDBY ON?
F7C7F B0           GOYES  STANdj         Yes...output text
F7C81 3100         LC(2)  =tOFF
F7C85 966          ?A#C   B              Is this STANDBY OFF?
F7C88 4E           GOYES  STANd+         No...must be expression
F7C8A 6712 STANdj  GOTO   CNTRLd         Decompile shared with CONTROL
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:       LOCALd  -  Decompile LOCAL statement
                 **
                 ** Category:   STDCMP
                 **
                 ** Purpose:
                 **      Decompile LOCAL [ LOCKOUT ] statement
                 **
                 ** Entry:
                 **      D0 points to the output buffer
                 **      D1 points to the input buffer
                 **      D[A] is the end of available memory
                 **      P=0
                 **
                 ** Exit:
                 **      D0,D1 positioned after the LOCAL statement
                 **      P=0
                 **
                 ** Calls:      GTEXT+,?A=CMA,OUTBLK,EXPRDC
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,9,10,11]
                 **
                 ** Stk lvls:   5 (EXPRDC)
                 **
```

```
                  ** History:
                  **
                  **    Date      Programmer            Modification
                  **  --------    ----------    ---------------------------------
                  **  10/26/83       NZ         Updated documentation
                  **  02/01/83       JH         Added Routine
                  **
                  ***********************************************************
                  ***********************************************************
F7C8E 1585 =LOCALd A=DAT1 6
F7C92 AF6          C=A    W             Set high nibs for compare
                  *
                  * Following lines are REALLY...
                  *        LC(6)  (=tLOCKO)~(=LEXPIL)~(tXWORD)
                  *****
F7C95 35           NIBHEX 35            LC(6)....
F7C97 00           CON(2) =tXWORD       tXWORD~...
F7C99 00           CON(2) =LEXPIL       LEXPIL~.
F7C9B 00           CON(2) =tLOCKO       tLOCKO.
                  *****
F7C9D 976          ?A#C   W             Is this LOCAL LOCKOUT?
F7CA0 72           GOYES  CLEARd        No...just a device specifier
                  *
                  * LOCAL LOCKOUT...
                  *
F7CA2 849          ST=0   9             No trailing blank
F7CA5 8F00         GOSBVL =GTEXT+
      000
F7CAC 7822 Loopd   GOSUB  ?A=CMA        A=DAT1 B;LC(2) =tCOMMA
F7CB0 171          D1=D1+ 2
F7CB3 962          ?A#C   B             Loop specifier?
F7CB6 D0           GOYES  LOCLd1        No...done
F7CB8 1C1          D1=D1- 2             Yes...skip the tCOMMA
F7CBB 7211         GOSUB  Outblk        Output the blank
F7CBF 7EA1         GOSUB  Exprdc        Decompile the loop expression
F7CC3 679F LOCLd1  GOTO   Outela        Output end of line
                  ***********************************************************
                  ***********************************************************
                  **
                  ** Name:        CLEARd, TRIGd, REMOTd - Device spec decompile
                  **
                  ** Category:    STDCMP
                  **
                  ** Purpose:
                  **      Decompile CLEAR, TRIGGER and REMOTE statements
                  **
                  ** Entry:
                  **      D0 points to the output buffer
                  **      D1 points to the input buffer
                  **      D[A] is the end of available memory
                  **      P=0
                  **
                  ** Exit:
                  **      D0, D1 positioned after the CLEAR, LOCAL or REMOTE stmt
                  **      P=0
```

```
                **
                ** Calls:      ?A=CMA,<PACKd>
                **
                ** Uses.......
                **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
                **
                ** Stk lvls:   6 (PILDC)
                **
                ** History:
                **
                **    Date     Programmer            Modification
                **  --------   ----------    ---------------------------------
                **  10/26/83       NZ        Updated documentation
                **  02/01/83       JH        Added optional device capability
                **
                ****************************************************************
                ****************************************************************
    F7CC7       =REMOTd
    F7CC7       =TRIGd
    F7CC7       =CLEARd
    F7CC7 7D02          GOSUB  ?A=CMA        Check for tCOMMA
    F7CCB 590           GONC   CLRD10        Not found...decompile device spec
    F7CCE 171           D1=D1+ 2             Found tCOMMA...skip it (EOL)
    F7CD1 698F          GOTO   Outela        Output end of line
                *-
                *-
    F7CD5       CLRD10
                *
                * Now have a <Device spec>
                *
    F7CD5 690F          GOTO   PACKd
                ****************************************************************
                ****************************************************************
                **
                ** Name:       OFFIOd - OFF IO and OFF INTR decompile
                ** Name:       RESTd - RESTORE IO decompile
                **
                ** Category:   STDCMP
                **
                ** Purpose:
                **      Decompile the "IO" part of OFF IO and RESTORE IO
                **      Decompile the "INTR" part of OFF INTR
                **      Decompile the "IO " <expr> of RESTORE IO [<num expr>]
                **
                ** Entry:
                **      D0 points to the output buffer
                **      D1 points to the input buffer (tokenized line)
                **      A[B]=next input token
                **      D[A] is then end of available memory
                **      P=0
                **
                ** Exit:
                **      Exits through OUTELA
                **      D0 points to the output buffer
                **      D1 points to the input buffer
                **
                ** Calls:      OtINTR,IOd,IOdspc
                **
                ** Uses.......
                **  Exclusive:   C
                **  Inclusive: A,C,D0,D1,P
                **
                ** Stk lvls:   3 (IOdspc)
                **
                ** History:
                **
                **    Date     Programmer              Modification
                **  --------   ----------    ---------------------------------
                **  12/22/82       NZ        Updated documentation
                **
                ***************************************************************
                ***************************************************************
 F7CD9 3100 =OFFIOd LC(2)  =tXWORD
 F7CDD 966          ?A#C   B
 F7CE0 C0           GOYES  OFIOd1
                *
                * This is OFF INTR
                *
 F7CE2 175          D1=D1+ 6           Step over the tINTR
 F7CE5 7D01         GOSUB  OtINTR      Output the INTR
 F7CE9 560          GONC   OFIOd2      Go always
                *_
                *_
 F7CEC          OFIOd1
 F7CEC 7400         GOSUB  IOd         Decompile "IO"
 F7CF0 6A6F OFIOd2  GOTO   Outela      Exit
                *_
                *_
 F7CF4 3394 IOd     LCASC  \OI\
       F4
 F7CFA 6000 Out2tc  GOTO   =oUT2TC     Output 2 tokens from C
                *
                * Output "IO ", decompile an expression
                *
 F7CFE 7BC0 =RESTd  GOSUB  IOdspc      Decompile "IO "
 F7D02 66A1         GOTO   CNTRL9      Finish up with expression
                ***************************************************************
                ***************************************************************
                **
                ** Name:       ASGNd - ASSIGN IO decompile
                **
                ** Category:   STDCMP
                **
                ** Purpose:
                **      Decompile the ASSIGN IO statement
                **
                ** Entry:
                **      D0 points to the output buffer
                **      D1 points to the input buffer (tokenized statement)
                **      D[A] is the end of available memory
                **      P=0
                **
                ** Exit:
                **      Exits through PACKd
                **
                ** Calls:      IOdspc,<PACKd>
                **
                ** Uses.......
                **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
                **
                ** Stk lvls:   5 <PACKd>
                **
                ** History:
                **
                **   Date      Programmer              Modification
                **  --------   ----------    ----------------------------------
                **  12/22/82      NZ         Updated documentation
                **
                *************************************************************
                *************************************************************
F7D06           =ASGNd
F7D06 73C0            GOSUB  IOdspc         Decompile "IO "
F7D0A 64DE            GOTO   PACKd          Device Decompile!
                *************************************************************
                *************************************************************
                **
                ** Name:       RESETd - RESET HPIL decompile
                **
                ** Category:   STDCMP
                **
                ** Purpose:
                **      Decompile the RESET HPIL statement
                **
                ** Entry:
                **      D1 points past the RESET token
                **      D0 points to the output buffer
                **      D[A] is the end of available memory
                **      P=0
                **
                ** Exit:
                **      Output buffer has "RESET HPIL"
                **      D0, D1 past the statement
                **
                ** Calls:      OUTNBC,<Loopd>
                **
                ** Uses.......
                **  Inclusive: A,B,C,D0,D1,R0,R1,R2,P,ST[0,3,8,10,11]
                **
                ** Stk lvls:   5 (Loopd)
                **
                ** History:
                **
                **   Date      Programmer              Modification
                **  --------   ----------    ----------------------------------
                **  02/18/83      NZ         Added loop number decompile
```

```
                  **  12/22/82       NZ          Updated documentation
                  **
                  **************************************************************
                  **************************************************************
      F7D0E 3784 =RESETd LCASC  \LIPH\
            0594
            C4
      F7D18 27           P=     7
      F7D1A 7000         GOSUB  =OUTNBC        Output "MPIL"
      F7D1E 6D8F         GOTO   Loopd
                  **************************************************************
                  **************************************************************
                  **
                  ** Name:        SENDd - Decompile the SEND statement
                  **
                  ** Category:    STDCMP
                  **
                  ** Purpose:
                  **      Decompile the SEND statement (also works for ENABLE
                  **      INTR and REQUEST)
                  **
                  ** Entry:
                  **      D1 points to the first item following the SEND token
                  **      D0 points to the output buffer
                  **      D[A] is the end of available memory
                  **      A[B] is the next token (at D1)
                  **      P=0
                  **
                  ** Exit:
                  **      D0,D1 after SEND command, P=0
                  **      Exits through OUTELA
                  **
                  ** Calls:       LOOPWd,FRASPd,ST!NOd,<OUTELA>
                  **
                  ** Uses.......
                  **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
                  **
                  ** Stk lvls:   6 (LOOPWd)(ST!NOd)
                  **
                  ** History:
                  **
                  **    Date     Programmer              Modification
                  **  --------   ----------    --------------------------------
                  **  12/22/82       NZ          Updated documentation
                  **
                  **************************************************************
                  **************************************************************
                  *
                  * SEND decompile will also work for REQUEST and ENABLE INTR
                  *
      F7D22 70A1 =ENABLd GOSUB  OtINTR         Decompile "INTR "
      F7D26 14B          A=DAT1 B              Read in the next token
      F7D29      =REQSTd
      F7D29 7210 =SENDd  GOSUB  LOOPWd
                  *
```

```
           * LOOP#d decompiles the loop number, if any, and returns with
           * A[B] containing the next token
           *
           * FRASPD decompiles a frame spec, if any. If not a frame spec,
           * it returns with carry set. In either case, A[B] is the next
           * token.
           *
F7D2D 7D20 SENDD1  GOSUB  FRASPd
F7D31 58F          GONC   SENDD1        Loop until frame spec not found
           *
           * If here, either EOL or expression
           *
           * ST!NOd Decompiles the string or numeric expression(s), if
           * any. If none are found, it returns with carry set.
           *
F7D34 7B40         GOSUB  ST!NOd
F7D38 54F          GONC   SENDD1        Continue with next frame spec
           *
           * If here, have reached end-of-line
           *
F7D3B 6F1F         GOTO   Outela        Output end of line
           **************************************************************
           **************************************************************
           **
           ** Name:       LOOP#d - Decompile an optional loop #
           **
           ** Category:   DCMUTL
           **
           ** Purpose:
           **      Decompile a loop number, if any. If none present, exit
           **      with carry set (Leaves next token in A[B])
           **
           ** Entry:
           **      D1 points to the (optional) loop #
           **      D0 points to the output buffer
           **      D[A] is the end of available memory
           **      A[B] is the next token (at D1)
           **
           ** Exit:
           **      D0,D1 positioned after the loop #, if found
           **      A[B] is the next token
           **      Carry set if no loop #, clear if loop # found
           **
           ** Calls:      EXPDC+,OUT2TC
           **
           ** Uses.......
           **  Exclusive: A,  C,            D1
           **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
           **
           ** Stk lvls:   5 (EXPDC+)
           **
           ** History:
           **
           **    Date     Programmer               Modification
           **  --------   ----------    --------------------------------
```

```
               **  03/01/83      NZ         Updated to read token after expr
               **  12/22/82      NZ         Updated documentation
               **
               *************************************************************
               *************************************************************
F7D3F          =LOOPMd
F7D3F 3100            LC(2)  =tSEMIC
F7D43 966             ?A#C   B
F7D46 00              RTNYES                Not a loop #...return, carry set
F7D48 7221            GOSUB  Expdc+         Expression decompile
F7D4C 3383            LCASC  \ ;\
      02
F7D52 74AF            GOSUB  Out2tc         Output terminating <semic><blank>
F7D56 171             D1=D1+ 2              Skip tSEMIC following the expr
F7D59 14B             A=DAT1 B              Read next token
F7D5C 03              RTNCC                 Return, carry clear (LOOP #)
               *************************************************************
               *************************************************************
               **
               ** Name:        FRASPd - Decompile a frame spec
               **
               ** Category:    DCMUTL
               **
               ** Purpose:
               **      Frame spec decompile routine
               **
               ** Entry:
               **      D0 points to the output buffer
               **      D1 points to the input buffer (tokens)
               **      D[A] is the end of available memory
               **      A[B] is the next token (at D1)
               **      P=0
               **
               ** Exit:
               **      A[B] is next token
               **      Carry clear if frame spec found, set if not found
               **      D0,D1 updated to current position
               **
               ** Calls:       ?A=CLN,OUT1TK,RANGEA,Outblk
               **
               ** Uses.......
               ** Exclusive:  A,C,   D1
               ** Inclusive:  A,C,D0,D1
               **
               ** Stk lvls:   2 (OUT1TK)(Outblk)
               **
               ** History:
               **
               **    Date     Programmer              Modification
               **  --------   ----------   ---------------------------------
               **  12/22/82      NZ        Updated documentation
               **
               *************************************************************
               *************************************************************
F7D5E          =FRASPd
```

```
F7D5E 7481          GOSUB  ?A=CLN
F7D62 480           GOC    FRASd2         This is a frame spec (Skip COLON)
F7D65 02            RTNSC                 Not a frame (return, carry set)
               *-
               *-
F7D67 7000 FRASd1   GOSUB  =oUT1TK        Output the character
F7D6B 171  FRASd2   D1=D1+ 2              Skip the current token/character
F7D6E 14B           A=DAT1 B              Read next character
F7D71 8E00          GOSUBL =RANGEA        Check if in [A-Z]
      00
F7D77 5FE           GONC   FRASd1         Yes...continue
               *
               * Output a trailing blank after mnemonic
               *
F7D7A 7350          GOSUB  Outblk
F7D7E AEE           ACEX   B              Restore item (OUTBYT does ACEX)
F7D81 03            RTNCC                 End of frame (return, carry clear)
               ****************************************************************
               ****************************************************************
               **
               ** Name:        ST!NOd - Decompile a string or numeric expr
               **
               ** Category:    DCMUTL
               **
               ** Purpose:
               **      Decompile string or numeric expr (Preceded by tCOMMA)
               **
               ** Entry:
               **      D0 points to the output buffer
               **      D1 points to the input buffer (tokens)
               **      D[A] is the end of available memory
               **      A[B] is the next token (at D1)
               **      P=0
               **
               ** Exit:
               **      A[B] is next token, D1 points to next token
               **      D0, D1 updated to current position, P=0
               **      Carry set if not a string or a numeric expression
               **
               ** Calls:       EXPDC+,?A=CM+,Outcma,Outblk
               **
               ** Uses.......
               **  Exclusive: A,  C,            D1
               **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
               **
               ** Stk lvls:    5 (EXPDC+)
               **
               ** History:
               **
               **   Date      Programmer              Modification
               **  --------   ----------   ---------------------------------
               **  12/22/82      NZ        Updated documentation
               **
               ****************************************************************
               ****************************************************************
```

```
F7D83 3100 =ST!NOd LC(2)  =tCOMMA
F7D87 966          ?ANC   B
F7D8A 00           RTNYES                Not an expression (RTNSC)
F7D8C 7ED0 ST!Nd1  GOSUB  Expdc+         D1=D1+2;EXPRDC
           *
           * A[B] is next item
           *
F7D90 7741         GOSUB  ?A=CM+
F7D94 5A0          GONC   ST!Nd2         Done with expression list...exit
           *
           * Another expression follows
           *
F7D97 7E30         GOSUB  Outcma         Output a comma between items
F7D9B 60FF         GOTO   ST!Nd1         Loop back and continue
           *_
           *_
F7D9F 7E20 ST!Nd2  GOSUB  Outblk         (Saves A[B] in C[B])
F7DA3 AEE          ACEX   B              Restore item from C[B]
F7DA6 03           RTNCC                 Exit, carry clear
           *************************************************************
           *************************************************************
           **
           ** Name:       PILDC - Decompile an HPIL device specifier
           **
           ** Category:   DCMUTL
           **
           ** Purpose:
           **      Decompile an HP-IL device spec stored as a literal:
           **      case:
           **       <t*>
           **       or <tX><numeric expression>[( <numeric expression> )]
           **       or <numeric expression>
           **       or <tLITRL> <literal> [( <numeric expression> )]
           **       or <tSEMIC> <volume label>
           **
           ** Entry:
           **      D1 points to the tCOLON in the input buffer
           **      D0 points to the output buffer
           **      D[A] is the end of available memory
           **      P=0
           **
           ** Exit:
           **      D0 points after the last character of the output line
           **      D1 points to the first token following the input tokens
           **      P=0
           **
           ** Calls:      OUTBYT,EXPDC+,?A=CLM,OUT1TK,EXPRDC
           **
           ** Uses.......
           **  Exclusive: A,  C,        D0,D1
           **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
           **
           ** Stk lvls:   5 (EXPRDC)(EXPDC+)
           **
           ** History:
```

```
           **
           **   Date     Programmer              Modification
           **  --------  ----------    --------------------------------
           **  12/22/82      NZ        Updated documentation
           **
           ************************************************************
           ************************************************************
           *
           * Syntax:
           *   Input stream:
           *       <t*>
           *   or  <t%> <num expr> [ <tCOLON> <num expr> ]
           *   or  <num expr>
           *   or  <tLITRL> <literal data> [ <tCOLON> <num expr> ]
           *   or  <tSEMIC> <literal volume label>
           *
           *   Output text:
           *       *
           *   or  :%<num expr> [ (<num expr>) ]
           *   or  :<num expr>
           *   or  :<literal data> [ (<num expr>) ]
           *   or  .<volume label>
           *
F7DA8 31A3 =PILDC  LCASC  \:\
F7DAC 7910         GOSUB  Outbyt         Output the colon
F7DB0 171          D1=D1+ 2
F7DB3 14B          A=DAT1 B              Read the next token
           *
           * Check for "*" token
           *
F7DB6 3100         LC(2)  =t*
F7DBA 966          ?A#C   B              Is it t*?
F7DBD 42           GOYES  PILDC2         No...check further
F7DBF 181          D0=D0- 2              Yes...undo the ":"
F7DC2 171          D1=D1+ 2              Skip the "*" token
F7DC5 31A2         LCASC  \*\
F7DC9 6000 Outbyt  GOTO   =OUTBYT        Done with this device spec
           *-
           *-
F7DCD 732F IOdspc  GOSUB  IOd            Output "IO "
F7DD1 3102 Outblk  LCASC  \ \
F7DD5 63FF         GOTO   Outbyt
           *-
           *-
F7DD9 31C2 Outcma  LCASC  \,\
F7DDD 6BEF         GOTO   Outbyt
           *-
           *-
F7DE1 3100 PILDC2  LC(2)  =t%
F7DE5 966          ?A#C   B              Is it Accessory ID?
F7DE8 F2           GOYES  PILDC5         No...check further
F7DEA 3152         LCASC  \%\            Yes...output %
           *
           * Accessory ID
           *
```

```
F7DEE 77DF PILDC3 GOSUB  Outbyt
F7DF2 7870        GOSUB  Expdc+         Step over tX first
F7DF6 7CE0        GOSUB  ?A=CLN         "(" token kludge
F7DFA 506         GONC   PILDC9         Not "(" token...check loop #
F7DFD 3182 PILDC4 LCASC  \(\
F7E01 74CF        GOSUB  Outbyt
F7E05 7560        GOSUB  Expdc+         (Step over tCOLON first)
F7E09 3192        LCASC  \)\
F7E0D 78BF        GOSUB  Outbyt         Send the closing ")"
F7E11 AEE         ACEX   B              Get token back to A[B]
F7E14 564         GONC   PILDC9         Go always to check for loop #
                  *-
                  *-
                  *
                  * Not Accessory ID - perhaps a device word
                  *
F7E17 3100 PILDC5 LC(2)  =tLITRL
F7E1B 966         ?A#C   B              Is this a literal?
F7E1E 42          GOYES  PILDC8         No...must be an address expression
F7E20 171         D1=D1+ 2              Skip =tLITRL
                  *
                  * If here, this is a literal (device word or Device ID)
                  *
F7E23 14B  PILDC6 A=DAT1 B              Read next character
F7E26 D6          C=A    A              Copy A[B] to C[B]
F7E28 A66         C=C+C  B              If carry, end of literal
F7E2B 4C0         GOC    PILDC7         Carry...end of literal
F7E2E 171  PILDc6 D1=D1+ 2              Still part of literal...skip input
                  *
                  * Output the character and loop back for next character
                  *
F7E31 7000        GOSUB  =oUT1TK        Output from A[B]
F7E35 5DE         GONC   PILDC6         Go always - loop back again
                  *-
                  *-
                  *
                  * High bit set...end of literal characters
                  *
F7E38      PILDC7
F7E38 7AA0        GOSUB  ?A=CLN         Is there a tCOLON ("(")?
F7E3C 40C         GOC    PILDC4         Yes...process the expression
F7E3F 5B1         GONC   PILDC9         Go always to check loop #
                  *-
                  *-
F7E42 3100 PILDC8 LC(2)  =tSEMIC
F7E46 966         ?A#C   B              Is this a volume label?
F7E49 E0          GOYES  PILDc8         No...must be address expression
                  *
                  * Literal volume label
                  *
F7E4B 181         D0=D0- 2              Back over the \:\
F7E4E 31E2        LCASC  \.\
F7E52 DA          A=C    A              Write out the \.\, then vol label
F7E54 59D         GONC   PILDc6         Go always
                  *-
```

```
                 *-
                 *
                 * If here, this must be an address expression
                 *
F7E57 7610 PILDc8   GOSUB  Exprdc
F7E5B 3100 PILDC9   LC(2)  =tSEMIC        Check if there is a loop spec
F7E5F 962           ?A=C   B              Loop specifier?
F7E62 40            GOYES  PILDC!         Yes...process it
F7E64 03            RTNCC                 No...return with carry clear
                 *-
                 *-
F7E66 31A3 PILDC!   LCASC  \:\            Loop specifier....
F7E6A 7B5F          GOSUB  Outbyt           output the colon,
F7E6E 171  Expdc+   D1=D1+ 2                then the expression
F7E71 8D00 Exprdc   GOVLNG =EXPRDC
      000
                 ***************************************************************
                 ***************************************************************
                 **
                 ** Name:       PASSd - PASS CONTROL decompile
                 **
                 ** Category:   STDCMP
                 **
                 ** Purpose:
                 **      Decompile the PASS CONTROL statement
                 **
                 ** Entry:
                 **      D1 points to the input buffer (tokens)
                 **      D0 points to the output buffer
                 **      D[A] is the end of available memory
                 **      A[B] is the next token (at D1)
                 **      P=0
                 **
                 ** Exit:
                 **      D0, D1 are positioned after the output/input tokens
                 **      Exits through OUTELA
                 **
                 ** Calls:      OUTNBC,?A=CMA,<PACKd>
                 **
                 ** Uses.......
                 **  Inclusive: A,B,C,R0,R1,R2,D0,D1,P,ST[0,3,8,10,11]
                 **
                 ** Stk lvls:   6 (PACKd)
                 **
                 ** History:
                 **
                 **   Date      Programmer            Modification
                 **  --------   ----------    ---------------------------------
                 **  10/27/83       NZ        Added documentation
                 **
                 ***************************************************************
                 ***************************************************************
F7E78 3F34 =PASSd   LCASC  \ LORTNOC\
      F4E4
      4525
```

```
           F4C4
           02
     F7E8A 2F            P=     15
     F7E8C 7000          GOSUB  =OUTNBC
     F7E90 7440          GOSUB  ?A=CMA
     F7E94 590           GONC   PASd10
     F7E97 171           D1=D1+ 2
     F7E9A 60CD OUtela   GOTO   Outela
                *-
                *-
     F7E9E 604D PASd10   GOTO   PACKd
                ************************************************************
                ************************************************************
                **
                ** Name:        CNTRLd - CONTROL ON/OFF decompile
                **
                ** Category:    STDCMP
                **
                ** Purpose:
                **      Decompile the CONTROL ON/OFF statements
                **
                ** Entry:
                **      DO is points to the input buffer (tokens)
                **      D1 points to the output buffer
                **      D[A] is the end of available memory
                **      A[B] is the next token (at D1)
                **      P=0
                **
                ** Exit:
                **      DO, D1 positioned after the statement
                **      Exits through PACKD6/OUTELA
                **
                ** Calls:       GTXT++,<OUTELA>,<PACKD6>
                **
                ** Uses.......
                **  Inclusive: A,B,C,RO,R1,R2,DO,D1,P,ST[0,3,8,10,11]
                **
                ** Stk lvls:    5 (PACKD6)
                **
                ** History:
                **
                **    Date      Programmer            Modification
                **  --------    ----------    ---------------------------------
                **  10/27/83        NZ        Added documentation
                **
                ************************************************************
                ************************************************************
     F7EA2 8F00 =CNTRLd GOSBVL =GTXT++         Output ON/OFF (blanks)
           000
     F7EA9 14F  CNTRL9  C=DAT1 B               Check if at end of line
     F7EAC 80D1          P=C    1
     F7EB0 0C            P=P+1                 If carry, at end of line now
     F7EB2 20            P=     0              Reset P=0 regardless
     F7EB4 45E           GOC    OUtela         End of line if carry
     F7EB7 664D          GOTO   PACKD6
```

```
                 ****************************************************************
                 ****************************************************************
                 **
                 ** Name:        ONINTd - ON INTR decompile
                 **
                 ** Category:    STDCMP
                 **
                 ** Purpose:
                 **      Decompile the ON INTR statement
                 **
                 ** Entry:
                 **      D0 points to the input buffer (tokens)
                 **      D1 points to the output buffer
                 **      D[A] is the end of available memory
                 **      A[B] is the next token (at D1)
                 **      P=0
                 **
                 ** Exit:
                 **      D0, D1 positioned after the statement
                 **      Exits through ONDC20 (mainframe)
                 **
                 ** Calls:      OtINTR,<ONDC20>
                 **
                 ** Uses.......
                 **  Inclusive: Same as ONDC20
                 **
                 ** Stk lvls:   Same as ONDC20
                 **
                 ** History:
                 **
                 **   Date      Programmer              Modification
                 **  --------   ----------    --------------------------------
                 **  10/27/83      NZ         Added documentation
                 **
                 ****************************************************************
                 ****************************************************************
     F7EB8 7700 =ONINTd GOSUB  OtINTR
     F7EBF 8D00         GOVLNG =ONDC20       Continue with ON ... GOTO/GOSUB
           000
                 *-
                 *-
                 *
                 * Output \INTR\
                 *
     F7EC6 3994 OtINTR  LCASC  \ RTNI\
           E445
           2502
     F7ED2 29           P=     9
     F7ED4 6000         GOTO   =OUTNBC       (Returns with P=0)
                 *-
                 *-
                 *
                 * Check if A[B] is a tCOMMA (Carry set if so)
                 *
     F7ED8 14B  =?A=CMA A=DAT1 B
```

```
F7EDB 3100 =?A=CM+ LC(2)  =tCOMMA
F7EDF 962          ?A=C   B
F7EE2 00           RTNYES
F7EE4 01           RTN
           *-
           *-
           *
           * Check if A[B] is tCOLON (Carry set if so)
           *
F7EE6 3100 =?A=CLN LC(2)  =tCOLON
F7EEA 962          ?A=C   B
F7EED 00           RTNYES
F7EEF 01           RTN
F7EF1              END
```

```
=?A=CLN  Abs 1015526 #F7EE6 -  1034    60   113   650   816   853
=?A=CM+  Abs 1015515 #F7EDB -  1025   711
=?A=CMA  Abs 1015512 #F7ED8 -  1024    66   117   182   297   344   923
=ASGNd   Abs 1015046 #F7D06 -   453
=CLEARd  Abs 1014983 #F7CC7 -   343   291
 CLRD10  Abs 1014997 #F7CD5 -   350   345
 CNTRL9  Abs 1015465 #F7EA9 -   967   418
=CNTRLd  Abs 1015458 #F7EA2 -   966   242
 DISPDC  Ext                -   130
=ENABLd  Abs 1015074 #F7D22 -   536
 EXPRDC  Ext                -   883
 Expdc+  Abs 1015406 #F7E6E -   882   605   707   815   820
 Exprdc  Abs 1015409 #F7E71 -   883    73   133   198   303   873
 FILDC*  Ext                -   180
=FRASPd  Abs 1015134 #F7D5E -   649   548
 FRASd1  Abs 1015143 #F7D67 -   655   659
 FRASd2  Abs 1015147 #F7D6B -   656   651
 GTEXT+  Ext                -   296
 GTXT++  Ext                -   966
 INITD0  Abs 1014868 #F7C54 -   181   199
=INITD2  Abs 1014892 #F7C6C -   198
 INITD3  Abs 1014885 #F7C65 -   192   183
=INITd   Abs 1014842 #F7C3A -   172
 IOd     Abs 1015028 #F7CF4 -   412   408   798
 IOdspc  Abs 1015245 #F7DCD -   798   417   454
 LEXPIL  Ext                -   287
=LOCALd  Abs 1014926 #F7C8E -   279
 LOCLd1  Abs 1014979 #F7CC3 -   304   300
=LOOPNd  Abs 1015103 #F7D3F -   601   235   539
 Loopd   Abs 1014956 #F7CAC -   297   495
=OFFIOd  Abs 1015001 #F7CD9 -   396
 OFIOd1  Abs 1015020 #F7CEC -   407   398
 OFIOd2  Abs 1015024 #F7CF0 -   409   404
 ONDC20  Ext                -  1010
=ONINTd  Abs 1015483 #F7EBB -  1009
 OUT3TC  Ext                -    55
 OUTBYT  Ext                -   795
 OUTELA  Ext                -   186
 OUTNBC  Ext                -   179   494   922  1018
=OUTPd   Abs 1014790 #F7C06 -   112
 OUTPd1  Abs 1014797 #F7C0D -   115   122
 OUTPd2  Abs 1014801 #F7C11 -   116   134
 OUTPd3  Abs 1014820 #F7C24 -   128   120
 OUTPd4  Abs 1014834 #F7C32 -   133   114
 OUtela  Abs 1015450 #F7E9A -   926   971
 OtINTR  Abs 1015494 #F7EC6 -  1016   403   536  1009
 Out2tc  Abs 1015034 #F7CFA -   413   607
 Outblk  Abs 1015249 #F7DD1 -   799   128   302   663   720
 Outbyt  Abs 1015241 #F7DC9 -   795   783   800   804   814   819   822   881
 Outcma  Abs 1015257 #F7DD9 -   803    69   121   193   716
 Outela  Abs 1014875 #F7C5B -   184    74   304   347   409   561   926
 PACKD6  Abs 1014782 #F7BFE -    73    61   972
 PACKD9  Abs 1014786 #F7C02 -    74    67
=PACKd   Abs 1014751 #F7BDF -    59    70   354   455   929
=PASSd   Abs 1015416 #F7E78 -   920
```

```
 PASd10  Abs 1015454 #F7E9E -   929   924
=PILDC   Abs 1015208 #F7DA8 -   782    65   115
 PILDC!  Abs 1015398 #F7E66 -   880   876
 PILDC2  Abs 1015265 #F7DE1 -   807   791
 PILDC3  Abs 1015278 #F7DEE -   814
 PILDC4  Abs 1015293 #F7DFD -   818   854
 PILDC5  Abs 1015319 #F7E17 -   830   809
 PILDC6  Abs 1015331 #F7E23 -   837   846
 PILDC7  Abs 1015352 #F7E38 -   852   840
 PILDC8  Abs 1015362 #F7E42 -   858   832
 PILDC9  Abs 1015387 #F7E5B -   874   817   824   855
 PILDc6  Abs 1015342 #F7E2E -   841   867
 PILDc8  Abs 1015383 #F7E57 -   873   860
=PRNTSd  Abs 1014739 #F7BD3 -    53
 RANGER  Ext                -   658
=REMOTd  Abs 1014983 #F7CC7 -   341
=REQSTd  Abs 1015081 #F7D29 -   538
=RESETd  Abs 1015054 #F7D0E -   492
=RESTd   Abs 1015038 #F7CFE -   417
 SENDD1  Abs 1015085 #F7D2D -   548   549   557
=SENDd   Abs 1015081 #F7D29 -   539
=ST!NOd  Abs 1015171 #F7D83 -   704   556
 ST!Nd1  Abs 1015180 #F7D8C -   707   717
 ST!Nd2  Abs 1015199 #F7D9F -   720   712
=STANDd  Abs 1014900 #F7C74 -   235
=STANd+  Abs 1014892 #F7C6C -   197   241
 STANdj  Abs 1014922 #F7C8A -   242   238
=TRIGd   Abs 1014983 #F7CC7 -   342
=XWORDd  Abs 1014875 #F7C5B -   185
 oUT1TK  Ext                -   655   845
 oUT2TC  Ext                -   413
 tX      Ext                -   807
 t*      Ext                -   789
 tCOLON  Ext                -  1034
 tCOMMA  Ext                -   704  1025
 tLITRL  Ext                -   830
 tLOCK0  Ext                -   288
 tOFF    Ext                -   239
 tON     Ext                -   236
 tSEMIC  Ext                -   602   858   874
 tXWORD  Ext                -   286   396
```

```
Input Parameters

  Source file name is NZ&DEC::MS

  Listing file name is NZ/DEC:TI:ML::-1

  Object file name is NZ%DEC:TI:MS::-1

                                         111111
                               0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

```
*
*
*       N   N  ZZZZZ   &      SSS   Y   Y  M   M
*       N   N      Z  & &    S   S  Y   Y  MM MM
*       NN  N     Z   & &    S       Y Y   M M M
*       N N N    Z     &      SSS     Y    M M M
*       N  NN   Z     & & &      S    Y    M   M
*       N   N  Z      &  &   S   S    Y    M   M
*       N   N  ZZZZZ   && &   SSS     Y    M   M
*
        TITLE  Symbolic Assignments <840301.1402>
*
* Status bit for ATTN key pressed (or other exception cause)
*
=Attn   EQU    12
*
* Other status bits
*
=sPRIVT EQU    11             Status for PRIVATE/SECURE stmt
=sUNSEC EQU    10             Status for [UN]Secure statement
=sOVERW EQU    8              Status for overwrite existing file
=sDevOK EQU    8              Status for device spec exec OK
=sSTK   EQU    7              Status for reading from stack
=CkTape EQU    5              Status to check for tape device
=sLoop? EQU    5              Status for allowing LOOP spec
=sReadd EQU    4              Status to force readdress the loop
=sFirst EQU    0              Status for first char in filespec
*
* Status bit corresponding to the bit I/O CPU sets if SREQ?
*
=sMBXsr EQU    1
*
* See NZ&PAR for parse status bits
*
*----------------------------------------------------------------
*
* Equates for P=, DDL/DDT
*
* DDL's
*
=Write0 EQU    0              Write to buffer 0
=Write1 EQU    1              Write to buffer 1
=Write  EQU    2              Write to tape
=SetBP  EQU    3              Set byte pointer
=Seek   EQU    4              Seek a record
=Format EQU    5              Format the medium
=PWrite EQU    6              Partial write mode
=Rewind EQU    7              Rewind
=CloseR EQU    8              Close record
=Xfr01L EQU    9              Transfer buffer 0-->1 (Listener)
=XchgL  EQU    10             Exchange buffers 0,1 (Listener)
=Verify EQU    11             Verify the medium
*
* DDT's
*
```

```
=Read0  EQU    0            Read from buffer 0
=Read1  EQU    1            Read from buffer 1
=Read   EQU    2            Read from tape
=Positn EQU    3            Read current position
=XchgT  EQU    4            Exchange buffers 0,1 (Talker)
=Xfr01T EQU    5            Transfer buffer 0-->1 (Talker)
=ImpByt EQU    6            Send implementation bytes
=MaxRec EQU    7            Send max addressable record
*
*-------------------------------------------------------------
*
* Equates for device specifiers
*
=DevTyp EQU    #1F          Device type
=DevID  EQU    #3F          Device ID
=VolLbl EQU    #5F          Volume label
=Null   EQU    #7F          "NULL" device
=Loop   EQU    #9F          "LOOP" device
*
*-------------------------------------------------------------
*
* Equates for D[S] values returning from START
*
=DsAddr EQU    0            Device address
=DsDevT EQU    1            Device type
=DsDevI EQU    2            Device ID
=DsVolL EQU    3            Volume label
=DsNull EQU    4            NULL
=DsLoop EQU    5            LOOP
*
*-------------------------------------------------------------
*
* Equates for STANDBY defaults
*
=#Timeo EQU    30           Default # IDY timeouts
=Timout EQU    2*1000       Default timeout between IDY (ms)
*
*-------------------------------------------------------------
*
* PRINT class equate (for OUTPUT class)
*
=OUTPTt EQU    2            This is next after PRINTt
=PLOTt  EQU    (OUTPTt)+1   This is for the PLOT class
*
*-------------------------------------------------------------
*
* I/O buffer numbers - See TI&EQU
*
*-------------------------------------------------------------
*
* HPIL frame types (return from FRAME)
*
=pACK   EQU    00           Acknowledge frame
=pSTATE EQU    01           Current I/O CPU state
=pDIAGR EQU    02           Diagnostic test results
```

```
=pDIAGL EQU    03              Diagnostic data
=pADDR  EQU    04              Address frame
=pIFC   EQU    05              IFC received (not active controller)
=pEOT   EQU    06              EOT received as controller
=pHALTD EQU    07              Conversation halted by I/O CPU
=pTERM  EQU    08              Terminator match (I/O CPU)
=pETE   EQU    09              ETE received
=pUTYPE EQU    10              Unrecognized mailbox message type
=pDATA  EQU    11              DATA/END frame
=pCMD   EQU    12              Command reveived
=pRDY   EQU    13              Ready frame reveived
=pIDY   EQU    14              IDY reveived
=p3DATA EQU    15              Triple byte data
*
*-----------------------------------------------------------------
*
* ERROR TYPES: (See MZ&ERR for most error numbers)
*
=ePARSE EQU    00              Parse error
=eTAPE  EQU    01              Tape error (mass storage error)
=ePIL   EQU    02              HPIL error (loop or I/O CPU)
*
*-----------------------------------------------------------------
*
* Parameters for File Information Buffers (FIB)
* See TI&EQU for values and names
*
*-----------------------------------------------------------------
*
* Status bits (for I/O CPU state)
*
=sLOCKD EQU    11              Locked out mode (remote)
=sRMOTE EQU    10              Remote mode
=sDATAO EQU    9               Data in output buffer
=sDATAV EQU    8               Data available
=sSTAND EQU    7               Controller standby mode
=sPOLLE EQU    6               Serial Poll Enabled
=sUNCNF EQU    5               Loop is not configured
=sINTR  EQU    4               Interrupt pending
=sSCNTR EQU    3               System Controller
=sTALKA EQU    2               Talker active
=sLISTR EQU    1               Listener
=sCONTR EQU    0               Controller
*
*-----------------------------------------------------------------
*
* Handshake bits (I/O CPU to HP-71 CPU) (in ST[3:0])
*
=s3BYTE EQU    3               Triple data byte transfer
=sMANUL EQU    2               I/O CPU is in manual mode
=sSRQIN EQU    1               SRQ received on loop
=sERROR EQU    0               Error detected/occurred
*
*-----------------------------------------------------------------
*
```

```
* Handshake bits (I/O CPU to HP-71 CPU) (in ST[7:0])
*
=hs3BYT EQU    7             Triple data xfer
=hsMANL EQU    6             Manual mode
=hsLPRQ EQU    5             SRQ received from loop
=hsERRO EQU    4             Error occured
=hsRQSR EQU    3             I/O CPU SRQ on HP-71 bus
=hsAWKE EQU    2             I/O CPU awake
=hsNRD  EQU    1             HP-71 NRD (to the I/O CPU)
=hsMGAV EQU    0             I/O CPU message available
*
*-------------------------------------------------------------
*
* Mailbox opcodes (TO I/O CPU)
*
* Frame class
*
=mFRAME EQU    #1000         Any of the class "FRAME"
=mDATAf EQU    #1000         DATA frame
=mDATA2 EQU    (mDATAf)/#100
=mENDf  EQU    #1200         END frame
=mCMDf  EQU    #1400         CoMmanD frame
=mCMD3  EQU    (mCMDf)/#10
=mCMD2  EQU    (mCMDf)/#100
=mEAR   EQU    (mCMDf)+#18   Enable AsynchRonous IDYs
=mUNL   EQU    (mCMDf)+#3F   Unaddress listeners
=mUNT   EQU    (mCMDf)+#5F   Unaddress talkers
=mIFC   EQU    (mCMDf)+#90   InterFaCe clear!!!
=mRDYf  EQU    #1500         ReaDY frame
=mIDYf  EQU    #1600         IDY frame
=mETO   EQU    (mRDYf)+#40   ETO
=mETE   EQU    (mRDYf)+#41   ETE
*
* Single-nibble parameter class
*
=mADDRM EQU    #2000         ADDRess Me as...
=maddrT EQU    #4            ...Talker
=maddrL EQU    #2            ...Listener
=mUNADM EQU    (mADDRM)+#10  UNADdress Me as...^
=mPDLOP EQU    #30           Power down the loop
*
* Address class
*
=mADDRT EQU    #4000         ADDRess ... as Talker
=mADDRL EQU    #5000         ADDRess ... as Listener
=mFINDD EQU    #6000         FIND Device, type n
=mFIND1 EQU    (mFINDD)/#1000 FIND Device, type n (1 nibble)
=mAUTOA EQU    #70           AUTO Address loop
=mAUTOS EQU    (mAUTOA)+1    AUTO Address (AES, AAD)
*
* Conversation descriptors
*
=mSDA   EQU    #800000       Start DAta conversation
=mSDA@5 EQU    (mSDA)/#100000 Start DAta conversation (P=5)
=mSST   EQU    #900000       Start STatus  "
```

```
=mSDI   EQU    #A00000        Start Device Id
=mSAI   EQU    #B00000        Start Accessory Id
=mTCT   EQU    #C00000        Transfer ConTrol
=mTCT@4 EQU    (mTCT)/#10000 Transfer ConTrol (P=4)
=mSETTO EQU    #D00000        SET TimeOut
=mST0@5 EQU    (mSETTO)/#100000 Set TimeOut (P=5)
=mSETFC EQU    #E00000        SET Frame Count
=mSFC@5 EQU    (mSETFC)/#100000 Set Frame Count @ nibble 5
*
* One-byte parameter class
*
=mSETDR EQU    #F30000        SET Device response
=mSETA1 EQU    #F30120        SET Accessory ID length (=1)
=mSETAI EQU    #F30321        SET Accessory ID value (=3)
=mSETS1 EQU    #F30140        SET Status length (=1)
=mSETST EQU    #F30041        SET Status value
=mSTS@4 EQU    #F3            SET Status value (at nibble 4)
=mSETD1 EQU    #F30610        SET Device ID length (=6)
=mSETDI EQU    #F30011        SET Device ID value (first byte)
=vDEVID EQU    \17PH\         Value of device ID (=HP71)
*
=mSETTM EQU    #F400          SET Terminator Mode
=mSETTC EQU    #F500          SET Terminator Character
=mSETIC EQU    #F600          SET # of IDY Timeouts
=mSETIT EQU    #F700          SET IDY Timeout (in mS)
=mCLRBF EQU    #F8            Clear data buffers (input&output)
=mSPTO  EQU    #F900          Set Serial Poll TimeOut
=mSETIM EQU    #FA00          Set interrupt mask
=mREADI EQU    #FB            Read interrupt cause
=mREADC EQU    #FC            Read last device dependent command
=CLRTSR EQU    #FD00          ...CLEAR terminate on SRQ mode
=SETTSR EQU    (CLRTSR)+1     ...SET terminate on SRQ mode
=mPULOP EQU    #FE            Power up the loop
=mSPDIS EQU    #FF00          Disable IDY serial poll
=mSPEN  EQU    (mSPDIS)+1     Enable IDY serial poll
*
* Non-parameter messages
*
=mNOP   EQU    #00            NO oPeration (check for HS)
=mRDADR EQU    #01            ReaD ADdRess table
=mSTATS EQU    #02            STATuS request to I/O CPU
=mSTSTC EQU    #0201          Request status, clear service reques
=mENDM  EQU    #03            END of Message
=mCSRQ  EQU    #04            Clear SRQ on loop
=mSSRQ  EQU    #05            Set SRQ on loop
=mERSTS EQU    #06            Request ERror STatuS
=mAUTOE EQU    #07            Enter AUTO End mode
=mMANUL EQU    #08            Go to manual mode
=mSCOPE EQU    #0801          Go into MANUAL mode, retransmit
=mAUTO  EQU    #09            Go to auto mode
=mUPDSC EQU    #0A00          Update System Controller bit(8/0)
=mRSTCA EQU    #0B            Reset current address
=mGETCA EQU    #0C            Read current address
=mINCCA EQU    #0D            Increment current address
=mMADDR EQU    #0E            Return "MY" address
```

```
=mCLRCA EQU    #0F00          Clear controller status
=mSETCA EQU    #0F01          (Set controller active)
=mTAKEC EQU    #0F03          Take control of the loop
*                             (2/0: if 2, then use IFC)
=mTAKEI EQU    (mTAKEC)~#90   Take control and send IFC frame
=mTAKEO EQU    (mTAKEC)~#10   Take control and send NOP frame
*
* Diagnostic class
*
=mRdMem EQU    #F00000        Read memory (add addr, RAM page)
=mWrMem EQU    #F10000        Write memory (add value~address)
=mTEST  EQU    #F2            I/O CPU self-test
*
*-----------------------------------------------------------------
*
* RAM usage...
*
=SngDev EQU    4              Single device I/O buffer
*
* IS-xxx:
*       nib:   usage:
*       ---    ------
*       2-0:   If device address known, address, loop # here
*              If not known/assigned/iobuffer, FFF
*              If assigned, not HPIL, Fxx, xx<>FF
*
*         3:   If unassigned/not HPIL, F
*              If IO buffer for device ID/volume label, 4
*              If type specified, loop # + 1 (nib 3: 1,2,3)
*              If address specified, 0
*              If this assignment has been "OFF"ed, bit 3 is 1
*
*       6-4:   If type, nib 6: sequence #, nibs 5-4: Acc id
*              If address, 6-4: address, loop #
*              If IO buffer, 6-4: io buffer #
*              If unassigned (NOT "OFF"ed), FFF
*              If not HPIL and nib 3=F, not defined
*
*-----------------------------------------------------------------
*
* Nibble "DSPSET"
*
=DispOK EQU    11             Display device is set up
=H82163 EQU    10             Display device is an HP82163A
=Printr EQU    9              Display device is a printer
=LoopOK EQU    8              Loop has not died while in disp
*
*-----------------------------------------------------------------
*
* Nibble "LOOPST" (bits 8 and 9 are cleared when START is called)
*
=Offed  EQU    11             If set, USER specified OFF IO
=Device EQU    10             Last START found device mode
*
*-----------------------------------------------------------------
```

```
             *
             * MBOX^: (3 nibbles)
             *       Middle 3 digits of address of last mailbox used (ie if
             *         mailbox was at address #20010 then MBOX^ is #001)
             *
             *--------------------------------------------------------------
    00000            END
```

```
=#Timeo  Abs       30 #0001E -     90
=Attn    Abs       12 #0000C -     15
=CLRTSR  Abs    64768 #0FD00 -    251    252
=CkTape  Abs        5 #00005 -     24
=CloseR  Abs        8 #00008 -     49
=DevID   Abs       63 #0003F -     70
=DevTyp  Abs       31 #0001F -     69
=Device  Abs       10 #0000A -    328
=DispOK  Abs       11 #0000B -    318
=DsAddr  Abs        0 #00000 -     79
=DsDevI  Abs        2 #00002 -     81
=DsDevT  Abs        1 #00001 -     80
=DsLoop  Abs        5 #00005 -     84
=DsNull  Abs        4 #00004 -     83
=DsVolL  Abs        3 #00003 -     82
=Format  Abs        5 #00005 -     46
=H82163  Abs       10 #0000A -    319
=InpByt  Abs        6 #00006 -     62
=Loop    Abs      159 #0009F -     73
=LoopOK  Abs        8 #00008 -    321
=MaxRec  Abs        7 #00007 -     63
=Null    Abs      127 #0007F -     72
=OUTPTt  Abs        2 #00002 -     97     98
=Offed   Abs       11 #0000B -    327
=PLOTt   Abs        3 #00003 -     98
=PWrite  Abs        6 #00006 -     47
=Positn  Abs        3 #00003 -     59
=Printr  Abs        9 #00009 -    320
=Read    Abs        2 #00002 -     58
=Read0   Abs        0 #00000 -     56
=Read1   Abs        1 #00001 -     57
=Rewind  Abs        7 #00007 -     48
=SETTSR  Abs    64769 #0FD01 -    252
=Seek    Abs        4 #00004 -     45
=SetBP   Abs        3 #00003 -     44
=SngDev  Abs        4 #00004 -    293
=Timout  Abs     2000 #007D0 -     91
=Verify  Abs       11 #0000B -     52
=VolLbl  Abs       95 #0005F -     71
=Write   Abs        2 #00002 -     43
=Write0  Abs        0 #00000 -     41
=Write1  Abs        1 #00001 -     42
=XchgL   Abs       10 #0000A -     51
=XchgT   Abs        4 #00004 -     60
=Xfr01L  Abs        9 #00009 -     50
=Xfr01T  Abs        5 #00005 -     61
=ePARSE  Abs        0 #00000 -    129
=ePIL    Abs        2 #00002 -    131
=eTAPE   Abs        1 #00001 -    130
=hs3BYT  Abs        7 #00007 -    168
=hsAWKE  Abs        2 #00002 -    173
=hsERRO  Abs        4 #00004 -    171
=hsLPRQ  Abs        5 #00005 -    170
=hsMANL  Abs        6 #00006 -    169
=hsMGAV  Abs        0 #00000 -    175
```

```
=hsNRD    Abs         1 #00001 -   174
=hsRQSR   Abs         3 #00003 -   172
=mADDRL   Abs     20480 #05000 -   210
=mADDRM   Abs      8192 #02000 -   201    204
=mADDRT   Abs     16384 #04000 -   209
=mAUTO    Abs         9 #00009 -   270
=mAUTOA   Abs       112 #00070 -   213    214
=mAUTOE   Abs         7 #00007 -   267
=mAUTOS   Abs       113 #00071 -   214
=mCLRBF   Abs       248 #000F8 -   246
=mCLRCA   Abs      3840 #00F00 -   276
=mCMD2    Abs        20 #00014 -   189
=mCMD3    Abs       320 #00140 -   188
=mCMDf    Abs      5120 #01400 -   187    188    189    190    191    192    193
=mCSRQ    Abs         4 #00004 -   264
=mDATA2   Abs        16 #00010 -   185
=mDATAf   Abs      4096 #01000 -   184    185
=mEAR     Abs      5144 #01418 -   190
=mENDM    Abs         3 #00003 -   263
=mENDf    Abs      4608 #01200 -   186
=mERSTS   Abs         6 #00006 -   266
=mETE     Abs      5441 #01541 -   197
=mETO     Abs      5440 #01540 -   196
=mFIND1   Abs         6 #00006 -   212
=mFINDD   Abs     24576 #06000 -   211    212
=mFRAME   Abs      4096 #01000 -   183
=mGETCA   Abs        12 #0000C -   273
=mIDYf    Abs      5632 #01600 -   195
=mIFC     Abs      5264 #01490 -   193
=mINCCA   Abs        13 #0000D -   274
=mMADDR   Abs        14 #0000E -   275
=mMANUL   Abs         8 #00008 -   268
=mNOP     Abs         0 #00000 -   259
=mPDLOP   Abs        48 #00030 -   205
=mPULOP   Abs       254 #000FE -   253
=mRDADR   Abs         1 #00001 -   260
=mRDYf    Abs      5376 #01500 -   194    196    197
=mREADC   Abs       252 #000FC -   250
=mREADI   Abs       251 #000FB -   249
=mRSTCA   Abs        11 #0000B -   272
=mRdMem   Abs15728640 #00000 -   285
=mSAI     Abs11534336 #00000 -   222
=mSCOPE   Abs      2049 #00801 -   269
=mSDA     Abs 8388608 #00000 -   218    219
=mSDA@5   Abs         8 #00008 -   219
=mSDI     Abs10485760 #00000 -   221
=mSETAI   Abs15926049 #30321 -   234
=mSETA1   Abs15925536 #30120 -   233
=mSETCA   Abs      3841 #00F01 -   277
=mSETDI   Abs15925265 #30011 -   239
=mSETDR   Abs15925248 #30000 -   232
=mSETD1   Abs15926800 #30610 -   238
=mSETFC   Abs14680064 #00000 -   227    228
=mSETIC   Abs     62976 #0F600 -   244
=mSETIM   Abs     64000 #0FA00 -   248
```

```
=mSETIT  Abs    63232 #0F700 -   245
=mSETST  Abs15925313 #30041 -   236
=mSETSI  Abs15925568 #30140 -   235
=mSETTC  Abs    62720 #0F500 -   243
=mSETTM  Abs    62464 #0F400 -   242
=mSETTO  Abs13631488 #00000 -   225    226
=mSFC@5  Abs       14 #0000E -   228
=mSPDIS  Abs    65280 #0FF00 -   254    255
=mSPEN   Abs    65281 #0FF01 -   255
=mSPTO   Abs    63744 #0F900 -   247
=mSSRQ   Abs        5 #00005 -   265
=mSST    Abs  9437184 #00000 -   220
=mSTATS  Abs        2 #00002 -   261
=mSTO@5  Abs       13 #0000D -   226
=mSTS@4  Abs      243 #000F3 -   237
=mSTSTC  Abs      513 #00201 -   262
=mTAKEC  Abs     3843 #00F03 -   278    280    281
=mTAKEI  Abs   983952 #F0390 -   280
=mTAKEO  Abs   983824 #F0310 -   281
=mTCT    Abs12582912 #00000 -   223    224
=mTCT@4  Abs      192 #000C0 -   224
=mTEST   Abs      242 #000F2 -   287
=mUNADM  Abs     8208 #02010 -   204
=mUNL    Abs     5183 #0143F -   191
=mUNT    Abs     5215 #0145F -   192
=mUPDSC  Abs     2560 #00A00 -   271
=mWrMem  Abs15794176 #10000 -   286
=maddrL  Abs        2 #00002 -   203
=maddrT  Abs        4 #00004 -   202
=p3DATA  Abs       15 #0000F -   123
=pACK    Abs        0 #00000 -   108
=pADDR   Abs        4 #00004 -   112
=pCMD    Abs       12 #0000C -   120
=pDATA   Abs       11 #0000B -   119
=pDIAGL  Abs        3 #00003 -   111
=pDIAGR  Abs        2 #00002 -   110
=pEOT    Abs        6 #00006 -   114
=pETE    Abs        9 #00009 -   117
=pHALTD  Abs        7 #00007 -   115
=pIDY    Abs       14 #0000E -   122
=pIFC    Abs        5 #00005 -   113
=pRDY    Abs       13 #0000D -   121
=pSTATE  Abs        1 #00001 -   109
=pTERM   Abs        8 #00008 -   116
=pUTYPE  Abs       10 #0000A -   118
=s3BYTE  Abs        3 #00003 -   159
=sCONTR  Abs        0 #00000 -   153
=sDATAO  Abs        9 #00009 -   144
=sDATAV  Abs        8 #00008 -   145
=sDevOK  Abs        8 #00008 -    22
=sERROR  Abs        0 #00000 -   162
=sFirst  Abs        0 #00000 -    27
=sINTR   Abs        4 #00004 -   149
=sLISTR  Abs        1 #00001 -   152
=sLOCKD  Abs       11 #0000B -   142
```

```
=sLoop?  Abs        5 #00005 -    25
=sMANUL  Abs        2 #00002 -   160
=sMBXsr  Abs        1 #00001 -    31
=sOVERW  Abs        8 #00008 -    21
=sPOLLE  Abs        6 #00006 -   147
=sPRIVT  Abs       11 #0000B -    19
=sRMOTE  Abs       10 #0000A -   143
=sReadd  Abs        4 #00004 -    26
=sSCNTR  Abs        3 #00003 -   150
=sSRQIN  Abs        1 #00001 -   161
=sSTAND  Abs        7 #00007 -   146
=sSTK    Abs        7 #00007 -    23
=sTALKA  Abs        2 #00002 -   151
=sUNCNF  Abs        5 #00005 -   148
=sUNSEC  Abs       10 #0000A -    20
=vDEVID  Abs825708616 #75048 -   240
```

```
Input Parameters

  Source file name is NZ&SYM::MS

  Listing file name is NZ/SYM:TI:ML::-1

  Object file name is NZ%SYM:TI:MS::-1

                                          111111
                                0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News
```

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