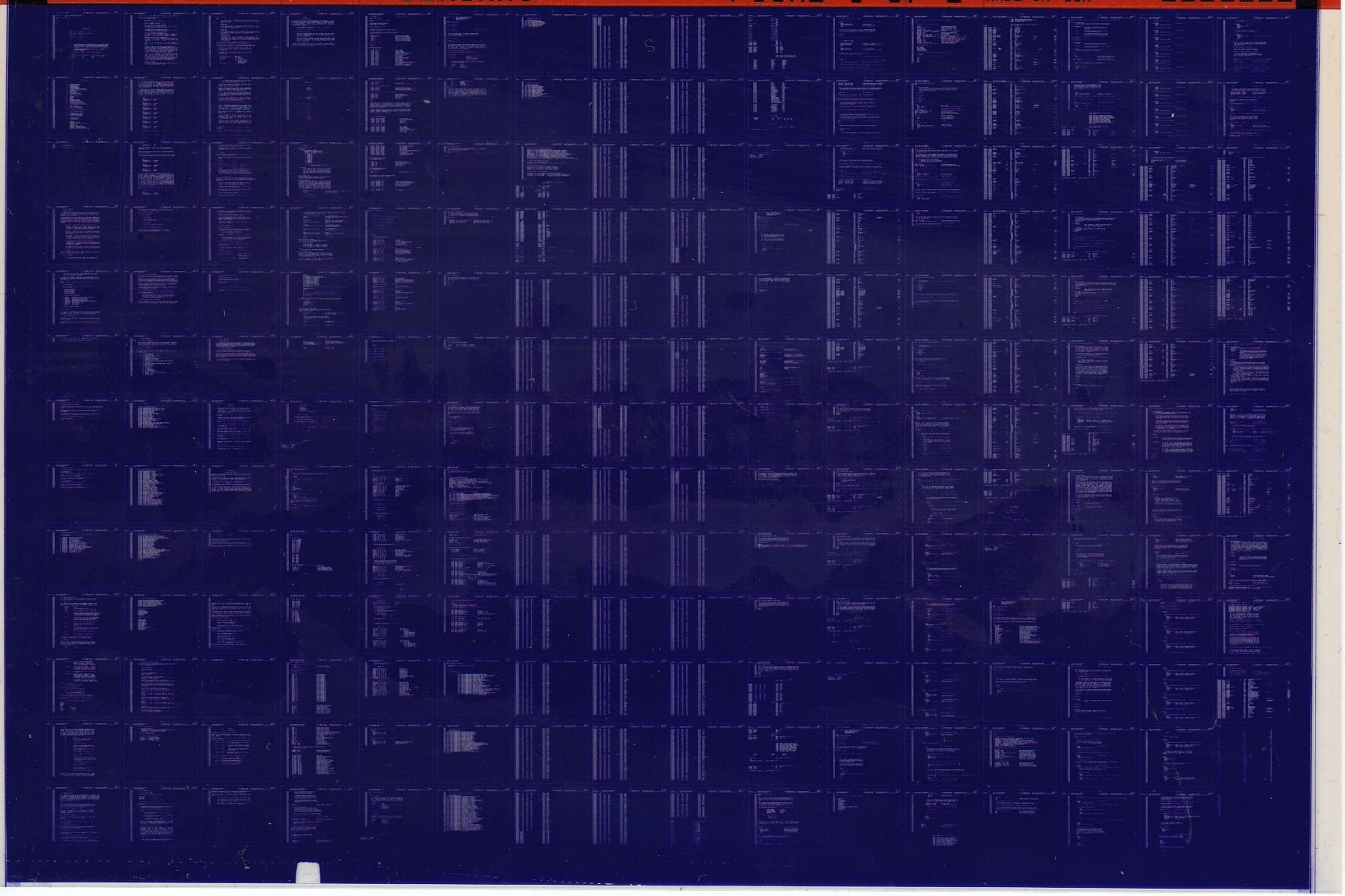
RC25

RC25 DISK FORMATTER
CZRCHAO

AH-T275A-MC
FICHE 1 OF 2



RC25 RC25 DISK FORMATTER AH-T275A-MC OCT 1983
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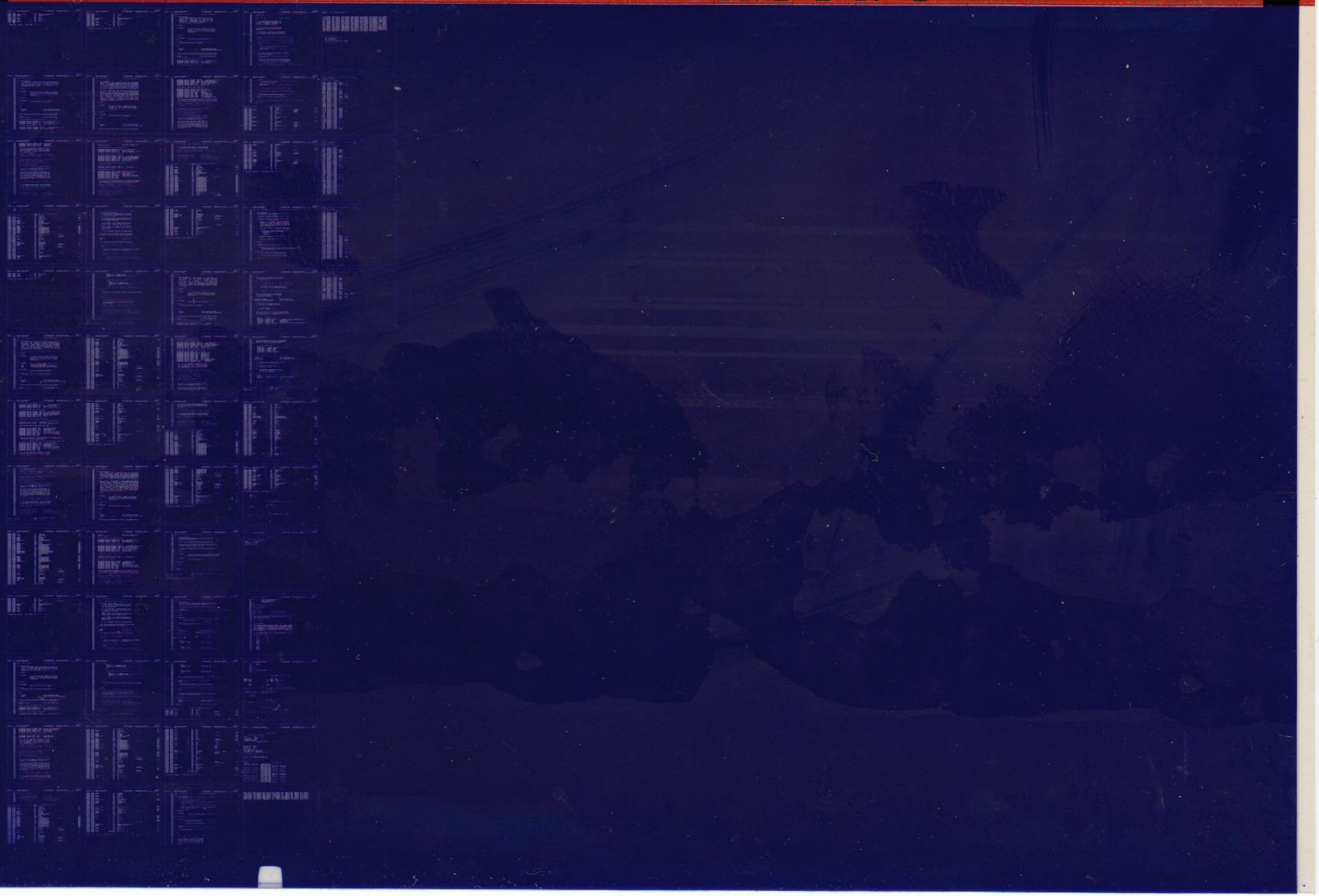

```
;       0001  MODULE CZRCH1   (%TITLE 'CZRCH RC25 DISK FORMATTER'
;       0002                  IDENT = 'REV A PATCH 00') =
;       0003
;       0004  %SBTTL  'USER DOCUMENTATION'
;     C 0005  %(
;     C 0006
;     C 0007
;     C 0008
;     C 0009
;     C 0010
;     C 0011
;     C 0012
;     C 0013
;     C 0014
;     C 0015
;     C 0016                                        IDENTIFICATION
;     C 0017                                        --------------
;     C 0018
;     C 0019                          PRODUCT CODE:  AC-T274A-MC
;     C 0020
;     C 0021                          PRODUCT NAME:  CZRCHA0 RC25 DISK FORMATTER
;     C 0022
;     C 0023                          PRODUCT DATE:  13-JUL-83
;     C 0024
;     C 0025                          MAINTAINER  :  Disk Engineering
;     C 0026
;     C 0027                          AUTHOR      :  D.W.Neale
;     C 0028
;     C 0029
;     C 0030
;     C 0031
;     C 0032
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;     C 0049
;     C 0050
```

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```
;       C 0106
;       C 0107          0.0  MAINTENANCE HISTORY
;       C 0108
;       C 0109              Modified By: D.W.Neale      Date: 13-Jul-83        Version: 1.0
;       C 0110
;       C 0111                  Original release
```

```
C 0112          1.0  GENERAL INFORMATION
C 0113
C 0114          1.1  PROGRAM ABSTRACT
C 0115
C 0116          This program will prepare RC25 media for use as addressable storage  by
C 0117          providing  headers  and replacing of bad blocks.  This formatter will be
C 0118          composed  of  two  sections;  a  host-resident  section,  and  a
C 0119          controller-resident DM code section.
C 0120
C 0121          The host section will serially format up to sixteen RC25  subsystems  by
C 0122          downline-loading  the  DM  code,  and  monitor  the  task.  The downline
C 0123          section will consist of overlays of DM code.  The first of these will be
C 0124          down-line loaded to the drive itself, and accomplish the actual business
C 0125          of formatting, calling in additional overlays as needed, asking software
C 0126          parameters  questions  and  printing  formatter  error and informational
C 0127          messages.
C 0128
C 0129          There are three general modes of DM formatter operation and they are:
C 0130
C 0131                  o REFORMAT - This mode is used to format a medium which has been
C 0132                    previously  formatted,  and  is  being  reformatted  to  clear
C 0133                    existing data or to change the mode of the medium to 512 bytes
C 0134                    per sector.  It assumes that the FCT is still intact.
C 0135
C 0136                  o RESTORE - This mode will only be run by DIGITAL  Manufacturing
C 0137                    personnel.   It provides an external copy of the FCT, produced
C 0138                    when  the  disk  was  manufactured  and  stored  offline,  to  the
C 0139                    RC25 formatter.
C 0140
C 0141                  o RECONSTRUCT - This mode is used when none of the  other  modes
C 0142                    is  possible.   It detects bad blocks by performing repetitive
C 0143                    read checks of each sector.  For this  reason,  a  RECONSTRUCT
C 0144                    run takes considerably longer than the other modes.
C 0145
C 0146          There are two general modes of HOST operation and they are:
C 0147
C 0148                  o ATTENDED MODE- This is where an operator must be present at the
C 0149                    console terminal to respond to DM formatter software parameter
C 0150                    questions.  In this HOST mode the operator can choose any of the
C 0151                    three DM formatting modes.
C 0152
C 0153                  o UN-ATTENDED MODE- This is where the HOST will automaticaly answer
C 0154                    DM formatter software parameter questions to perform a REFORMAT
C 0155                    mode to all units selected units via the hardware P_Tables.
C 0156
C 0157          1.2     Performance Goals
C 0158
C 0159          Before initiating the format process, simple  checks  will  be  made  to
C 0160          assure  the  object  drive  exists, and that communications are possible
C 0161          between host and downline program sections.
C 0162
C 0163          To maximize throughput:
C 0164
C 0165              o For full Track reads a half Track skew will be employed.  That
C 0166                is,  for even physical LBN track numbers each  block number in
C 0167                Track N+1  will  occur  16  block times  later than in Track N.
C 0168
```

```
C 0169              o During bad block replacement, primary replacement blocks (RBN)
C 0170                will be used first.  A second pass will then use secondary
C 0171                RBN's for any additional bad blocks.
C 0172
C 0173          All bad blocks, whether induced by the manufacturing process or
C 0174          wear-caused, will be revectored to Replacement Blocks (RBN). This will
C 0175          assure the full compliment of 25,451 blocks per surface for host
C 0176          applications use.
C 0177
C 0178          Product reliability is enhanced through use of four copies of the FCT
C 0179          and RCT.
C 0180
C 0181          1.3  SYSTEM REQUIREMENTS
C 0182
C 0183              The following are required to run the RC25 Formatter
C 0184              on PDP-11 Systems:
C 0185
C 0186               * A PDP-11 series CPU
C 0187               * A minimum of 28K words of main memory
C 0188               * An RC25 subsystem
C 0189               * An XXDP+ load medium
C 0190               * A console terminal
C 0191               * Diagnostic Supervisor
C 0192
C 0193          1.4  RELATED DOCUMENTS AND STANDARDS
C 0194
C 0195              1.  DUP.V05      Diagnostic/Utilities Protocal version 0.5
C 0196              2.  UQSSP.DOC    Unibus/Q-Bus Storage Systems port V1.5
C 0197              4.  MSCP.DOC     Mass Storage Control Protocal
C 0198              5.  AZTEC.DOC    RC25 Microcode Documentation
C 0199              6.  DSDFV11.DOC  Standard Disk Format Specification version 1.1
C 0200              7.  SUPPRGC.DOC  PDP-11 Diagnostic Supervisor Programming quide
C 0201              8.  CHQUSD.SEQ   XXDP+/SUPR user manual
C 0202              9.  BLISS-16     Language Guide
C 0203              10. BLISS-16     User's Guide
C 0204
C 0205          1.5  DIAGNOSTIC HIERARCY PREREQUISITES
C 0206
C 0207          A fully functional CPU, main memory and RC25 subsystem are required.
C 0208
C 0209          1.6  ASSUMPTIONS
C 0210
C 0211          Prior to the first formatting of a media, an exhaustive surface analysis
C 0212          is assumed to have taken place to detect bad spots caused by the
C 0213          manufacturing process.  The results of this analysis is assumed to have
C 0214          been written as two FCT images per FCT track on the RC25 media.
C 0215
C 0216          1.7 PRODUCT USERS AND USES
C 0217
C 0218          This program is intended for use on media which has undergone a surface
C 0219          analysis process, resulting in the writing of Factory Control Tables
C 0220          (FCT) on the media.
C 0221
C 0222          The program will be used by Engineering and Manufacturing Groups as a
C 0223          product development tool, and by Field Service personnel for media
C 0224          recovery.
C 0225
```

```
;       C 0226          This program is a utility and is not intended for use as a diagnostic.
;       C 0227
;       C 0228          For future use, the DM formatter code portion of this program  will  be
;       C 0229          used by operating systems  as a format utiity program.
;       C 0230
```

```
;       C 0231          1.8  RESTRICTIONS
;       C 0232
;       C 0233          This program will be host loaded.
;       C 0234
;       C 0235          With the exception of the FCT and inner DBN tracks,  all information  previously
;       C 0236          recorded  on the media will be destroyed.  This includes all LBN, RBN and RCT
;       C 0237          blocks.
;       C 0238
;       C 0239          The format process will reset the forced error indicator (EDC field)  of
;       C 0240          each LBN, DBN, and used RBN   and set the forced error indicators of all
;       C 0241          unused RBN's.
;       C 0242
;       C 0243          The FCT preamble will indicate zero for both the size  of  the  576 byte
;       C 0244          replacement table, and the size of the controller scratch area.
;       C 0245
;       C 0246          All sectors will have 512 byte data fields.
;       C 0247
;       C 0248          This Host program will run on only PDP-11 family  CPUs  which support the
;       C 0249          Diagnostic Supervisors.
;       C 0250
```

```
;       C 0251          1.9 Bad Block Definition
;       C 0252
;       C 0253          The Formatter's bad block replacement convention is as follows:
;       C 0254
;       C 0255          For Read operations:
;       C 0256          --------------------
;       C 0257          Any ECC, read or compare data failure will result in four retries.
;       C 0258
;       C 0259          Failure of any retries will be considered a Hard error  and
;       C 0260          the block in error will be replaced.
;       C 0261
;       C 0262          The block in question will be considered good and no revectoring
;       C 0263          will be done if all retries are successful.
;       C C264
;       C 0265          For Write operations:
;       C 0266          ---------------------
;       C 0267          A Write failure will result in four retries.
;       C 0268
;       C 0269          Failure of any retries will be considered a Hard error  and
;       C 0270          the block in error will be replaced.
;       C 0271
;       C 0272          The block in question will be considered good and no revectoring
;       C 0273          will be done if all retries are successful.
```

```
;       C 0274          1.10 SOURCE MODULE DEFINITION
;       C 0275
;       C 0276          The following list all source module comprising CZRCHA and a description
;       C 0277          of thier contents.
;       C 0278
;       C 0279          1. CZRCH0.R16   Host source bliss library
;       C 0280          2. CZRCH1.B16   Program source document module
;       C 0281          3. CZRCH2.B16   Global data module
;       C 0282          4. CZRCH3.B16   Init code source module
;       C 0283          5. CZRCH4.B16   Test source module
;       C 0284          6. CZRCH5.B16   Global routine source module
;       C 0285          7. CZRCH6.B16   DM formatter down-line load executable module
;       C 0286          8. CZRCH7.B16   DRS> Last address source module
;       C 0287          9. CZRCH8.EXE   DMCONV.EXE Dmconv exicutable code
;       C 0288         10. CZRCH9.BP2   DMCONV.BP2 Dmconv source module
;       C 0289         11. CZRCH10.MAC  AZFMTR.MAC DM formatter source macro module
;       C 0290         12. CZRCH11.SAV  AZFMTR.SAV DM formatter executable code
;       C 0291         13. CZRCH12.2D   Project Functional specification run-off source module
;       C 0292         14. CZRCHA.COM   Project indirect command file
;       C 0293         15. CZRCHA.DOC   Program document listing file
;       C 0294         16. CZRCHA.SEQ   Host sequence listing
;       C 0295         17. CZRCHA.BIN   Program XXDP+ .bin file
;       C 0296         18. CZRCH13.LST  DM formatter listing file
;       C 0297
```

```
C 0298          2.0  OPERATING INSTRUCTIONS
C 0299
C 0300          This  section contains a brief description of the runtime services.
C 0301          for detailed information, refer to the XXDP+ user's manual (CHQUS).
C 0302
C 0303          2.1  COMMANDS
C 0304
C 0305          There  are eleven legal commands for the diagnostic runtime services
C 0306          (supervisor).  This  section lists  the commands  and gives  a  very
C 0307          brief description of them.  The XXDP+ user's manual has more details.
C 0308
C 0309                  COMMAND         EFFECT
C 0310                  -------         ----------------------------
C 0311                  START           Start the diagnostic from an initial state
C 0312
C 0313                  RESTART         Start the diagnostic without initializing
C 0314
C 0315                  CONTINUE        Continue at test that was interrupted (after ^C)
C 0316                                  Attempts to continue after a control c will result
C 0317                                  in the present units formatting to be aborted and
C 0318                                  the next logical units formatting to commence.
C 0319
C 0320                  PROCEED         Continue from an error halt.  This host program
C 0321                                  is coded to be a utility and not a diagnostic,
C 0322                                  therefor no error macros are used.  For this
C 0323                                  reason this DRS> command has no meaning.
C 0324
C 0325                  EXIT            Return to XXDP+ monitor (XXDP+ operation only!)
C 0326
C 0327                  ADD             Activate a unit for testing (all units are
C 0328                                  considered to be active at start time
C 0329
C 0330                  DROP            Deactivate a unit
C 0331
C 0332                  PRINT           Print statistical information.  Report summary
C 0333                                  coding is remote DM program driven and is not
C 0334                                  implemented in the host.
C 0335
C 0336                  DISPLAY         Type a list of all device information
C 0337
C 0338                  FLAGS           Type the state of all flags (see section 2.3)
C 0339
C 0340                  ZFLAGS          Clear all flags (see section 2.3)
C 0341
C 0342          A command can be recognized by the first three characters.
C 0343          So you may,  for example, type  "STA" instead  of "START".
C 0344
C 0345          2.2  SWITCHES
C 0346
C 0347          There are  several  switches which are used to modify supervisor
C 0348          operation. These  switches are  appended  to the legal  commands.
C 0349          All  of  the  legal  switches  are  tabulated below with a brief
C 0350          description of each. In the descriptions below, a decimal number
C 0351          is designated by "DDDDD".
C 0352
C 0353                  SWITCH          EFFECT
C 0354                  ------          ------------------------------
```

```
;       C 0355                  /TESTS:LIST     Execute only those tests specified in
;       C 0356                                  the list.  List is a string of test
;       C 0357                                  numbers, for example - /TESTS:1:5:7-10.
;       C 0358                                  This list will cause tests 1,5,7,8,9,10 to
;       C 0359                                  be run.  All other tests will not be run.
;       C 0360
;       C 0361                  /PASS:DDDDD     Execute DDDDD passes (DDDDD = 1 to 64000)
;       C 0362                                  The host code will perform only one pass.
;       C 0363                                  At completion of pass one the program will
;       C 0364                                  be terminated regardless of this switch.
;       C 0365
;       C 0366                  /FLAGS:FLGS     Set specified flags.  flags are described
;       C 0367                                  in section 2.3.
;       C 0368
;       C 0369                  /EOP:DDDDD      Report end of pass message after every
;       C 0370                                  DDDDD passes only.  (DDDDD = 1 to 64000)
;       C 0371                                  The host code will perform only one pass.
;       C 0372                                  At completion of pass one the program will
;       C 0373                                  be terminated regardless of this switch.
;       C 0374
;       C 0375                  /UNITS:LIST     TEST/ADD/DROP only those units specified
;       C 0376                                  in the list.  List example - /UNITS:0:5:10-12
;       C 0377                                  use units 0,5,10,11,12 (unit numbers = 0-63)
;       C 0378
;       C 0379          Example of switch usage:
;       C 0380
;       C 0381                  START/TESTS:1-5/PASS:1000/EOP:100
;       C 0382
;       C 0383          The effect of this command will be:
;       C 0384
;       C 0385                  1. Tests 1 through 5 will be executed.
;       C 0386
;       C 0387                  2. All  units will  tested 1000 times.
;       C 0388
;       C 0389                  3. The  end of  pass messages will be
;       C 0390                     printed after each 100 passes only.
;       C 0391
;       C 0392          A Switch can be recognized by the first three characters.  You
;       C 0393          may, for  example, type  "/TES:1-5" instead   of "/TESTS:1-5".
;       C 0394
;       C 0395          Below is a table that specifies which switches can be used by
;       C 0396          each command.
;       C 0397
;       C 0398                  TESTS   PASS    FLAGS   EOP     UNITS
;       C 0399                  ------------------------------------
;       C 0400          START     X       X       X       X       X
;       C 0401          RESTART   X       X       X       X       X
;       C 0402          CONTINUE          X       X       X
;       C 0403          PROCEED                   X
;       C 0404          DROP                                      X
;       C 0405          ADD                                       X
;       C 0406          PRINT
;       C 0407          DISPLAY                                   X
;       C 0408          FLAGS
;       C 0409          ZFLAGS
;       C 0410          EXIT
;       C 0411
```

```
C 0412
C 0413          2.3  FLAGS
C 0414
C 0415          Flags are used to set up certain operational parameters such as
C 0416          looping  on error.  All flags are cleared at startup and remain
C 0417          cleared  until explicitly  set  using the  flags switch.  Flags
C 0418          are  also cleared  after  a start  command unless set using the
C 0419          flag  switch.  The ZFLAGS  command  may also  be used  to clear
C 0420          all flags.  with the exception of the START and ZFLAGS commands,
C 0421          No  commands affect the state of the flags;  they remain set or
C 0422          cleared as specified by the last flag switch.
C 0423
C 0424                  FLAG            EFFECT
C 0425                  ----            ------------------------------
C 0426                  HOE             Halt on error - control is returned to
C 0427                                  runtime services command mode
C 0428
C 0429                  LOE             Loop on error
C 0430
C 0431                  IER*            Inhibit all error reports
C 0432
C 0433                  IBR*            Inhibit  all error reports except first
C 0434                                  level  (first level contains error type,
C 0435                                  number, PC, test and unit)
C 0436
C 0437                  IXR*            Inhibit extended error reports (those
C 0438                                  called by PRINTX macro's)
C 0439
C 0440                  PRI             Direct messages to line printer
C 0441
C 0442                  PNT             Print test number as test executes
C 0443
C 0444                  BOE             "BELL" on error
C 0445
C 0446                  UAM             Unattended mode (no manual intervention)
C 0447
C 0448                  ISR             Inhibit statistical reports (does not apply
C 0449                                  to diagnostics which do not support statis-
C 0450                                  tical reporting)
C 0451
C 0452                  IDR             Inhibit program dropping of units
C 0453
C 0454                  ADR             Execute autodrop code
C 0455
C 0456                  LOT             Loop on test
C 0457
C 0458                  EVL             Execute evaluation (on diagnostics which
C 0459                                  have evaluation support)
C 0460
C 0461                          *error messages are described in section 3.1
C 0462
C 0463
C 0464          See the XXDP+ user's manual for more details on flags.  You may
C 0465          specify  more  than one flag with the flag switch.  For example,
C 0466          to  cause  the program to  loop on error, inhibit error reports
C 0467          and  type a "BELL"  on error,  you may use the following string:
C 0468
```

```
C 0469                  /FLAGS:LOE:IER:BOE
C 0470
C 0471
C 0472          2.4  HARDWARE QUESTIONS
C 0473
C 0474          When a diagnostic is started, the runtime services will prompt the  user
C 0475          for  hardware  information by typing "CHANGE HW (L) ?".  You must answer
C 0476          "Y" after a start command  unless  the  hardware  information  has  been
C 0477          "preloaded"  using  the setup utility (see Chapter 6 of the XXDP+ user's
C 0478          Manual).  When you answer this question with a "Y", the runtime services
C 0479          will  ask  for the number of units (in decimal).  You will then be asked
C 0480          the following questions for each unit.
C 0481
C 0482          # UNITS (D) ?
C 0483
C 0484          Answer with the number of units to be tested (no default).  This
C 0485          answer will determine how many times the following questions are
C 0486          asked.  A unit is a logical disk (single platter) on  an  RC25.
C 0487          A maximum of sixteen units will be accepted by the init code.
C 0488
C 0489          RC25  IP   REGISTER   ADDRESS (O) 172150 ?
C 0490
C 0491          Answer with  the  address  of  the  IP  Register  of  one  RC25
C 0492          controller   as  addressed  by  the  processor  with  memory
C 0493          management turned off (i.e., An even 16 bit address in the range
C 0494          of 160000 to 177774).
C 0495
C 0496          RC25 INTERRUPT VECTOR ADDRESS (O) 154 ?
C 0497
C 0498          Answer  with  the  interrupt  vector  address   of   the   RC25
C 0499          controller.   A  vector  address in the range of 4 to 774 may be
C 0500          specified.
C 0501
C 0502          RC25    BUS   REQUEST   LEVEL (D) 5 ?
C 0503
C 0504          Answer with the interrupt priority used by the RC25.  Levels  4
C 0505          to 7 are accepted.
C 0506
C 0507          UNIT  NUMBER TO BRING  ONLINE (D) 0 ?
C 0508
C 0509          Answer with the physical platter number you wish to bring online.
C 0510          The removable platter is an even number and the fixed platter is
C 0511          the sequentially following odd number.
C 0512
C 0513          2.5  SOFTWARE QUESTIONS
C 0514
C 0515          The supervisor will ask the question "CHANGE SW (L) ?.  This question is
C 0516          to  be  answered  with 'Y'.  The following message will be printed to the
C 0517          console terminal:
C 0518
C 0519                  FORMAT IN UNATTENDED REFORMAT MODE (L) YES ?
C 0520
C 0521          A 'YES' response (the default) will cause the host to run in UN-ATTENDED
C 0522          reformat mode (see  section 7.2 for description).
C 0523
C 0524          A 'NO' response will cause the host to run in ATTENDED mode (see section
C 0525          7.1 for description).  In this mode an operator must be present at the
```

```
C 0526          console terminal to answer the following DM formatter software questions:
C 0527
C 0528          The DM will ask the following questions.  The question numbers  are those
C 0529          used as the DUP question numbers.
C 0530
C 0531                  0.  Enter date:
C 0532                      Enter the current date in MM-DD-YYYY.
C 0533
C 0534                  1.  Enter unit number to format:
C 0535                      Enter the number of the unit to format.
C 0536
C 0537                  2.  Enter sector size to be used (512/576):
C 0538                      This question is for compatibility  with  other  formatters.
C 0539                      The RC25 formatter will skip this question.
C 0540
C 0541                  3.  Enter mode to be used (slow/normal/fast):
C 0542                      This question is for compatibility  with  other  formatters.
C 0543                      The RC25 formatter will skip this question.
C 0544
C 0545                  4.  Use existing bad block information (y/n):
C 0546                      If the answer is YES, a REFORMAT mode format  is  done.   If
C 0547                      the  answer  is  NO,  the  mode  of  format is determined by
C 0548                      question 5.  If the answer is YES, question 5 is skipped.
C 0549
C 0550                  5.  DOWN-LINE LOAD bad block information (y/n):
C 0551                      An answer of NO will cause a RECONSTRUCT mode format  to  be
C 0552                      performed.   If  an  answer  of YES is given, a RESTORE mode
C 0553                      format will  be  performed.   An  answer  of  NO  will  skip
C 0554                      question 6.
C 0555
C 0556                      NOTE:  It is the  responsibility  of  the  host  program  to
C 0557                      obtain  the  name  of  the file to be used for the DOWN-LINE
C 0558                      LOAD.
C 0559
C 0560                  6.  Continue if bad block information is inaccessible (y/n):
C 0561                      An answer of YES will cause a RECONSTRUCT mode format to  be
C 0562                      done  if the formatter cannot read the FCT on the disk or if
C 0563                      a RESTORE mode format was attempted and the bad  block  data
C 0564                      file was unavailable.  An answer of NO will cause the format
C 0565                      to abort if the bad block information is  inaccessible.   An
C 0566                      answer of NO will terminate the question sequence.
C 0567
C 0568                      FCT blocks will be requested via  the  special  DUP  message
C 0569                      code.   The  first data word in this message will be the FCT
C 0570                      block (relative to zero) requested by  the  formatter.   All
C 0571                      DUP  sequence numbers for FCT block requests will be 1.  The
C 0572                      response is a 3 word block from the host.  The first word is
C 0573                      0 if the block was successfully retrieved and non-zero if it
C 0574                      was not.  The next 2 words contain the UNIBUS address  of  a
C 0575                      buffer containing the 512 byte block from the FCT file.
C 0576
C 0577                  7.  Enter serial number:
C 0578                      Enter the 64-bit decimal serial number of  the  disk  to  be
C 0579                      formatted.   In the RC25 formatter this number is used only
C 0580                      if a RECONSTRUCT mode format is used.
C 0581
```

```
C 0582          2.6  EXTENDED P-TABLE DIALOGUE
C 0583
C 0584          When you  answer the hardware questions, you are building entries
C 0585          in  a table that describes the  devices under test.  The simplest
C 0586          way  to build  this table  is  to  answer  all questions for each
C 0587          unit  to  be  tested.  If you  have a multiplexed device such as
C 0588          a  mass storage controller with several drives or a communication
C 0589          device with several lines, this becomes tedious since most of the
C 0590          answers are repetitious.
C 0591
C 0592          To  illustrate a  more efficient method, suppose  you are testing
C 0593          a  fictional  device,  the XY11.  Suppose this device consists of
C 0594          a control  module with  eight  units (sub-devices) attached to it.
C 0595          These units are described by the octal numbers 0 through 7.  There
C 0596          is  one  hardware  parameter that can vary among units called the
C 0597          Q-FACTOR.   This Q-FACTOR  may  be 0 or 1.  Below is a simple way
C 0598          to build a table for one xy11 with eight units.
C 0599
C 0600                  # UNITS (D) ?  8<CR>
C 0601
C 0602                  UNIT 1
C 0603                  CSR ADDRESS (O)  ?  160000<CR>
C 0604                  SUB-DEVICE # (O) ?  0<CR>
C 0605                  Q-FACTOR (O) 0   ?  1<CR>
C 0606
C 0607                  UNIT 2
C 0608                  CSR ADDRESS (O)  ?  160000<CR>
C 0609                  SUB-DEVICE # (O) ?  1<CR>
C 0610                  Q-FACTOR (O) 1   ?  0<CR>
C 0611
C 0612                  UNIT 3
C 0613                  CSR ADDRESS (O)  ?  160000<CR>
C 0614                  SUB-DEVICE # (O) ?  2<CR>
C 0615                  Q-FACTOR (O) 0   ?  <CR>
C 0616
C 0617                  UNIT 4
C 0618                  CSR ADDRESS (O)  ?  160000<CR>
C 0619                  SUB-DEVICE # (O) ?  3<CR>
C 0620                  Q-FACTOR (O) 0   ?  <CR>
C 0621
C 0622                  UNIT 5
C 0623                  CSR ADDRESS (O)  ?  160000<CR>
C 0624                  SUB-DEVICE # (O) ?  4<CR>
C 0625                  Q-FACTOR (O) 0   ?  <CR>
C 0626
C 0627                  UNIT 6
C 0628                  CSR ADDRESS (O)  ?  160000<CR>
C 0629                  SUB-DEVICE # (O) ?  5<CR>
C 0630                  Q-FACTOR (O) 0   ?  <CR>
C 0631
C 0632                  UNIT 7
C 0633                  CSR ADDRESS (O)  ?  160000<CR>
C 0634                  SUB-DEVICE # (O) ?  6<CR>
C 0635                  Q-FACTOR (O) 0   ?  1<CR>
C 0636
C 0637                  UNIT 8
C 0638                  CSR ADDRESS (O)  ?  160000<CR>
```

```
C 0639                  SUB-DEVICE # (0) ?  7<CR>
C 0640                  Q-FACTOR (0) 1   ?  <CR>
C 0641
C 0642          Notice that the default value for the Q-FACTOR changes when a
C 0643          non-default  response is  given.  Be  careful when specifying
C 0644          multiple units!
C 0645
C 0646          As you  can see  from the  above example, the hardware parameters
C 0647          do not vary significantly from unit to unit.  The procedure shown
C 0648          is not very efficient.
C 0649
C 0650          The runtime services can take multiple unit specifications  however.
C 0651          Let's build the same table using the multiple specification feature.
C 0652
C 0653                  # UNITS (D) ?  8<CR>
C 0654
C 0655                  UNIT 1
C 0656                  CSR ADDRESS (0)  ?  160000<CR>
C 0657                  SUB-DEVICE # (0) ?  0,1<CR>
C 0658                  Q-FACTOR (0) 0   ?  1,0<CR>
C 0659
C 0660                  UNIT 3
C 0661                  CSR ADDRESS (0)  ?  160000<CR>
C 0662                  SUB-DEVICE # (0) ?  2-5<CR>
C 0663                  Q-FACTOR (0) 0   ?  0<CR>
C 0664
C 0665                  UNIT 7
C 0666                  CSR ADDRESS (0)  ?  160000<CR>
C 0667                  SUB-DEVICE # (0) ?  6,7<CR>
C 0668                  Q-FACTOR (0) 0   ?  1<CR>
C 0669
C 0670          As  you can  see in  the above dialogue, the runtime services will
C 0671          build as  many entries as it can with the information given in any
C 0672          one  pass through  the questions.  In  the first pass, two entries
C 0673          are built since two sub-devices and Q-FACTORS were specified.  The
C 0674          services  assume that  the CSR address is 160000 for both since it
C 0675          was  specified only  once.  In  the second pass, four entries were
C 0676          built.  This  is  because  four  sub-devices were  specified.  The
C 0677          "-" construct tells  the  runtime services  to increment the data
C 0678          from  the first  number to  the second.  In this case, sub-devices
C 0679          2, 3, 4  and 5  were specified.  (If the sub-device were specified
C 0680          by  addresses, the  increment would  be by  2 since addresses must
C 0681          be  on an  even  boundary.)  The  CSR  addresses and Q-FACTORS for
C 0682          the  four entries  are  assumed  to be  160000 and 0  respectively
C 0683          since  they were  only  specified  once.  The  last two  units are
C 0684          specified in the third pass.
C 0685
C 0686          The whole process could have been accomplished in one pass as shown
C 0687          below.
C 0688
C 0689                  # UNITS (D) ?  8<CR>
C 0690
C 0691                  UNIT 1
C 0692                  CSR ADDRESS (0)  ?  160000<CR>
C 0693                  SUB-DEVICE # (0) ?  0-7<CR>
C 0694                  Q-FACTOR (0) 0   ?  0,1,0,,,,1,1<CR>
C 0695
```

```
;       C 0696          As you can see from this example, null replies (commas enclosing
;       C 0697          a null field) tell the runtime services to repeat the last reply.
;       C 0698
;       C 0699          2.7  QUICK START-UP PROCEDURE  (XXDP+)
;       C 0700
;       C 0701          To start-up this program:
;       C 0702
;       C 0703                  1. Boot XXDP+
;       C 0704
;       C 0705                  2. Give the date
;       C 0706
;       C 0707                  3. Type "R CZRCHA", where name is the name of the bin or bic
;       C 0708                     file for this program
;       C 0709
;       C 0710                  4. Type "START"
;       C 0711
;       C 0712                  5. Answer the "CHANGE HW" question with "Y"
;       C 0713
;       C 0714                  6. Answer all the hardware questions
;       C 0715
;       C 0716                  7. Answer the "CHANGE SW" question with "N"
;       C 0717
;       C 0718          When  you follow  this procedure you will be using only the
;       C 0719          defaults for flags and software parameters.  These defaults
;       C 0720          are described in sections 2.3 and 2.5.
;       C 0721
```

```
;       C 0722          2.8  PID (PROCESS INDICATOR) WORDS
;       C 0723
;       C 0724          The process indicator words (PID) are maintained by the remote DM program
;       C 0725          and indicates to the host the DM programs progress running in the controller.
;       C 0726
;       C 0727          These PID words are then obtained by the host via the DUP GET_DUST_STATUS
;       C 0728          command. The newly obtained PID are compared to previous PID words.  If
;       C 0729          the PID has not increased since the last GET_DUST_STATUS then the remote
;       C 0730          program is to be considered dead and the connection to the controller broken.
;       C 0731
;       C 0732          However if the PID value has increased since the last GET_DUST_STATUS then
;       C 0733          the remote program is to be considered still running.  The new PID words
;       C 0734          are saved and command time out waits reinitiated.
;       C 0735
;       C 0736          This host code will print out to the console terminal the PID values after
;       C 0737          each GET_DUST_STATUS while the formatter is running in the controller.
;       C 0738          The printing format is as follows:
;       C 0739
;       C 0740                  FORMATTER PROGRESSING: PID HI=xxxxxxx(O) PID LO=xxxxxx(O)
;       C 0741
;       C 0742          To further demonstrate to the host the progress of the DM formatter
;       C 0743          the following is performed:
;       C 0744
;       C 0745                  Each time the DM formatter calls in a new overlay from host
;       C 0746                  memory the low PID word is cleared and the high PID word is
;       C 0747                  incremented.  The operator can then be observed when new
;       C 0748                  overlays are called into DM memory.
;       C 0749
;       C 0750          2.9  HOST/DM FORMATTER RUN TIME MESSAGES
;       C 0751
;       C 0752          All host: messages, fatal errors or operator prompts are printed in UPPER
;       C 0753          case characters while all DM formatter: messages, fatal errors, completion
;       C 0754          information or operator prompts are printed in lower case characters.
```

```
;       C 0755          3.0  ERROR INFORMATION
;       C 0756
;       C 0757          3.1  TYPES OF ERROR MESSAGES
;       C 0758
;       C 0759          Due to the fact that this is an utility and not a diagnostic error macro
;       C 0760          calls will not be used by this host code to report errors.  Instead all
;       C 0761          errors will be printed to the operator via the PRINTF macro using the
;       C 0762          prefix "$FTLERR- error message text" indicating this to be a fatal error.
;       C 0763
;       C 0764          3.2  SPECIFIC ERROR MESSAGES
;       C 0765
;       C 0766          DM Code Error Messages
;       C 0767
;       C 0768          All errors returned are fatal.  Error messages  returned  by  the  RC25
;       C 0769          formatter  are  as  follows.   The error numbers given are the DUP error
;       C 0770          message numbers.
;       C 0771
;       C 0772                  1  "GET STATUS failure"
;       C 0773                  2  "LESI send error"
;       C 0774                  3  "Unsuccessful LESI command"
;       C 0775                  4  "LESI receive error"
;       C 0776                  5  "UNIBUS I/O error"
;       C 0777                  6  "Formatter initialization error"
;       C 0778                  7  "Nonexistent unit number"
;       C 0779                  8  "DBN/XBN format error (drive FORMAT command failed)"
;       C 0780                  9  "FCT does not have enough good copies of each block"
;       C 0781                 10  "SEEK error"
;       C 0782                 11  "RCT does not have enough good copies of each block"
;       C 0783                 12  "LBN format error (drive FORMAT command failed)"
;       C 0784                 13  "FCT write error"
;       C 0785                 14  "RCT read error"
;       C 0786                 15  "RCT write error"
;       C 0787                 16  "RCT full"
;       C 0788                 17  "FCT read error"
;       C 0789                 18  "FCT nonexistent"
;       C 0790                 19  "FCT downline-load error"
;       C 0791                 20  "Drive init timeout"
;       C 0792                 21  "Illegal response to start-up question"
;       C 0793                 22  "WARNING - possible head addressing problems - run diagnostics"
;       C 0794                 23  "INPUT Error"
;       C 0795                 24  "Media degraded"
;       C 0796
;       C 0797
```

```
;       C 0798          Host Error Messages
;       C 0799
;       C 0800          !
;       C 0801          ! Generic self-detected fatal port/controller errors
;       C 0802          !
;       C 0803          $FTLERR- UNRECOGNIZABLE ERROR CODE
;       C 0804          $FTLERR- ENVELOPE/PACKET READ (PARITY OR TIMEOUT)
;       C 0805          $FTLERR- ENVELOPE/PACKET WRITE (PARITY OR TIMEOUT
;       C 0806          $FTLERR- CONTROLLER ROM AND RAM PARITY
;       C 0807          $FTLERR- CONTROLLER RAM PARITY
;       C 0808          $FTLERR- CONTROLLER ROM PARITY
;       C 0809          $FTLERR- RING READ (PARITY OR TIMEOUT)
;       C 0810          $FTLERR- RING WRITE (PARITY OR TIMEOUT)
;       C 0811          $FTLERR- INTERRUPT MASTER
;       C 0812          $FTLERR- HOST ACCESS TIMEOUT
;       C 0813          $FTLERR- CREDIT LIMIT EXCEEDED
;       C 0814          $FTLERR- BUS MASTER ERROR
;       C 0815          $FTLERR- DIAGNOSTIC CONTROLLER FATAL ERROR
;       C 0816          $FTLERR- INSTRUCTION LOOP TIMEOUT
;       C 0817          $FTLERR- INVALID CONNECTION IDENTIFIER
;       C 0818          $FTLERR- INTERRUPT WRITE
;       C 0819          $FTLERR- MAINTENANCE READ/WRITE INVALID REGION IDENTIFIER
;       C 0820          $FTLERR- MAINTENANCE WRITE LOAD TO NON-LOADABLE CONTROLLER
;       C 0821          $FTLERR- CONTROLLER RAM ERROR (NON-PARITY)
;       C 0822          $FTLERR- INIT SEQUENCE ERROR
;       C 0823          $FTLERR- HIGH LEVEL PROTOCOL INCOMPATIBILITY ERROR
;       C 0824          $FTLERR- PURGE/POLL HARDWARE FAILURE
;       C 0825          $FTLERR- MAPPING REGISTER READ ERROR (PARITY OR TIMEOUT)
```

```
;       C 0826      !
;       C 0827      ! RC25 Self-detected fatal port/controller errors
;       C 0828      !
;       C 0829          $FTLERR- VAX READ/WRITE ERROR ON INTERRUPT
;       C 0830          $FTLERR- INCONSISTENCY AT U.BFIL
;       C 0831          $FTLERR- INCONSISTENCY AT U.BMTY
;       C 0832          $FTLERR- INCONSISTENCY AT U.ALOC
;       C 0833          $FTLERR- INCONSISTENCY AT SERVO ENTRY (PIP SET)
;       C 0834          $FTLERR- INCONSISTENCY AT SERVO ENTRY (ERR SET)
;       C 0835          $FTLERR- INCONSISTENCY AT U.SEND
;       C 0836          $FTLERR- INCONSISTENCY AT U.RECV
;       C 0837          $FTLERR- INCONSISTENCY AT U.ATTN
;       C 0838          $FTLERR- INCONSISTENCY AT U.ONLN
;       C 0839          $FTLERR- ILLEGAL D REQUEST (U.QDRQ)
;       C 0840          $FTLERR- FENCE-POST ERROR AT PROTAB
;       C 0841          $FTLERR- BAD PACKET DEQUEUED AT U.DONE
;       C 0842          $FTLERR- UNEXPLAINED D-PROC SUSPENSION (U..TDS)
;       C 0843          $FTLERR- DUP PACKET D-Q FAILED (XFC 34/35)
;       C 0844          $FTLERR- INCONSISTENCY AT U.HTST
;       C 0845          $FTLERR- INCONSISTENCY AT U.SEKO
;       C 0846          $FTLERR- INCONSISTENCY AT U.CKSV
;       C 0847          $FTLERR- D.OPCD FOUND ILLEGAL OPCODE
;       C 0848          $FTLERR- D.CSF FOUND ILLEGAL OPCODE
;       C 0849          $FTLERR- UNKNOWN BAD DRIVE STATUS AT D.DSTS
;       C 0850          $FTLERR- ILLEGAL XFC EXECUTED BY DM
;       C 0851          $FTLERR- D PICKED UP A ZERO SCB.DB
;       C 0852          $FTLERR- INCONSISTENCY AT D IDLE LOOP
;       C 0853          $FTLERR- DM WORD COUNT ERROR ON HOST DMA/SEND/RECV
;       C 0854          $FTLERR- UNKNOWN DISPLAY FAULT CODE AT D.DFLT
;       C 0855          $FTLERR- DRIVE NOT FAULTING IN P.OFLN STATE
;       C 0856          $FTLERR- U POWER UP DIAGNOSTICS FAILED
;       C 0857          $FTLERR- D POWER UP DIAGNOSTICS FAILED
;       C 0858          $FTLERR- ADAPTER CARD FAILURE
;       C 0859          $FTLERR- EC.TMR TIMED OUT
;       C 0860          $FTLERR- U.SEND/U.RECV RING READ INCONSISTENCY
;       C 0861          $FTLERR- UNKNOWN WAITRV REASON AT D.RVCT
;       C 0862          $FTLERR- D.ARCS DID NOT FIND CLOSEST UNDONE ZONE
;       C 0863          $FTLERR- U.SEEK FOUND SEEK TO ILLEGAL TRACK
;       C 0864          $FTLERR- U.HTST INIT DIAG DMA WRITE FAILED
;       C 0865          $FTLERR- U.HTST INIT DIAG DMA COMPARE FAILED
;       C 0866          $FTLERR- U.SYDR FOUND SS.DER SET AND SS.SPN NOT SET
;       C 0867          $FTLERR- MASTER DRIVES ACLO ASSERTED
```

```
;       C 0868          !
;       C 0869          ! Host runtime fatal error messages
;       C 0870          !
;       C 0871          $FTLERR- NON-EXISTENT RC25 REGISTER ADRS xxxxxx
;       C 0872          $FTLERR- DUP SERVER ACTIVE AFTER INITIALIZATION
;       C 0873          $FTLERR- DUP SERVER INACTIVE AFTER EX_SUP_PROG COMMAND
;       C 0874          $FTLERR- RESPONCE STATUS ERROR: actual status error message
;       C 0875          $FTLERR- HOST/CONTROLLER OUT OF SEQ
;       C 0876          $FTLERR- REMOTE PROG NOT RUNNING
;       C 0877          $FTLERR- UNKNOWN RETURN STATUS CODE
;       C 0878          $FTLERR- COM AREA INIT ERROR
;       C 0879          $FTLERR- PORT/HOST SYNC ERROR
;       C 0880          $FTLERR- MESSAGE LENGTH ERROR
;       C 0881          $FTLERR- UNKNOWN ENDCODE RECEIVED
;       C 0882          $FTLERR- ADAPTOR PURGE ERROR
;       C 0883          $FTLERR- UNKNOWN INTERRUPT
;       C 0884          $FTLERR- INIT SEQ STEP TIMED OUT
;       C 0885          $FTLERR- INIT SEQ COMPARE ERROR
;       C 0886          $FTLERR- UNEXPECTED ATTENTION END MESSAGE RECEIVED
;       C 0887          $FTLERR- UNEXPECTED COMMAND OPCODE IN END MESSAGE RECEIVED
;       C 0888          $FTLERR- UNEXPECTED SERIOUS EXCEPTION END MESSAGE RECEIVED
;       C 0889          $FTLERR- INVALID COMMAND END MESSAGE RECEIVED
;       C 0890          $FTLERR- UNKNOWN MESSAGE TYPE RECEIVED
;       C 0891          $FTLERR- OUTSTANDING COMMAND BUFFER FULL
;       C 0892          $FTLERR- OUTSTANDING COMMAND BUFFER OUT OF SYNC ERROR
;       C 0893          $FTLERR- UNKNOWN MESSAGE NUMBER RECEIVED
;       C 0894          $FTLERR- FILE READ ERROR
;       C 0895          $FTLERR- PORT/CONTROLLER TIMEOUT ERROR
;       C 0896          $FTLERR- ILLEGAL FCT FILE LENGTH
```

```
;       C 0897          !
;       C 0898          ! Init code fatal error messages
;       C 0899          !
;       C 0900          $FTLERR- NO ADDITIONAL UNITS TO FORMAT - ABORTING
;       C 0901          $FTLERR- INIT CODE RE-ENTERED DUE TO PWR FAIL
;       C 0902          $FTLERR- ABORTING HOST AND REMOTE PROGRAMS
;       C 0903          $FTLERR- ILLEGAL NUMBER OF UNITS SELECTED
;       C 0904          $FTLERR- LIMIT OF SIXTEEN UNITS PER FORMATING SESSION
;       C 0905          $FTLERR- RC25 CONTROLLER INITIALIZATION ERROR
;       C 0906          $FTLERR- PROTOCOL VIOLATION ERROR
;       C 0907          $FTLERR- COMMUNICATION AREA INIT ERROR
;       C 0908          !
;       C 0909          ! Dup return status codes
;       C 0910          !
;       C 0911          SUCCESSFUL
;       C 0912          INVALID COMMAND
;       C 0913          NO REGION AVAILABLE
;       C 0914          NO REGION SUITABLE
;       C 0915          PROGRAM NOT KNOWN
;       C 0916          LOAD FAILURE
;       C 0917          STANDALONE
;       C 0918          !
;       C 0919          ! MSCP return status codes
;       C 0920          !
;       C 0921          SUCCESS
;       C 0922          INVALID COMMAND
;       C 0923          COMMAND ABORTED
;       C 0924          UNIT-OFFLINE
;       C 0925          UNIT-AVAILABLE
;       C 0926          MEDIA FORMAT ERROR
;       C 0927          WRITE PROTECTED
;       C 0928          COMPARE ERROR
;       C 0929          DATA ERROR
;       C 0930          HOST BUFFER ACCESS ERROR
;       C 0931          CONTROLLER ERROR
;       C 0932          DRIVE ERROR
;       C 0933          MESSAGE FROM AN INTERNAL DIAGNOSTIC
;       C 0934
```

```
;       C 0935          4.0  PERFORMANCE AND PROGRESS REPORTS
;       C 0936
;       C 0937          The formatter issues the following messages upon normal completion.  All
;       C 0938          but  the  last are sent as DUP informational messages.  The last is sent
;       C 0939          as  a  DUP  termination  message.
;       C 0940
;       C 0941            1.  "format completed"
;       C 0942
;       C 0943            2.  "n revectored LBNs"
;       C 0944                Where n is the number of LBNs revectored in  the  user  data
;       C 0945                area.
;       C 0946
;       C 0947            3.  "n primary revectored LBNs"
;       C 0948                Where n is the number of  LBNs  in  message  #2  which  were
;       C 0949                primary revectors.
;       C 0950
;       C 0951             4.  "n secondary/tertiary revectored LBNs"
;       C 0952                Where n is the number of the LBNs in message #2  which  were
;       C 0953                secondary or tertiary revectors.
;       C 0954
;       C 0955            5.  "n bad blocks in the RCT area due to data errors"
;       C 0956                Where n is the number of blocks in the total RCT area  which
;       C 0957                were bad due to errors in the data portion of their sectors.
;       C 0958
;       C 0959            6.  "n bad blocks in the RCT due to header or timing errors"
;       C 0960                Where n is the number of blocks in the total RCT area  which
;       C 0961                were  bad  due  to  errors  in the header or timing areas of
;       C 0962                their sectors.
;       C 0963
;       C 0964            7.  "n bad blocks in the DBN area due to data errors"
;       C 0965                Where n is the number of blocks in the DBN area  which  were
;       C 0966                bad due to errors in the data area of their sectors.
;       C 0967
;       C 0968            8.  "n bad blocks in the  DBN  area  due  to  header  or  timing
;       C 0969                errors"
;       C 0970                Where n is the number of blocks in the DBN area  which  were
;       C 0971                bad  due  to  errors  in  the header or timing area of their
;       C 0972                sectors.
;       C 0973
;       C 0974            9.  "n bad blocks in the XBN area due to data errors"
;       C 0975                Where n is the number of blocks in the XBN area  which  were
;       C 0976                bad due to errors in the data area of their sectors.
;       C 0977
;       C 0978           10.  "n bad blocks in the  XBN  area  due  to  header  or  timing
;       C 0979                errors"
;       C 0980                Where n is the number of blocks in the XBN area  which  were
;       C 0981                bad  due  to  errors  in  the header or timing area of their
;       C 0982                sectors.
;       C 0983
;       C 0984           11.  "n bad RBNS"
;       C 0985                Where n is the number of blocks in the RBN area  which  were
;       C 0986                bad due to errors in the data area of their sectors.
;       C 0987
;       C 0988           12.  "n blocks retried on the check pass"
;       C 0989                Where n is the number of blocks which had an  error  on  the
;       C 0990                first read attempt after formatting.
;       C 0991
```

```
;       C 0992          13.  "FCT used successfully" or
;       C 0993
;       C 0994          14.  "FCT was not used"
;       C 0995               Depending on the answers to the start-up questions  and  the
;       C 0996               availability  of  the  bad  block  information  (FCT).  This
;       C 0997               message has the DUP termination message code.
;       C 0998
;       C 0999      5.0  DEVICE INFORMATION TABLES
;       C 1000
;       C 1001           !
;       C 1002           ! Hardware parameter coding questions
;       C 1003           !
;       C 1004           HW_Q1_IP     = IP REGISTER ADDRESS
;       C 1005           HW_Q2_VECTOR = INTERRUPT VECTOR ADDRESS
;       C 1006           HW_Q3_BR     = BUS REQUEST  LEVEL
;       C 1007           HW_Q4_UNIT   = UNIT NUMBER TO FORMAT
;       C 1008
```

```
C 1009          6.0  TEST SUMMARIES
C 1010
C 1011          6.1  Reformat Mode Procedure
C 1012
C 1013          Reformat mode is accomplished in four sections:
C 1014
C 1015          * Table Setup
C 1016          * Scanning
C 1017          * Replacement
C 1018          * Check Pass
C 1019
C 1020
C 1021          6.1.1   Table Setup
C 1022
C 1023          This section will build an RCT skeleton and perform part of the  primary
C 1024          revectoring.
C 1025
C 1026          A.  The presence of a good FCT will be determined by the ability
C 1027              to read each block in an FCT copy, and by verifying the data
C 1028              contained in the FCT Information Block.
C 1029
C 1030              If none of the four FCT copies is good, the  Formatter  will
C 1031              either:
C 1032
C 1033                  1.  Abort the program if DM  software  question  #6  was
C 1034                      answered with a 'NO'.
C 1035
C 1036                  2.  Will do a Reconstruct mode if software  question  #6
C 1037                      was answered with a 'YES'.
C 1038
C 1039                      (Software question #6 is:  Continue  if  bad  block
C 1040                      information is inaccessible (Y/N):).
C 1041
C 1042          B.  The RCT tracks will be formatted.  Bad blocks  in  the  RCT
C 1043              area  will  be  marked  with  a header code of 11.  If a bad
C 1044              block occurs in the same position in each copy of  the  RCT,
C 1045              the format will be aborted, as the media is unusable.
C 1046
C 1047          C.  Outer DBN tracks will be formatted here.
C 1048
C 1049          D.  A  partial  RCT  will  be  built  from  the  FCT:   The  RCT
C 1050              Information   Block   will   be   assembled.   FCT  Bad  Block
C 1051              Descriptors  coded   for   primary   revectoring   will   be
C 1052              transformed  into  RCT  entries.  This is done by converting
C 1053              the PBN address into an LBN address, and  entering  it  into
C 1054              the  corresponding  RBN  descriptor  slot for the particular
C 1055              track, with a code of 02.  Other RBN descriptors  will  be
C 1056              designated   as   unallocated  (code  00)  if  they  have  a
C 1057              corresponding RBN, or as nulls (code 10) if they do not.
C 1058
C 1059              Two copies of the RCT will be written to each of the two RCT
C 1060              tracks.
C 1061
C 1062              All LBN's marked for secondary revectoring will be stored in
C 1063              an  "R2"  Table.   Replacement RBN's for these LBN's will be
C 1064              resolved after primary revectoring is completed.
C 1065
```

6.1.2 Scanning

NOTE:

The following section 6.1.2 generally describes the scanning philosphy used by this formatter. Specific scanning philosphies for each formatting mode is as follows:

REFORMT mode:

In this mode the FCT file is accessable. The RCT file is built from the FCT and the LBN area is scanned for additional bad blocks. This mode will scan only for data pattern W.

RESTORE mode:

In this mode an external FCT file is brought in form the Host and written to the media's FCT track. After the FCT file has been restored a normal Reformat mode is performed scanning for data pattern W only.

RECONSTRUCT mode:

In this mode the FCT file is inaccessable. The FCT I.D. block is not formatted but rather read/write scanned with all data patterns. The I.D> is then rebuilt indicating zero FCT entries. The Reformat mode overlay is then called in to DM space and will read/write scan the LBN area with all data patterns.

This section writes headers throughout the LBN area. It scans for additional bad blocks, and completes the primary revectoring.

Scanning will start at LBN Track 0 (Top Surface OGB) and progress to LBN Track Max (Bottom Surface OGB) following logical ordering of LBN tracks.

E. An LBN track is written with headers and Data Pattern W, using the Format Track on Index XFC. A failure of this XFC will result in 10 retries. If all retries fail, the format will be aborted.

The header codes connote block status. They will be determined by the FCT Bad Block Descriptors as in the following table:

FCT Descriptor Code	Header Code
Not listed	00 - Good LBN
12 or 14	05 - Primary revector
02 or 04	03 - Secondary revector
01	11 - Secondary revector-header problem
Any for RBN	11 - Unusable RBN

NOTE

If the RBN is not listed in the FCT, a single block per track may be designated for primary revectoring with an FCT descriptor code of 12 or 14.

If there are no bad blocks in the track, the forced error indicator will be set in the RBN at format XFC time by complimenting its expected EDC field.

F. All blocks in the track will be read without revectoring enabled, and compared to Pattern W. A write-read-compare sequence will then be performed on each block in the track using Pattern M, which is the compliment of Pattern W.

Error-free blocks will be written with LBN-unique Pattern 1. If the track has a primary revector block, its data field will be written with 128 copies of the track's RBN address, and the RBN will be written with LBN-unique Pattern 1 for the replaced block.

Each block, except used RBN and secondary replacement blocks, is read and its data compared to the expected value. This will be done with revectoring enabled for a primary replacement block, and disabled for the others.

This process is repeated using LBN-unique patterns 2, 3 and 4.

G. Any error, including correctable errors, will result in 4 retries. Any block failing these will be considered a bad block. If no primary revector block already exists in the track, the first to fail will be primary revectored by making an RCT entry in its RBN descriptor, reheadering it with a code of 05, and resetting the RBN forced error flag.

Other new bad blocks will be reheadered with secondary revector codes of 03 or 11, depending on the presence of header errors.

If any new bad block(s) is found, steps D and E will be partially repeated to include the additional bad block information, and verify the format write. The write-read-compare sequences with patterns 2, 3 and 4 will not be repeated, however.

H. Addresses of blocks to be secondary revectored will be accrued in an "R2 Table" within the program, until 127 entries are made. At this time, 8 copies of the table will be saved on outer DBN tracks starting at DBN block 0 top surface.

6.1.3 Replacement

This section will complete the RCT and resolve all secondary bad block replacement.

I. When all tracks have undergone the scanning section, The "R2 Tables" will be read from the media. The secondary

revectors will be resolved in the RCT, finding RBN Bad Block Descriptors through the Ping-pong algorithm.

Tracks whose RBN is assigned to be used for secondary revectoring will be written to reset the forced error indicator in the RBN.

6.1.4 Check pass

This section makes write and read passes of the media as a final check to verify revectoring capabilities.

J. Starting with the LBN track pair nearest the OGB, the data fields of all blocks on the media will be written as follows:

Block Type	Data
Good	Pattern 3
Primary revectored	Pattern 3 of replaced block
Secondary revectored	Pattern 3 of replaced block
Used RBN	Pattern 3 of replaced block

Starting with the top surface LBN track nearest the OGB all Host Application Blocks will be read to test for revectoring capabilities. Failure of any read or write will result in 10 retries. Failure of all retries will result in a fatal error message sent to the host and the format aborted.

6.2 Restore Mode Procedure

Restore mode will only be run by DIGITAL Manufacturing personnel. It requires an external copy of the FCT produced when the platter was manufactured and is stored on the System Boot Media. This procedure is as follows:

A. The FCT tracks will be formatted using the Format Track on Index XFC. A failure of this XFC will result in 10 retries. If all retries fail, the format will be aborted.

The header code of each block will be 12, indicating good FCT blocks. The data will be pattern W.

B. Each block will be read and its data verified. Write-read-compare sequences will then be performed on each block, using patterns M, 1, 2, 3 and 4.

Any errors will result in 10 retries. Any block failing a retry will be considered a bad block.

C. The tracks will be reformatted, if necessary, to change bad block header codes to 11.

D. The operator will be queried for the original FCT file name. The FCT file will then be inputted from the boot device and sent to the DU when requested.

E. Two copies of the FCT will be written to each FCT track. These will include bad blocks found in step B.

F. This mode will be aborted if any FCT sector fails in all 4 copies. The RECONSTRUCT mode will then be called in if the option to continue if the FCT file is inaccessable else the formatter will be aborted.

G. The program will automatically enter the Format Mode, and proceed as in 4.1 above.

6.3 Reconstruct Mode Procedure

This mode will be performed if:

1. The operator has explicitly requested this as the formatting mode by answering 'NO' to the following software questions:

   . "Use existing Bad Block information?"
   . "Down-line load Bad Block information?"

2. The Operator has responded with a 'YES' to the software question:

   . "Continue if Bad Block information is inaccessible?" and the Bad Block file is discovered inaccessible during a Reformat or Restore Formatting Mode.

Reconstruct formatting procedure is as follows:

1. Sector 0 of each FCT copy will be read/write scanned.

   The Formatting process will be aborted if all four copies of Sector 0 are bad.

2. The Volume Information Block (Sector 0) will be reconstructed using the following information:

   . Media Mode = 512 Byte Format

   . Formatting Instance Number = 0

   . Volume Serial Number = Operator Supplied S.N.

   . Time of First Formatting = Operator Supplied Date (VAX/VMS Format)

   . Time of Most Recent Formatting = Operator Supplied Date (VAX/VMS Format)

   . Number of Used 512 Table Entries = 0

```
;       C 1294
;       C 1295          . Number of Used 576 Table Entries = 0
;       C 1296
;       C 1297          . Remaining Words Zeroed
;       C 1298
;       C 1299      3.  The Volume Information Block is then  written  to  each  FCT
;       C 1300          copy and read back for data integrity.
;       C 1301
;       C 1302          Read Failures at all four copies will cause  the  formatting
;       C 1303          process to abort.
;       C 1304
;       C 1305                                      NOTE
;       C 1306
;       C 1307               Remaining FCT Sectors 1 thru 15 are not altered.
;       C 1308
;       C 1309
;       C 1310
;       C 1311      4.  The formatting process will then perform the  Reformat  Mode
;       C 1312          Procedure.
;       C 1313
```

```
:       C 1314          7.0  HOST TEST SUMMARIES
:       C 1315
:       C 1316          7.1  ATTENDED FORMAT MODE
:       C 1317
:       C 1318          In this HOST mode the operator must be present at the console terminal
:       C 1319          to respond to DM formatter software questions.  Via these sofware questions
:       C 1320          the operator can choose from any of the three formatting modes (REFORMAT,
:       C 1321          RESTORE or RECONSTRUCT) and can specify the unit number to be formatted.
:       C 1322          The unit number given to the DM formatter however must be the same unit
:       C 1323          the host reported bringing on-line.
:       C 1324
:       C 1325          7.2  UN-ATTENDED REFORMAT MODE
:       C 1326
:       C 1327          In this HOST mode a REFORMAT mode will automatically be preformed on all
:       C 1328          physical unit numbers contained within operator built P_Tables.
:       C 1329
:       C 1330          When this mode is selected (which is the hosts default mode) the host
:       C 1331          will ask the operator for the date in the same format as the DM formatter
:       C 1332          would.  This date is then automatically given to the DM formatter and the
:       C 1333          physical unit number within the current P_Table is given to the DM as the
:       C 1334          unit to format.
:       C 1335
:       C 1336          In this mode the operator can select up to 16 units (a unit being a physical
:       C 1337          platter) to format and be free to leave the console terminal while the
:       C 1338          units are being formatted.
:       C 1339
```

```
;       C 1340          8.0  APPENDIX
;       C 1341
;       C 1342                                  APPENDIX A
;       C 1343
;       C 1344                                  GLOSSARY
;       C 1345  DBN         Diagnostic Block Number.  A number of per surface are reserved
;       C 1346              for diagnostic use.  These tracks are called the DBN area.
;       C 1347
;       C 1348  DM          Diagnostic Machine.  An interpreter built into the RC25
;       C 1349              firmware which is used to execute programs downline loaded
;       C 1350              into the RC25's buffer memory.
;       C 1351
;       C 1352  EDC         Error Detecting Code.  A means of verifying correct controller
;       C 1353              operation.
;       C 1354
;       C 1355  FCT         Factory Control Table.  A 16 sector table containing volume ID
;       C 1356              information and a map of bad blocks on the media.  The FCT is
;       C 1357              written as part of the initial media formatting.
;       C 1358
;       C 1359  FRU         Field Replaceable Unit.  An item which may be exchanged in the
;       C 1360              field.
;       C 1361
;       C 1362  IGB         Inner Guard Bands.  The guard bands closer to the spindle.
;       C 1363
;       C 1364  IP          Initialization and Polling Register.  This register is used
;       C 1365              for port control.
;       C 1366
;       C 1367  LBN         Logical Block Number.  Host visible blocks including the Host
;       C 1368              Application Area and the RCT tracks.
;       C 1369
;       C 1370  MSCP        Mass Storage Command Protocol.  The method of communication
;       C 1371              used between the host and the RC25 over the bus.
;       C 1372
;       C 1373  OGB         Outer Guard Bands.  The guard bands further from the spindle.
;       C 1374
;       C 1375  PBN         Physical Block Number.  The absolute address of a block on
;       C 1376              RC25 media.
;       C 1377
;       C 1378  RBN         Replacement Block Number.  RC25 has one RBN per track for bad
;       C 1379              block replacement.
;       C 1380
;       C 1381  RCT         Replacement and Caching Table.  A 16 sector table containing
;       C 1382              media ID information and a map of the current bad block
;       C 1383              locations.
;       C 1384
;       C 1385  RZ01        RC25 product name.
;       C 1386
;       C 1387  SA          Status, Address and Purge Register for port control.
;       C 1388
;       C 1389  XFC         Extended Function Call.  Instructions which interface
;       C 1390              Diagnostic Machine code to the RC25 microcode.
```

```
;       C 1391
;       C 1392
;       C 1393                                  APPENDIX B
;       C 1394
;       C 1395                              BAD BLOCK REPLACEMENT
;       C 1396
;       C 1397  Bad block replacement is an addressing technique  for  replacing  a  bad
;       C 1398  block  with  a  good  one.  The  block  which  replaces  it is called a
;       C 1399  replacement block, or RBN.
;       C 1400
;       C 1401  Each RC25 track has 32 blocks.  In the host-addressable area, the first
;       C 1402  thirty-one  are  for normal data storage, and are called Logical Blocks,
;       C 1403  or LBNs.  The last block on each of these tracks is an RBN.
;       C 1404
;       C 1405  If a single bad block exists on a track, it can be replaced by  the  RBN
;       C 1406  of that track.  This is called Primary replacement.
;       C 1407
;       C 1408  If other bad blocks are found in the same track, they must  be  replaced
;       C 1409  by unused RBNs of other tracks.  This is called Secondary replacement.
;       C 1410
;       C 1411  Two types of tables record bad block information for the media.  One  is
;       C 1412  the  Factory  Control  Table (FCT), which is written on the media at the
;       C 1413  factory.  It is a map of the bad  blocks  caused  by  the  manufacturing
;       C 1414  process.   The  other  is the Replacement and Caching Table (RCT), which
;       C 1415  includes both the FCT information, and bad block  information  uncovered
;       C 1416  by  the  latest  formatting of the media.  There are four copies of each
;       C 1417  table per unit.
;       C 1418
```

```
;       C 1419
;       C 1420                                  APPENDIX C
;       C 1421
;       C 1422                                     FCT
;       C 1423
;       C 1424
;       C 1425  The basic unit of the FCT is the Bad Block Descriptor.  This  descriptor
;       C 1426  gives  the  Physical Block Address of the bad block, and a four bit code
;       C 1427  indicating why it was retired.
;       C 1428
;       C 1429  The Physical Block Address, or PBN, is the absolute address of  a  block
;       C 1430  anywhere on the media, without the distinction of host-accessibility.
;       C 1431
;       C 1432  There are a variable number of Bad Block Descriptors in the FCT.   These
;       C 1433  descriptors  are  sorted in descending track order, and in ascending PBN
;       C 1434  order within tracks.
```

```
;       C 1435
;       C 1436
;       C 1437                                  APPENDIX D
;       C 1438
;       C 1439                                      RCT
;       C 1440
;       C 1441  The basic unit of the RCT is the double-word RBN Descriptor.  There  are
;       C 1442  1584  of  these, one for each RBN in the host-accessible LBN area of the
;       C 1443  media.
;       C 1444
;       C 1445  The position of each RBN Descriptor in the RCT is fixed.  The first  RBN
;       C 1446  Descriptor  is  associated with the RBN block in the first host- visible
;       C 1447  track.  The second descriptor with the RBN of the second  host-  visible
;       C 1448  track, etc..
;       C 1449
;       C 1450  In the format process, the FCT is given.  Four copies of it are found on
;       C 1451  the  media;   two  on  each  FCT track.  The RCT is rebuilt from the FCT
;       C 1452  entries and additional bad block information is gathered in a scan pass.
;       C 1453
;       C 1454  Primary  replacement  may  be  possible  for  one  block  per  track  if
;       C 1455  identified  as  bad  by  either  of these sources.  The track's RBN must
;       C 1456  itself be a good, unused block.
;       C 1457
;       C 1458  Primary replacement is accomplished by:
;       C 1459
;       C 1460          * Making the bad block's header code 05.
;       C 1461
;       C 1462          * Writing the bad block's data field as 128
;       C 1463            copies of its track's RBN address.
;       C 1464
;       C 1465          * Writing the address of the bad block to the associated
;       C 1466            RBN Descriptor in the RCT (with a code of 02).
;       C 1467
;       C 1468  Secondary replacement is needed for bad blocks which do not have a good,
;       C 1469  unused RBN block.
;       C 1470
;       C 1471  Secondary replacement is accomplished similarly to Primary  Replacement.
;       C 1472  but first an unused RBN of another track must be found.
;       C 1473
;       C 1474          * Find an unused RBN Descriptor in the RCT,
;       C 1475            using the Ping-pong algorithm.
;       C 1476
;       C 1477          * Make the bad block's header code 03 or 11,
;       C 1478            depending on error type.
;       C 1479
;       C 1480          * Write the bad block's data field with 128
;       C 1481            copies of the target RBN address.
;       C 1482
;       C 1483          * Write the address of the bad block to the associated
;       C 1484            RBN Descriptor in the RCT (with a code of 03).
;       C 1485
;       C 1486  After replacement an attempt by the host to access a replaced block will
;       C 1487  result in access to the block with which it had been replaced.
;       C 1488
;       C 1489  Good blocks are headered with codes of 00.
;       C 1490
;       C 1491  To help detect addressing problems, unused RBNs will have a forced error
```

```
;       C 1492  indication set by complimenting their EDC fields.
```

```
C 1493
C 1494
C 1495                                  APPENDIX E
C 1496
C 1497                                DATA PATTERNS
C 1498
C 1499  Six patterns will be used during the scan pass.
C 1500
C 1501  Pattern W is a pseudo-random pattern, with the LBN address as the  first
C 1502  word.  Pattern  M is its compliment.  Its use will assure that all data
C 1503  bits can toggle.
C 1504
C 1505  Patterns 1 through 4  are  made  up  of  single  word  elements.  These
C 1506  elements are as follows:
C 1507
C 1508          Element A = 071311.     This causes peak shift in data encoding.
C 1509
C 1510          Element B = 106466.     This causes single transitions spaced by
C 1511                                  1, 2, 3 and 4 zeroes.
C 1512
C 1513          Element C = 043146.     This causes both the highest and lowest
C 1514                                  frequency of transitions in the encoding
C 1515                                  logic.
C 1516
C 1517          Element D = 134631.     This also causes both the highest and
C 1518                                  lowest frequency of transitions in the
C 1519                                  encoding logic.
C 1520
C 1521          Element L = 17NNNN.     Where NNNN is the LBN address to which the
C 1522                                  pattern is written.
C 1523
C 1524
C 1525  These elements are assembled into patterns 1 through 4 as follows:
C 1526
C 1527
C 1528          Pattern 1 = LBBAAABBBBAAAAABBBBBBAAAAAAABBBBBBBB etc.
C 1529
C 1530          Pattern 2 = BLABBBAAAABBBBBAAAAAABBBBBBBAAAAAAAA etc.
C 1531
C 1532          Pattern 3 = LDDCCCDDDDCCCCCDDDDDDCCCCCCCDDDDDDDD etc.
C 1533
C 1534          Pattern 4 = DLCDDDCCCCDDDDDCCCCCCDDDDDDDCCCCCCCC etc.
C 1535
C 1536
```

```
;       C 1537  Embedding the LBN address within the patterns gives them LBN-uniqueness.
;       C 1538  This feature is taken advantage of in validating revectoring.
;       C 1539
;       C 1540  Three steps are taken  to  insure  the  data  will  not  interfere  with
;       C 1541  Secondary  Revectoring  by  matching the "Compare 128" algorithm.  These
;       C 1542  are:
;       C 1543
;       C 1544          * The high four bits in every word contain invalid header codes.
;       C 1545
;       C 1546          * Before secondary revectoring is attempted, blocks not involved
;       C 1547            with  revectoring  will  be  written  with  data  fields which
;       C 1548            contain no 32-bit repetitive patterns.
;       C 1549
;       C 1550          * When the format  is  complete,  no  unrevectored  blocks  will
;       C 1551            contain data which has 32-bit repetitive patterns.
;       C 1552
```

```
;       C 1553
;       C 1554                                  APPENDIX F
;       C 1555
;       C 1556                                  Ping-Pong algorithm
;       C 1557
;       C 1558      The  search begins  at  the  primary replacement  block  descriptor.  If the
;       C 1559      the descriptor is not empty then a ping pong search of the sector  containing
;       C 1560      the  primary  replacement  block  descriptor  ensues.  If an empty descriptor
;       C 1561      is not  encountered then  a  linear  scan  of the remaining  RCT   blocks and
;       C 1562      descriptors within  blocks,  (with  wrap-around at the end of the RCT) ensues
;       C 1563      until one of two things occur:
;       C 1564
;       C 1565           1.  An unallocated replacement block descriptor  is  encountered  in  an
;       C 1566               overflow location - a secondary.
;       C 1567
;       C 1568           2.  The entire RCT is searched without success - a failure.
;       C 1569
;       C 1570      The search operates at two levels:
;       C 1571
;       C 1572           1.  Within the primary descriptor RCT sector, outward  from  the  primary
;       C 1573               descriptor  searched (starting with the next highest RBN descriptor).
;       C 1574               Note that this degenerates to a linear search once the first or  last
;       C 1575               descriptor is encountered.
;       C 1576
;       C 1577           2.  Then a linear search, starting  with  the  next  highest  RCT  sector
;       C 1578               address,  once the initial sector has been completely searched.  Each
;       C 1579               new sector is searched in a linear fashion starting at the lowest RBN
;       C 1580               descriptor  and  scanning  until  the  highest  RBN descriptor in the
;       C 1581               sector is encountered.
;       C 1582
;       C 1583      If at any time during the linear  search  a  null  (not  an  empty)  entry  is
;       C 1584      encountered,  the  search  resumes  at the first entry in the third RCT sector
;       C 1585      (the firs* with descriptors).  The search is terminated  when  it  is  certain
;       C 1586      that all the RCT entries have been searched.
;       C 1587
```

```
;       C 1588
;       C 1589
;       C 1590                          ALGORITHM FIGURE -
;       C 1591
;       C 1592
;       C 1593                  RCT sector 3    +----------+<----------+
;       C 1594                                  |          |           |
;       C 1595                                  |  FIRST   |           |
;       C 1596                                  |   RCT    |           |
;       C 1597                                  | DESCRIPTR|           |
;       C 1598                                  |  SECTOR  |           |
;       C 1599                                  |          |           |
;       C 1600                                  +----------+           |
;       C 1601                                       |                 |
;       C 1602                                       V                 |
;       C 1603                  RCT sector n    +----------+           |
;       C 1604                                  |          |           |
;       C 1605                                  |          |<-+        |
;       C 1606                                  |----------|  |  pong  |
;       C 1607          entrance to routine-->  | primary  |--+        |
;       C 1608                                  |----------|  |  ping  |
;       C 1609                                  |          |<-+        |
;       C 1610                                  +----------+           |
;       C 1611                                       |                 |
;       C 1612                                       V                 |
;       C 1613                  RCT sector n+1  +----------+           |
;       C 1614                                  |          |           |
;       C 1615                                  |  RCT     |           |
;       C 1616                                  |          |           |
;       C 1617                                  |  BLOCK   |           |
;       C 1618                                  |          V           |
;       C 1619                                  |          |           |
;       C 1620                                  +----------+           |
;       C 1621                                       |                 |
;       C 1622                                       V                 |
;       C 1623          Last RCT sector         +----------+           |
;       C 1624                                  |          |           |
;       C 1625                                  |  LAST    |           |
;       C 1626                                  |          |           |
;       C 1627                                  |  RCT     |           |
;       C 1628                                  |          |           |
;       C 1629                                  |  BLOCK   V           |
;       C 1630                                  |----------|           |
;       C 1631                                  |NUL ENTRY |           |
;       C 1632                                  +----------+ -->-------+
```

```
;       C 1633                          APPENDIX G
;       C 1634
;       C 1635                  CREATING CZRCHA DM   CODE
;       C 1636
;       C 1637          G.I  FILES REQUIRED
;       C 1638                  A. RTEM (RT-11 emulator) including:
;       C 1639                          a. DMACRO.SAV The DM macro assembler
;       C 1640                          b. DMACRO.MAC The DM macro library
;       C 1641                          c. DTX.SAV    The XXDP+ UPD2 emulator including:
;       C 1642                          d. DTX DRIVERS including:
;       C 1643                              1. IZDDA0.DTX
;       C 1644                              2. IZDKA0.DTX
;       C 1645                              3. IZDLA0.DTX
;       C 1646                              4. IZDMA0.DTX
;       C 1647                              5. IZDTA0.DTX
;       C 1648                              6. IZDXA0.DTX
;       C 1649                              7. IZDYA0.DTX
;       C 1650                              8. IZMMA0.DTX
;       C 1651                              9. IZMSA0.DTX
;       C 1652                             10. IZMTA0.DTX
;       C 1653
;       C 1654                          e. STARTM.COM RTEM start up com file.  See below
;       C 1655                                        assembling DM source files
;       C 1656
;       C 1657                  B. DMCONV.EXE
;       C 1658                          Converts DMACRO  output  .SAV files  into  a Bliss
;       C 1659                          ascii  array. This ascii  array is then built into
;       C 1660                          a seperate  Bliss  module and compiled. The object
;       C 1661                          code  from this module is then linked   with other
;       C 1662                          Bliss object modules resulting in a APT compatible,
;       C 1663                          contigious  object file including both host and DM
;       C 1664                          code.
;       C 1665
;       C 1666          G.1  BUILDING DM SOURCE CODE
;       C 1667                  DM source code can be built using any of the text editors
;       C 1668                  available under any operating system.  Guide lines for its
;       C 1669                  creation can be found in the AZTEC.DOC manual.
;       C 1670
;       C 1671          G.2  ASSEMBLING DM SOURCE CODE
;       C 1672                  The DM macro assembler (DMACRO.SAV) is used to assemble DM
;       C 1673                  code modules and is written to be run under RT-11 (or RTEM
;       C 1674                  emulator).  The  following  example  demonstrated the RTEM
;       C 1675                  startup com file used to create  the released DM formatter
;       C 1676                  .SAV file. This start-up command file includes: allocating
;       C 1677                  more virtual storage, bringing the DM source code into the
;       C 1678                  RTEM system, assembling   the DM  source code, linking and
;       C 1679                  moving the  output  .SAV  file back  to the user directory.
;       C 1680                  The following example is performed on VMS operating system.
;       C 1681
;       C 1682                          $ <VMS>
;       C 1683                          $ set def [neale.rtem]          !Set default directory to the RTEM sub-directory
;       C 1684                          $ mcr rtem                      !Run the RT-11 emulator
;       C 1685                          . RTE>/vs                       !Type /vs to prompt RTE>
;       C 1686
;       C 1687                          RTEM-11 (VAX/VMS) V01.00
;       C 1688
;       C 1689                          RT-11FB (S) V04.00L
```

```
;       C 1690
;       C 1691                  !
;       C 1692                  ! The following is performed by the startm.com start-up command file.  Before
;       C 1693                  ! running the command file  the  virtual  storage disk VS1: must have already
;       C 1694                  ! been generated using the JOAT utility.
;       C 1695                  !
;       C 1696                  .SET TT:NOCRLF,SCOPE,WIDTH 80           !Set term characteristics
;       C 1697                  .R JOAT                                 !Enter JOAT (Jack of all trades) utility
;       C 1698                  *MORE/V:VS1                             !Allocate virtual device VS1: to RTEM system
;       C 1699                  *^C                                     !Exit JOAT
;       C 1700
;       C 1701                  .DEL VS1:*.*                            !Make room in VS1: for this assembly
;       C 1702                  .R FIP                                  !Enter File interchange program
;       C 1703                  *VS1:=[NEALE.AZTEC]AZFMTR.MAC/F         !Bring in DM source code from user directory
;       C 1704                  *^C                                     !Exit FIP
;       C 1705
;       C 1706                  .R DMACRO                               !Run the DM macro assembler
;       C 1707                  *VS1:AZFMTR,AZFMTR=DMACRO,VS1:AZFMTR    !Assemble DM source and save in VS1:
;       C 1708                  *^C                                     !Exit the DM assembler
;       C 1709
;       C 1710                  .R LINK                                 !Run the RTEM linker
;       C 1711                  *VS1:AZFMTR,AZFMTR=VS1:AZFMTR           !Link the .obj file and save in VS1:
;       C 1712                  *^C                                     !Exit the linker
;       C 1713
;       C 1714                  .R FIP                                  !Run FIP
;       C 1715                  *[NEALE.AZTEC]/F=VS1:AZFMTR.LST         !Output .LST file to user directory
;       C 1716                  *[NEALE.AZTEC]/F/I=VS1:AZFMTR.SAV       !Output .SAV file to user directory
;       C 1717                  *^C                                     !Exit FIP
;       C 1718
;       C 1719                  .BOO SY                                 !Return to VMS
;       C 1720                  $ <VMS>
;       C 1721
;       C 1722          G.3  BUILDING THE BLISS ASCII ARRAY
;       C 1723                  The next step is to run the DMCONV program to build the
;       C 1724                  Bliss ascii array from the DMACRO output .SAV file.  To
;       C 1725                  do this follow this example:
;       C 1726
;       C 1727                          $ run DMCONV.EXE
;       C 1728                          INPUT FILE  NAME (I.E. XXXXXX.YYY) AZFMTR.SAV
;       C 1729                          OUTPUT FILE NAME (I.E. XXXXXX.YYY) AZFMTR.VEC
;       C 1730                          BLOCK VECTOR NAME (I.E. XXXXXX.YYY) AZFMTR
;       C 1731
;       C 1732                  Note:
;       C 1733                    In this example it is assumed that DMCONV.EXE and the
;       C 1734                    .SAV file are both in the default directory.
;       C 1735
;       C 1736          G.4 BUILDING THE DM BLISS MODULE
;       C 1737                  The  output from  the  DMCONV program  (AZFMTR.VEC) is then
;       C 1738                  included  into  a Bliss module (for the purpose of CZRCHA this
;       C 1739                  module is  AZKEL6.B16) and compiled.  To  compile this module
;       C 1740                  takes a VERY long time so it is suggested that it is submitted
;       C 1741                  to the batch queue after hours.
;       C 1742
;       C 1743                  The  entire  procedure  to  compile and  link all Bliss source
;       C 1744                  modules  (including the DM  bliss  module)  is demonstrated by
;       C 1745                  the following command procedure (azcom.com):
;       C 1746
```

```
;       C 1747                          $ @azcom                                        !Execute command procedre
;       C 1748                          $ set verify
;       C 1749                          $ bliss/pdp11/list/library CZRCH0.R16
;       C 1750                          $ bliss/pdp11/listing=CZRCHA.DOC CZRCH1.B16
;       C 1751                          $ bliss/pdp11/list CZRCH2.B16
;       C 1752                          $ bliss/pdp11/list CZRCH3.B16
;       C 1753                          $ bliss/pdp11/list CZRCH4.B16
;       C 1754                          $ bliss/pdp11/list CZRCH5.B16
;       C 1755                          $ set process/name='Killer
;       C 1756                          $ bliss/pdp11/list CZRCH6.B16
;       C 1757                          $ set process/name='Fisher man
;       C 1758                          $ bliss/pdp11/list CZRCH7.B16
;       C 1759                          $ MCR TKB
;       C 1760                          CZRCHA/NOHD/NOMM,CZRCHA/CR/-SP=CZRCH2,CZRCH3,CZRCH4,CZRCH5,CZRCH6,CZRCH7,neislb/lb
;       C 1761                          /
;       C 1762                          PAR=DUMMY:2000:176000
;       C 1763                          STACK=0
;       C 1764                          //
;       C 1765                          $ !*************************************************************
;       C 1766                          $ !*                                                           *
;       C 1767                          $ !*   Now run the TKBBIN program to create a .bin file        *
;       C 1768                          $ !*                                                           *
;       C 1769                          $ !*************************************************************
;       C 1770                          $ set noverify
;       C 1771                          $
;       C 1772
;       C 1773                  The TKBBIN  utility is then run on the output from the TKB linker to produce
;       C 1774                  an XXDP+ executable .BIN file.  The following is an example of the procedure:
;       C 1775
;       C 1776                          $ RUN TKBBIN
;       C 1777                          Input filename ? CZRCHA
;       C 1778                          ;load Addr: 2000
;       C 1779                          ;xfer Addr: 1
;       C 1780                          ;Nr char  : 74600
;       C 1781                          End of Job
;       C 1782                          $
;       C 1783
;       C 1784          G.5  GETTING .BIN FILES ONTO XXDP+ MEDIA
;       C 1785                  The RT-11 emulator is used to move XXDP+ .BIN files from a
;       C 1786                  VMS user directory onto XXDP+ media.  The following is an
;       C 1787                  example of this procedure.
;       C 1788
;       C 1789                          $ set def [neale.rtem]                          !Set default directory to RTEM sub-directory
;       C 1790                          $ mcr rtem                                      !Run the RT-11 emulator
;       C 1791                          .RTE>/vs                                        !Type /vs to prompt
;       C 1792                          !
;       C 1793                          ! The startm.com command file will automatically
;       C 1794                          ! begin to execute when entering RTEM.  Control
;       C 1795                          ! c the command procedure at this time and do the
;       C 1796                          ! following:
;       C 1797                          !
;       C 1798                          .R JOAT                                         !Run JOAT utility
;       C 1799                          .DL0:/A                                         !Allocate XXDP+ device to pip .BIN file to
;       C 1800                          *^C                                             !Exit JOAT
;       C 1801
;       C 1802                          .R FIP                                          !Run FIP utility
;       C 1803                          *VS1:=[NEALE.AZTEC]CZRCHA.BIN/F/I               !Bring .BIN file from user directory into VS1:
```

```
;       C 1804                          *^C                                     !Exit FIP
;       C 1805
;       C 1806                          .R DTX                                  !Run the XXDP+ UPD2 emulator
;       C 1807                          *DEL DL0:CZRCHA.BIN                     !Delete from XXDP+ media old .BIN file
;       C 1808                          *PIP DL0:CZRCHA.BIN=VS1:CZRCHA.BIN      !PIP new .BIN file to XXDP+ media
;       C 1809                          *LOAD DL0:CZRCHA.BIN                    !Load the file to verify the chack-sum
;       C 1810                          XFR: 000001 CORE:002000,76600
;       C 1811                          *^C                                     !Exit DTX
;       C 1812
;       C 1813                          .BOO SY                                 !Boot back to VMS
;       C 1814                          $ <VMS>                                 !Back at VMS again
```

```
;       C 1815                          APPENDIX H
;       C 1816
;       C 1817                  CREATING CZRCHA HOST CODE
;       C 1818
;       C 1819          H.I  FILES REQUIRED
;       C 1820                  A. Text editor
;       C 1821                  B. Bliss16 compilier
;       C 1822                  C. TKB linker
;       C 1823                  D. TKBBIN Utility This converts Bliss16 .EXE files into XXPD+
;       C 1824                                  .BIN files.
;       C 1825
;       C 1826
;       C 1827          H.1  SOURCE FILE CREATING
;       C 1828
;       C 1829          Using any text editor, follow PDP-11 diagnostic design guidelines demonstrated
;       C 1830          in SUPPRGC.DOC and CHQUSD.SEQ.
;       C 1831
;       C 1832          H.2  COMPILING BLISS SOURCE MODULES
;       C 1833
;       C 1834          Follow steps starting at G.4 to compile Bliss source modules and
;       C 1835          to get the .BIN file onto XXDP+ media.
;         1836  )%
;         1837  ELUDOM


                                        .TITLE  CZRCH1 CZRCH RC25 DISK FORMATTER
                                        .IDENT  /REV A /


;                                       PSECT SUMMARY
;
;       Psect Name                      Words     Attributes




;                                       COMMAND QUALIFIERS
;       BLISS /PDP11/LIST=CZRCHA.DOC CZRCH1.B16

; Size:         0 code + 0 data words
; Run Time:       00:08.6
; Elapsed Time:   00:15.1
; Memory Used:  6 pages
; Compilation Complete
```

```
;       0001  %TITLE 'RC25 FORMATTER LIBRARY MODULE'
;       0002  %sbttl 'MACRO DEFINITIONS'
;       0003
;       0004  macro
;       0005      !
;       0006      ! This macro will transfer the operator inputed date from it storage
;       0007      ! place into the send buffer where it will then be sent to the DM.
;       0008      !
;     M 0009      $FILLDATE =
;     M 0010          begin
;     M 0011          map
;     M 0012              snd_buf : vector [74, byte];
;     M 0013
;     M 0014          incru i from 0 to 11 do SND_BUF [.i] = .DATETXT [.i];
;     M 0015
;       0016          end;%,
;       0017
;     M 0018      WRT_RC25 (0, IMAGE) =
;     M 0019
;     M 0020      begin
;     M 0021      local
;     M 0022          RC$M_REG;
;     M 0023      RC$M_REG = IMAGE;
;     M 0024      (.RC25_ADDR + %upval*0) = .RC$M_REG;
;       0025      end%,
;       0026
;       0027  !
;       0028  ! Dup Protocol Macros Declarations
;       0029  !
;     M 0030    REC_BASE =
;       0031        HDR_SIZ, 0, 0, 16, 0%,
;     M 0032    SND_BASE =
;       0033        HDR_SIZ + REC_ALLOCATE , 0, 0, 16, 0%,
;       0034  !
;       0035  ! Macro to clear out the DUP send data text buffer
;       0036  ! before requesting input form operator.  This  by
;       0037  ! default puts a null byte at the end of the ascii
;       0038  ! input.
;       0039  !
;     M 0040     $CLRSBUF =
;       0041        incru i from 0 to SNDB_SIZE - 1 do SND_BUF [.i] = ZEROS;%,
;       0042  !
;       0043  ! General purpose word reference field select
;       0044  !
;     M 0045    WORD_REF =
;       0046        0, 16, 0%;
;       0047
```

```
0048  %sbttl 'SUPERVISOR DEFINED LITERALS'
0049
0050  literal
0051  !+
0052  ! BIT DIFINITIONS
0053  !-
0054      BIT15 = %o'100000',
0055      BIT14 = %o'40000',
0056      BIT13 = %o'20000',
0057      BIT12 = %o'10000',
0058      BIT11 = %o'4000',
0059      BIT10 = %o'2000',
0060      BIT09 = %o'1000',
0061      BIT08 = %o'400',
0062      BIT07 = %o'200',
0063      BIT06 = %o'100',
0064      BIT05 = %o'40',
0065      BIT04 = %o'20',
0066      BIT03 = %o'10',
0067      BIT02 = %o'4',
0068      BIT01 = %o'2',
0069      BIT00 = %o'1',
0070      !
0071      BIT9 = BIT09,
0072      BIT8 = BIT08,
0073      BIT7 = BIT07,
0074      BIT6 = BIT06,
0075      BIT5 = BIT05,
0076      BIT4 = BIT04,
0077      BIT3 = BIT03,
0078      BIT2 = BIT02,
0079      BIT1 = BIT01,
0080      BIT0 = BIT00,
0081  !+
0082  ! EVENT FLAG DEFINITIONS
0083  !   EF32:EF17 RESERVED FOR SUPERVISOR TO PROGRAM COMMUNICATION
0084  !-
0085      EF_START = 32,                          ! START COMMAND WAS ISSUED
0086      EF_RESTART = 31,                        ! RESTART COMMAND WAS ISSUED
0087      EF_CONTINUE = 30,                       ! CONTINUE COMMAND WAS ISSUED
0088      EF_NEW = 29,                            ! A NEW PASS HAS BEEN STARTED
0089      EF_PWR = 28,                            ! A POWER-FAIL/POWER-UP OCCURRED
```

```
;       0090  !+
;       0091  ! PRIORITY LEVEL DEFINITIONS
;       0092  !-
;       0093      PRI07 = %o'340',
;       0094      PRI06 = %o'300',
;       0095      PRI05 = %o'240',
;       0096      PRI04 = %o'200',
;       0097      PRI03 = %o'140',
;       0098      PRI02 = %o'100',
;       0099      PRI01 = %o'40',
;       0100      PRI00 = %o'0',
;       0101  !+
;       0102  !OPERATOR FLAG BITS
;       0103  !-
;       0104      EVL = %o'4',
;       0105      LOT = %o'10',
;       0106      ADR = %o'20',
;       0107      IDU = %o'40',
;       0108      ISR = %o'100',
;       0109      UAM = %o'200',
;       0110      BOE = %o'400',
;       0111      PNT = %o'1000',
;       0112      PRI = %o'2000',
;       0113      IXE = %o'4000',
;       0114      IBE = %o'10000',
;       0115      IER = %o'20000',
;       0116      LOE = %o'40000',
;       0117      HOE = %o'100000',
```

```
;       0118  %sbttl 'FORMATTER DEFINED LITERALS'
;       0119  !
;       0120  ! Down line load external FCT copy literals
;       0121  !
;       0122     FCT_SEC_0 = 0,                    !FCT sector zero request
;       0123     FCT_SEC_15 = 15,                  !FCT sector fifteen request
;       0124  !
;       0125  ! Global flag word bit definitions
;       0126  !
;       0127     NON_EXIST_REG = BIT0,             !Non-existant register flag
;       0128  !
;       0129  ! Message selection literials
;       0130  !
;       0131     MSG0 = 0,                         !Select message 0
;       0132     MSG1 = 1,                         !Select message 1
;       0133     MSG2 = 2,                         !Select message 2
;       0134     MSG3 = 3,                         !Select message 3
;       0135     MSG4 = 4,                         !Select message 4
;       0136     MSG5 = 5,                         !Select message 5
;       0137     MSG6 = 6,                         !Select message 6
;       0138     MSG7 = 7,                         !Select message 7
;       0139     MSG8 = 8,                         !Select message 8
;       0140     MSG9 = 9,                         !Select message 9
;       0141     MSG10 = 10,                       !Select message 10
;       0142     MSG11 = 11,                       !Select message 11
;       0143     MSG12 = 12,                       !Select message 12
;       0144     MSG13 = 13,                       !Select message 13
;       0145     MSG14 = 14,                       !Select message 14
;       0146     MSG15 = 15,                       !Select message 15
;       0147     MSG16 = 16,                       !Select message 16
;       0148     MSG17 = 17,                       !Select message 17
;       0149     MSG18 = 18,                       !Select message 18
;       0150     MSG19 = 19,                       !Select message 19
;       0151     MSG20 = 20,                       !Select message 20
;       0152     MSG21 = 21,                       !Select message 21
;       0153     MSG22 = 22,                       !Select message 22
;       0154     MSG23 = 23,                       !Select message 23
;       0155     MSG24 = 24,                       !Select message 24
;       0156     MSG25 = 25,                       !Select message 25
;       0157     MSG26 = 26,                       !Select message 26
;       0158     MSG27 = 27,                       !Select message 27
;       0159     MSG28 = 28,                       !Select message 28
;       0160     MSG29 = 29,                       !Select message 29
;       0161     MSG30 = 30,                       !Select message 30
;       0162  !
;       0163  ! Miscellanious literals
;       0164  !
;       0165     DUP = 2,                          !DUP connection ID constant
;       0166     MSCP = 0,                         !MSCP connection ID constant
;       0167     FAILURE = 0,                      !Failure return code
;       0168     SUCCESS = 1,                      !Success return code
;       0169     BLK0 = 0,                         !Selects block 0 of struct
;       0170     BLK1 = 1,                         !Selects block 1 of struct
;       0171     BLK2 = 2,                         !Selects block 2 of struct
;       0172     BLK3 = 3,                         !Selects block 3 of struct
;       0173     WRD0 = 0,                         !Selects word 0 of block
;       0174     WRD1 = 1,                         !Selects word 1 of block
```

```
0175        WRD2 = 2,                               !Selects word 2 of block
0176        WRD3 = 3,                               !Selects word 3 of block
0177        WRD4 = 4,                               !Selects word 4 of block
0178        WRD5 = 5,                               !Selects word 5 of block
0179        WRD6 = 6,                               !Selects word 6 of block
0180        ISRD = 0,                               !Select the read word (1st) ISD_STRUCTURE
0181        ISWRT = 1,                              !Select the write word (2nd) in ISD_STRUCTURE
0182        STEP1 = 0,                              !Initialization sequence step one
0183        STEP4 = 3,                              !Initialization sequence step two
0184        TRUE = 1,                               !True indicator
0185        FALSE = 0,                              !False indicator
0186        SET_FLG = 1,                            !Set the indicated flag to one
0187        CLR_FLG = 0,                            !Clear the indicated flag to zero
0188        ONE = 1,                                !Ones data type
0189        ZERO = 0,                               !Zero data type
0190        ONES = %o'177777',                      !All ones data type
0191        ZEROS = 0,                              !All zeros data type
0192        L$LIMIT = 16,                           !Allowable number of units to format
0193        DM_SIZE = 10240,                        !Size of DM buffer size
0194        FCT_SIZE = 4096,                        !Size of fct buffer size
0195        !
0196        ! Command opcode bits 6 and 7 indicate the type of message
0197        ! (command, end or attention message).  The following literials
0198        ! define these field values.
0199        !
0200        CMD$MSG = %b'00',                       !Command opcode message type
0201        ATT$MSG = %b'01',                       !Attention opcode msg type
0202        END$MSG = %b'10',                       !End opcode message type
0203        !
0204        ! Error code literials
0205        !
0206        PAS_CODE = %o'00',                      !Pass code
0207        CIE_CODE = %o'01',                      !Communication area init error
0208        CTO_CODE = %o'11',                      !Controller time out error
0209        PFE_CODE = %o'21',                      !Port fatal error
0210        RSE_CODE = %o'31',                      !response status error
0211        PVE_CODE = %o'41',                      !Host/Controller out of sequence
0212        RPD_CODE = %o'51',                      !Remote program died error code
0213        PSE_CODE = %O'61',                      !Port/host synchronious error
0214        MLE_CODE = %O'71',                      !Message length error code
0215        UEC_CODE = %O'101',                     !Unknown end code error
0216        APR_CODE = %O'201',                     !Adaptor purge reguest error
0217        UIN_CODE = %O'301',                     !Unknown interrupt error code
0218        ATN_CODE = %O'401',                     !Attention msg received
0219        CMD_CODE = %O'501',                     !Command msg received
0220        SEX_CODE = %O'601',                     !Serious exception error received
0221        IVC_CODE = %O'701',                     !Invalid command error received
0222        UMT_CODE = %O'1001',                    !Unknown message type
0223        OBF_CODE = %O'2001',                    !Out standing buffer full error
0224        OSE_CODE = %O'3001',                    !Out$std_buffer out of sync error
0225        UMN_CODE = %O'4001',                    !Unknown message number
0226        FRE_CODE = %O'5001',                    !File read error code from load media
0227        ILL_FCT  = %O'6001',                    !Illegal FCT file length
0228        !
0229        ! Dup Protocol literials
0230        !
0231        ! Note:
```

```
0232      !    The values assigned to the literials
0233      !    REC_SIZ, SND_SIZ are represented  in
0234      !    powers of 2 notation per DUP spec.
0235      !
0236      !    By redefining these two literials the
0237      !    communications area allocation and init
0238      !    sequence is automatically handled and
0239      !    no other parameter modification is needed.
0240      !
0241      !    Further more the send and receive rings
0242      !    can be of different lengths.  However the
0243      !    maximum value allowed is 7 (2**7 = 128 slots)
0244      !    per DUP spec.
0245      !
0246        REC_SIZ = 2,                          !Define number of receive slots
0247        SND_SIZ = 2,                          !Define number of send slots
0248    !
0249    ! This one is tricky: (Hdr_siz)
0250    !       The communication area is defined to be a
0251    !       contigious Blockvector (two words per block)
0252    !       data segment of size, Rec_allocate + Snd_allocate +
0253    !       Hdr_siz.  The two words per block coming from the
0254    !       two words needed to represent the ring descriptors.
0255    !
0256    !       Hdr_siz is then really * 2 or 4 words of storage
0257    !       to represent the interrupt and purge indicators.
0258    !
0259        HDR_SIZ = 2,                          !Define com area header size 4 words
0260    !
0261    !
0262        REC_ALLOCATE = 1^REC_SIZ,             !Define receive ring allocation
0263        SND_ALLOCATE = 1^SND_SIZ,             !Define send ring allocation
0264        !
0265        ! Ring_size equals the total number of ring descriptors
0266        ! (number  of  2  word  blocks) allocated   within  the
0267        ! communitcations area.
0268        !
0269        RING_SIZE = REC_ALLOCATE + SND_ALLOCATE + HDR_SIZ,
0270    !
0271    ! The  RB_SIZ  by  definition, DUP spec, must be
0272    ! a minimum of 60 bytes long (30 words) 64 bytes
0273    ! overall.  The  additional  2  words for the UQ
0274    ! port  information  is  accounted for in azkel2
0275    ! when the storage is allocated.
0276    !
0277        RB_SIZE = 30,                         !Number of "words" in response buffer
0278    !
0279    ! The biggest command I'll ever send will
0280    ! be (I hope) will be 40 bytes, 42 overall,
0281    ! and again the UQ port 2 words is allowed
0282    ! for in azkel2.
0283    !
0284        SB_SIZE = 20,                         !Number of "words" in send buffer
0285                                              !
0286        SNDB_SIZE = 37,                       !Send DUP cmd text buffer size
0287        RECB_SIZE = 120,                      !Receive DUP cmd text buffer size
0288        PORT_OWNED = 1,                       !Descriptor owned by port
```

```
0289      HOST_OWNED = 0,                       !Descriptor owned by host
0290  !
0291  ! Delay literal values
0292  !
0293  ! An argument of one results in a 100us
0294  ! delay.
0295  !
0296  ! A roman numeral notation is used to
0297  ! denote values of delay arguments.
0298  ! The notation is as follows:
0299  !
0300  ! I (1), V (5), X (10), L (50), C (100),
0301  ! D (500), M (1000)
0302  !
0303  ! Any symbol following another of equal or greater
0304  ! value adds to its value, as II = 2, XI = 11.
0305  !
0306  ! Any symbol proceeding one of greater value subtracts
0307  ! from the second and the remainder added to the first
0308  ! as XIV = 14, LIX = 59.
0309  !
0310      ONE_SEC = 1000,                       !One second delay argument
0311      ONE_MINUTE = 60000,                   !One minute delay argument
0312      C_US = 1,                             !100 micro sec delay argument
0313      CC_US = 2,                            !200 micro sec delay argument
0314      CCC_US = 3,                           !300 micro sec delay argument
0315      XC_US = 4,                            !400 micro sec delay argument
0316      D_US = 5,                             !500 micro sec delay argument
0317  !
0318  ! RC25 register offsets
0319  !
0320      RCIP = 0,
0321      RCSA = 1,
0322  !
0323  ! Command packet opcodes
0324  ! (See note following)
0325  !
0326      OP_ABO = %o'1',                       !Abort command
0327      OP_ACC = %o'20',                      !Access command
0328      OP_AVL = %o'10',                      !Available command
0329      OP_CCD = %o'21',                      !Compare controller data command
0330      OP_CMP = %o'40',                      !Compare host data command
0331      OP_DAP = %o'13',                      !Determine access path
0332      OP_ERS = %o'22',                      !Erase command
0333      OP_FLU = %o'23',                      !Flush command
0334      OP_GCS = %o'02',                      !Get command status command
0335      OP_GUS = %o'03',                      !Get unit status command
0336      OP_ONL = %o'11',                      !Online command
0337      OP_RD = %o'41',                       !Read command
0338      OP_RPL = %o'24',                      !Replace command
0339      OP_SCC = %o'04',                      !Set controller characteristics command
0340      OP_SUC = %o'12',                      !Set unit characteristics command
0341      OP_WR = %o'42',                       !Write command
0342      OP_MRD = %o'30',                      !Maintenance read command
0343      OP_MWR = %o'31',                      !Maintenance write command
0344      !
0345      ! End message and serious exception encodes
```

```
0346      ! (see note following)
0347      !
0348      OP_END = %o'200',                       !End packet flag
0349      OP_SEX = %o'7',                         !Serious exception end packet
0350      !
0351      ! MSCP  Attention message endcodes
0352      !
0353      OP_AVA = %o'100',                       !Available attention message
0354      OP_DUP = %o'101',                       !Duplicate unit number attention message
0355      OP_ACP = %o'102',                       !Access path attention message
0356      OP_RLC = %o'103',                       !Reset command limit attention message
0357      !
0358      !  The following are the dup op-code commands
0359      !
0360      OP_GDS = %o'1',                         !Get dust status
0361      OP_ESP = %o'2',                         !Execute supplied program
0362      OP_ELP = %o'3',                         !Execute local program
0363      OP_SED = %o'4',                         !Receive data
0364      OP_RED = %o'5',                         !Send data
0365      OP_ABT = %o'6',                         !Abort program
0366  !+
0367  !   NOTE:
0368  !   -----
0369  !
0370  !   End message opcodes  (also called endcodes) are formed by adding   the end
0371  !   message  flag  to  the  command opcode.  For  example, a READ commands end
0372  !   message contains the value OP.RED + OP.END in its opcode field. The Invalid
0373  !   command  end  message contains just the end message flag (i.e., OP.END) in
0374  !   its opcode field.  The serious exception opcode shown above (i.e. OP.SEX +
0375  !   OP.END) in its opcode field.
0376  !
0377  !   Commands opcode bits 6 and 7 indicate the type of message (command, end or
0378  !   attention  message.  Command opcodes bits 3 through 5 indicate the command
0379  !   catagory  (immediate, sequential  or no-sequential) and whether or not the
0380  !   command includes a buffer descriptor.
0381  !
0382  !   See MSCP document appendix "A-1 NOTE:" for more information on this topic.
0383  !-
0384      !
0385      ! DUP endcode message types
0386      !
0387      EOP_GDS = OP_GDS + OP_END,                  !Get dust status
0388      EOP_ESP = OP_ESP + OP_END,                  !Execute supplied program
0389      EOP_ELP = OP_ELP + OP_END,                  !Execute local program
0390      EOP_RED = OP_RED + OP_END,                  !Receive data
0391      EOP_SED = OP_SED + OP_END,                  !Send data
0392      EOP_ABT = OP_ABT + OP_END,                  !Abort program
0393      !
0394      ! MSCP endcode messag types
0395      !
0396      EOP_ABO = OP_ABO + OP_END,                  !Abort command
0397      EOP_ACC = OP_ACC + OP_END,                  !Access command
0398      EOP_AVL = OP_AVL + OP_END,                  !Available command
0399      EOP_CCD = OP_CCD + OP_END,                  !Compare controller data command
0400      EOP_CMP = OP_CMP + OP_END,                  !Compare host data command
0401      EOP_ERS = OP_ERS + OP_END,                  !Erase command
0402      EOP_FLU = OP_FLU + OP_END,                  !Flush command
```

```
0403        EOP_GCS = OP_GCS + OP_END,          !Get command status command
0404        EOP_GUS = OP_GUS + OP_END,          !Get unit status command
0405        EOP_ONL = OP_ONL + OP_END,          !Online command
0406        EOP_RD = OP_RD + OP_END,            !Read command
0407        EOP_RPL = OP_RPL + OP_END,          !Replace command
0408        EOP_SCC = OP_SCC + OP_END,          !Set controller characteristics command
0409        EOP_SUC = OP_SUC + OP_END,          !Set unit characteristics command
0410        EOP_WR = OP_WR + OP_END,            !Write command
0411        EOP_MRD = OP_MRD + OP_END,          !Maintenance read command
0412        EOP_MWR = OP_MWR + OP_END,          !Maintenance write command
0413        EOP_SEX = OP_SEX + OP_END,          !Serious exception
0414
0415    !+
0416    ! Dup Command message envelope
0417    ! byte sizes beginning at text+0
0418    ! of the command envelope.
0419    !-
0420        SZ_GDS = 12,                        !Get dust status size
0421        SZ_ESP = 40,                        !Execute supplied program size
0422        SZ_ELP = 48,                        !Execute local program size
0423        SZ_RED = 28,                        !Receive data size
0424        SZ_SED = 28,                        !Send data size
0425        SZ_ABT = 12,                        !Abort program size
0426    !+
0427    ! MSCP Command message envelope
0428    ! byte sizes beginning at text+0
0429    ! of the command envelope.
0430    !-
0431        SZ_SCC = 32,                        !Set Controller characteristics
0432        SZ_ONL = 36,                        !On-line command
0433
0434    !+
0435    ! The following are the expected number of bytes
0436    ! in a commands  end  packet  transmitted by the
0437    ! communications mechanism to the host.
0438    !-
0439        !
0440        ! DUP command end message sizes
0441        !
0442        ESZ_GDS = %DECIMAL '48',            !Get dust status end packet size
0443        ESZ_ESP = %DECIMAL '48',            !Execute supplied prog end packet size
0444        ESZ_ELP = %DECIMAL '48',            !Execute local prog end packet size
0445        ESZ_RED = %DECIMAL '48',            !Receive data end packet size
0446        ESZ_SED = %DECIMAL '48',            !Send data end packet size
0447        ESZ_ABT = %DECIMAL '48',            !Abort program end packet size
0448        !
0449        ! MSCP command end message sizes
0450        !
0451        ESZ_SCC = %DECIMAL '48',            !Set controller characteristics
0452        ESZ_ONL = %DECIMAL '48';            !On line command
```

```
;       0453  %sbttl 'FIELD DECLARATIONS'
;       0454
;       0455  field
;       0456
;       0457      !+
;       0458      ! Definitions:
;       0459      !
;       0460      !     ISD_FIELD = Initialization Sequence Data_Field
;       0461      !
;       0462      !
;       0463      !     ISRD_ = Initialization Sequence Read = 0
;       0464      !
;       0465      !
;       0466      !     ISWRT_ = Initialization Sequence Write = 1
;       0467      !
;       0468      !
;       0469      !     S1R_ = Step One Read
;       0470      !
;       0471      !
;       0472      !     S1W_ = Step One Write
;       0473      !
;       0474      !
;       0475      !     etc.
;       0476      !
;       0477      !-
;       0478
;       0479      ISD_FIELD =
;       0480          set
;       0481          !
;       0482          ! Miscellanious status register field
;       0483          ! referance declarations.
;       0484          !
;       0485          RC_ALL = [0, 16, 0],                    !RC25 word access
;       0486          ERR_BIT = [15, 1, 0],                   !Error bit
;       0487          ISR_ALL = [0, 16, 0],                   !Initialize sequence read word
;       0488          ISW_ALL = [0, 16, 0],                   !Initialize sequence write word
;       0489          STP_FIELD = [11, 4, 0],                 !All step bit fields
;       0490          SA_GO = [0, 1, 0],                      !Status register GO bit
;       0491          ERR_CODE = [0, 11, 0],                  !SA register fatal error code
;       0492          !
;       0493          ! Step one read SA register field reference
;       0494          !
;       0495          S1R_STEP = [11, 1, 0],                  !Step one step bit
;       0496          S1R_NV = [10, 1, 0],                    !No host inter vec settable adrs
;       0497          S1R_QB = [9, 1, 0],                     !22-bit addressing support
;       0498          S1R_DI = [8, 1, 0],                     !Enhanced diag implementation
;       0499          S1R_OD = [7, 1, 0],                     !Port allows odd host address
;       0500          S1R_MP = [6, 1, 0],                     !Port supports address mapping
;       0501          S1R_RSVD = [0, 6, 0],                   !Reserved field
;       0502          !
;       0503          ! Step one write SA register field reference
;       0504          !
;       0505          S1W_WR = [14, 1, 0],                    !Diag wrap around
;       0506          S1W_CRING = [11, 3, 0],                 !Number of C-ring slots 'pwrs of 2'
;       0507          S1W_RRING = [8, 3, 0],                  !Number of R-ring slots 'pwrs of 2'
;       0508          S1W_IE = [7, 1, 0],                     !Init Sequence interrupt request
;       0509          S1W_VADR = [0, 7, 0],                   !Interrupt vector address
```

```
0510          !
0511          ! Step two read SA register field reference
0512          !
0513          S2R_STEP = [12, 1, 0],                  !Step two step bit
0514          S2R_PTYP = [8, 3, 0],                   !Port type number
0515          S2R_BIT7 = [7, 1, 0],                   !Echoed IE bit from step one write
0516          S2R_WR = [6, 1, 0],                     !Echoed bit 14 from step one write
0517          S2R_CRING = [3, 3, 0],                  !Echoed bits 3-5 from step one write
0518          S2R_RRING = [0, 3, 0],                  !Echoed bits 0-2 from step one write
0519          !
0520          ! Step two write SA register field reference
0521          !
0522          S2W_LRBASE = [0, 16, 0],                !Ring base lower address
0523          S2W_PI = [0, 1, 0],                     !Adapter purge interrupt request
0524          !
0525          ! Step three read SA register field reference
0526          !
0527          S3R_STEP = [13, 1, 0],                  !Step three step bit
0528          S3R_RSVD = [8, 3, 0],                   !Reserved
0529          S3R_IE = [7, 1, 0],                     !Echoed IE bit from step one write
0530          S3R_VADR = [0, 7, 0],                   !Echoed VADR from step one write
0531          !
0532          ! Step three write SA register field reference
0533          !
0534          S3W_PP = [15, 1, 0],                    !Purge & Poll test request
0535          S3W_HRBASE = [0, 15, 0],                !Ring base high address
0536          !
0537          ! Step four read SA register field reference
0538          !
0539          S4R_STEP = [14, 1, 0],                  !Step four step bit
0540          S4R_RSVD = [8, 3, 0],                   !Reserved
0541          S4R_MOD = [4, 4, 0],                    !Encoded controller indentification
0542          S4R_VER = [0, 4, 0],                    !Mod 16 value of u-code version
0543          !
0544          ! Step four write SA register field reference
0545          !
0546          S4W_RSVD = [8, 8, 0],                   !Reserved
0547          S4W_BURST = [2, 6, 0],                  !Max number longwords per NPR xfer
0548          S4W_LF = [1, 1, 0],                     !Last fail request
0549          S4W_GO = [0, 1, 0]                      !Go bit
0550          tes,
```

```
0551      !+
0552      ! Field declaration to define the interrupt
0553      ! indicator and purge words of the communications
0554      ! area.
0555      !-
0556
0557      HDR_FIELD =
0558          set
0559          !
0560          ! Header Word Ringbase -4
0561          !
0562  !       RESERVED = [0, 0, 16, 0],
0563          !
0564          ! Header Word Ringbase -3
0565          !
0566  !       RSVD = [1, 0, 8, 0],
0567          ADP_CH = [1, 8, 8, 0],
0568          !
0569          ! Header Word Ringbase -2
0570          !
0571          CMD_INT = [2, 0, 16, 0],
0572          !
0573          ! Header Word Ringbase -1
0574          !
0575          RSP_INT = [3, 0, 16, 0]
0576          tes,
0577
```

```
;        0578      !+
;        0579      ! Field declaration to define the fields within
;        0580      ! the send and receive ring descriptors.
;        0581      !-
;        0582
;        0583      DSC_FIELD =
;        0584          set
;        0585          !
;        0586          ! Low order envelope address
;        0587          !
;        0588          LO_EN$AD = [0, 0, 16, 0],
;        0589          !
;        0590          ! High order 18 bit unibus or Qbus address
;        0591          !
;        0592          HI_EN$AD = [1, 0, 2, 0],
;        0593          !
;        0594          ! Q_Bus extention address
;        0595          !
;        0596          QB_EXT = [1, 2, 4, 0],
;        0597          !
;        0598          ! Reserver field
;        0599          !
;        0600          D$RSVD = [1, 6, 8, 0],
;        0601          !
;        0602          ! Flag bit
;        0603          !
;        0604          FLAG_BIT = [1, 14, 1, 0],
;        0605          !
;        0606          ! Ownership bit
;        0607          !
;        0608          OWN_BIT = [1, 15, 1, 0]
;        0609          tes,
```

```
0610      !+
0611      ! Field declaration to define the fields within
0612      ! message envelope buffers.
0613      !-
0614
0615      ENV_FIELD =
0616          set
0617          !
0618          ! UQ Port envelope header field declaration
0619          !
0620          MSG_LENGTH = [0, 0, 16, 0],             !Message length
0621          CREDITS = [1, 0, 4, 0],                 !Credits
0622          MSG_TYPE = [1, 4, 4, 0],                !Message type
0623          CONN_ID = [1, 8, 8, 0],                 !Connection ID
0624          !
0625          ! DUP/MSCP command and response envelope header
0626          ! field declaration
0627          !
0628          CMD_LREF = [2, 0, 16, 0],               !Command Ref number low word
0629          CMD_HREF = [3, 0, 16, 0],               !Command Ref number high word
0630          UNIT_NUM = [4, 0, 16, 0],               !Unit selection field
0631          UN_LUSED = [4, 0, 16, 0],               !Unused low word
0632          UN_HUSED = [5, 0, 16, 0],               !Unused high word
0633          TYP$MSG = [6, 6, 2, 0],                 !End code message type
0634          OPCODE = [6, 0, 8, 0],                  !Opcode
0635          ENDCODE = [6, 0, 8, 0],                 !Opcode
0636          E$FLAG = [6, 8, 8, 0],                  !End message flag field
0637          RSVD = [6, 8, 8, 0],                    !Reserved
0638          STATUS = [7, 0, 16, 0],                 !Status
0639          STA_CODE = [7, 0, 5, 0],                !Status code
0640          MODIFIER = [7, 0, 16, 0],               !Modifier
0641
0642          !++
0643          ! DUP command and response envelope parameter
0644          ! field declarations
0645          !--
0646
0647          !+
0648          ! ABORT command and response envelope parameter
0649          ! field declartion
0650          !-
0651          !
0652          ! No parameters declared
0653          !
0654          !       response FIELD
0655          ! No parameters declared
0656
0657          !+
0658          ! GET DUST STATUS command and response envelope
0659          ! parameter field declaration
0660          !-
0661          !       COMMAND FIELD
0662          ! No parameters declared
0663          !
0664          !       response FIELD
0665          !
0666          PLO_EXT = [8, 0, 16, 0],                !Program Extension low word
```

```
0667          PHI_EXT = [9, 0, 8, 0],                 !Program Extension high word
0668          F$LAGS = [9, 8, 8, 0],                  !Flags
0669          FLG_B0 = [9, 8, 1, 0],                  !Flag field bit 0
0670          FLG_B1 = [9, 9, 1, 0],                  !Flag field bit 1
0671          FLG_B2 = [9, 10, 1, 0],                 !Flag field bit 2
0672          FLG_B3 = [9, 11, 1, 0],                 !Flag field bit 3
0673          PLO_IND = [10, 0, 16, 0],               !Progress indicator low word
0674          PHI_IND = [11, 0, 16, 0],               !Progress indicator high word
0675          TIM_OUT = [12, 0, 16, 0],               !Time out
0676
0677          !+
0678          ! EXECUTE SUPPLIED PROGRAM command and response
0679          ! envelope parameter field declartion
0680          !-
0681          !
0682          !       COMMAND FIELD
0683          !
0684          BLO_CNT = [8, 0, 16, 0],                !Byte count low word
0685          BHI_CNT = [9, 0, 16, 0],                !Byte count high word
0686          BPA_LO = [10, 0, 16, 0],                !Buffer physical adrs bits <0-15>
0687          BPA_HI = [11, 0, 2, 0],                 !Buffer physical adrs bits <16-17>
0688          QBUS_EXT = [11, 2, 4, 0],               !Q_bus extention
0689          RSV = [11, 6, 2, 0],                    !Reserved field
0690          UBA_CHAN = [11, 8, 8, 0],               !Unibus adaptor channel number
0691          RSV0 = [ 12, 0, 16, 0],                 !These next four words are not
0692          RSV1 = [ 13, 0, 16, 0],                 !in the UQ port implementation.
0693          RSV2 = [ 14, 0, 16, 0],                 !
0694          RSV3 = [ 15, 0, 16, 0],                 !
0695          !
0696          ! These next field definitions are the same
0697          ! as above except they are for the overlay
0698          ! buffer descriptors.  To make life easy for
0699          ! me I'll use the same names and just prefix
0700          ! the names with a $ for uniqueness.
0701          !
0702          $BPA_LO = [16, 0, 16, 0],               !Buffer physical adrs bits <0-15>
0703          $BPA_HI = [17, 0, 2, 0],                !Buffer physical adrs bits <16-17>
0704          $QBUS_EXT = [17, 2, 4, 0],              !Q_bus extention
0705          $RSV = [17, 6, 2, 0],                   !Reserved field
0706          $UBA_CHAN = [17, 8, 8, 0],              !Unibus adaptor channel number
0707          $RSV0 = [ 18, 0, 16, 0],                !These next four words are not
0708          $RSV1 = [ 19, 0, 16, 0],                !in the UQ port implementation.
0709          $RSV2 = [ 20, 0, 16, 0],                !
0710          $RSV3 = [ 21, 0, 16, 0],                !
0711          !
0712          !       response FIELD
0713          ! No parameters declared
0714
0715          !+
0716          ! EXECUTE LOCAL PROGRAM command and response
0717          ! parameter field declartion
0718          !-
0719          !
0720          !       COMMAND FIELD
0721          !
0722          PN_0 = [8, 0, 16, 0],                   !Program name word 0
0723          PN_1 = [9, 0, 16, 0],                   !Program name word 1
```

```
        PN_2 = [10, 0, 16, 0],                  !Program name word 2
        !
        !       response FIELD
        !
        version = [8, 0, 16, 0],                !Version
        TIME_OUT = [9, 0, 8, 0],                !Time out
        FLAGS = [9, 8, 8, 0],                   !Flags

        !+
        ! SEND DATA/RECEIVE DATA command and response
        ! parameter field declartion
        !-
        !       COMMAND FIELD
        ! byte count, buffer descriptor are the same
        ! as Execute Supplied Program parameters
        !
        !       response FIELD
        ! byte count is the same
        ! as Execute Supplied Program parameters


        !++
        ! MSCP command and response envelope parameter
        ! field declarations
        !--

        !+
        ! SET CONTROLLER CHARACTERISTICS command and response
        ! parameter field declartion
        !-
        !
        !       COMMAND FIELD
        !
        MSCP_VER = [ 8, 0, 16, 0],                      !MSCP version
        CTL_FLAGS = [ 9, 0, 16, 0],                     !Controller flags
        HOST_TOV = [ 10, 0, 16, 0],                     !Host time out value
        RS$VD = [ 11, 0, 16, 0],                                !Reserved
        T$D_0 = [ 12, 0, 16, 0],                                !Time and Date word 0
        T$D_1 = [ 13, 0, 16, 0],                                !Time and Date word 1
        T$D_2 = [ 14, 0, 16, 0],                                !Time and Date word 2
        T$D_3 = [ 15, 0, 16, 0],                                !Time and Date word 3
        CDP_LO = [ 16, 0, 16, 0],                       !Cntlr dep parameter lo word
        CDP_HI = [ 17, 0, 16, 0],                       !Cntlr dep parameter hi wrd
        !
        !       RESPONSE FIELD
        !
        !MSCP_VER = [ 8, 0, 16, 0],                     !Same as cmd field
        !CTL_FLAGS = [ 9, 0, 16, 0],                    !Same as cmd field
        CTL_TOV = [ 10, 0, 16, 0],                      !Cntlr time out value
        CSVRSN = [ 11, 0, 8, 0],                                !Cntlr S/W, F/W, u-code rev num
        CHVRSN = [ 11, 8, 8, 0],                                !Cntlr H/W rev num
        CID_0 = [ 12, 0, 16, 0],                                !Cntlr identifier wrd 0
        CID_1 = [ 13, 0, 16, 0],                                !Cntlr identifier wrd 1
        CID_2 = [ 14, 0, 16, 0],                                !Cntlr identifier wrd 2
        CID_3 = [ 15, 0, 16, 0],                                !Cntlr identifier wrd 3

        !+
```

```
0781          ! ONLINE COMMAND command and response
0782          ! parameter field declartion
0783          !-
0784          !
0785          !       COMMAND FIELD
0786          !
0787          RSV$D= [ 8, 0, 16, 0],                  !Reserved
0788          UNT_FLAGS = [ 9, 0, 16, 0],             !Unit flag field
0789          RSVD$0 = [ 10, 0, 16, 0],               !Reserved field
0790          RSVD$1 = [ 11, 0, 16, 0],               !Reserved field
0791          RSVD$2 = [ 12, 0, 16, 0],               !Reserved field
0792          RSVD$3 = [ 13, 0, 16, 0],               !Reserved field
0793          RSVD$4 = [ 14, 0, 16, 0],               !Reserved field
0794          RSVD$5 = [ 15, 0, 16, 0],               !Reserved field
0795          DDP_LO = [ 16, 0, 16, 0],               !Device dependent parameter
0796          DDP_HI = [ 17, 0, 16, 0],               !Device dependent parameter
0797          SHADOW_UNIT = [ 18, 0, 16, 0],          !Shadow unit
0798          COPY_SPEED  = [ 19, 0, 16, 0],          !Copy speed
0799          !
0800          !       RESPONSE FIELD
0801          !
0802          MUNT_CODE = [ 8, 0, 16, 0],             !Multi-unit code
0803    !     UNT_FLAGS = [ 9, 0, 16, 0],             !Same as cmd field
0804    !     RSVD$0 = [ 10, 0, 16, 0],               !Same as cmd field
0805    !     RSVD$1 = [ 11, 0, 16, 0],               !Same as cmd field
0806          UID_0 = [ 12, 0, 16, 0],                !Unit ident word 0
0807          UID_1 = [ 13, 0, 16, 0],                !Unit ident word 1
0808          UID_2 = [ 14, 0, 16, 0],                !Unit ident word 2
0809          UID_3 = [ 15, 0, 16, 0],                !Unit ident word 3
0810          MTID_LO = [ 16, 0, 16, 0],              !Media type ident word 0
0811          MTID_HI = [ 17, 0, 16, 0],              !Media type ident word
0812    !     SHADOW_UNIT = [ 18, 0, 16, 0],          !Same as cmd
0813          SHA_STATE = [ 19, 0, 16, 0],            !Shadow state
0814          USZ_LO = [ 20, 0, 16, 0],               !Unit size lo word
0815          USZ_HI = [ 21, 0, 16, 0],               !Unit size hi word
0816          VSN_LO = [ 22, 0, 16, 0],               !Volume serial num lo word
0817          VSN_HI = [ 23, 0, 16, 0]                !Volume serial num hi word
0818          tes,
0819
```

```
0820      !+
0821      ! Send Receive command buffer field definition
0822      !-
0823      RECB_FIELD =
0824          set
0825          MSG_NUM = [0, 0, 12, 0],
0826          MSG_TYP = [0, 12, 4, 0],
0827          MSG_TXT = [1, 0, 16, 0]
0828          tes,
0829
0830      !+
0831      ! Outstanding command buffer field declarations
0832      !-
0833      OUT$FIELD =
0834          set
0835          CMD_WRD = [0, 0, 16, 0],          !Command word ref "word 0 of slot"
0836          REC_FLG = [0, 15, 1, 0],          !Command received indicator flag
0837          CMD_REF = [0, 0, 8, 0],           !Command reference field
0838          ENV_ADR = [1, 0, 16, 0]           !Envelope adrs field
0839          tes;
0840
```

```
;       0841  %sbttl 'LINKAGE DELCARATIONS'
;       0842
;       0843  linkage
;       0844        !
;       0845        ! Call_lnk$typ
;       0846        !
;       0847        ! This  spcifies that  the PDP-11  JSR and RTS instructions
;       0848        ! are used by  the compiled  code,  and that the parameters
;       0849        ! with   standard  parameters  locations are   passed using
;       0850        ! register 5 (R5) as the argument pointer with the register
;       0851        ! usage as follows:
;       0852        !
;       0853        ! Register          Usage
;       0854        ! --------          -----
;       0855        !    0              Value return register, non-preserved
;       0856        !    1-4            Preserved
;       0857        !    5              Argument pointer
;       0858        !    6              Stack pointer
;       0859        !    7              Program counter
;       0860        !
;       0861        !
;       0862        CALL_LNK$TYP = call (standard),
;       0863        !
;       0864        !
;       0865        ! Int_lnk$typ
;       0866        !
;       0867        ! Specifies that a routine will be called only by a PDP-11
;       0868        ! hardware or  software interrupt  and will be returned via
;       0869        ! the RTI instruction. Register usage is as follows:
;       0870        !
;       0871        ! Register          Default usage
;       0872        ! --------          -------------
;       0873        !   0-5            Preserved
;       0874        !   6              Stack pointer
;       0875        !   7              Program pointer
;       0876        !
;       0877        !
;       0878        INT_LNK$TYP = interrupt (standard);
;       0879


;                                       COMMAND QUALIFIERS

;       BLISS /PDP11/LIST/LIBRARY CZRCH0.R16

; Run Time:         00:06.0
; Elapsed Time:     00:07.6
; Memory Used:  51 pages
; Library Precompilation Complete
```

```
;       0001  MODULE CZRCH2 (%TITLE 'CZRCH RC25 DISK FORMATTER'
;       0002                 IDENT = 'REV A PATCH 00',
;       0003                 ADDRESSING_MODE (RELATIVE) ,
;       0004                 ENVIRONMENT (NOEIS)
;       0005                 ) =
;       0006  BEGIN
;       0007  %sbttl 'PROGRAM HEADER'
;       0008  !
;       0009  ! Pretty Declarations
;       0010  !
;       0011  !<BLF/LOWERCASE_KEY>
;       0012  !
;       0013
;       0014  library 'CZRCH0';                          !Define RC25 Formatter Library
;       0015
;       0016  require 'BLSMAC.REQ';                      !Define Bliss Macro Require file
;       1505
;       1506  !+
;       1507  ! The  psect  named  "code  or  $code$" is redefinded here
;       1508  ! to  be  called "aa$code".  This is done to force the TKB
;       1509  ! linker to place the programs header information starting
;       1510  ! at absolute address 2000.
;       1511  !-
;       1512  psect
;       1513      code = aa$code;
;       1514
;       1515  literal
;       1516      DS$NBR_OF_TESTS = 1;                   !Indicates number of test in Diag
;       1517
;       1518  !+
;       1519  ! The structure of a diagnostic program may contain any or  all  of  the
;       1520  ! ten  optional  sections.  But five of the optional sections require a
;       1521  ! pointer that is derived by and for the supervisor, and is  located  in
;       1522  ! the  header  block.  Therefore,  in  relation to the effective use of
;       1523  ! these five pointers, the optional sections call must be coded  to  re-
;       1524  ! flect usage (i.e., any,all,or none).
;       1525  !
;       1526  ! The following coding possibilities exist:
;       1527  !
;       1528  !  POINTER (BGNRPT,BGNSW,BGNSFT,BGNAU,BGNDU,ERRTBL,BGNSETUP)
;       1529  !
;       1530  !  (or any subset of the args)
;       1531  !
;       1532  !  POINTER (ALL)                  ; All provides pointers for all five
;       1533  !                                 ; sections
;       1534  !  POINTER (NONE)                 ; None indicates to supervisor that no
;       1535  !                                 ; pointers are required.
;       1536  !                                 ; this is the default
;       1537  !
;       1538  !       No pointers are optional using bliss. Make sure the following
;       1539  !       sections of  code are in place (in the correct skels),even if
;       1540  !       the sections are blank.
;       1541  !
;       1542  !       ARGUMENT        FUNCTION
;       1543  !       --------        ------
;       1544  !       RPT             REPORT CODE
;       1545  !       SW              SOFTWARE TABLE
```

```
;          1546  !       SFT             SOFTWARE TABLE QUESTIONS
;          1547  !       AU              ADD CODE
;          1548  !       DU              DROP CODE
;          1549  !       TBL             ERROR TABLE
;          1550  !       SETUP           ASSEMBLED P-TABLES
;          1551  !-
;          1552  POINTER (ALL);
;          1553  !+
;          1554  ! The program  header section contains  general  information  which  des-
;          1555  ! cribes  the  major characteristics of the diagnostic program.  This in-
;          1556  ! cludes, the  program name, and revision and  patch-order  levels.   The
;          1557  ! header  also  provides  space   for an event flag register, and for the
;          1558  ! storage of  pointers, through which the supervisor may find  access  to
;          1559  ! other  key sections of the program(e.g., dispatch table, initialize and
;          1560  !  clean-up code, etc.).  An argument on the header gives the device type
;          1561  ! if it is an XXDP+ bootable device.  This enables the supervisor to pro-
;          1562  ! vide load medium protection when necessary.
;          1563  !-
;          1564  HEADER (%ascii'CZRCH ', %ascii'A', %ascii'0', 1200, 0, PRI00);
```

```
;          1565  %sbttl 'DISPATCH TABLE'
;          1566  !+
;          1567  ! The dispatch table section contains address pointers  to  the  various
;          1568  ! tests  contained within the diagnostic program.  This section requires
;          1569  ! the coding of only the dispatch macro.
;          1570  !-
;          1571  DISPATCH (DS$NBR_OF_TESTS);
;          1572  ERRTBL;                                 !Define Supervisor Error table storage
```

```
;          1573  %sbttl 'DEFAULT HARDWARE P-TABLE'
;          1574  !+
;          1575  ! The  default hardware P-Table contains default values of
;          1576  ! the test-device parameters.  The structure of this table
;          1577  ! is  identical to  the structure of the hardware P-Tables,
;          1578  ! and  is used  as a  "template" for building the P-Tables.
;          1579  !-
;          1580  BGNHW (DFPTBL);
;          1581
;          1582  global
;          1583      HW_IP_ADRS : word initial (%o'172150'),     !Define RC25 Controler IP reg
;          1584      HW_VECTOR : word initial (%o'154'),         !Define RC25 interrupt vector adddrs
;          1585      HW_BR_LEVEL : word initial (5),             !Define RC25 bus request level
;          1586      HW_UNIT_NO : word initial (0);              !Define RC25 unit no. to format
;          1587
;          1588  ENDHW;
```

```
;          1589  %sbttl 'SOFTWARE P-TABLE'
;          1590  !+
;          1591  ! The  software table  contains various  data used  by  the
;          1592  ! program as  operational parameters.  These parameters are
;          1593  ! set up at assembly time and may be varied by the operator
;          1594  ! at run time.
;          1595  !-
;          1596  BGNSW (SFPTBL);
;          1597
;          1598  global
;          1599      SW_UNATT : word initial (1);                !Format in unattended refmt mode
;          1600
;          1601  ENDSW;
```

```
;          1602  %sbttl 'PROTECTION TABLE'
;          1603  !+
;          1604  ! This  table is used by the runtime
;          1605  ! services to protect the load media.
;          1606  !
;          1607  ! 1st arg =     Offset into P_Table for csr address
;          1608  ! 2nd arg =     Offset into P_Table for massbus address
;          1609  ! 3rd arg =     Offset into P_Table for drive number
;          1610  !-
;          1611  BGNPROT (-1, -1, -1);
;          1612  ENDPROT;
```

```
;          1613  %sbttl 'MODULE DECLARATIONS'
;          1614  !+
;          1615  ! Within  BLSMAC.REQ  the  psect  names, plit global and own,
;          1616  ! are  redefined  to  be aa$code.  This is done to force the
;          1617  ! tkb  linker  to  link  the  header information starting at
;          1618  ! at absolute  address  2000.  Redefine  these  psect  names
;          1619  ! back  to  their  original names for house keeping purposes.
;          1620  !
;          1621  ! Also  change  the attributes for the psect "global" so that
;          1622  ! global data will not be linked starting at absolute address
;          1623  ! 2000.
;          1624  !-
;          1625  psect
;          1626      plit = $plit$( global),
;          1627      global = $glob$(nowrite, noexecute, global, concatenate),
;          1628      own = $own$;
;          1629
;          1630  !+
;          1631  ! Structure declarations used within this
;          1632  ! module.
;          1633  !-
;          1634
;          1635  structure
;          1636
;          1637      !+
;          1638      ! RC25  register  accessing structure.  This
;          1639      ! structure  allows  RC25 register accessing
;          1640      ! to  be transportable between the PDP-11 and
;          1641      ! VAX Diagnostic Supervisors.
;          1642      !
;          1643      ! This  also  defines an access algorithm for
;          1644      ! VAX to allow field reference to MBA address
;          1645      ! space  without  generating  machine  checks.
;          1646      !-
;          1647
;          1648      RC25 [0, P, S, E] =
;          1649          begin
;          1650
;          1651          local
;          1652              RC$S_REG;
;          1653
;          1654          RC$S_REG = .(RC25 + %upval*0)<0, %bpval, 0>;
;          1655          RC$S_REG
;          1656          end
;          1657          <P, S, E>;
;          1658
```

```
;          1659  %sbttl 'GLOBAL DATA SECTION'
;          1660  !+
;          1661  ! The global data section contains data that are used
;          1662  ! in more than one test or module.
;          1663  !-
;          1664
;          1665  global
;          1666      !
;          1667      ! Communication area Declarations
;          1668      !
;          1669      COM_AREA : blockvector [REC_ALLOCATE + SND_ALLOCATE + HDR_SIZ, 2, word],
;          1670      HEAD_AREA : ref block [4, word] field (HDR_FIELD),
;          1671      RECEIVE_RING : ref blockvector [REC_ALLOCATE, 2, word] field (DSC_FIELD),
;          1672      SEND_RING : ref blockvector [SND_ALLOCATE, 2, word] field (DSC_FIELD),
;          1673      REC_ENVELOPE : blockvector [REC_ALLOCATE, RB_SIZE + 2, word] field (ENV_FIELD),
;          1674      SND_ENVELOPE : blockvector [SND_ALLOCATE, SB_SIZE + 2, word] field (ENV_FIELD),
;          1675      FCT_BUF : block [256, word],
;          1676      REC_BUF : block [RECB_SIZE, word] field (RECB_FIELD),
;          1677      SND_BUF : vector [SNDB_SIZE, word],
;          1678      OUT$STD_BUF : blockvector [REC_ALLOCATE, 2, word] field (OUT$FIELD),
;          1679      RET_EN$AD : ref block [RB_SIZE + 2, word] field (ENV_FIELD);
;          1680
;          1681  global bind
;          1682      !
;          1683      ! Diagnostic supervisor printing ascii format strings.
;          1684      !
;          1685      FMT1 = uplit (%asciz'%N%T'),                    !Print one ascii string pointer
;          1686      FMT2 = uplit (%asciz'%N%N%AINITIALIZING RC25 CONTROLLER ADDRESS:%S%O6%A(O)%N'),
;          1687      FMT3 = uplit (%asciz'%N%ALOGICAL UNIT %D2%A(D)%S%APHYSICAL UNIT %D2%A(D)%S%AFORMAT ABORTED'),
;          1688      FMT4 = uplit (%asciz'%N%AMICRO CODES MOD 16 VERSION NUMBER =%S%O2%A(O)%N'),
;          1689      FMT5 = uplit (%asciz'%N%ABRINGING ONLINE: LOGICAL UNIT %D2%A(D)%S%APHYSICAL UNIT %D2%A(D)%N'),
;          1690      FMT6 = uplit (%asciz'%N%A$FTLERR- NON-EXISTENT RC25 CONTROLLER ADDRESS %O6%A(O)%N'),
;          1691      FMT7 = uplit (%asciz'%AFORMATTING PHYSICAL UNIT %D2%A(D)%N'),
;          1692      PID_FMT = uplit (%asciz'%N%AFORMATTER PROGRESSING:  PID HI=%O6%A(O)%S%S%APID LO=%O6%A(O)'),
;          1693      CRLF = uplit (%asciz'%N'),
;          1694      XCRLF = uplit (%asciz'%N%N%N%N%N%N%N%N'),
;          1695      !
;          1696      ! Ring base address declaration
;          1697      !
;          1698      RINGBASE = COM_AREA [REC_BASE],
;          1699      !
;          1700      !
;          1701      !
;          1702      MSGADR = REC_BUF [MSG_TXT];
;          1703
;          1704  global
;          1705      !
;          1706      ! Miscellaneous data declarations
;          1707      !
;          1708      DATETXT : vector [12, byte],                    !Operator data input storage
;          1709      FLG_WRD : bitvector [16],                       !Global flag word
;          1710      NEX_FLAG : word,                                !Non-existent RC25 register flag
;          1711      OVSA : word,                                    !Overlay section starting adrs
;          1712      NXT_CRN : byte,                                 !Stores next cmd ref number
;          1713      RET_STATUS : word initial (%o'000000'),         !Saves various return status codes
;          1714      LUN : word,                                     !Stores logical unit number being formatted
;          1715      PID_SAVE : vector [2, word],                    !Saves proces indicator word
```

```
;         1716        NSD_SLOT : word,                        !Next send Descriptor slot
;         1717        NRD_SLOT : word,                        !Next receive Descriptor slot
;         1718        !
;         1719        ! Hardware P_Table storage declarations
;         1720        !
;         1721        RC25_ADDR : ref RC25 field (ISD_FIELD), !Controller register access structure
;         1722        VEC_ADDR : word,                        !Interrupt vector address storage
;         1723        BR_LEVEL : word,                        !Bus request level storage
;         1724        UNIT_NO : word,                         !Unit number to format storage
;         1725        PTBL_PTR : ref vector [4, word],        !Stores P_Table base address
;         1726    !
;         1727    ! Dup Protocol data structures
;         1728    !
;         1729    !+
;         1730    !Reserved field mask structure declaration
;         1731    !-
;         1732        RSVD_STRUCT : vector [4, word] preset (     !Reserved SA reg fields definitions
;         1733            [0] = %x'002FF',                        !Step one rsvd field
;         1734            [1] = %x'0000',                         !Step two rsvd field
;         1735            [2] = %x'0700',                         !Step three rsvd field
;         1736            [3] = %x'07FF'),                        !Step four rsvd & ucode field
;         1737
;         1738    !+
;         1739        ! Init Sequence Data_Structure declaration
;         1740        !-
;         1741
;         1742        ISD_STRUCT : blockvector [4, 2, word] field (ISD_FIELD) preset (
;         1743            !
;         1744            ! Step one read SA register field declaration
;         1745            !
;         1746            [BLK0, WRD0, ERR_BIT] = 0,                  !Error bit
;         1747            [BLK0, WRD0, STP_FIELD] = %b'0001',         !All step bit fields
;         1748            [BLK0, WRD0, S1R_NV] = 0,                   !No host inter vec settable adrs
;         1749            [BLK0, WRD0, S1R_QB] = 1,                   !Mask out
;         1750            [BLK0, WRD0, S1R_DI] = 1,                   !Enhanced diag implementation
;         1751            [BLK0, WRD0, S1R_OD] = 1,                   !Mask out
;         1752            [BLK0, WRD0, S1R_MP] = 1,                   !Mask out
;         1753            [BLK0, WRD0, S1R_RSVD]= %x'3f',             !Reserved field
;         1754            !
;         1755            ! Step one write SA register field declaration
;         1756            !
;         1757            [BLK0, WRD1, ERR_BIT] = 1,                  !Error bit
;         1758            [BLK0, WRD1, S1W_WR]= 0,                    !Diag wrap around
;         1759            [BLK0, WRD1, S1W_CRING]= SND_SIZ,           !Number of Send-ring slots 'pwrs of 2'
;         1760            [BLK0, WRD1, S1W_RRING]= REC_SIZ,           !Number of Receive-ring slots 'pwrs of 2'
;         1761            [BLK0, WRD1, S1W_IE]= 0,                    !Init Sequence interrupt request
;         1762            [BLK0, WRD1, S1W_VADR]= %o'33',             !Interrupt vector address
;         1763            !
;         1764            ! Step two read SA register field declaration
;         1765            !
;         1766            [BLK1, WRD0, ERR_BIT] = 0,                  !Error bit
;         1767            [BLK1, WRD0, STP_FIELD] = %b'0010',         !All step bit fields
;         1768            [BLK1, WRD0, S2R_PTYP]= 0,                  !Port type number
;         1769            [BLK1, WRD0, S2R_BIT7]= 1,                  !Echoed IE bit from step one write
;         1770            [BLK1, WRD0, S2R_WR]= 0,                    !Echoed bit 14 from step one write
;         1771            [BLK1, WRD0, S2R_CRING]= SND_SIZ,           !Echoed bits 3-5 from step one write
;         1772            [BLK1, WRD0, S2R_RRING]= REC_SIZ,           !Echoed bits 0-2 from step one write
```

```
;          1773          !
;          1774          ! Step two write SA register field declaration
;          1775          !
;          1776          [BLK1, WRD1, S2W_LRBASE]= RINGBASE,          !Ring base lower address
;          1777          !
;          1778          ! NOTE:
;          1779          ! The adapter purge interrupt is loaded within
;          1780          ! the bgninit code due to the inability to field
;          1781          ! select bits <1, 15, 0> from the ringbase adrs.
;          1782          ! [BLK1, WRD1, S2W_PI]= 0,                    !Adapter purge interrupt request
;          1783          !
;          1784          ! Step three read SA register field declaration
;          1785          !
;          1786          [BLK2, WRD0, ERR_BIT] = 0,                   !Error bit
;          1787          [BLK2, WRD0, STP_FIELD] = %b'0100',          !All step bit fields
;          1788          [BLK2, WRD0, S3R_RSVD]= %o'7',               !Reserved
;          1789          [BLK2, WRD0, S3R_IE]= 0,                     !Echoed IE bit from step one write
;          1790          [BLK2, WRD0, S3R_VADR]= %o'33',              !Echoed VADR from step one write
;          1791          !
;          1792          ! Step three write SA register field declaration
;          1793          !
;          1794          [BLK2, WRD1, S3W_PP]= 0,                     !Purge & Poll test request
;          1795          [BLK2, WRD1, S3W_HRBASE]= 0,                 !Ring base high address
;          1796          !
;          1797          ! Step four read SA register field declaration
;          1798          !
;          1799          [BLK3, WRD0, ERR_BIT] = 0,                   !Error bit
;          1800          [BLK3, WRD0, STP_FIELD] = %b'1000',          !All step bit fields
;          1801          [BLK3, WRD0, S4R_RSVD]= %o'7',               !Reserved
;          1802          [BLK3, WRD0, S4R_MOD] = %x'f',               !Mask it out
;          1803          [BLK3, WRD0, S4R_VER] = %x'f',               !Mask it out
;          1804          !
;          1805          ! Step four write SA register field declaration
;          1806          !
;          1807          [BLK3, WRD1, S4W_RSVD]= %o'377',             !Reserved
;          1808          [BLK3, WRD1, S4W_BURST]= 0,                  !Max number longwords per NPR xfer
;          1809          [BLK3, WRD1, S4W_LF]= 0,                     !Last fail request
;          1810          [BLK3, WRD1, S4W_GO]= 0);                    !Go bit
;          1811
```

```
;          1812  %sbttl 'GLOBAL TEXT SECTION'
;          1813  !+
;          1814  ! The global text section contains format statements,
;          1815  ! messages, and ASCII information that are used in
;          1816  ! all modules.
;          1817  !-
;          1818
;          1819  global bind
;          1820      !
;          1821      ! Self-detected fatal port/controller errors
;          1822      !
;          1823      PFE_STRUCT = uplit (
;          1824                          uplit (%asciz'%N%A$FTLERR- UNRECOGNIZABLE ERROR CODE'),
;          1825                          uplit (%asciz'%N%A$FTLERR- ENVELOPE/PACKET READ (PARITY OR TIMEOUT)'),
;          1826                          uplit (%asciz'%N%A$FTLERR- ENVELOPE/PACKET WRITE (PARITY OR TIMEOUT)'),
;          1827                          uplit (%asciz'%N%A$FTLERR- CONTROLLER ROM AND RAM PARITY'),
;          1828                          uplit (%asciz'%N%A$FTLERR- CONTROLLER RAM PARITY'),
;          1829                          uplit (%asciz'%N%A$FTLERR- CONTROLLER ROM PARITY'),
;          1830                          uplit (%asciz'%N%A$FTLERR- RING READ (PARITY OR TIMEOUT)'),
;          1831                          uplit (%asciz'%N%A$FTLERR- RING WRITE (PARITY OR TIMEOUT)'),
;          1832                          uplit (%asciz'%N%A$FTLERR- INTERRUPT MASTER'),
;          1833                          uplit (%asciz'%N%A$FTLERR- HOST ACCESS TIMEOUT'),
;          1834                          uplit (%asciz'%N%A$FTLERR- CREDIT LIMIT EXCEEDED'),
;          1835                          uplit (%asciz'%N%A$FTLERR- BUS MASTER ERROR'),
;          1836                          uplit (%asciz'%N%A$FTLERR- DIAGNOSTIC CONTROLLER FATAL ERROR'),
;          1837                          uplit (%asciz'%N%A$FTLERR- INSTRUCTION LOOP TIMEOUT'),
;          1838                          uplit (%asciz'%N%A$FTLERR- INVALID CONNECTION IDENTIFIER'),
;          1839                          uplit (%asciz'%N%A$FTLERR- INTERRUPT WRITE'),
;          1840                          uplit (%asciz'%N%A$FTLERR- MAINTENANCE READ/WRITE INVALID REGION IDENTIFIER'),
;          1841                          uplit (%asciz'%N%A$FTLERR- MAINTENANCE WRITE LOAD TO NON-LOADABLE CONTROLLER'),
;          1842                          uplit (%asciz'%N%A$FTLERR- CONTROLLER RAM ERROR (NON-PARITY)'),
;          1843                          uplit (%asciz'%N%A$FTLERR- INIT SEQUENCE ERROR'),
;          1844                          uplit (%asciz'%N%A$FTLERR- HIGH LEVEL PROTOCOL INCOMPATIBILITY ERROR'),
;          1845                          uplit (%asciz'%N%A$FTLERR- PURGE/POLL HARDWARE FAILURE '),
;          1846                          uplit (%asciz'%N%A$FTLERR- MAPPING REGISTER READ ERROR (PARITY OR TIMEOUT)')
;          1847                                                  ) : vector [23],
;          1848  !<BLF/PAGE>
```

```
;          1849      !
;          1850      ! Error message structure
;          1851      !
;          1852      EMSG_STRUCT = uplit (
;          1853  uplit (%asciz'%N%A$FTLERR- RESPONSE STATUS ERROR:%S'),
;          1854  uplit (%asciz'%N%A$FTLERR- HOST/CONTROLLER OUT OF SEQ'),
;          1855  uplit (%asciz'%N%A$FTLERR- REMOTE PROG NOT RUNNING'),
;          1856  uplit (%asciz'%N%A$FTLERR- UNKNOWN RETURN STATUS CODE'),
;          1857  uplit (%asciz'%N%A$FTLERR- COM AREA INIT ERROR'),
;          1858  uplit (%asciz'%N%A$FTLERR- PORT/HOST SYNC ERROR'),
;          1859  uplit (%asciz'%N%A$FTLERR- MESSAGE LENGTH ERROR'),
;          1860  uplit (%asciz'%N%A$FTLERR- UNKNOWN ENDCODE RECEIVED'),
;          1861  uplit (%asciz'%N%A$FTLERR- ADAPTOR PURGE ERROR'),
;          1862  uplit (%asciz'%N%A$FTLERR- UNKNOWN INTERRUPT'),
;          1863  uplit (%asciz'%N%A$FTLERR- INIT SEQ STEP TIMED OUT'),
;          1864  uplit (%asciz'%N%A$FTLERR- INIT SEQ COMPARE ERROR'),
;          1865  uplit (%asciz'%N%A$FTLERR- UNEXPECTED ATTENTION END MESSAGE RECEIVED'),
;          1866  uplit (%asciz'%N%A$FTLERR- UNEXPECTED COMMAND OPCODE IN END MESSAGE RECEIVED'),
;          1867  uplit (%asciz'%N%A$FTLERR- UNEXPECTED SERIOUS EXCEPTION END MESSAGE RECEIVED'),
;          1868  uplit (%asciz'%N%A$FTLERR- INVALID COMMAND END MESSAGE RECEIVED'),
;          1869  uplit (%asciz'%N%A$FTLERR- UNKNOWN MESSAGE TYPE RECEIVED'),
;          1870  uplit (%asciz'%N%A$FTLERR- OUTSTANDING COMMAND BUFFER FULL'),
;          1871  uplit (%asciz'%N%A$FTLERR- OUT STANDING COMMAND BUFFER OUT OF SYNC ERROR'),
;          1872  uplit (%asciz'%N%A$FTLERR- UNKNOWN MESSAGE NUMBER RECEIVED'),
;          1873  uplit (%asciz'%N%A$FTLERR- FILE READ ERROR'),
;          1874  uplit (%asciz'%N%A$FTLERR- PORT/CONTROLLER TIMEOUT ERROR'),
;          1875  uplit (%asciz'%N%A$FTLERR- ILLEGAL FCT FILE LENGTH')) : vector [23],
;          1876  !<blf/page>
```

```
;          1877      !
;          1878      ! Self-detected fatal port/controller errors
;          1879      !
;          1880      RC_STRUCTURE = uplit (
;          1881  uplit (%asciz'%N%A$FTLERR- VAX READ/WRITE ERROR ON INTERRUPT'),
;          1882  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT U.BFIL'),
;          1883  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT U.BMTY'),
;          1884  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT U.ALOC'),
;          1885  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT SERVO ENTRY (PIP SET)'),
;          1886  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT SERVO ENTRY (ERR SET)'),
;          1887  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT U.SEND'),
;          1888  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT U.RECV'),
;          1889  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT U.ATTN'),
;          1890  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT U.ONLN'),
;          1891  uplit (%asciz'%N%A$FTLERR- ILLEGAL D REQUEST (U.QDRQ)'),
;          1892  uplit (%asciz'%N%A$FTLERR- FENCE-POST ERROR AT PROTAB'),
;          1893  uplit (%asciz'%N%A$FTLERR- BAD PACKET DEQUEUED AT U.DONE'),
;          1894  uplit (%asciz'%N%A$FTLERR- UNEXPLAINED D-PROC SUSPENSION (U..TDS)'),
;          1895  uplit (%asciz'%N%A$FTLERR- DUP PACKET D-Q FAILED (XFC 34/35)'),
;          1896  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT U.HTST'),
;          1897  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT U.SEKO'),
;          1898  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT U.CKSV'),
;          1899  uplit (%asciz'%N%A$FTLERR- D.OPCD FOUND ILLEGAL OPCODE'),
;          1900  uplit (%asciz'%N%A$FTLERR- D.CSF FOUND ILLEGAL OPCODE'),
;          1901  uplit (%asciz'%N%A$FTLERR- UNKNOWN BAD DRIVE STATUS AT D.DSTS'),
;          1902  uplit (%asciz'%N%A$FTLERR- ILLEGAL XFC EXECUTED BY DM'),
;          1903  uplit (%asciz'%N%A$FTLERR- D PICKED UP A ZERO SCB.DB'),
;          1904  uplit (%asciz'%N%A$FTLERR- INCONSISTENCY AT D IDLE LOOP'),
;          1905  uplit (%asciz'%N%A$FTLERR- DM WORD COUNT ERROR ON HOST DMA/SEND/RECV'),
;          1906  uplit (%asciz'%N%A$FTLERR- UNKNOWN DISPLAY FAULT CODE AT D.DFLT'),
;          1907  uplit (%asciz'%N%A$FTLERR- DRIVE NOT FAULTING IN P.OFLN STATE'),
;          1908  uplit (%asciz'%N%A$FTLERR- U POWER UP DIAGNOSTICS FAILED'),
;          1909  uplit (%asciz'%N%A$FTLERR- D POWER UP DIAGNOSTICS FAILED'),
;          1910  uplit (%asciz'%N%A$FTLERR- ADAPTER CARD FAILURE'),
;          1911  uplit (%asciz'%N%A$FTLERR- EC.TMR TIMED OUT'),
;          1912  uplit (%asciz'%N%A$FTLERR- U.SEND/U.RECV RING READ INCONSISTENCY'),
;          1913  uplit (%asciz'%N%A$FTLERR- UNKNOWN WAITRV REASON AT D.RVCT'),
;          1914  uplit (%asciz'%N%A$FTLERR- D.ARCS DID NOT FIND CLOSEST UNDONE ZONE'),
;          1915  uplit (%asciz'%N%A$FTLERR- U.SEEK FOUND SEEK TO ILLEGAL TRACK'),
;          1916  uplit (%asciz'%N%A$FTLERR- U.HTST INIT DIAG DMA WRITE FAILED'),
;          1917  uplit (%asciz'%N%A$FTLERR- U.HTST INIT DIAG DMA COMPARE FAILED'),
;          1918  uplit (%asciz'%N%A$FTLERR- U.SYDR FOUND SS.DER SET AND SS.SPN NOT SET'),
;          1919  uplit (%asciz'%N%A$FTLERR- MASTER DRIVES ACLO ASSERTED')
;          1920                          ) : vector [39],
;          1921  !<blf/page>
```

```
;          1922      !
;          1923      ! Dup return status codes
;          1924      !
;          1925      SDUP_STRUCT = uplit (
;          1926  uplit (%asciz'%A SUCCESSFUL%N'),
;          1927  uplit (%asciz'%AINVALID COMMAND%N'),
;          1928  uplit (%asciz'%ANO REGION AVAILABLE%N'),
;          1929  uplit (%asciz'%ANO REGION SUITABLE%N'),
;          1930  uplit (%asciz'%APROGRAM NOT KNOWN%N'),
;          1931  uplit (%asciz'%ALOAD FAILURE%N'),
;          1932  uplit (%asciz'%ASTANDALONE%N')
;          1933          ) : vector [7],
;          1934  !<blf/page>
```

```
;          1935      !
;          1936      ! MSCP return status codes
;          1937      !
;          1938      SMSCP_STRUCT = uplit (
;          1939  uplit (%asciz'%ASUCCESS%N'),
;          1940  uplit (%asciz'%AINVALID COMMAND%N'),
;          1941  uplit (%asciz'%ACOMMAND ABORTED%N'),
;          1942  uplit (%asciz'%AUNIT-OFFLINE%N'),
;          1943  uplit (%asciz'%AUNIT-AVAILABLE%N'),
;          1944  uplit (%asciz'%AMEDIA FORMAT ERROR%N'),
;          1945  uplit (%asciz'%AWRITE PROTECTED%N'),
;          1946  uplit (%asciz'%ACOMPARE ERROR%N'),
;          1947  uplit (%asciz'%ADATA ERROR%N'),
;          1948  uplit (%asciz'%AHOST BUFFER ACCESS ERROR%N'),
;          1949  uplit (%asciz'%ACONTROLLER ERROR%N'),
;          1950  uplit (%asciz'%ADRIVE ERROR%N'),
;          1951  uplit (%asciz'%AMESSAGE FROM AN INTERNAL DIAGNOSTIC%N')
;          1952            ) : vector [13],
;          1953  !<BLF/PAGE>
```

```
;          1954      !
;          1955      ! Init code error and informational messages
;          1956      !
;          1957      DATMSG = uplit (%asciz'ENTER DATE <MM-DD-YYYY> '),
;          1958      NO_ADD_UNITS = uplit (%asciz'%N%ANO ADDITIONAL UNITS TO FORMAT - ABORTING'),
;          1959      PWR_MSG = uplit (%asciz'%N%A$FTLERR- INIT CODE RE-ENTERED DUE TO PWR FAIL'),
;          1960      ABO_MSG = uplit (%asciz'%N%A$FTLERR- ABORTING HOST AND REMOTE PROGRAMS'),
;          1961      TO_MANY_UNITS = uplit (%asciz'%N%A$FTLERR- ILLEGAL NUMBER OF UNITS SELECTED'),
;          1962      GOOD_NUM_UNITS = uplit (%asciz'%N%A$FTLERR- LIMIT OF SIXTEEN UNITS PER FORMATING SESSION'),
;          1963      BOOT_FAILURE = uplit (%asciz'%N%A$FTLERR- RC25 CONTROLLER INITIALIZATION ERROR'),
;          1964      PROTO_VIOLATION = uplit (%asciz'%N%A$FTLERR- PROTOCOL VIOLATION ERROR'),
;          1965      PORT_INIT_ERR = uplit (%asciz'%N%A$FTLERR- COMMUNICATION AREA INIT ERROR'),
;          1966      ACTIVE_DUP_SERVER = uplit (%asciz'%N%A$FTLERR- DUP SERVER ACTIVE AFTER INITIALIZING'),
;          1967      INACTIVE_DUP_SERVER = uplit (%asciz'%N%A$FTLERR- DUP SERVER INACTIVE AFTER EX_SUP_PROG COMMAND'),
;          1968      !
;          1969      ! Local load media DM module file name.ext
;          1970      !
;          1971      !DM_FN$EXT = UPLIT (%ASCIZ'AZFMTR.SAV'),
;          1972      FCT_REQ_MSG = uplit (%asciz'ENTER FCT FILE NAME TO RESTORE (FILENAME.EXT): '),
;          1973      !
;          1974      ! Hardware parameter coding questions
;          1975      !
;          1976      HW_Q1_IP = uplit (%asciz'RC25  IP   REGISTER   ADDRESS'),
;          1977      HW_Q2_VECTOR = uplit (%asciz'RC25 INTERRUPT VECTOR ADDRESS'),
;          1978      HW_Q3_BR = uplit (%asciz'RC25    BUS   REQUEST   LEVEL'),
;          1979      HW_Q4_UNIT = uplit (%asciz'UNIT  NUMBER TO BRING  ONLINE'),
;          1980      !
;          1981      ! Software parameter coding questions
;          1982      !
;          1983      SW_Q1_UNATT = uplit (%asciz'FORMAT IN UNATTENDED REFORMAT MODE'),
;          1984      SW_Q2_NOTICE = uplit (%asciz'%N%A********************** NOTICE **********************'),
;          1985      SW_Q3_OPER = uplit (%asciz'%N%A     OPERATOR MUST BE PRESENT IN ATTENDED MODE '),
;          1986      SW_Q4_UNATT = uplit (%asciz'%N%A       RUNNING IN UN-ATTENDED REFORMAT MODE');
;          1987
;          1988  end
;          1989
;          1990  eludom


                                        .TITLE  CZRCH2 CZRCH RC25 DISK FORMATTER
                                        .IDENT  /REV A /


000000                                  .PSECT  AA$CODE,  RO
000000     103     132     122  L$NAME::.ASCII  /CZR/
000003     103     110     040         .ASCII  /CH /
000006     000                         .BYTE   0
000007     000                         .BYTE   0
000010                          L$REV::
000010     101                         .ASCII  /A/
000011     060                         .ASCII  /0/
000012  000000G                 L$UNIT::.WORD   T$PTHV
000014  002260                  L$TIML::.WORD   2260
000016  000000G                 L$HPCP::.WORD   L$HARD
000020  000000G                 L$SPCP::.WORD   L$SOFT
000022  000140'                 L$HPTP::.WORD   L$HW
000024  000154'                 L$SPTP::.WORD   L$SW
```

```
000026  000000G                         L$LADP::.WORD   L$LAST
000030  000000                          L$STA:: .WORD   0
000032  000000                          L$CO::  .WORD   0
000034  000000                          L$DTYP::.WORD   0
000036  000000                          L$APT:: .WORD   0
000040  000124'                         L$DTP:: .WORD   L$DISPATCH
000042  000000                          L$PRIO::.WORD   0
000044  000000                          L$ENVI::.WORD   0
000046  000000                          L$EXP1::.WORD   0
000050                                  L$MREV::
000050      003                                 .BYTE   3
000051      003                                 .BYTE   3
000052  000000                          L$EF::  .WORD   0
000054  000000                                  .WORD   0
000056  000000                          L$SPC:: .WORD   0
000060  000000G                         L$DEVP::.WORD   L$DVTYP
000062  000000G                         L$REPP::.WORD   L$RPT
000064  000000                          L$EXP4::.WORD   0
000066  000000                          L$EXP5::.WORD   0
000070  000000G                         L$AUT:: .WORD   L$AU
000072  000000G                         L$DUT:: .WORD   L$DU
000074  000000                          L$LUN:: .WORD   0
000076  000000G                         L$DESP::.WORD   L$DESC
000100  104035                          L$LOAD::.WORD   -73743
000102  000126'                         L$ETP:: .WORD   L$ERRTBL
000104  000000G                         L$ICP:: .WORD   L$INIT
000106  000000G                         L$CCP:: .WORD   L$CLEAN
000110  000000G                         L$ACP:: .WORD   L$AUTO
000112  000160'                         L$PRT:: .WORD   L$PROT
000114  000000                          L$TEST::.WORD   0
000116  000000                          L$DLY:: .WORD   0
000120  000000                          L$HIME::.WORD   0
000122  000001                          D$PCNT::.WORD   1
000124  000000G                         L$DISPATCH::
                                                .WORD   T1
000126                                  ERRTYP::.BLKW   1
000130                                  ERRNBR::.BLKW   1
000132                                  ERRMSG::.BLKW   1
000134                                  ERRBLK::.BLKW   1
000136  000000C                         L$HWLEN::
                                                .WORD   <<L$NDHW-L$HWLEN>/2>
000140  172150                          HW.IP.ADRS::
                                                .WORD   -5630
000142  000154                          HW.VECTOR::
                                                .WORD   154
000144  000005                          HW.BR.LEVEL::
                                                .WORD   5
000146  000000                          HW.UNIT.NO::
                                                .WORD   0
000150                                  L$NDHW::.BLKW   1
000152  000000C                         L$SWLEN::
                                                .WORD   <<L$NDSW-L$SWLEN>/2>
000154  000001                          SW.UNATT::
                                                .WORD   1
000156                                  L$NDSW::.BLKW   1
000160  177777                          L$PROT::.WORD   -1
000162  177777                                  .WORD   -1
```

```
000164  177777                                  .WORD   -1


000000                                          .PSECT  $PLIT$,  RO ,  D  ,  GBL
000000      045     116     045         P.AAA:  .ASCII  /%N%/
000003      124     000     000                 .ASCII  /T/<00><00>
000006      045     116     045         P.AAB:  .ASCII  /%N%/
000011      116     045     101                 .ASCII  /N%A/
000014      111     116     111                 .ASCII  /INI/
000017      124     111     101                 .ASCII  /TIA/
000022      114     111     132                 .ASCII  /LIZ/
000025      111     116     107                 .ASCII  /ING/
000030      040     122     103                 .ASCII  / RC/
000033      062     065     040                 .ASCII  /25 /
000036      103     117     116                 .ASCII  /CON/
000041      124     122     117                 .ASCII  /TRO/
000044      114     114     105                 .ASCII  /LLE/
000047      122     040     101                 .ASCII  /R A/
000052      104     104     122                 .ASCII  /DDR/
000055      105     123     123                 .ASCII  /ESS/
000060      072     045     123                 .ASCII  /:%S/
000063      045     117     066                 .ASCII  /%06/
000066      045     101     050                 .ASCII  /%A(/
000071      117     051     045                 .ASCII  /O)%/
000074      116     000                         .ASCII  /N/<00>
000076      045     116     045         P.AAC:  .ASCII  /%N%/
000101      101     114     117                 .ASCII  /ALO/
000104      107     111     103                 .ASCII  /GIC/
000107      101     114     040                 .ASCII  /AL /
000112      125     116     111                 .ASCII  /UNI/
000115      124     040     045                 .ASCII  /T %/
000120      104     062     045                 .ASCII  /D2%/
000123      101     050     104                 .ASCII  /A(D/
000126      051     045     123                 .ASCII  /)%S/
000131      045     101     120                 .ASCII  /%AP/
000134      110     131     123                 .ASCII  /HYS/
000137      111     103     101                 .ASCII  /ICA/
000142      114     040     125                 .ASCII  /L U/
000145      116     111     124                 .ASCII  /NIT/
000150      040     045     104                 .ASCII  / %D/
000153      062     045     101                 .ASCII  /2%A/
000156      050     104     051                 .ASCII  /(D)/
000161      045     123     045                 .ASCII  /%S%/
000164      101     106     117                 .ASCII  /AFO/
000167      122     115     101                 .ASCII  /RMA/
000172      124     040     101                 .ASCII  /T A/
000175      102     117     122                 .ASCII  /BOR/
000200      124     105     104                 .ASCII  /TED/
000203      000                                 .ASCII  <00>
000204      045     116     045         P.AAD:  .ASCII  /%N%/
000207      101     115     111                 .ASCII  /AMI/
000212      103     122     117                 .ASCII  /CRO/
000215      040     103     117                 .ASCII  / CO/
000220      104     105     123                 .ASCII  /DES/
000223      040     115     117                 .ASCII  / MO/
000226      104     040     061                 .ASCII  /D 1/
```

```
000231  066  040  126            .ASCII  /6 V/
000234  105  122  123            .ASCII  /ERS/
000237  111  117  116            .ASCII  /ION/
000242  040  116  125            .ASCII  / NU/
000245  115  102  105            .ASCII  /MBE/
000250  122  040  075            .ASCII  /R =/
000253  045  123  045            .ASCII  /%S%/
000256  117  062  045            .ASCII  /O2%/
000261  101  050  117            .ASCII  /A(O/
000264  051  045  116            .ASCII  /)%N/
000267  000                     .ASCII  <00>
000270  045  116  045  P.AAE:    .ASCII  /%N%/
000273  101  102  122            .ASCII  /ABR/
000276  111  116  107            .ASCII  /ING/
000301  111  116  107            .ASCII  /ING/
000304  040  117  116            .ASCII  / ON/
000307  114  111  116            .ASCII  /LIN/
000312  105  072  040            .ASCII  /E: /
000315  114  117  107            .ASCII  /LOG/
000320  111  103  101            .ASCII  /ICA/
000323  114  040  125            .ASCII  /L U/
000326  116  111  124            .ASCII  /NIT/
000331  040  045  104            .ASCII  / %D/
000334  062  045  101            .ASCII  /2%A/
000337  050  104  051            .ASCII  /(D)/
000342  045  123  045            .ASCII  /%S%/
000345  101  120  110            .ASCII  /APH/
000350  151  123  111            .ASCII  /YSI/
000353  103  101  114            .ASCII  /CAL/
000356  040  125  116            .ASCII  / UN/
000361  111  124  040            .ASCII  /IT /
000364  045  104  062            .ASCII  /%D2/
000367  045  101  050            .ASCII  /%A(/
000372  104  051  045            .ASCII  /D)%/
000375  116  000  000            .ASCII  /N/<00><00>
000400  045  116  045  P.AAF:    .ASCII  /%N%/
000403  101  044  106            .ASCII  /A$F/
000406  124  114  105            .ASCII  /TLE/
000411  122  122  055            .ASCII  /RR-/
000414  040  116  117            .ASCII  / NO/
000417  116  055  105            .ASCII  /N-E/
000422  130  111  123            .ASCII  /XIS/
000425  124  105  116            .ASCII  /TEN/
000430  124  040  122            .ASCII  /T R/
000433  103  062  065            .ASCII  /C25/
000436  040  103  117            .ASCII  / CO/
000441  116  124  122            .ASCII  /NTR/
000444  117  114  114            .ASCII  /OLL/
000447  105  122  040            .ASCII  /ER /
000452  101  104  104            .ASCII  /ADD/
000455  122  105  123            .ASCII  /RES/
000460  123  040  045            .ASCII  /S %/
000463  117  066  045            .ASCII  /O6%/
000466  101  050  117            .ASCII  /A(O/
000471  051  045  116            .ASCII  /)%N/
000474  000  000                  .ASCII  <00><00>
000476  045  101  106  P.AAG:    .ASCII  /%AF/
```

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000501  117  122  115                .ASCII  /ORM/
000504  101  124  124                .ASCII  /ATT/
000507  111  116  107                .ASCII  /ING/
000512  040  120  110                .ASCII  / PH/
000515  131  123  111                .ASCII  /YSI/
000520  103  101  114                .ASCII  /CAL/
000523  040  125  116                .ASCII  / UN/
000526  111  124  040                .ASCII  /IT /
000531  045  104  062                .ASCII  /%D2/
000534  045  101  050                .ASCII  /%A(/
000537  104  051  045                .ASCII  /D)%/
000542  116  000                     .ASCII  /N/<00>
000544  045  116  045       P.AAH:    .ASCII  /%N%/
000547  101  106  117                .ASCII  /AFO/
000552  122  115  101                .ASCII  /RMA/
000555  124  124  105                .ASCII  /TTE/
000560  122  040  120                .ASCII  /R P/
000563  122  117  107                .ASCII  /ROG/
000566  122  105  123                .ASCII  /RES/
000571  123  111  116                .ASCII  /SIN/
000574  107  072  040                .ASCII  /G: /
000577  040  120  111                .ASCII  / PI/
000602  104  040  110                .ASCII  /D H/
000605  111  075  045                .ASCII  /I=%/
000610  117  066  045                .ASCII  /O6%/
000613  101  050  117                .ASCII  /A(O/
000616  051  045  123                .ASCII  /)%S/
000621  045  123  045                .ASCII  /%S%/
000624  101  120  111                .ASCII  /API/
000627  104  040  114                .ASCII  /D L/
000632  117  075  045                .ASCII  /O=%/
000635  117  066  045                .ASCII  /O6%/
000640  101  050  117                .ASCII  /A(O/
000643  051  000  000                .ASCII  /)/<00><00>
000646  045  116  000       P.AAI:    .ASCII  /%N/<00>
000651  000                          .ASCII  <00>
000652  045  116  045       P.AAJ:    .ASCII  /%N%/
000655  116  045  116                .ASCII  /N%N/
000660  045  116  045                .ASCII  /%N%/
000663  116  045  116                .ASCII  /N%N/
000666  045  116  045                .ASCII  /%N%/
000671  116  000  000                .ASCII  /N/<00><00>
000674  045  116  045       P.AAL:    .ASCII  /%N%/
000677  101  044  106                .ASCII  /A$F/
000702  124  114  105                .ASCII  /TLE/
000705  122  122  055                .ASCII  /RR-/
000710  040  125  116                .ASCII  / UN/
000713  122  105  103                .ASCII  /REC/
000716  117  107  116                .ASCII  /OGN/
000721  111  132  101                .ASCII  /IZA/
000724  102  114  105                .ASCII  /BLE/
000727  040  105  122                .ASCII  / ER/
000732  122  117  122                .ASCII  /ROR/
000735  040  103  117                .ASCII  / CO/
000740  104  105  000                .ASCII  /DE/<00>
000743  000                          .ASCII  <00>
000744  045  116  045       P.AAM:    .ASCII  /%N%/
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```
000747  101  044  106                .ASCII  /A$F/
000752  124  114  105                .ASCII  /TLE/
000755  122  122  055                .ASCII  /RR-/
000760  040  105  116                .ASCII  / EN/
000763  126  105  114                .ASCII  /VEL/
000766  117  120  105                .ASCII  /OPE/
000771  057  120  101                .ASCII  <57>/PA/
000774  103  113  105                .ASCII  /CKE/
000777  124  040  122                .ASCII  /T R/
001002  105  101  104                .ASCII  /EAD/
001005  040  050  120                .ASCII  / (P/
001010  101  122  111                .ASCII  /ARI/
001013  124  131  040                .ASCII  /TY /
001016  117  122  040                .ASCII  /OR /
001021  124  111  115                .ASCII  /TIM/
001024  105  117  125                .ASCII  /EOU/
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010161      123     124     105                 .ASCII  /STE/
010164      122     040     104                 .ASCII  /R D/
010167      122     111     126                 .ASCII  /RIV/
010172      105     123     040                 .ASCII  /ES /
010175      101     103     114                 .ASCII  /ACL/
010200      117     040     101                 .ASCII  /O A/
010203      123     123     105                 .ASCII  /SSE/
010206      122     124     105                 .ASCII  /RTE/
010211      104     000     000                 .ASCII  /D/<00><00>
010214   004736'                        P.ACG:  .WORD   P.ACH
010216   005016'                                .WORD   P.ACI
010220   005064'                                .WORD   P.ACJ
010222   005132'                                .WORD   P.ACK
010224   005200'                                .WORD   P.ACL
010226   005264'                                .WORD   P.ACM
010230   005350'                                .WORD   P.ACN
010232   005416'                                .WORD   P.ACO
010234   005464'                                .WORD   P.ACP
010236   005532'                                .WORD   P.ACQ
010240   005600'                                .WORD   P.ACR
010242   005650'                                .WORD   P.ACS
010244   005720'                                .WORD   P.ACT
010246   005774'                                .WORD   P.ACU
010250   006060'                                .WORD   P.ACV
010252   006140'                                .WORD   P.ACW
010254   006206'                                .WORD   P.ACX
010256   006254'                                .WORD   P.ACY
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010260  006322'                                 .WORD   P.ACZ
010262  006374'                                 .WORD   P.ADA
010264  006444'                                 .WORD   P.ADB
010266  006524'                                 .WORD   P.ADC
010270  006574'                                 .WORD   P.ADD
010272  006644'                                 .WORD   P.ADE
010274  006716'                                 .WORD   P.ADF
010276  007006'                                 .WORD   P.ADG
010300  007070'                                 .WORD   P.ADH
010302  007150'                                 .WORD   P.ADI
010304  007224'                                 .WORD   P.ADJ
010306  007300'                                 .WORD   P.ADK
010310  007342'                                 .WORD   P.ADL
010312  007400'                                 .WORD   P.ADM
010314  007464'                                 .WORD   P.ADN
010316  007542'                                 .WORD   P.ADO
010320  007630'                                 .WORD   P.ADP
010322  007710'                                 .WORD   P.ADQ
010324  007770'                                 .WORD   P.ADR
010326  010052'                                 .WORD   P.ADS
010330  010142'                                 .WORD   P.ADT
010332      045     101     040         P.ADV:  .ASCII  /%A /
010335      123     125     103                 .ASCII  /SUC/
010340      103     105     123                 .ASCII  /CES/
010343      123     106     125                 .ASCII  /SFU/
010346      114     045     116                 .ASCII  /L%N/
010351      000                                 .ASCII  <00>
010352      045     101     111         P.ADW:  .ASCII  /%AI/
010355      116     126     101                 .ASCII  /NVA/
010360      114     111     104                 .ASCII  /LID/
010363      040     103     117                 .ASCII  / CO/
010366      115     115     101                 .ASCII  /MMA/
010371      116     104     045                 .ASCII  /ND%/
010374      116     000                         .ASCII  /N/<00>
010376      045     101     116         P.ADX:  .ASCII  /%AN/
010401      117     040     122                 .ASCII  /O R/
010404      105     107     111                 .ASCII  /EGI/
010407      117     116     040                 .ASCII  /ON /
010412      101     126     101                 .ASCII  /AVA/
010415      111     114     101                 .ASCII  /ILA/
010420      102     114     105                 .ASCII  /BLE/
010423      045     116     000                 .ASCII  /%N/<00>
010426      045     101     116         P.ADY:  .ASCII  /%AN/
010431      117     040     122                 .ASCII  /O R/
010434      105     107     111                 .ASCII  /EGI/
010437      117     116     040                 .ASCII  /ON /
010442      123     125     111                 .ASCII  /SUI/
010445      124     101     102                 .ASCII  /TAB/
010450      114     105     045                 .ASCII  /LE%/
010453      116     000     000                 .ASCII  /N/<00><00>
010456      045     101     120         P.ADZ:  .ASCII  /%AP/
010461      122     117     107                 .ASCII  /ROG/
010464      122     101     115                 .ASCII  /RAM/
010467      040     116     117                 .ASCII  / NO/
010472      124     040     113                 .ASCII  /T K/
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010500      116     045     116                 .ASCII  /N%N/
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010515      111     114     125                     .ASCII  /ILU/
010520      122     105     045                     .ASCII  /RE%/
010523      116     000     000                     .ASCII  /N/<00><00>
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010531      124     101     116                     .ASCII  /TAN/
010534      104     101     114                     .ASCII  /DAL/
010537      117     116     105                     .ASCII  /ONE/
010542      045     116     000                     .ASCII  /%N/<00>
010545      000                                     .ASCII  <00>
010546  010332'                         P.ADU:      .WORD   P.ADV
010550  010352'                                     .WORD   P.ADW
010552  010376'                                     .WORD   P.ADX
010554  010426'                                     .WORD   P.ADY
010556  010456'                                     .WORD   P.ADZ
010560  010504'                                     .WORD   P.AEA
010562  010526'                                     .WORD   P.AEB
010564      045     101     123         P.AED:      .ASCII  /%AS/
010567      125     103     103                     .ASCII  /UCC/
010572      105     123     123                     .ASCII  /ESS/
010575      045     116     000                     .ASCII  /%N/<00>
010600      045     101     111         P.AEE:      .ASCII  /%AI/
010603      116     126     101                     .ASCII  /NVA/
010606      114     111     104                     .ASCII  /LID/
010611      040     103     117                     .ASCII  / CO/
010614      115     115     101                     .ASCII  /MMA/
010617      116     104     045                     .ASCII  /ND%/
010622      116     000                             .ASCII  /N/<00>
010624      045     101     103         P.AEF:      .ASCII  /%AC/
010627      117     115     115                     .ASCII  /OMM/
010632      101     116     104                     .ASCII  /AND/
010635      040     101     102                     .ASCII  / AB/
010640      117     122     124                     .ASCII  /ORT/
010643      105     104     045                     .ASCII  /ED%/
010646      116     000                             .ASCII  /N/<00>
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010653      116     111     124                     .ASCII  /NIT/
010656      055     117     106                     .ASCII  /-OF/
010661      106     114     111                     .ASCII  /FLI/
010664      116     105     045                     .ASCII  /NE%/
010667      116     000     000                     .ASCII  /N/<00><00>
010672      045     101     125         P.AEH:      .ASCII  /%AU/
010675      116     111     124                     .ASCII  /NIT/
010700      055     101     126                     .ASCII  /-AV/
010703      101     111     114                     .ASCII  /AIL/
010706      101     102     114                     .ASCII  /ABL/
010711      105     045     116                     .ASCII  /E%N/
010714      000     000                             .ASCII  <00><00>
010716      045     101     115         P.AEI:      .ASCII  /%AM/
010721      105     104     111                     .ASCII  /EDI/
010724      101     040     106                     .ASCII  /A F/
010727      117     122     115                     .ASCII  /ORM/
010732      101     124     040                     .ASCII  /AT /
010735      105     122     122                     .ASCII  /ERR/
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010743  116  000  000                .ASCII  /N/<00><00>
010746  045  101  127        P.AEJ:  .ASCII  /%AW/
010751  122  111  124                .ASCII  /RIT/
010754  105  040  120                .ASCII  /E P/
010757  122  117  124                .ASCII  /ROT/
010762  105  103  124                .ASCII  /ECT/
010765  105  104  045                .ASCII  /ED%/
010770  116  000                    .ASCII  /N/<00>
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010775  117  115  120                .ASCII  /OMP/
011000  101  122  105                .ASCII  /ARE/
011003  040  105  122                .ASCII  / ER/
011006  122  117  122                .ASCII  /ROR/
011011  045  116  000                .ASCII  /%N/<00>
011014  045  101  104        P.AEL:  .ASCII  /%AD/
011017  101  124  101                .ASCII  /ATA/
011022  040  105  122                .ASCII  / ER/
011025  122  117  122                .ASCII  /ROR/
011030  045  116  000                .ASCII  /%N/<00>
011033  000                         .ASCII  <00>
011034  045  101  110        P.AEM:  .ASCII  /%AH/
011037  117  123  124                .ASCII  /OST/
011042  040  102  125                .ASCII  / BU/
011045  106  106  105                .ASCII  /FFE/
011050  122  040  101                .ASCII  /R A/
011053  103  103  105                .ASCII  /CCE/
011056  123  123  040                .ASCII  /SS /
011061  105  122  122                .ASCII  /ERR/
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011075  117  116  124                .ASCII  /ONT/
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011103  114  105  122                .ASCII  /LER/
011106  040  105  122                .ASCII  / ER/
011111  122  117  122                .ASCII  /ROR/
011114  045  116  000                .ASCII  /%N/<00>
011117  000                         .ASCII  <00>
011120  045  101  104        P.AEO:  .ASCII  /%AD/
011123  122  111  126                .ASCII  /RIV/
011126  105  040  105                .ASCII  /E E/
011131  122  122  117                .ASCII  /RRO/
011134  122  045  116                .ASCII  /R%N/
011137  000                         .ASCII  <00>
011140  045  101  115        P.AEP:  .ASCII  /%AM/
011143  105  123  123                .ASCII  /ESS/
011146  101  107  105                .ASCII  /AGE/
011151  040  106  122                .ASCII  / FR/
011154  117  115  040                .ASCII  /OM /
011157  101  116  040                .ASCII  /AN /
011162  111  116  124                .ASCII  /INT/
011165  105  122  116                .ASCII  /ERN/
011170  101  114  040                .ASCII  /AL /
011173  104  111  101                .ASCII  /DIA/
011176  107  116  117                .ASCII  /GNO/
011201  123  124  111                .ASCII  /STI/
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011212  010600'                                 .WORD   P.AEE
011214  010624'                                 .WORD   P.AEF
011216  010650'                                 .WORD   P.AEG
011220  010672'                                 .WORD   P.AEH
011222  010716'                                 .WORD   P.AEI
011224  010746'                                 .WORD   P.AEJ
011226  010772'                                 .WORD   P.AEK
011230  011014'                                 .WORD   P.AEL
011232  011034'                                 .WORD   P.AEM
011234  011072'                                 .WORD   P.AEN
011236  011120'                                 .WORD   P.AEO
011240  011140'                                 .WORD   P.AEP
011242      105     116     124         P.AEQ:  .ASCII  /ENT/
011245      105     122     040                 .ASCII  /ER /
011250      104     101     124                 .ASCII  /DAT/
011253      105     040     074                 .ASCII  /E </
011256      115     115     055                 .ASCII  /MM-/
011261      104     104     055                 .ASCII  /DD-/
011264      131     131     131                 .ASCII  /YYY/
011267      131     076     040                 .ASCII  /Y> /
011272      000     000                         .ASCII  <00><00>
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011302      040     101     104                 .ASCII  / AD/
011305      104     111     124                 .ASCII  /DIT/
011310      111     117     116                 .ASCII  /ION/
011313      101     114     040                 .ASCII  /AL /
011316      125     116     111                 .ASCII  /UNI/
011321      124     123     040                 .ASCII  /TS /
011324      124     117     040                 .ASCII  /TO /
011327      106     117     122                 .ASCII  /FOR/
011332      115     101     124                 .ASCII  /MAT/
011335      040     055     040                 .ASCII  / - /
011340      101     102     117                 .ASCII  /ABO/
011343      122     124     111                 .ASCII  /RTI/
011346      116     107     000                 .ASCII  /NG/<00>
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011360      124     114     105                 .ASCII  /TLE/
011363      122     122     055                 .ASCII  /RR-/
011366      040     111     116                 .ASCII  / IN/
011371      111     124     040                 .ASCII  /IT /
011374      103     117     104                 .ASCII  /COD/
011377      105     040     122                 .ASCII  /E R/
011402      105     055     105                 .ASCII  /E-E/
011405      116     124     105                 .ASCII  /NTE/
011410      122     105     104                 .ASCII  /RED/
011413      040     104     125                 .ASCII  / DU/
011416      105     040     124                 .ASCII  /E T/
011421      117     040     120                 .ASCII  /O P/
011424      127     122     040                 .ASCII  /WR /
011427      106     101     111                 .ASCII  /FAI/
011432      114     000                         .ASCII  /L/<00>
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011450  040  101  102         .ASCII  / AB/
011453  117  122  124         .ASCII  /ORT/
011456  111  116  107         .ASCII  /ING/
011461  040  110  117         .ASCII  / HO/
011464  123  124  040         .ASCII  /ST /
011467  101  116  104         .ASCII  /AND/
011472  040  122  105         .ASCII  / RE/
011475  115  117  124         .ASCII  /MOT/
011500  105  040  120         .ASCII  /E P/
011503  122  117  107         .ASCII  /ROG/
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011522  124  114  105         .ASCII  /TLE/
011525  122  122  055         .ASCII  /RR-/
011530  040  111  114         .ASCII  / IL/
011533  114  105  107         .ASCII  /LEG/
011536  101  114  040         .ASCII  /AL /
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011544  102  105  122         .ASCII  /BER/
011547  040  117  106         .ASCII  / OF/
011552  040  125  116         .ASCII  / UN/
011555  111  124  123         .ASCII  /ITS/
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011630  125  116  111         .ASCII  /UNI/
011633  124  123  040         .ASCII  /TS /
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011641  040  106  117         .ASCII  / FO/
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011675  122  122  055         .ASCII  /RR-/
011700  040  122  103         .ASCII  / RC/
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011717  122  040  111                .ASCII  /R I/
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011725  111  101  114                .ASCII  /IAL/
011730  111  132  101                .ASCII  /IZA/
011733  124  111  117                .ASCII  /TIO/
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011762  040  120  122                .ASCII  / PR/
011765  117  124  117                .ASCII  /OTO/
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011776  117  114  101                .ASCII  /OLA/
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012047  101  122  105                .ASCII  /ARE/
012052  101  040  111                .ASCII  /A I/
012055  116  111  124                .ASCII  /NIT/
012060  040  105  122                .ASCII  / ER/
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012123  111  126  105                .ASCII  /IVE/
012126  040  101  106                .ASCII  / AF/
012131  124  105  122                .ASCII  /TER/
012134  040  111  116                .ASCII  / IN/
012137  111  124  111                .ASCII  /ITI/
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012166  040  104  125                .ASCII  / DU/
012171  120  040  123                .ASCII  /P S/
012174  105  122  126                .ASCII  /ERV/
012177  105  122  040                .ASCII  /ER /
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012205  103  124  111                .ASCII  /CTI/
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012213  101  106  124                .ASCII  /AFT/
012216  105  122  040                .ASCII  /ER /
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012224  123  125  120                .ASCII  /SUP/
012227  137  120  122                .ASCII  /_PR/
012232  117  107  040                .ASCII  /OG /
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012240  115  101  116                .ASCII  /MAN/
012243  104  000  000                .ASCII  /D/<00><00>
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012251  105  122  040                .ASCII  /ER /
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012257  040  106  111                .ASCII  / FI/
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012276  105  123  124                .ASCII  /EST/
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012304  040  050  106                .ASCII  / (F/
012307  111  114  105                .ASCII  /ILE/
012312  116  101  115                .ASCII  /NAM/
012315  105  056  105                .ASCII  /E.E/
012320  130  124  051                .ASCII  /XT)/
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012334  111  120  040                .ASCII  /IP /
012337  040  040  122                .ASCII  /  R/
012342  105  107  111                .ASCII  /EGI/
012345  123  124  105                .ASCII  /STE/
012350  122  040  040                .ASCII  /R  /
012353  040  101  104                .ASCII  / AD/
012356  104  122  105                .ASCII  /DRE/
012361  123  123  000                .ASCII  /SS/<00>
012364  122  103  062        P.AFD:  .ASCII  /RC2/
012367  065  040  111                .ASCII  /5 I/
012372  116  124  105                .ASCII  /NTE/
012375  122  122  125                .ASCII  /RRU/
012400  120  124  040                .ASCII  /PT /
012403  126  105  103                .ASCII  /VEC/
012406  124  117  122                .ASCII  /TOR/
012411  040  101  104                .ASCII  / AD/
012414  104  122  105                .ASCII  /DRE/
012417  123  123  000                .ASCII  /SS/<00>
012422  122  103  062        P.AFE:  .ASCII  /RC2/
```

```
012425  065  040  040            .ASCII  /5  /
012430  040  040  102            .ASCII  /  B/
012433  125  123  040            .ASCII  /US /
012436  040  040  122            .ASCII  /  R/
012441  105  121  125            .ASCII  /EQU/
012444  105  123  124            .ASCII  /EST/
012447  040  040  040            .ASCII  /   /
012452  114  105  126            .ASCII  /LEV/
012455  105  114  000            .ASCII  /EL/<00>
012460  125  116  111  P.AFF:    .ASCII  /UNI/
012463  124  040  040            .ASCII  /T  /
012466  116  125  115            .ASCII  /NUM/
012471  102  105  122            .ASCII  /BER/
012474  040  124  117            .ASCII  / TO/
012477  040  102  122            .ASCII  / BR/
012502  111  116  107            .ASCII  /ING/
012505  040  040  117            .ASCII  /  O/
012510  116  114  111            .ASCII  /NLI/
012513  116  105  000            .ASCII  /NE/<00>
012516  106  117  122  P.AFG:    .ASCII  /FOR/
012521  115  101  124            .ASCII  /MAT/
012524  040  111  116            .ASCII  / IN/
012527  040  125  116            .ASCII  / UN/
012532  101  124  124            .ASCII  /ATT/
012535  105  116  104            .ASCII  /END/
012540  105  104  040            .ASCII  /ED /
012543  122  105  106            .ASCII  /REF/
012546  117  122  115            .ASCII  /ORM/
012551  101  124  040            .ASCII  /AT /
012554  115  117  104            .ASCII  /MOD/
012557  105  000  000            .ASCII  /E/<00><00>
012562  045  116  045  P.AFH:    .ASCII  /%N%/
012565  101  052  052            .ASCII  /A**/
012570  052  052  052            .ASCII  /***/
012573  052  052  052            .ASCII  /***/
012576  052  052  052            .ASCII  /***/
012601  052  052  052            .ASCII  /***/
012604  052  052  052            .ASCII  /***/
012607  052  052  052            .ASCII  /***/
012612  052  040  116            .ASCII  /* N/
012615  117  124  111            .ASCII  /OTI/
012620  103  105  040            .ASCII  /CE /
012623  052  052  052            .ASCII  /***/
012626  052  052  052            .ASCII  /***/
012631  052  052  052            .ASCII  /***/
012634  052  052  052            .ASCII  /***/
012637  052  052  052            .ASCII  /***/
012642  052  052  052            .ASCII  /***/
012645  052  052  052            .ASCII  /***/
012650  000  000                 .ASCII  <00><00>
012652  045  116  045  P.AFI:    .ASCII  /%N%/
012655  101  040  040            .ASCII  /A  /
012660  040  040  040            .ASCII  /   /
012663  117  120  105            .ASCII  /OPE/
012666  122  101  124            .ASCII  /RAT/
012671  117  122  040            .ASCII  /OR /
012674  115  125  123            .ASCII  /MUS/
```

```
012677  124  040  102                    .ASCII  /T B/
012702  105  040  120                    .ASCII  /E P/
012705  122  105  123                    .ASCII  /RES/
012710  105  116  124                    .ASCII  /ENT/
012713  040  111  116                    .ASCII  / IN/
012716  040  101  124                    .ASCII  / AT/
012721  124  105  116                    .ASCII  /TEN/
012724  104  105  104                    .ASCII  /DED/
012727  040  115  117                    .ASCII  / MO/
012732  104  105  040                    .ASCII  /DE /
012735  000                             .ASCII  <00>
012736  045  116  045          P.AFJ:    .ASCII  /%N%/
012741  101  040  040                    .ASCII  /A  /
012744  040  040  040                    .ASCII  /   /
012747  040  040  122                    .ASCII  /  R/
012752  125  116  116                    .ASCII  /UNN/
012755  111  116  107                    .ASCII  /ING/
012760  040  111  116                    .ASCII  / IN/
012763  040  125  116                    .ASCII  / UN/
012766  055  101  124                    .ASCII  /-AT/
012771  124  105  116                    .ASCII  /TEN/
012774  104  105  104                    .ASCII  /DED/
012777  040  122  105                    .ASCII  / RE/
013002  106  117  122                    .ASCII  /FOR/
013005  115  101  124                    .ASCII  /MAT/
013010  040  115  117                    .ASCII  / MO/
013013  104  105  000                    .ASCII  /DE/<00>


000000                          .PSECT  $GLOB$,  RO ,  D  ,  GBL
000000                  COM.AREA::
                                .BLKW   24
000050                  HEAD.AREA::
                                .BLKW   1
000052                  RECEIVE.RING::
                                .BLKW   1
000054                  SEND.RING::
                                .BLKW   1
000056                  REC.ENVELOPE::
                                .BLKW   200
000456                  SND.ENVELOPE::
                                .BLKW   130
000736                  FCT.BUF::
                                .BLKW   400
001736                  REC.BUF::
                                .BLKW   170
002316                  SND.BUF::
                                .BLKW   45
002430                  OUT$STD.BUF::
                                .BLKW   10
002450                  RET.EN$AD::
                                .BLKW   1
002452                  DATETXT::
                                .BLKW   6
002466                  FLG.WRD::
                                .BLKW   1
```

```
002470                                  NEX.FLAG::
                                                .BLKW   1
002472                                  OVSA::  .BLKW   1
002474                                  NXT.CRN::
                                                .BLKB   1
                                                .EVEN
002476  000000                          RET.STATUS::
                                                .WORD   0
002500                                  LUN::   .BLKW   1
002502                                  PID.SAVE::
                                                .BLKW   2
002506                                  NSD.SLOT::
                                                .BLKW   1
002510                                  NRD.SLOT::
                                                .BLKW   1
002512                                  RC25.ADDR::
                                                .BLKW   1
002514                                  VEC.ADDR::
                                                .BLKW   1
002516                                  BR.LEVEL::
                                                .BLKW   1
002520                                  UNIT.NO::
                                                .BLKW   1
002522                                  PTBL.PTR::
                                                .BLKW   1
002524  001377                          RSVD.STRUCT::
                                                .WORD   1377
002526  000000                                  .WORD   0
002530  003400                                  .WORD   3400
002532  003777                                  .WORD   3777
002534  005777                          ISD.STRUCT::
                                                .WORD   5777
002536  111033                                  .WORD   -66745
002540  010222                                  .WORD   10222
002542  000010'                                 .WORD   RINGBASE
002544  023433                                  .WORD   23433
002546  000000                                  .WORD   0
002550  043777                                  .WORD   43777
002552  177400                                  .WORD   -400


                                        .GLOBL  L$SOFT, T$PTHV, L$RPT, L$INIT
                                        .GLOBL  L$CLEAN, L$LAST, L$HARD, L$DVTYP
                                        .GLOBL  L$DESC, L$DU, L$AU, L$AUTO, T1


        000126'                 L$ERRTBL==      ERRTYP
        000154'                 L$SW==          L$SWLEN+2
        000140'                 L$HW==          L$HWLEN+2
        000011'                 L$DEPO==        L$REV+1
        000140'                 DFPTBL==        L$HWLEN+2
        000154'                 SFPTBL==        L$SWLEN+2
        000000'                 FMT1==          P.AAA
        000006'                 FMT2==          P.AAB
        000076'                 FMT3==          P.AAC
        000204'                 FMT4==          P.AAD
        000270'                 FMT5==          P.AAE
```

```
000400'                 FMT6==                  P.AAF
000476'                 FMT7==                  P.AAG
000544'                 PID.FMT==               P.AAH
000646'                 CRLF==                  P.AAI
000652'                 XCRLF==                 P.AAJ
000010'                 RINGBASE==              COM.AREA+10
001740'                 MSGADR==                REC.BUF+2
002660'                 PFE.STRUCT==            P.AAK
004660'                 EMSG.STRUCT==           P.ABI
010214'                 RC.STRUCTURE==          P.ACG
010546'                 SDUP.STRUCT==           P.ADU
011210'                 SMSCP.STRUCT==          P.AEC
011242'                 DATMSG==                P.AEQ
011274'                 NO.ADD.UNITS==          P.AER
011352'                 PWR.MSG==               P.AES
011434'                 ABO.MSG==               P.AET
011514'                 TO.MANY.UNITS==         P.AEU
011572'                 GOOD.NUM.UNITS==        P.AEV
011664'                 BOOT.FAILURE==          P.AEW
011746'                 PROTO.VIOLATION==       P.AEX
012014'                 PORT.INIT.ERR==         P.AEY
012070'                 ACTIVE.DUP.SERVER==     P.AEZ
012152'                 INACTIVE.DUP.SERVER==
                                                P.AFA
012246'                 FCT.REQ.MSG==           P.AFB
012326'                 HW.Q1.IP==              P.AFC
012364'                 HW.Q2.VECTOR==          P.AFD
012422'                 HW.Q3.BR==              P.AFE
012460'                 HW.Q4.UNIT==            P.AFF
012516'                 SW.Q1.UNATT==           P.AFG
012562'                 SW.Q2.NOTICE==          P.AFH
012652'                 SW.Q3.OPER==            P.AFI
012736'                 SW.Q4.UNATT==           P.AFJ


                        PSECT SUMMARY

Psect Name              Words     Attributes
 AA$CODE                   59      RO  ,  I  ,  LCL,  REL,  CON
 $GLOB$                   694      RO  ,  D  ,  GBL,  REL,  CON
 $PLIT$                  2823      RO  ,  D  ,  GBL,  REL,  CON


                    LIBRARY STATISTICS

                                 -------- Symbols --------    Blocks
File                             Total    Loaded   Percent      Read

SPIDER$USERS:[NEALE.AZTEC]CZRCH0.L16;5
                                   398       176        44        42
```

```
;                                       COMMAND QUALIFIERS

;       BLISS /PDP11/LIST CZRCH2.B16

; Size:          0 code + 3576 data words
; Run Time:          00:24.0
; Elapsed Time:      00:35.7
; Memory Used:  209 pages
; Compilation Complete
```

```
;       0001  MODULE CZRCH3 (%TITLE 'CZRCH RC25 DISK FORMATTER'
;       0002                  IDENT = 'REV A PATCH 00',
;       0003                  ADDRESSING_MODE (RELATIVE) ,
;       0004                  ENVIRONMENT (NOEIS)
;       0005                  ) =
;       0006  BEGIN
;       0007  %sbttl 'MODULE DECLARATIONS'
;       0008  !
;       0009  ! Pretty Declarations
;       0010  !
;       0011  !<BLF/LOWERCASE_KEY>
;       0012  !
;       0013
;       0014  library 'CZRCH0';                                 !Define RC25 Library module
;       0015
;       0016  require 'BLSMAC.REQ';                             !Define Bliss Macro Library
;       1505
;       1506  !+
;       1507  ! Structure declarations used within this module.
;       1508  !-
;       1509
;       1510  structure
;       1511
;       1512      !+
;       1513      ! RC25  register  accessing  structure. This
;       1514      ! structure  allows  RC25 register accessing
;       1515      ! to  be transportable between the PDP-11 and
;       1516      ! VAX Diagnostic Supervisors.
;       1517      !
;       1518      ! This  also  defines an access algorithm for
;       1519      ! VAX to allow field reference to MBA address
;       1520      ! space  without  generating  machine  checks.
;       1521      !-
;       1522
;       1523      RC25 [O, P, S, E] =
;       1524          begin
;       1525
;       1526          local
;       1527              RC$S_REG;
;       1528
;       1529          RC$S_REG = .(RC25 + %upval*0)<0, %bpval, 0>;
;       1530          RC$S_REG
;       1531          end
;       1532          <P, S, E>;
;       1533
;       1534  !<blf/page>
```

```
;        1535  !+
;        1536  ! The  psect  named "code  or  $code$"  is redefinded here
;        1537  ! to  be  called "aa$code".  This is done to force the tkb
;        1538  ! linker to place the programs header information starting
;        1539  ! at absolute address  2000.  Then for consistency "a$code"
;        1540  ! is  used  inplace  of "code or $code" across all modules.
;        1541  !-
;        1542  psect
;        1543      code = aa$code;
;        1544
;        1545  !+
;        1546  ! External  Routine declared outside this module.
;        1547  !-
;        1548
;        1549  external routine
;        1550      DECODE : novalue,
;        1551      LOAD_FILE;
;        1552
;        1553  !<blf/page>
```

```
;        1554  !+
;        1555  ! External Declaration of  datums declared outside of this module.
;        1556  !-
;        1557
;        1558  external
;        1559      !
;        1560      ! DM load file from local media definitions
;        1561      !
;        1562      !DM_FN$EXT,                                   !DM file name ascii text
;        1563      AZFMTR : vector [8892, word],                 !DM host buffer adrs
;        1564      OVSA : word,                                  !Overlay section starting adrs
;        1565      !
;        1566      ! Hardware question ascii string messages
;        1567      !
;        1568      HW_Q1_IP,                                     !H/W question 1 for IP reg address
;        1569      HW_Q2_VECTOR,                                 !H/W question 2 for interrupt vector address
;        1570      HW_Q3_BR,                                     !H/W question 3 for bus req level
;        1571      HW_Q4_UNIT,                                   !H/W question 4 for unit no. to format
;        1572      !
;        1573      ! Software question ascii string messages
;        1574      !
;        1575      SW_Q1_UNATT,                                  !Unattended reformat software question
;        1576      SW_Q2_NOTICE,                                 !Notice message
;        1577      SW_Q3_OPER,                                   !Operator must be present in this mode
;        1578      SW_Q4_UNATT,                                  !Running in unattended mode
;        1579      !
;        1580      ! Formatting print string
;        1581      !
;        1582      FMT2,                                         !Notifies unit being formatted
;        1583      FMT3,                                         !Notifies format abort
;        1584      CRLF,                                         !<CR><LF>
;        1585      XCRLF,                                        !Prints ten <CR><LF>
;        1586      !
;        1587      ! Init code error and informational messages
;        1588      !
;        1589      NO_ADD_UNITS,
;        1590      PWR_MSG,
;        1591      ABO_MSG,
;        1592      TO_MANY_UNITS,
;        1593      GOOD_NUM_UNITS,
;        1594      DATMSG,                                       !Message to ask operator for date
;        1595      !
;        1596      ! Miscellaneous external data declarations
;        1597      !
;        1598      FLG_WRD : bitvector [16],                     !Global flag word
;        1599      LUN : byte,
;        1600      PTBL_PTR : ref vector [4, word],
;        1601      DATETXT : vector [12, byte],                  !Storage for operator date input
;        1602      !
;        1603      ! Supervisor defined data declarations
;        1604      !
;        1605      L$UNIT,
;        1606      !
;        1607      ! Hardware P_Table storage declarations
;        1608      !
;        1609      RC25_ADDR : ref RC25 field (ISD_FIELD),
;        1610      VEC_ADDR : word,
```

```
;          1611      BR_LEVEL : word,
;          1612      UNIT_NO : word,
;          1613      !
;          1614      ! Software question response storage declarations
;          1615      !
;          1616      SW_UNATT : word,
;          1617      !
;          1618      ! Formatter data structures
;          1619      !
;          1620      ISD_STRUCT : blockvector [4, 2, word] field (ISD_FIELD);
;          1621
```

```
;          1622  %sbttl 'TYPE AND DESCRIPTION'
;          1623  !+
;          1624  ! Two lines of text will be printed to the operator (in addition to  the
;          1625  ! program name).  The first will come from the "DESCRIPT" macro at start
;          1626  ! up time and will identify the diagnostics.  The second will come  from
;          1627  ! the  "DEVTYPE"  macro  at hardware dialogue time and will identify the
;          1628  ! device under test.  The arugments of  both  macros  are  72  character
;          1629  ! ascii strings enclosed in parenthesises:
;          1630  !-
;          1631  DESCRIPT (%asciz'RC25 DISK FORMATTER');
;          1632  DEVTYP (%asciz'RC25 DISK DRIVE SUBSYSTEM');
```

```
;          1633  %sbttl 'HARDWARE PARAMETER CODING'
;          1634  !+
;          1635  ! The  hardware parameter  coding section contains macros
;          1636  ! that are used by the supervisor to build P-Tables.  The
;          1637  ! macros are not executed as machine instructions but are
;          1638  ! interpreted  by the supervisor as data structures.  The
;          1639  ! macros allow the supervisor to establish communications
;          1640  ! with the operator.
;          1641  !-
;          1642  BGNHRD;
;          1643  GPRMA (HW_Q1_IP, %o'0', 0, %o'16000', %o'177777', YES, 1);      !Get RC25 Controller IP register
;          1644  GPRMA (HW_Q2_VECTOR, %o'2', 0, 4, %o'774', YES, 1);     !Get RC25 Interrupt Vector address
;          1645  GPRMD (HW_Q3_BR, %o'4', 0, %o'177777', 0, 7, YES, 1);    !Get RC25 Bus Request Priority
;          1646  GPRMD (HW_Q4_UNIT, %o'6', 0, %o'177777', 0, %decimal'253', YES, 1);     !Get unit number to format
;          1647  ENDHRD;
```

```
;          1648  %sbttl 'SOFTWARE PARAMETER CODING SECTION'
;          1649  !+
;          1650  ! The  software  parameter coding section contains macros
;          1651  ! that are used by the supervisor to build P-Tables.  The
;          1652  ! macros are not executed as machine instructions but are
;          1653  ! interpreted by  the supervisor as data structures.  The
;          1654  ! macros allow the supervisor to establish communications
;          1655  ! with the operator.
;          1656  !-
;          1657  BGNSFT;
;          1658  GPRML (SW_Q1_UNATT, 0, 1, YES, 1);
;          1659  ENDSFT;
```

```
;          1660  %sbttl 'REPORT CODING SECTION'
;          1661  !+
;          1662  ! The  statistical  report  coding section contains the PRINTS macros  that
;          1663  ! will  be  used to generate statistical reports.  The 'BGNRPT' and 'ENDRPT'
;          1664  ! macros  are  used  as  begining and ending directives for the coding  con-
;          1665  ! tained  in  the  section.   However, an externally located DORPT call, or
;          1666  ! a   print  command  from the operator, may be used to request  the  execu-
;          1667  ! tion of the report coding.
;          1668  !-
;          1669  BGNRPT;
;          1670  return;
;          1671  !
;          1672  ! Report summary coding is remote program driven
;          1673  !
;          1674  ENDRPT;


                                        .TITLE  CZRCH3 CZRCH RC25 DISK FORMATTER
                                        .IDENT  /REV A /


000000                                  .PSECT  AA$CODE,  RO
000000     122     103     062  L$DESC::.ASCII  /RC2/
000003     065     040     104          .ASCII  /5 D/
000006     111     123     113          .ASCII  /ISK/
000011     040     106     117          .ASCII  / FO/
000014     122     115     101          .ASCII  /RMA/
000017     124     124     105          .ASCII  /TTE/
000022     122     000                  .ASCII  /R/<00>
000024                                  .BLKB   2
000026     122     103     062  L$DVTYP::
                                        .ASCII  /RC2/
000031     065     040     104          .ASCII  /5 D/
000034     111     123     113          .ASCII  /ISK/
000037     040     104     122          .ASCII  / DR/
000042     111     126     105          .ASCII  /IVE/
000045     040     123     125          .ASCII  / SU/
000050     102     123     131          .ASCII  /BSY/
000053     123     124     105          .ASCII  /STE/
000056     115     000                  .ASCII  /M/<00>
000060                                  .BLKB   2
000062  000000C                 L$HRDLN::
                                        .WORD   <<<L$NDHRD-L$HRDLN>/2>-1>
000064  000031                  GP$1::  .WORD   31
000066  000000G                         .WORD   HW.Q1.IP
000070  016000                          .WORD   16000
000072  177777                          .WORD   -1
000074  001031                  GP$2::  .WORD   1031
000076  000000G                         .WORD   HW.Q2.VECTOR
000100  000004                          .WORD   4
000102  000774                          .WORD   774
000104  002032                  GP$3::  .WORD   2032
000106  000000G                         .WORD   HW.Q3.BR
000110  177777                          .WORD   -1
000112  000000                          .WORD   0
000114  000007                          .WORD   7
000116  003052                  GP$4::  .WORD   3052
```

```
000120  000000G                         .WORD   HW.Q4.UNIT
000122  177777                          .WORD   -1
000124  000000                          .WORD   0
000126  000375                          .WORD   375
000130                          L$NDHRD::
                                .BLKW   1
000132  000000C                 L$SFTLN::
                                .WORD   <<<L$NDSFT-L$SFTLN>/2>-1>
000134  000130                  GP$5::  .WORD   130
000136  000000G                         .WORD   SW.Q1.UNATT
000140  000001                          .WORD   1
000142                          L$NDSFT::
                                .BLKW   1

                                .GLOBL  DECODE, LOAD.FILE, AZFMTR, OVSA
                                .GLOBL  HW.Q1.IP, HW.Q2.VECTOR, HW.Q3.BR
                                .GLOBL  HW.Q4.UNIT, SW.Q1.UNATT, SW.Q2.NOTICE
                                .GLOBL  SW.Q3.OPER, SW.Q4.UNATT, FMT2
                                .GLOBL  FMT3, CRLF, XCRLF, NO.ADD.UNITS
                                .GLOBL  PWR.MSG, ABO.MSG, TO.MANY.UNITS
                                .GLOBL  GOOD.NUM.UNITS, DATMSG, FLG.WRD
                                .GLOBL  LUN, PTBL.PTR, DATETXT, L$UNIT
                                .GLOBL  RC25.ADDR, VEC.ADDR, BR.LEVEL
                                .GLOBL  UNIT.NO, SW.UNATT, ISD.STRUCT


        000064'                 L$HARD==        L$HRDLN+2
        000134'                 L$SOFT==        L$SFTLN+2


                                .SBTTL  LRPT REPORT CODING SECTION
000000  000207                  LRPT:   RTS     PC                      ;                       1659

; Routine Size:  1 word,        Routine Base:  AA$CODE + 0144
; Maximum stack depth per invocation:  0 words



                                .SBTTL  L$RPT REPORT CODING SECTION
000000  004767  177772          L$RPT:: JSR     PC,LRPT                 ;                       1670
000004  104425                          TRAP    25
000006  000207                          RTS     PC

; Routine Size:  4 words,       Routine Base:  AA$CODE + 0146
; Maximum stack depth per invocation:  2 words
```

```
;         1675  %sbttl 'INITIALIZE SECTION'
;         1676  BGNINIT;
;         1677
;         1678  !++
;         1679  ! The  initialization code is executed at the beginning of every
;         1680  ! sub-pass  and  is primarily used for requesting P_Tables.  Any
;         1681  ! other  set-up type functions may also be performed in the init
;         1682  ! code.
;         1683  !
;         1684  ! The  initialize code is executed under five conditions.  There
;         1685  ! are supervisor event flags that are used to let the diagnostic
;         1686  ! know under which condition the execution is taking place.  The
;         1687  ! event flags are read using the "READEF" macro.
;         1688  !
;         1689  ! The  conditions  under which the init code is executed and the
;         1690  ! corrresponding event flags are:
;         1691  !
;         1692  !                   START COMMAND           EF.START
;         1693  !                   RESTART COMMAND         EF.RESTART
;         1694  !                   CONTINUE COMMAND        EF.CONTINUE
;         1695  !                   POWERDOWN/POWERUP       EF.PWR
;         1696  !                   NEW PASS                EF.NEW
;         1697  !
;         1698  !         Example of event flag use:
;         1699  !
;         1700  !                   if READEF(EF.START) then
;         1701  !                      START_FLAG = 1;
;         1702  !--
;         1703
;         1704  !+
;         1705  ! First  read  the  event flag  EF_PWR to see if  this  init code  is being
;         1706  ! performed due  to   a  system  power  fail.  If  it  is  then  report the
;         1707  ! incident  to  the operator and abort the DM machine and further execution
;         1708  ! of this program.
;         1709  !-
;         1710
;         1711  if READEF (EF_PWR)                          !Is the PWR event flag set
;         1712  then
;         1713      begin                                   !Report the incident and abort
;         1714      PRINTB (PWR_MSG);                       !Power fail print message
;         1715      PRINTB (ABO_MSG);                       !Aborting program message
;         1716      WRT_RC25 (RCIP, ONES);                  !Abort DM code execution
;         1717      DOCLN;                                  !Abort further program execution
;         1718      end;
;         1719
;         1720  !
;         1721  ! See if the DRS commands START or RESTART were used to start
;         1722  ! this formatting session.  If either of them were used then
;         1723  ! start the formatting session at logical unit zero.
;         1724  !
;         1725
;         1726  if (READEF (EF_START)) or (READEF (EF_RESTART)) !Did start of restart get us here
;         1727  then
;         1728      begin
;         1729      !
;         1730      ! Check the operator for triing to format
;         1731      ! more than the defined  limit.   If they
```

```
;       1732      ! are   then  report  the  error  and die.
;       1733      !
;       1734
;       1735      if .L$UNIT gtru L$LIMIT                     !Is the formatting limit exceeded
;       1736      then
;       1737          begin
;       1738          PRINTB (TO_MANY_UNITS);                 !Report the error
;       1739          PRINTB (GOOD_NUM_UNITS);                !Tell him/her the limit
;       1740          DOCLN;                                  !Go to cleanup and die
;       1741          end;
;       1742
;       1743      !
;       1744      ! Test to see if this host code is to run in UNATTENDED REFORMT MODE.
;       1745      ! If it is then ask the operator for the date.  If not then tell the
;       1746      ! operator that an operator must be present during this formatting.
;       1747      !
;       1748
;       1749      if .SW_UNATT
;       1750      then
;       1751          begin
;       1752          !
;       1753          ! Clear out the date text buffer before loading in date.
;       1754          !
;       1755
;       1756          incr i from 0 to 11 do
;       1757              DATETXT [.i] = ZEROS;
;       1758
;       1759          GMANID (DATMSG, DATETXT, A, %o'177777', 8, 10, NO);     !Get date from operator
;       1760          PRINTB (SW_Q2_NOTICE);                  !Print notice message
;       1761          PRINTB (SW_Q4_UNATT);                   !Report running in ATTENDED mode
;       1762          end
;       1763      else
;       1764          begin
;       1765          PRINTB (SW_Q2_NOTICE);                  !Print notice message
;       1766          PRINTB (SW_Q3_OPER);                    !Tell operator he/she must be present
;       1767          end;
;       1768
;       1769      !+
;       1770      ! Everything  looks  good  so far, move  on and  get the
;       1771      ! hardware question responses and save them.
;       1772      !-
;       1773
;       1774      LUN = -1;                                   !Start formatting at logical unit 0
;       1775
;       1776      do
;       1777          begin
;       1778          LUN = .LUN + 1;                         !Up pointer to next logical unit to GPHARD
;       1779
;       1780          if .LUN gequ .L$UNIT then DOCLN;        !End host code if no logical units
;       1781
;       1782          end
;       1783      until (GPHARD (.LUN, PTBL_PTR)) nequ ZERO;  !Repeat GPHARD's until P_Table adrs returned
;       1784
;       1785      !
;       1786      ! Get the P_Table parameters for this unit and go format it.
;       1787      !
;       1788      RC25_ADDR = .PTBL_PTR [wrd0];               !Load up the controllers base addres
```

```
;       1789      VEC_ADDR = .PTBL_PTR [wrd1];                !Load up the controllers vector address
;       1790      BR_LEVEL = .PTBL_PTR [wrd2];                !Load up the controllers bus request
;       1791      UNIT_NO = .PTBL_PTR [wrd3];                 !Load up the unit number to format
;       1792
;       1793      !+
;       1794      ! Before  leaving  the  init  code section we must first do some house keeping
;       1795      ! left behind from the ISD_STRUCT preset declaration.  The adapter purge interrupt
;       1796      ! bit must be defined for the type machine this formatter is  running under.
;       1797      !-
;       1798
;       1799      if %bliss (bliss16)                         !Define compiler
;       1800      then
;       1801          ISD_STRUCT [BLK1, WRD1, S2W_PI] = ZERO  !No purging for PDP-11
;       1802      else
;       1803          ISD_STRUCT [BLK1, WRD1, S2W_PI] = ONE;  !Purging for VAX-11
;       1804
;       1805  !++
;       1806  ! This commented code will load an external copy of the formatter from
;       1807  ! the local load media into azkel6 module space starting at AZFMTR : VECTOR [ ,word]
;       1808  !
;       1809  !     !+
;       1810  !     ! Now load in the RC25 formatter DM code from the local boot device
;       1811  !     ! into the blank buffer allocated in azkel6.  Report  load error if
;       1812  !     ! an error code is returned.
;       1813  !     !
;       1814  !     ! The DM code will only be read in during start! or restarts of the
;       1815  !     ! host code.  Block zero of the  the  DM .sav file  will thrown out.
;       1816  !     !-
;       1817  !
;       1818  !     if LOAD_FILE (AZFMTR, DM_FN$EXT, DM_SIZE) then DECODE ();
;       1819  !
;       1820  !--
;       1821
;       1822      !
;       1823      ! Now calculate the overlay sections starting address and store the result
;       1824      ! in global location 'OVSA' for future reference.
;       1825      !
;       1826      ! This takes the DM buffer starting adrs and adds to it the number of bytes
;       1827      ! in the (initial load + remote program header size) resulting in the first
;       1828      ! adrs of the overlay section.
;       1829      !
;       1830      OVSA = AZFMTR + (.AZFMTR [WRD0]);           !Calculate overlay start adrs
;       1831      end
;       1832  else
;       1833      begin
;       1834      !
;       1835      ! The continue flag set will cause the current units formatting to be
;       1836      ! aborted.  The next sequential logical unit will then be  formatted.
;       1837      !
;       1838
;       1839      if READEF (EF_CONTINUE)
;       1840      then
;       1841          begin
;       1842          !
;       1843          ! End this Host code if this .lun is the the last logical unit to format.
;       1844          ! Else do another GPHARD macro to get the next logical unit to format.
;       1845          !
```

```
;        1846          PRINTB (FMT3, .LUN, .UNIT_NO);          !Report this luns format was aborted
;        1847          WRT_RC25 (RCIP, ONES);                  !Abort this current units formatting
;        1848
;        1849          if (.LUN + 1) gequ .L$UNIT
;        1850          then
;        1851              begin
;        1852              PRINTB (NO_ADD_UNITS);              !Report no more unit to format
;        1853              DOCLN;
;        1854              end;
;        1855
;        1856          end;
;        1857
;        1858      !
;        1859      ! The new pass event flag set means that all logical units have
;        1860      ! been formatted.  Therefore end this host code and return to DS>.
;        1861      !
;        1862
;        1863      if READEF (EF_NEW) then DOCLN;              !New pass means all units formatted
;        1864
;        1865      !
;        1866      ! Repeat doing GPHARDS until a non-zero value is returned or all logical units
;        1867      ! have been GPHARD'ed.  End this host code if all logical units have been formatted.
;        1868      !
;        1869
;        1870      do
;        1871          begin
;        1872          LUN = .LUN + 1;                         !Up pointer to next logical unit
;        1873
;        1874          if .LUN gequ .L$UNIT then DOCLN;        !End the host if all logical units GPHARD'ed
;        1875
;        1876          end
;        1877      until (GPHARD (.LUN, PTBL_PTR)) nequ ZERO;  !Repeat until a P_table adrs is returned
;        1878
;        1879      !
;        1880      ! Get the P_Table parameters for this unit and go format it.
;        1881      !
;        1882      RC25_ADDR = .PTBL_PTR [wrd0];               !Load up the controllers base addres
;        1883      VEC_ADDR = .PTBL_PTR [wrd1];                !Load up the controllers vector address
;        1884      BR_LEVEL = .PTBL_PTR [wrd2];                !Load up the controllers bus request
;        1885      UNIT_NO = .PTBL_PTR [wrd3];                 !Load up the unit number to format
;        1886      end;
;        1887
;        1888  !
;        1889  ! Tell the operator which RC25 controller is being initialized this pass.
;        1890  !
;        1891  PRINTB (XCRLF);                                 !Space between each formatting pass
;        1892  PRINTB (FMT2, .PTBL_PTR [WRD0]);
;        1893  ENDINIT;


                                        .SBTTL  LINIT ;INITIALIZE SECTION
000000  012700  000034          LINIT:  MOV     #34,R0                          ;                       1711
000004  104447                          TRAP    47
000006  103023                          BHIS    1$
000010  012746  000000G                 MOV     #PWR.MSG,-(SP)                  ;                       1714
000014  012746  000001                  MOV     #1,-(SP)
000020  010600                          MOV     SP,R0                           ; SP,*
```

```
000022  104414                          TRAP    14
000024  012716  000000G                MOV     #ABO.MSG,(SP)           ;                       1715
000030  012746  000001                  MOV     #1,-(SP)
000034  010600                          MOV     SP,R0                   ; SP,*
000036  104414                          TRAP    14
000040  012700  177777                  MOV     #-1,R0                  ; *,RC$M.REG            1716
000044  010077  000000G                 MOV     R0,@RC25.ADDR           ; RC$M.REG,*
000050  104444                          TRAP    44
000052  062706  000006                  ADD     #6,SP                   ;                       1713
000056  012700  000040          1$:     MOV     #40,R0                  ;                       1726
000062  104447                          TRAP    47
000064  103404                          BCS     2$
000066  012700  000037                  MOV     #37,R0
000072  104447                          TRAP    47
000074  103151                          BHIS    9$
000076  026727  000000G 000020  2$:     CMP     L$UNIT,#20              ;                       1735
000104  101417                          BLOS    3$
000106  012746  000000G                 MOV     #TO.MANY.UNITS,-(SP)    ;                       1738
000112  012746  000001                  MOV     #1,-(SP)
000116  010600                          MOV     SP,R0                   ; SP,*
000120  104414                          TRAP    14
000122  012716  000000G                 MOV     #GOOD.NUM.UNITS,(SP)    ;                       1739
000126  012746  000001                  MOV     #1,-(SP)
000132  010600                          MOV     SP,R0                   ; SP,*
000134  104414                          TRAP    14
000136  104444                          TRAP    44
000140  062706  000006                  ADD     #6,SP                   ;                       1737
000144  032767  000001  000000G 3$:     BIT     #1,SW.UNATT             ;                       1749
000152  001434                          BEQ     5$
000154  005000                          CLR     R0                      ; I                     1756
000156  105060  000000G         4$:     CLRB    DATETXT(R0)             ; *(I)                  1757
000162  005200                          INC     R0                      ; I                     1756
000164  020027  000013                  CMP     R0,#13                  ; I,*
000170  003772                          BLE     4$
000172  104443                          TRAP    43                      ;                       1759
000174  000406                          .WORD   406
000176  000000G                         .WORD   DATETXT
000200  000142                          .WORD   142
000202  000000G                         .WORD   DATMSG
000204  177777                          .WORD   -1
000206  000010                          .WORD   10
000210  000012                          .WORD   12
000212  012746  000000G                 MOV     #SW.Q2.NOTICE,-(SP)     ;                       1760
000216  012746  000001                  MOV     #1,-(SP)
000222  010600                          MOV     SP,R0                   ; SP,*
000224  104414                          TRAP    14
000226  012716  000000G                 MOV     #SW.Q4.UNATT,(SP)       ;                       1761
000232  012746  000001                  MOV     #1,-(SP)
000236  010600                          MOV     SP,R0                   ; SP,*
000240  104414                          TRAP    14
000242  000414                          BR      6$                      ;                       1749
000244  012746  000000G         5$:     MOV     #SW.Q2.NOTICE,-(SP)     ;                       1765
000250  012746  000001                  MOV     #1,-(SP)
000254  010600                          MOV     SP,R0                   ; SP,*
000256  104414                          TRAP    14
000260  012716  000000G                 MOV     #SW.Q3.OPER,(SP)        ;                       1766
000264  012746  000001                  MOV     #1,-(SP)
```

```
000270  010600                                  MOV     SP,R0                           ; SP,*
000272  104414                                  TRAP    14
000274  112767  000377  000000G          6$:    MOVB    #377,LUN                        ;                       1774
000302  105267  000000G                  7$:    INCB    LUN                             ;                       1778
000306  005000                                  CLR     R0                              ;                       1780
000310  156700  000000G                          BISB    LUN,R0
000314  020067  000000G                          CMP     R0,L$UNIT
000320  103401                                  BLO     8$
000322  104444                                  TRAP    44
000324  005000                          8$:     CLR     R0                              ;                       1783
000326  156700  000000G                          BISB    LUN,R0
000332  104442                                  TRAP    42
000334  010067  000000G                          MOV     R0,PTBL.PTR
000340  001760                                  BEQ     7$
000342  011067  000000G                          MOV     (R0),RC25.ADDR                  ;                       1788
000346  016067  000002  000000G                  MOV     2(R0),VEC.ADDR                  ;                       1789
000354  016067  000004  000000G                  MOV     4(R0),BR.LEVEL                  ;                       1790
000362  016067  000006  000000G                  MOV     6(R0),UNIT.NO                   ;                       1791
000370  142767  000001  000006G                  BICB    #1,ISD.STRUCT+6                 ;                       1799
000376  016767  000000G 000000G                  MOV     AZFMTR,OVSA                     ;                       1830
000404  062767  000000G 000000G                  ADD     #AZFMTR,OVSA
000412  062706  000006                          ADD     #6,SP                           ;                       1728
000416  000504                                  BR      14$                             ;                       1726
000420  012700  000036                  9$:     MOV     #36,R0                          ;                       1839
000424  104447                                  TRAP    47
000426  103040                                  BHIS    11$
000430  016746  000000G                          MOV     UNIT.NO,-(SP)                   ;                       1846
000434  005046                                  CLR     -(SP)
000436  116716  000000G                          MOVB    LUN,(SP)
000442  012746  000000G                          MOV     #FMT3,-(SP)
000446  012746  000003                          MOV     #3,-(SP)
000452  010600                                  MOV     SP,R0                           ; SP,*
000454  104414                                  TRAP    14
000456  012700  177777                          MOV     #-1,R0                          ; *,RC$M.REG            1847
000462  010077  000000G                          MOV     R0,@RC25.ADDR                   ; RC$M.REG,*
000466  005000                                  CLR     R0                              ;                       1849
000470  156700  000000G                          BISB    LUN,R0
000474  005200                                  INC     R0
000476  020067  000000G                          CMP     R0,L$UNIT
000502  103410                                  BLO     10$
000504  012716  000000G                          MOV     #NO.ADD.UNITS,(SP)              ;                       1852
000510  012746  000001                          MOV     #1,-(SP)
000514  010600                                  MOV     SP,R0                           ; SP,*
000516  104414                                  TRAP    14
000520  104444                                  TRAP    44
000522  005726                                  TST     (SP)+                           ;                       1851
000524  062706  000010          10$:    ADD     #10,SP                          ;                       1841
000530  012700  000035          11$:    MOV     #35,R0                          ;                       1863
000534  104447                                  TRAP    47
000536  103001                                  BHIS    12$
000540  104444                                  TRAP    44
000542  105267  000000G          12$:    INCB    LUN                             ;                       1872
000546  005000                                  CLR     R0                              ;                       1874
000550  156700  000000G                          BISB    LUN,R0
000554  020067  000000G                          CMP     R0,L$UNIT
000560  103401                                  BLO     13$
000562  104444                                  TRAP    44
```

```
000564  005000                          13$:    CLR     R0                              ;                       1877
000566  156700  000000G                       BISB    LUN,R0
000572  104442                                TRAP    42
000574  010067  000000G                       MOV     R0,PTBL.PTR
000600  001760                                BEQ     12$
000602  011067  000000G                       MOV     (R0),RC25.ADDR                  ;                       1882
000606  016067  000002  000000G               MOV     2(R0),VEC.ADDR                  ;                       1883
000614  016067  000004  000000G               MOV     4(R0),BR.LEVEL                  ;                       1884
000622  016067  000006  000000G               MOV     6(R0),UNIT.NO                   ;                       1885
000630  012746  000000G                14$:    MOV     #XCRLF,-(SP)                    ;                       1891
000634  012746  000001                        MOV     #1,-(SP)
000640  010600                                MOV     SP,R0                           ; SP,*
000642  104414                                TRAP    14
000644  017716  000000G                       MOV     @PTBL.PTR,(SP)                  ;                       1892
000650  012746  000000G                       MOV     #FMT2,-(SP)
000654  012746  000002                        MOV     #2,-(SP)
000660  010600                                MOV     SP,R0                           ; SP,*
000662  104414                                TRAP    14
000664  062706  000010                        ADD     #10,SP                          ;                       1674
000670  000207                                RTS     PC

; Routine Size:  221 words,     Routine Base:  AA$CODE + 0156
; Maximum stack depth per invocation:  7 words
```

```
                                        .SBTTL  L$INIT INITIALIZE SECTION
000000  004767  177102          L$INIT::JSR     PC,LINIT                        ;                       1892
000004  104411                          TRAP    11
000006  000207                          RTS     PC

; Routine Size:  4 words,       Routine Base:  AA$CODE + 1050
; Maximum stack depth per invocation:  2 words
```

```
;          1894  %sbttl 'AUTODROP SECTION'
;          1895  !+
;          1896  ! This code is executed immediately after the initialize code if
;          1897  ! the "ADR" flag was set.  The unit(s) under test are checked to
;          1898  ! see  if they  will  respond.  Those that don't are immediately
;          1899  ! dropped from testing.
;          1900  !-
;          1901  BGNAUTO;
;          1902  return;
;          1903  ENDAUTO;


                                        .SBTTL  LAUTO AUTODROP SECTION
000000  000207                  LAUTO:    RTS     PC                            ;                                1893

; Routine Size:  1 word,        Routine Base:  AA$CODE + 1060
; Maximum stack depth per invocation:  0 words



                                        .SBTTL  L$AUTO AUTODROP SECTION
000000  004767  177772          L$AUTO::  JSR     PC,LAUTO                      ;                                1902
000004  104461                           TRAP    61
000006  000207                           RTS     PC

; Routine Size:  4 words,       Routine Base:  AA$CODE + 1062
; Maximum stack depth per invocation:  2 words
```

```
;          1904  %sbttl 'CLEANUP CODING SECTION'
;          1905  !+
;          1906  ! Cleanup coding is assembled with the diagnostic program, utilizing in-
;          1907  ! itiating  (BGNCLN)  and ending (ENDCLN) directives.  The coding can be
;          1908  ! used by either the diagnostic program or the supervisor to affect  the
;          1909  ! return of a test device to a static state.
;          1910  !
;          1911  ! The clean-up code is invoked in three different ways:
;          1912  !
;          1913  !       A. At end of every sub-pass
;          1914  !       B. Issuance of DOCLN macro
;          1915  !       C. Operator ^C
;          1916  !-
;          1917  BGNCLN;
;          1918  !
;          1919  ! Before initing the RC25 controller check first to make sure that
;          1920  ! that this is not a non-existant register.
;          1921  !
;          1922
;          1923  if not .FLG_WRD [NON_EXIST_REG] then WRT_RC25 (RCIP, ONES);     !Abort DM code execution
;          1924
;          1925  return;
;          1926  ENDCLN;


                                        .SBTTL  LCLEAN CLEANUP CODING SECTION
000000  032767  000002  000000G LCLEAN: BIT     #2,FLG.WRD                      ;                               1923
000006  001004                        BNE     1$
000010  012700  177777                MOV     #-1,R0                          ; *,RC$M.REG
000014  010077  000000G               MOV     R0,@RC25.ADDR                   ; RC$M.REG,*
000020  000207                 1$:    RTS     PC                              ;                               1903

; Routine Size:  9 words,       Routine Base:  AA$CODE + 1072
; Maximum stack depth per invocation:  0 words



                                        .SBTTL  L$CLEAN CLEANUP CODING SECTION
000000  004767  177752          L$CLEAN::
                                        JSR     PC,LCLEAN                       ;                               1925
000004  104412                          TRAP    12
000006  000207                          RTS     PC

; Routine Size:  4 words,       Routine Base:  AA$CODE + 1114
; Maximum stack depth per invocation:  2 words
```

```
;         1927  %sbttl 'DROP UNIT SECTION'
;         1928  !+
;         1929  ! The drop code is invoked by a DODU macro or a drop command,  and  con-
;         1930  ! tains any code that needs to be executed in conjunction with the drop-
;         1931  ! ping of a unit from the test cycle.  No coding  is  required  in  this
;         1932  ! section.
;         1933  !
;         1934  ! The effect of a DODU is the same whether executed in the init code  or
;         1935  ! in a hardware test.  It invokes the drop unit coding and causes subse-
;         1936  ! quent GPHARD'S for that logical unit to be  returned  'NOT  COMPLETE'.
;         1937  ! This   effect   lasts only  for  the  duration  of the current command.
;         1938  !-
;         1939  BGNDU;
;         1940  return;
;         1941  ENDDU;


                                        .SBTTL  LDU DROP UNIT SECTION
000000  000207                    LDU:    RTS     PC                              ;       1926

; Routine Size:  1 word,        Routine Base:  AA$CODE + 1124
; Maximum stack depth per invocation:  0 words




                                        .SBTTL  L$DU DROP UNIT SECTION
000000  004767  177772              L$DU::  JSR     PC,LDU                          ;       1940
000004  104453                              TRAP    53
000006  000207                             RTS     PC

; Routine Size:  4 words,       Routine Base:  AA$CODE + 1126
; Maximum stack depth per invocation:  2 words
```

```
;          1942  %sbttl 'ADD UNIT SECTION'
;          1943  !+
;          1944  ! The add code is invoked by the ADD command, and contains any code that
;          1945  ! needs  to  be  executed  in conjunction with adding a unit back to the
;          1946  ! test cycle.  No coding is required in this section.
;          1947  !
;          1948  ! Units may be added to the test sequence only through the use of opera-
;          1949  ! tor  ADD  command.   Each unit must have a P-TABLE in memory due to an
;          1950  ! earlier hardware dialogue (i.e.  the  unit  was  previously  dropped).
;          1951  ! The  ADD code must be delimited by BGNAU, ENDAU.  There is no particu-
;          1952  ! lar coding required in the add code to cause the add to be  effective:
;          1953  !
;          1954  ! The section is just for programmer housekeeping.
;          1955  !-
;          1956  BGNAU;
;          1957  return;
;          1958  ENDAU;


                                        .SBTTL  LAU ADD UNIT SECTION
000000  000207                  LAU:    RTS     PC                              ;  1941

; Routine Size:  1 word,        Routine Base:  AA$CODE + 1136
; Maximum stack depth per invocation:  0 words



                                        .SBTTL  L$AU ADD UNIT SECTION
000000  004767  177772            L$AU::  JSR     PC,LAU                          ;  1957
000004  104452                          TRAP    52
000006  000207                          RTS     PC

; Routine Size:  4 words,       Routine Base:  AA$CODE + 1140
; Maximum stack depth per invocation:  2 words

;          1959  end
;          1960
;          1961  eludom


;                                       PSECT SUMMARY
;
;       Psect Name                      Words     Attributes
;        AA$CODE                          308      RO ,  I  ,  LCL,  REL,  CON


;                                LIBRARY STATISTICS
;
;                                              -------- Symbols --------    Blocks
;       File                                   Total    Loaded   Percent      Read
;
;  SPIDER$USERS:[NEALE.AZTEC]CZRCH0.L16;5
```

```
;                                       398        62        15        24



;                                       COMMAND QUALIFIERS

;       BLISS /PDP11/LIST CZRCH3.B16

; Size:         258 code + 50 data words
; Run Time:       00:17.0
; Elapsed Time:   00:23.5
; Memory Used:  214 pages
; Compilation Complete
```

```
0001  MODULE CZRCH4 (%TITLE 'CZRCH RC25 DISK FORMATTER'
0002                  IDENT = 'REV A PATCH 00',
0003                  ADDRESSING_MODE (RELATIVE) ,
0004                  ENVIRONMENT (NOEIS)
0005                  ) =
0006  BEGIN
0007  %sbttl 'MODULE DECLARATIONS'
0008  !
0009  ! Pretty Declarations
0010  !
0011  !<blf/lowercase_key>
0012  !
0013
0014  library 'CZRCH0';                          !Define RC25 formatter library
0015
0016  require 'BLSMAC.REQ';                      !Define Bliss Macro require file
1505
1506  !+
1507  ! The  psect named  "code or $code$" is redefinded here
1508  ! to be called "ab$code".  This is done to organize the
1509  ! formatters  test  sections  into  a  seperate  psect.
1510  !-
1511  psect
1512      code = ab$code;
1513
1514  !+
1515  ! Structure declarations used within this module.
1516  !-
1517
1518  structure
1519
1520      !+
1521      ! RC25  register  accessing  structure. This
1522      ! structure  allows  RC25 register accessing
1523      ! to  be transportable between the PDP-11 and
1524      ! VAX Diagnostic Supervisors.
1525      !
1526      ! This  also  defines an access algorithm for
1527      ! VAX to allow field reference to MBA address
1528      ! space  without  generating  machine checks.
1529      !-
1530
1531      RC25 [O, P, S, E] =
1532          begin
1533
1534          local
1535              RC$S_REG;
1536
1537          RC$S_REG = .(RC25 + %upval*0)<0, %bpval, 0>;
1538          RC$S_REG
1539          end
1540          <P, S, E>;
1541
1542  !<blf/page>
```

```
;          1543  !+
;          1544  ! External Routines declared outside this module.
;          1545  !-
;          1546
;          1547  external routine
;          1548      ABORT,
;          1549      GET_DUST_STATUS,
;          1550      EX_SUP_PROG,
;          1551      EX_LOC_PROG,
;          1552      REC_DATA,
;          1553      SEND_DATA,
;          1554      SET_CNTLR_CHAR,
;          1555      ON_LINE,
;          1556      DUP$I_SERVICE : INT_LNK$TYP novalue,
;          1557      INT$I_SERVICE : INT_LNK$TYP novalue,
;          1558      INIT_COM_AREA,
;          1559      BOOT_RC25,
;          1560      DECODE : novalue;
;          1561
;          1562  !<blf/page>
```

```
;       1563  !+
;       1564  ! External Declaration of  datums declared outside of this module.
;       1565  !-
;       1566
;       1567  external
;       1568      !
;       1569      ! Micellanious external data declarations
;       1570      !
;       1571      SW_UNATT,                                   !Unattended reformat mode flag
;       1572      DATETXT : vector [12, byte],                !Stores operator date input
;       1573      LUN : word,                                 !Logical unit number storage
;       1574      UNIT_NO : word,                             !Physical unit number storage
;       1575      FLG_WRD : bitvector [16],                   !Global flag word
;       1576      ISD_STRUCT : blockvector [4, 2, word] field (ISD_FIELD),    !Init sequence data
;       1577      PTB[_PTR : ref vector [4, word] volatile,
;       1578      NEX_FLAG : word,                            !RC25 register existence flag
;       1579      NXT_CRN : byte,                             !Next seq command ref number
;       1580      RET_EN$AD : ref block [RB_SIZE + 2, word] field (ENV_FIELD),
;       1581      FCT_BUF : block [256, word],                !External FCT sector load buffer
;       1582      SND_BUF : vector [SNDB_SIZE, word],         !DUP send cmd text buffer
;       1583      REC_BUF : block [RECB_SIZE, word] field (RECB_FIELD),       !DUP receive  cmd text buffer
;       1584      MSGADR,                                     !Pointer to DM sent ascii text
;       1585      NSD_SLOT : word,                            !Stores next send ring slot to load cmd into
;       1586      NRD_SLOT : word,                            !Stores next receive slot to expect response in
;       1587      VEC_ADDR : word,                            !Stores controllers vector address
;       1588      RET_STATUS : word,                          !Stores return status of called routines
;       1589      PID_SAVE : vector [2, word],                !Saves process indicator word
;       1590      RC25_ADDR : ref RC25 field (ISD_FIELD),     !RC25 reference structure
;       1591      !
;       1592      ! Init sequence code error
;       1593      !
;       1594      BOOT_FAILURE,
;       1595      PROTO_VIOLATION,
;       1596      PORT_INIT_ERR,
;       1597      ACTIVE_DUP_SERVER,
;       1598      INACTIVE_DUP_SERVER,
;       1599      !
;       1600      ! External FCT request message during RESTORE formatting mode
;       1601      !
;       1602      FCT_REQ_MSG,
;       1603      !
;       1604      ! Printing format strings and ascii text strings
;       1605      !
;       1606      DATMSG,
;       1607      CRLF,
;       1608      FMT1,
;       1609      FMT5,
;       1610      FMT6,
;       1611      FMT7;
;       1612
```

```
;          1613  %sbttl 'RC25 REGISTER EXISTENCE TEST'
;          1614  BGNTST;
;          1615
;          1616  !++
;          1617  ! Functional Description :
;          1618  !       This section will be the first code to be executed during a formatting
;          1619  !       session and will ensure that the object drive to format actually does
;          1620  !       exist.  The format for the unit will be aborted if the drive fails to
;          1621  !       respond to this initial test.
;          1622  !
;          1623  ! Implicit Inputs :
;          1624  !       none
;          1625  !
;          1626  ! Implicit Outputs :
;          1627  !       none
;          1628  !
;          1629  ! Completion Codes :
;          1630  !       none
;          1631  !
;          1632  ! Side Effects :
;          1633  !       none
;          1634  !--
;          1635
;          1636  local
;          1637      EOF,                                    !EOF indicator
;          1638      DUMMY : volatile,                       !Dummy variable for register ext test
;          1639      TEMP : volatile,
;          1640      RETRIES;                                !Store number of retries to perform
;          1641
;          1642  FLG_WRD [NON_EXIST_REG] = ZERO;            !Initially clear nonexistant register flag
;          1643  NEX_FLAG = ZEROS;                         !Clear out nex flag
;          1644  SETVEC (4, INT$I_SERVICE, PRI07);         !Set up for an nex trap
;          1645  TEMP = .PTBL_PTR [WRD0];                  !Get this controllers IP address
;          1646  TEMP = .TEMP + 2;                         !Make it into the SA register address
;          1647
;          1648  if ..TEMP                                 !Read the sa register
;          1649  then                                      !This is so that if there
;          1650      begin                                 !Is an nex there will be
;          1651      DUMMY = ZEROS;                        !A single opperand inst.
;          1652      end;                                  !So that it will trap
;          1653
;          1654  CLRVEC (4);                               !correctly.
;          1655
;          1656  if .NEX_FLAG eql ONES                     !See if we got an nex
;          1657  then
;          1658      begin                                 !Address not there
;          1659      PRINTB (FMT6, .PTBL_PTR [WRD0]);      !Print error message
;          1660      FLG_WRD [NON_EXIST_REG] = ONE;        !Set flag indicating non-existant reg
;          1661      DOCLN;
;          1662      end;
;          1663
```

```
;          1664  %sbttl 'INITIALIZE RC25 CONTROLLER'
;          1665  !+
;          1666  ! The  next thing to be done is to boot the RC25  controller.  We  will  allow
;          1667  ! a few retries if not successful after the first boot  before  we  concidered
;          1668  ! the Controller dead.
;          1669  !
;          1670  ! But  before  we  do  the boot sequence the processors priority and interrupt
;          1671  ! vector address must first  be  loaded.  During  the  init  sequence the Init
;          1672  ! sequence interrupt service routine will just flag  any interrupts and ignore
;          1673  ! them since interrupts are   disabled  during  init  sequence.  Later the DUP
;          1674  ! interrupt service routine will be load and do the DUP communications protocol.
;          1675  !
;          1676  ! The following priorities will be assigned:
;          1677  !       1. Processor  will  run  at  priority zero.
;          1678  !       2. The RC25 runs at priority 5 by default.
;          1679  !       3. The  DUP interrupt routine will run at priority 7.
;          1680  !-
;          1681  SETPRI (PRI00);                                !Set the processers priority
;          1682  CLRVEC (.VEC_ADDR);                           !Clear out the vector before setting
;          1683  SETVEC (.VEC_ADDR, INT$I_SERVICE, PRI07);     !Set the interrupt service priority
;          1684                                                 !
;          1685  !+
;          1686  ! Retry  the RC25 booting until the return is true or the retry limit is reached.
;          1687  !-
;          1688  RETRIES = -1;                                 !Reset the retry counter
;          1689
;          1690  do
;          1691      begin
;          1692      RET_STATUS = BOOT_RC25 ();                 !Boot the RC25 controller
;          1693      RETRIES = .RETRIES + 1;                    !Up the retry count
;          1694      end
;          1695  until (.RET_STATUS) or (.RETRIES eqlu ONE);    !Repeat the Boot until done
;          1696
;          1697  !
;          1698  ! Report booting error if the return status  never  came  back as true.
;          1699  !
;          1700
;          1701  if not .RET_STATUS                            !Did the Controller boot
;          1702  then
;          1703      begin                                      !Report a boot error
;          1704      PRINTB (BOOT_FAILURE);
;          1705      DOCLN;                                     !Abort the program
;          1706      end;
;          1707
;          1708  !+
;          1709  ! Now  that  the RC25 controller is booted, check to make sure that the controller
;          1710  ! has done its part of the DUP  protocol  by clearing  out the port communications area.
;          1711  !
;          1712  ! While we're there set up the communication area  for the up and coming communications
;          1713  ! between the remote and host program.
;          1714  !-
;          1715
;          1716  if INIT_COM_AREA ()                            !Was the com area cleared out as expected
;          1717  then
;          1718      begin                                      !Com area not inited so error and abort
;          1719      PRINTB (PROTO_VIOLATION);
;          1720      PRINTB (PORT_INIT_ERR);
```

```
;          1721      DOCLN;
;          1722      end;
;          1723
;          1724  !
;          1725  ! Before writing the go to the IP register load the DUP interrupt service adrs
;          1726  ! into the RC25 vector address for the up and  coming  communications  between
;          1727  ! the host and controller.
;          1728  !
;          1729  CLRVEC (.VEC_ADDR);                                !Clear out the vector before starting
;          1730  SETVEC (.VEC_ADDR, DUP$I_SERVICE, PRI07);          !Set the interrupt service priority
;          1731  !+
;          1732  ! Start the controllers functional micro code by writing the SA Register
;          1733  ! with step four write data with the go bit set.
;          1734  !-
;          1735  WRT_RC25 (RCSA, (.ISD_STRUCT [BLK3, ISWRT, ISW_ALL] or %o'000001'));    !Let the controller go
```

```
;          1736  %sbttl 'BRING RC25 CONTROLLER ONLINE'
;          1737
;          1738  !++
;          1739  ! Functional Description :
;          1740  !       This section will set the RC25 controllers characteristics and place
;          1741  !       the unit on-line.
;          1742  !
;          1743  ! Implicit Inputs :
;          1744  !       none
;          1745  ! Implicit Outputs :
;          1746  !       none
;          1747  ! Completion Codes :
;          1748  !       none
;          1749  ! Side Effects :
;          1750  !       none
;          1751  !--
;          1752
;          1753  !+
;          1754  ! Set the controller characteristics.  Default values will be taken in all cases
;          1755  ! except for the host time out value which will be changed to 'wait for ever'.
;          1756  !-
;          1757
;          1758  if SET_CNTLR_CHAR () then DECODE ();           !Call decode if not successful
;          1759
;          1760  !+
;          1761  ! Do a unit on line cmd which will spin up the device and load the heads.  The
;          1762  ! unit to be placed on line will be the last unit number received from the 'gphard'
;          1763  ! macro in the init code.
;          1764  !-
;          1765  PRINTB (FMT5, .LUN, .UNIT_NO);                 !Tell operator which units coming online
;          1766                                                  !
;          1767
;          1768  if ON_LINE () then DECODE ();                  !Call decode if not successful
;          1769
```

```
;        1770  %sbttl 'DOWN LINE LOAD FORMATTER AND MONITOR TASK'
;        1771
;        1772  !++
;        1773  ! Functional Description :
;        1774  !       This section will down line-load the RC25 formatter and monitor
;        1775  !       the formatting task.
;        1776  !
;        1777  ! Implicit Inputs :
;        1778  !       none
;        1779  ! Implicit Outputs :
;        1780  !       none
;        1781  ! Completion Codes :
;        1782  !       none
;        1783  ! Side Effects :
;        1784  !       none
;        1785  !--
;        1786
;        1787  !
;        1788  ! See if the Dup server in the RC25 Controller is in an
;        1789  ! idle  state.  To do this first get the dust status and
;        1790  ! then look at the flag field bit 3 for a :
;        1791  !       0 = idle
;        1792  !       1 = active
;        1793  !
;        1794
;        1795  if GET_DUST_STATUS () then DECODE ();          !Call Decode if connection error
;        1796
;        1797  !
;        1798  ! Look in the flag field bit 3 to see if the server is active.
;        1799  !
;        1800
;        1801  if .RET_EN$AD [FLG_B3]                        !If the server is active exit and reboot
;        1802  then
;        1803      begin
;        1804      PRINTB (ACTIVE_DUP_SERVER);
;        1805      DOCLN;
;        1806      end;
;        1807
;        1808  !
;        1809  ! The  server  is  not  active  so  down  line load the formatter
;        1810  ! and start its execution by issuing a "Execute supplied program".
;        1811  ! Call  the  decode  routine  if  a  connection error is detected.
;        1812  !
;        1813
;        1814  if EX_SUP_PROG () then DECODE ();             !Call decode if connection error
;        1815
;        1816  !
;        1817  ! Get the dust status to see if the server is in an active
;        1818  ! state.  An  active state is what we want so error if the
;        1819  ! server is in an idle state.
;        1820  !
;        1821  ! If  in the active state then save the progress indicator
;        1822  ! in "Pid_save" for future reference.
;        1823  !
;        1824
;        1825  if GET_DUST_STATUS () then DECODE ();          !Call decode if connection error
;        1826
```

```
;          1827  !
;          1828  ! Look at the flag field bit 3 to see if the server is active.
;          1829  !
;          1830
;          1831  if not (.RET_EN$AD [FLG_B3])                    !Reboot if server is idle
;          1832  then
;          1833      begin
;          1834      PRINTB (INACTIVE_DUP_SERVER);
;          1835      DOCLN;
;          1836      end
;          1837  else
;          1838      begin
;          1839      PID_SAVE [0] = .RET_EN$AD [PLO_IND];          !Save progress indicator lo word
;          1840      PID_SAVE [1] = .RET_EN$AD [PHI_IND];          !Save progress indicator hi word
;          1841      end;
;          1842
;          1843  !+
;          1844  ! The  Dup  server is in the active state running the formatter
;          1845  ! program.  This  DO  LOOP  will  loop  on the DUP sub-protocol
;          1846  ! doing  the "send  and receive" data commands.  These commands
;          1847  ! establish  the communications  between  this host program and
;          1848  ! the  remote formatter program running in the RC25 controller.
;          1849  !-
;          1850  RETRIES = ZERO;                                 !Clear out the retry flag
;          1851
;          1852  while TRUE do
;          1853      begin
;          1854
;          1855      !+
;          1856      ! Do a 'Receive_data' command which poll's the remote program
;          1857      ! for  a  message.  The  returned  message  can  either be a:
;          1858      !
;          1859      !   1. Question
;          1860      !         Where the ascii text is a prompt for information.
;          1861      !
;          1862      !   2. Default question
;          1863      !         Where  the  default question message is identical
;          1864      !         to  the  question message exept that a null (zero
;          1865      !         length) send data is taken to be a default answer
;          1866      !         to the question.
;          1867      !
;          1868      !   3. Information
;          1869      !         Where the  ascii  text  is an informative message.
;          1870      !
;          1871      !   4. Termination
;          1872      !         Where the ascii text is an normal termination message.
;          1873      !
;          1874      !   5. Fatal Error
;          1875      !         Where  the  ascii  text  is a fatal error message.
;          1876      !
;          1877      !   6. Special
;          1878      !         This  type is used when only a host program could
;          1879      !         respond.
;          1880      !-
;          1881
;          1882      if REC_DATA () then DECODE ();              !Call decode if connection error
;          1883
```

```
;          1884      !
;          1885      ! From  the first word in the send/receive data buffer, look
;          1886      ! to  see  what type  message the remote program has sent to
;          1887      ! the  Host program.  Use this  message type number to index
;          1888      ! into the select expression to perform the requested action
;          1889      ! by the remote program.
;          1890      !
;          1891                                                !
;          1892      $CLRSBUF;                                 !Clear out the send buffer area
;          1893
;          1894      selectoneu .REC_BUF [MSG_TYP] of          !Select the appropriate action
;          1895          set
;          1896
;          1897          [1] :                                 !Question message type
;          1898              begin
;          1899              !
;          1900              ! Look  into  the  send/receive data buffer  at the message
;          1901              ! number field and  see  what  question the remote  program
;          1902              ! is   asking.  Use the  fields  value  to  index  into the
;          1903              ! select  expression  to  perform  the  appropriate  action.
;          1904              !
;          1905
;          1906              selectoneu .REC_BUF [MSG_NUM] of  !Select the requested question
;          1907                  set
;          1908
;          1909                  [0] :                         !Enter current date <MM-DD-YYYY>
;          1910                      begin
;          1911                      !
;          1912                      ! If in un-attended reformat mode then give to the DM the
;          1913                      ! date received from the init code else let the DM prompt
;          1914                      ! the operator for the date.
;          1915                      !
;          1916
;          1917                      if .SW_UNATT              !Is the host running in unattended mode
;          1918                      then
;          1919                          begin
;          1920
;          1921                          if .RETRIES           !Did DM not verify the date the last ime
;          1922                          then
;          1923                              begin
;          1924                              !
;          1925                              ! Clear out the date text buffer before loading in
;          1926                              ! date and ask the operator for the date again.
;          1927                              !
;          1928
;          1929                              incr i from 0 to 11 do
;          1930                                  DATETXT [.i] = ZEROS;
;          1931
;          1932                              GMANID (DATMSG, DATETXT, A, %o'177777', 8, 10, NO); !Get date from operator
;          1933                              end;
;          1934
;          1935                          $FILLDATE;            !Fill the send buffer with the date
;          1936                          RETRIES = ONE;        !Set the retry flag
;          1937                          end
;          1938                      else
;          1939                          begin
;          1940                          GMANID (MSGADR, SND_BUF, A, %o'177777', 8, 10, NO);
```

```
;          1941                            end;
;          1942
;          1943                        PRINTB (CRLF);
;          1944
;          1945                        if SEND_DATA () then DECODE ();
;          1946
;          1947                        end;
;          1948
;          1949                    [7] :                           !Enter a non-zero serial number
;          1950                        begin
;          1951                        GMANID (MSGADR, SND_BUF, A, %o'177777', 1, 64, NO);
;          1952                        PRINTB (CRLF);
;          1953
;          1954                        if SEND_DATA () then DECODE ();
;          1955
;          1956                        end;
;          1957
;          1958                    [otherwise] :                   !This message number is unknown
;          1959                        begin
;          1960                        RET_STATUS = UMN_CODE;      !Unknown message number error code
;          1961                        DECODE ();                  !Report error and die
;          1962                        end;
;          1963                    tes;
;          1964
;          1965                end;
;          1966
;          1967            [2] :                                   !Default Question
;          1968                begin
;          1969
;          1970                selectoneu .REC_BUF [MSG_NUM] of
;          1971                    set
;          1972
;          1973                    [1] :                           !Enter unit number to format <0>
;          1974                        begin
;          1975                        !
;          1976                        ! If in un-attended reformat mode then give to the DM the
;          1977                        ! unit number obtained from the hardware P_Table else let
;          1978                        ! the DM prompt the operator for the unit to format.
;          1979                        !
;          1980
;          1981                        if .SW_UNATT                !Is the host running in unattended mode
;          1982                        then
;          1983                            begin
;          1984                            SND_BUF = .UNIT_NO;
;          1985                            PRINTB (FMT7, .UNIT_NO);        !Report which unit is being formatted
;          1986                            end
;          1987                        else
;          1988                            begin
;          1989                            GMANID (MSGADR, SND_BUF, A, %o'177777', 1, 3, YES);
;          1990                            end;
;          1991
;          1992                        PRINTB (CRLF);
;          1993
;          1994                        if SEND_DATA () then DECODE ();
;          1995
;          1996                        end;
;          1997
```

```
;          1998                    [4] :                           !Use existing bad block information <N>
;          1999                        begin
;          2000                        !
;          2001                        ! If in un-attended reformat mode then tell the DM to
;          2002                        ! do a reformat mode else let the DM prompt the operator
;          2003                        ! for the formatting mode to use for this unit.
;          2004                        !
;          2005
;          2006                        if .SW_UNATT                !Is the host running in unattended mode
;          2007                        then
;          2008                            begin
;          2009                            SND_BUF = %c'Y';        !Default to do reformat mode
;          2010                            end
;          2011                        else
;          2012                            begin
;          2013                            GMANID (MSGADR, SND_BUF, A, %o'177777', 1, 3, YES);
;          2014                            end;
;          2015
;          2016                        PRINTB (CRLF);
;          2017
;          2018                        if SEND_DATA () then DECODE ();
;          2019
;          2020                        end;
;          2021
;          2022                    [5] :                           !Use down-line load <N>
;          2023                        begin
;          2024                        GMANID (MSGADR, SND_BUF, A, %o'177777', 1, 3, YES);
;          2025                        PRINTB (CRLF);
;          2026
;          2027                        if SEND_DATA () then DECODE ();
;          2028
;          2029                        end;
;          2030
;          2031                    [6] :                           !Continue if bad block information is inaccessable <N>
;          2032                        begin
;          2033
;          2034                        if .SW_UNATT                !Is the host running in unattended mode
;          2035                        then
;          2036                            begin
;          2037                            SND_BUF = %c'N';        !Default not to continue
;          2038                            end
;          2039                        else
;          2040                            begin
;          2041                            GMANID (MSGADR, SND_BUF, A, %o'177777', 1, 3, YES);
;          2042                            end;
;          2043
;          2044                        PRINTB (CRLF);
;          2045
;          2046                        if SEND_DATA () then DECODE ();
;          2047
;          2048                        end;
;          2049
;          2050                    [otherwise] :                   !This message number is unknown
;          2051                        begin
;          2052                        RET_STATUS = UMN_CODE;      !Unknown message number error code
;          2053                        DECODE ();                  !Report error and die
;          2054                        end;
```

```
;          2055                    tes;
;          2056
;          2057                end;
;          2058
;          2059            [3] :                                   !Informational message
;          2060                begin
;          2061
;          2062                selectoneu .REC_BUF [MSG_NUM] of
;          2063                    set
;          2064
;          2065                    [0, 1, 2, 3, 4, 5, 7, 9, 11, 14, 16] :  !All possible information msg's
;          2066                        begin
;          2067                        PRINTB (FMT1, MSGADR);
;          2068                        end;
;          2069
;          2070                    [otherwise] :                   !This message number is unknown
;          2071                        begin
;          2072                        RET_STATUS = UMN_CODE;      !Unknown message number error code
;          2073                        DECODE ();                  !Report error and die
;          2074                        end;
;          2075                    tes;
;          2076
;          2077                end;
;          2078
;          2079            [4] :                                   !Termination message
;          2080                begin
;          2081
;          2082                selectoneu .REC_BUF [MSG_NUM] of
;          2083                    set
;          2084
;          2085                    [12, 13] :                      !Abort and normal termination type
;          2086                        begin
;          2087                        PRINTB (FMT1, MSGADR);
;          2088                        WRT_RC25 (RCIP, ONES);      !Stop the remote program
;          2089                        exitloop                    !Return to init code
;          2090                        end;
;          2091
;          2092                    [otherwise] :                   !This message number is unknown
;          2093                        begin
;          2094                        RET_STATUS = UMN_CODE;      !Unknown message number error code
;          2095                        DECODE ();                  !Report error and die
;          2096                        end;
;          2097                    tes;
;          2098
;          2099                end;
;          2100
;          2101            [5] :                                   !Fatal error message
;          2102                begin
;          2103
;          2104                selectoneu .REC_BUF [MSG_NUM] of
;          2105                    set
;          2106
;          2107                    [1 to 24] :                     !Error messages are from 1 to 24
;          2108                        begin
;          2109                        PRINTB (FMT1, MSGADR);
;          2110                        WRT_RC25 (RCIP, ONES);      !Stop the remote program
;          2111                        DOCIN;                      !Kill this formatter and return to init code
```

```
;          2112                    end;
;          2113
;          2114                [otherwise] :                   !This message number is unknown
;          2115                    begin
;          2116                    RET_STATUS = UMN_CODE;      !Unknown message number error code
;          2117                    DECODE ();                  !Report error and die
;          2118                    end;
;          2119                tes;
;          2120
;          2121            end;
;          2122
;          2123        [6] :                                   !Special message type
;          2124            begin
;          2125
;          2126            selectoneu .REC_BUF [MSG_NUM] of
;          2127                set
;          2128
;          2129                [1] :                           !FCT sector request
;          2130                    begin
;          2131                    !
;          2132                    ! If this is the first FCT sector request (sector 0) then ask
;          2133                    ! the operator for the external FCT file name and open the file.
;          2134                    ! The supervisor will error and return to DRS> monitor if the
;          2135                    ! requested file is not found on the local load media.
;          2136                    !
;          2137
;          2138                    if .REC_BUF [MSG_TXT] eql FCT_SEC_0
;          2139                    then
;          2140                        begin
;          2141                        GMANID (FCT_REQ_MSG, SND_BUF, A, %o'177777', 1, 10, NO);
;          2142                        OPEN (SND_BUF);
;          2143                        end;
;          2144
;          2145                    !
;          2146                    ! Load into the FCT_BUF the next sequential 256 FCT sector words
;          2147                    !
;          2148
;          2149                    incr FCT_WRD from FCT_BUF to FCT_BUF + %o'776' by %o'2' do
;          2150                        begin
;          2151                        EOF = GETWORD (.FCT_WRD);
;          2152                        end;
;          2153
;          2154                    !
;          2155                    ! Test to see if the EOF indicator was returned from the GETWORD macro
;          2156                    ! before 16 FCT sectors were read indicating an illegal FCT file format.
;          2157                    !
;          2158                    ! End of file is reached when .EOF = 0;
;          2159                    !
;          2160
;          2161                    if ((.EOF eql ZERO) and (.REC_BUF [MSG_TXT] lss FCT_SEC_15)) or (.REC_BUF [MSG_TXT] gtr
;          2162                        FCT_SEC_15)
;          2163                    then
;          2164                        begin
;          2165                        SND_BUF [0] = ONES;     !Indicate failure to get good FCT file
;          2166
;          2167                        if SEND_DATA () then DECODE (); !Send failure to DM
;          2168
```

```
;          2169                        RET_STATUS = ILL_FCT;   !Host will also report the failure
;          2170                        DECODE ();              !Error out and die
;          2171                        end;
;          2172
;          2173                    !
;          2174                    ! Return to the remote program a success indicator and the
;          2175                    ! unibus lo and hi adrs of where this FCT sector can be found
;          2176                    ! and send the information back to the remote program.
;          2177                    !
;          2178                    SND_BUF [0] = ZERO;         !Indicate success
;          2179                    SND_BUF [1] = FCT_BUF;      !Lo unibus adrs of FCT sector
;          2180                    SND_BUF [2] = ZERO;         !Hi unibus adrs of FCt sector
;          2181
;          2182                    if SEND_DATA () then DECODE ();     !Send reply back to DM
;          2183
;          2184                    !
;          2185                    ! Close this External FCT file if this is FCT sector 15.
;          2186                    !
;          2187
;          2188                    if .REC_BUF [MSG_TXT] eql FCT_SEC_15 then CLOSE;
;          2189
;          2190                    end;
;          2191
;          2192                [otherwise] :
;          2193                    begin
;          2194                    RET_STATUS = UMN_CODE;
;          2195                    DECODE ();
;          2196                    end;
;          2197                tes;
;          2198
;          2199                end;
;          2200
;          2201            [otherwise] :                       !This message number is unknown
;          2202                begin
;          2203                RET_STATUS = UMT_CODE;          !Unknown message number error code
;          2204                DECODE ();                      !Report error and die
;          2205                end;
;          2206            tes;
;          2207
;          2208        end;
;          2209
;          2210    ENDTST;
```

```
                                    .TITLE  CZRCH4 CZRCH RC25 DISK FORMATTER
                                    .IDENT  /REV A /

                                    .GLOBL  ABORT, GET.DUST.STATUS, EX.SUP.PROG
                                    .GLOBL  EX.LOC.PROG, REC.DATA, SEND.DATA
                                    .GLOBL  SET.CNTLR.CHAR, ON.LINE, DUP$I.SERVICE
                                    .GLOBL  INT$I.SERVICE, INIT.COM.AREA, BOOT.RC25
                                    .GLOBL  DECODE, SW.UNATT, DATETXT, LUN
                                    .GLOBL  UNIT.NO, FLG.WRD, ISD.STRUCT, PTBL.PTR
                                    .GLOBL  NEX.FLAG, NXT.CRN, RET.EN$AD, FCT.BUF
                                    .GLOBL  SND.BUF, REC.BUF, MSGADR, NSD.SLOT
                                    .GLOBL  NRD.SLOT, VEC.ADDR, RET.STATUS
                                    .GLOBL  PID.SAVE, RC25.ADDR, BOOT.FAILURE
```

```
                                        .GLOBL  PROTO.VIOLATION, PORT.INIT.ERR
                                        .GLOBL  ACTIVE.DUP.SERVER, INACTIVE.DUP.SERVER
                                        .GLOBL  FCT.REQ.MSG, DATMSG, CRLF, FMT1
                                        .GLOBL  FMT5, FMT6, FMT7


                                        .SBTTL  $T1 DOWN LINE LOAD FORMATTER AND MONITOR TASK
000000                                  .PSECT  AB$CODE,  RO

000000  004167  000000G          $T1:   JSR     R1,$SAVE3                       ;                       1611
000004  024646                         CMP     -(SP),-(SP)
000006  142767  000002  000000G         BICB    #2,FLG.WRD                      ;                       1642
000014  005067  000000G                 CLR     NEX.FLAG                        ;                       1643
000020  012746  000340                  MOV     #340,-(SP)                      ;                       1644
000024  012746  000000G                 MOV     #INT$I.SERVICE,-(SP)
000030  012746  000004                  MOV     #4,-(SP)
000034  012746  000003                  MOV     #3,-(SP)
000040  104437                         TRAP    37
000042  017766  000000G 000010         MOV     @PTBL.PTR,10(SP)                ; *,TEMP                1645
000050  062766  000002  000010         ADD     #2,10(SP)                       ; *,TEMP                1646
000056  032776  000001  000010         BIT     #1,@10(SP)                      ; *,TEMP                1648
000064  001402                         BEQ     1$
000066  005066  000012                 CLR     12(SP)                          ; DUMMY                 1651
000072  012700  000004          1$:    MOV     #4,R0                           ;                       1654
000076  104436                         TRAP    36
000100  026727  000000G 177777         CMP     NEX.FLAG,#-1                    ;                       1656
000106  001015                         BNE     2$
000110  017716  000000G                 MOV     @PTBL.PTR,(SP)                  ;                       1659
000114  012746  000000G                 MOV     #FMT6,-(SP)
000120  012746  000002                  MOV     #2,-(SP)
000124  010600                         MOV     SP,R0                           ; SP,*
000126  104414                         TRAP    14
000130  152767  000002  000000G         BISB    #2,FLG.WRD                      ;                       1660
000136  104444                         TRAP    44
000140  022626                         CMP     (SP)+,(SP)+                     ;                       1658
000142  005000                  2$:    CLR     R0                              ;                       1681
000144  104441                         TRAP    41
000146  016700  000000G                 MOV     VEC.ADDR,R0                     ;                       1682
000152  104436                         TRAP    36
000154  012716  000340                  MOV     #340,(SP)                       ;                       1683
000160  012746  000000G                 MOV     #INT$I.SERVICE,-(SP)
000164  016746  000000G                 MOV     VEC.ADDR,-(SP)
000170  012746  000003                  MOV     #3,-(SP)
000174  104437                         TRAP    37
000176  012703  177777                 MOV     #-1,R3                          ; *,RETRIES             1688
000202  004767  000000G          3$:    JSR     PC,BOOT.RC25                    ;                       1692
000206  010067  000000G                 MOV     R0,RET.STATUS
000212  005203                         INC     R3                              ; RETRIES               1693
000214  032700  000001                  BIT     #1,R0                           ; *,RET.STATUS          1695
000220  001003                         BNE     4$
000222  020327  000001                  CMP     R3,#1                           ; RETRIES,*
000226  001365                         BNE     3$
000230  032767  000001  000000G  4$:    BIT     #1,RET.STATUS                   ;                       1701
000236  001010                         BNE     5$
000240  012716  000000G                 MOV     #BOOT.FAILURE,(SP)              ;                       1704
000244  012746  000001                  MOV     #1,-(SP)
000250  010600                         MOV     SP,R0                           ; SP,*
```

```
000252  104414                          TRAP    14
000254  104444                          TRAP    44
000256  005726                          TST     (SP)+                   ;                               1703
000260  004767  000000G          5$:    JSR     PC,INIT.COM.AREA        ;                               1716
000264  006000                          ROR     R0
000266  103016                          BCC     6$
000270  012716  000000G                MOV     #PROTO.VIOLATION,(SP)   ;                               1719
000274  012746  000001                  MOV     #1,-(SP)
000300  010600                          MOV     SP,R0                   ; SP,*
000302  104414                          TRAP    14
000304  012716  000000G                MOV     #PORT.INIT.ERR,(SP)     ;                               1720
000310  012746  000001                  MOV     #1,-(SP)
000314  010600                          MOV     SP,R0                   ; SP,*
000316  104414                          TRAP    14
000320  104444                          TRAP    44
000322  022626                          CMP     (SP)+,(SP)+             ;                               1718
000324  016700  000000G          6$:    MOV     VEC.ADDR,R0             ;                               1729
000330  104436                          TRAP    36
000332  012716  000340                  MOV     #340,(SP)               ;                               1730
000336  012746  000000G                MOV     #DUP$I.SERVICE,-(SP)
000342  016746  000000G                MOV     VEC.ADDR,-(SP)
000346  012746  000003                  MOV     #3,-(SP)
000352  104437                          TRAP    37
000354  016701  000016G                MOV     ISD.STRUCT+16,R1        ; *,RC$M.REG                    1735
000360  052701  000001                  BIS     #1,R1                   ; *,RC$M.REG
000364  016700  000000G                MOV     RC25.ADDR,R0
000370  010160  000002                  MOV     R1,2(R0)                ; RC$M.REG,*
000374  004767  000000G                JSR     PC,SET.CNTLR.CHAR       ;                               1758
000400  006000                          ROR     R0
000402  103002                          BCC     7$
000404  004767  000000G                JSR     PC,DECODE
000410  016716  000000G          7$:    MOV     UNIT.NO,(SP)            ;                               1765
000414  016746  000000G                MOV     LUN,-(SP)
000420  012746  000000G                MOV     #FMT5,-(SP)
000424  012746  000003                  MOV     #3,-(SP)
000430  010600                          MOV     SP,R0                   ; SP,*
000432  104414                          TRAP    14
000434  004767  000000G                JSR     PC,ON.LINE              ;                               1768
000440  006000                          ROR     R0
000442  103002                          BCC     8$
000444  004767  000000G                JSR     PC,DECODE
000450  004767  000000G          8$:    JSR     PC,GET.DUST.STATUS      ;                               1795
000454  006000                          ROR     R0
000456  103002                          BCC     9$
000460  004767  000000G                JSR     PC,DECODE
000464  016700  000000G          9$:    MOV     RET.EN$AD,R0            ;                               1801
000470  032760  004000  000022          BIT     #4000,22(R0)
000476  001410                          BEQ     10$
000500  012716  000000G                MOV     #ACTIVE.DUP.SERVER,(SP) ;                               1804
000504  012746  000001                  MOV     #1,-(SP)
000510  010600                          MOV     SP,R0                   ; SP,*
000512  104414                          TRAP    14
000514  104444                          TRAP    44
000516  005726                          TST     (SP)+                   ;                               1803
000520  004767  000000G          10$:   JSR     PC,EX.SUP.PROG          ;                               1814
000524  006000                          ROR     R0
000526  103002                          BCC     11$
```

```
000530  004767  000000G                        JSR     PC,DECODE
000534  004767  000000G              11$:      JSR     PC,GET.DUST.STATUS              ;                       1825
000540  006000                                 ROR     R0
000542  103002                                 BCC     12$
000544  004767  000000G                        JSR     PC,DECODE
000550  016701  000000G              12$:      MOV     RET.EN$AD,R1                    ;                       1831
000554  032761  004000  000022               BIT     #4000,22(R1)
000562  001011                                 BNE     13$
000564  012716  000000G                        MOV     #INACTIVE.DUP.SERVER,(SP)       ;                       1834
000570  012746  000001                        MOV     #1,-(SP)
000574  010600                                 MOV     SP,R0                           ; SP,*
000576  104414                                 TRAP    14
000600  104444                                 TRAP    44
000602  005726                                 TST     (SP)+                           ;                       1833
000604  000406                                 BR      14$                             ;                       1831
000606  016167  000024  000000G      13$:      MOV     24(R1),PID.SAVE                 ;                       1839
000614  016167  000026  000002G               MOV     26(R1),PID.SAVE+2               ;                       1840
000622  005003                       14$:      CLR     R3                              ; RETRIES               1850
000624  004767  000000G              15$:      JSR     PC,REC.DATA                     ;                       1882
000630  006000                                 ROR     R0
000632  103002                                 BCC     16$
000634  004767  000000G                        JSR     PC,DECODE
000640  005000                       16$:      CLR     R0                              ; I
000642  005060  000000G              17$:      CLR     SND.BUF(R0)                     ; *(I)
000646  062700  000002                        ADD     #2,R0                           ; *,I
000652  020027  000110                        CMP     R0,#110                         ; I,*
000656  101771                                 BLOS    17$
000660  016701  000000G                        MOV     REC.BUF,R1                      ;                       1894
000664  006201                                 ASR     R1
000666  006201                                 ASR     R1
000670  006201                                 ASR     R1
000672  006201                                 ASR     R1
000674  000301                                 SWAB    R1
000676  042701  177760                        BIC     #177760,R1
000702  020127  000001                        CMP     R1,#1
000706  001107                                 BNE     24$
000710  016700  000000G                        MOV     REC.BUF,R0                      ;                       1906
000714  042700  170000                        BIC     #170000,R0
000720  001060                                 BNE     23$
000722  032767  000001  000000G               BIT     #1,SW.UNATT                     ;                       1917
000730  001435                                 BEQ     21$
000732  032703  000001                        BIT     #1,R3                           ; *,RETRIES             1921
000736  001417                                 BEQ     19$
000740  005000                                 CLR     R0                              ; I                     1929
000742  105060  000000G              18$:      CLRB    DATETXT(R0)                     ; *(I)                  1930
000746  005200                                 INC     R0                              ; I                     1929
000750  020027  000013                        CMP     R0,#13                          ; I,*
000754  003772                                 BLE     18$
000756  104443                                 TRAP    43                              ;                       1932
000760  000406                                 .WORD   406
000762  000000G                                .WORD   DATETXT
000764  000142                                 .WORD   142
000766  000000G                                .WORD   DATMSG
000770  177777                                 .WORD   -1
000772  000010                                 .WORD   10
000774  000012                                 .WORD   12
000776  005000                       19$:      CLR     R0                              ; I                     1933
```

```
001000  116060  000000G 000000G        20$:    MOVB    DATETXT(R0),SND.BUF(R0)         ; *(I),*(I)
001006  005200                                 INC     R0                              ; I
001010  020027  000013                         CMP     R0,#13                          ; I,*
001014  101771                                 BLOS    20$
001016  012703  000001                         MOV     #1,R3                           ; *,RETRIES                             1936
001022  000410                                 BR      22$                             ;                                       1917
001024  104443                         21$:    TRAP    43                              ;                                       1940
001026  000406                                 .WORD   406
001030  000000G                                .WORD   SND.BUF
001032  000142                                 .WORD   142
001034  000000G                                .WORD   MSGADR
001036  177777                                 .WORD   -1
001040  000010                                 .WORD   10
001042  000012                                 .WORD   12
001044  012716  000000G                 22$:    MOV     #CRLF,(SP)                      ;                                       1943
001050  012746  000001                         MOV     #1,-(SP)
001054  010600                                 MOV     SP,R0                           ; SP,*
001056  104414                                 TRAP    14
001060  000547                                 BR      31$                             ;                                       1945
001062  020027  000007                 23$:    CMP     R0,#7                           ;                                       1906
001066  001153                                 BNE     33$
001070  104443                                 TRAP    43                              ;                                       1951
001072  000406                                 .WORD   406
001074  000000G                                .WORD   SND.BUF
001076  000142                                 .WORD   142
001100  000000G                                .WORD   MSGADR
001102  177777                                 .WORD   -1
001104  000001                                 .WORD   1
001106  000100                                 .WORD   100
001110  012716  000000G                        MOV     #CRLF,(SP)                      ;                                       1952
001114  012746  000001                         MOV     #1,-(SP)
001120  010600                                 MOV     SP,R0                           ; SP,*
001122  104414                                 TRAP    14
001124  000525                                 BR      31$                             ;                                       1954
001126  020127  000002                 24$:    CMP     R1,#2                           ;                                       1894
001132  001175                                 BNE     39$
001134  016700  000C00G                        MOV     REC.BUF,R0                      ;                                       1970
001140  042700  170000                         BIC     #170000,R0
001144  020027  000001                         CMP     R0,#1
001150  001040                                 BNE     27$
001152  032767  000001  000000G               BIT     #1,SW.UNATT                     ;                                       1981
001160  001415                                 BEQ     25$
001162  016767  000000G 000000G               MOV     UNIT.NO,SND.BUF                 ;                                       1984
001170  016716  000000G                        MOV     UNIT.NO,(SP)                    ;                                       1985
001174  012746  000000G                        MOV     #FMT7,-(SP)
001200  012746  000002                         MOV     #2,-(SP)
001204  010600                                 MOV     SP,R0                           ; SP,*
001206  104414                                 TRAP    14
001210  022626                                 CMP     (SP)+,(SP)+                     ;                                       1983
001212  000410                                 BR      26$                             ;                                       1981
001214  104443                         25$:    TRAP    43                              ;                                       1989
001216  000406                                 .WORD   406
001220  000000G                                .WORD   SND.BUF
001222  000152                                 .WORD   152
001224  000000G                                .WORD   MSGADR
001226  177777                                 .WORD   -1
001230  000001                                 .WORD   1
```

```
001232  000003                          .WORD   3
001234  012716  000000G         26$:    MOV     #CRLF,(SP)              ;                       1992
001240  012746  000001                  MOV     #1,-(SP)
001244  010600                          MOV     SP,R0                   ; SP,*
001246  104414                          TRAP    14
001250  000453                          BR      31$                     ;                       1994
001252  020027  000004          27$:    CMP     R0,#4                   ;                       1970
001256  001027                          BNE     30$
001260  032767  000001  000000G         BIT     #1,SW.UNATT             ;                       2006
001266  001404                          BEQ     28$
001270  012767  000131  000000G         MOV     #131,SND.BUF            ;                       2009
001276  000410                          BR      29$                     ;                       2006
001300  104443                  28$:    TRAP    43                      ;                       2013
001302  000406                          .WORD   406
001304  000000G                         .WORD   SND.BUF
001306  000152                          .WORD   152
001310  000000G                         .WORD   MSGADR
001312  177777                          .WORD   -1
001314  000001                          .WORD   1
001316  000003                          .WORD   3
001320  012716  000000G         29$:    MOV     #CRLF,(SP)              ;                       2016
001324  012746  000001                  MOV     #1,-(SP)
001330  010600                          MOV     SP,R0                   ; SP,*
001332  104414                          TRAP    14
001334  000421                          BR      31$                     ;                       2018
001336  020027  000005          30$:    CMP     R0,#5                   ;                       1970
001342  001023                          BNE     32$
001344  104443                          TRAP    43                      ;                       2024
001346  000406                          .WORD   406
001350  000000G                         .WORD   SND.BUF
001352  000152                          .WORD   152
001354  000000G                         .WORD   MSGADR
001356  177777                          .WORD   -1
001360  000001                          .WORD   1
001362  000003                          .WORD   3
001364  012716  000000G                 MOV     #CRLF,(SP)              ;                       2025
001370  012746  000001                  MOV     #1,-(SP)
001374  010600                          MOV     SP,R0                   ; SP,*
001376  104414                          TRAP    14
001400  004767  000000G         31$:    JSR     PC,SEND.DATA            ;                       2027
001404  006000                          ROR     R0
001406  103436                          BLO     36$
001410  000437                          BR      37$                     ;                       2023
001412  020027  000006          32$:    CMP     R0,#6                   ;                       1970
001416  001036                  33$:    BNE     38$
001420  032767  000001  000000G         BIT     #1,SW.UNATT             ;                       2034
001426  001404                          BEQ     34$
001430  012767  000116  000000G         MOV     #116,SND.BUF            ;                       2037
001436  000410                          BR      35$                     ;                       2034
001440  104443                  34$:    TRAP    43                      ;                       2041
001442  000406                          .WORD   406
001444  000000G                         .WORD   SND.BUF
001446  000152                          .WORD   152
001450  000000G                         .WORD   MSGADR
001452  177777                          .WORD   -1
001454  000001                          .WORD   1
001456  000003                          .WORD   3
```

```
001460  012716  000000G                 35$:    MOV     #CRLF,(SP)                      ;                               2044
001464  012746  000001                          MOV     #1,-(SP)
001470  010600                                  MOV     SP,R0                           ; SP,*
001472  104414                                  TRAP    14
001474  004767  000000G                         JSR     PC,SEND.DATA                    ;                               2046
001500  006000                                  ROR     R0
001502  103002                                  BCC     37$
001504  004767  000000G                 36$:    JSR     PC,DECODE
001510  005726                          37$:    TST     (SP)+                           ;                               2032
001512  000533                                  BR      44$                             ;                               1970
001514  012767  004001  000000G         38$:    MOV     #4001,RET.STATUS                ;                               2052
001522  000167  000532                          JMP     57$                             ;                               2053
001526  020127  000003                 39$:    CMP     R1,#3                           ;                               1894
001532  001037                                  BNE     41$
001534  016700  000000G                         MOV     REC.BUF,R0                      ;                               2062
001540  042700  170000                          BIC     #170000,R0
001544  020027  000005                          CMP     R0,#5
001550  101417                                  BLOS    40$
001552  020027  000007                          CMP     R0,#7
001556  001414                                  BEQ     40$
001560  020027  000011                          CMP     R0,#11
001564  001411                                  BEQ     40$
001566  020027  000013                          CMP     R0,#13
001572  001406                                  BEQ     40$
001574  020027  000016                          CMP     R0,#16
001600  001403                                  BEQ     40$
001602  020027  000020                          CMP     R0,#20
001606  001342                                  BNE     38$
001610  012716  000000G                 40$:    MOV     #MSGADR,(SP)                    ;                               2067
001614  012746  000000G                         MOV     #FMT1,-(SP)
001620  012746  000002                          MOV     #2,-(SP)
001624  010600                                  MOV     SP,R0                           ; SP,*
001626  104414                                  TRAP    14
001630  000463                                  BR      43$                             ;                               2066
001632  020127  000004                 41$:    CMP     R1,#4                           ;                               1894
001636  001030                                  BNE     42$
001640  016700  000000G                         MOV     REC.BUF,R0                      ;                               2082
001644  042700  170000                          BIC     #170000,R0
001650  020027  000014                          CMP     R0,#14
001654  103717                                  BLO     38$
001656  020027  000015                          CMP     R0,#15
001662  101314                                  BHI     38$
001664  012716  000000G                         MOV     #MSGADR,(SP)                    ;                               2087
001670  012746  000000G                         MOV     #FMT1,-(SP)
001674  012746  000002                          MOV     #2,-(SP)
001700  010600                                  MOV     SP,R0                           ; SP,*
001702  104414                                  TRAP    14
001704  022626                                  CMP     (SP)+,(SP)+
001706  012700  177777                          MOV     #-1,R0                          ; *,RC$M.REG                    2088
001712  010077  000000G                         MOV     R0,@RC25.ADDR                   ; RC$M.REG,*
001716  000564                                  BR      59$                             ;                               2086
001720  020127  000005                 42$:    CMP     R1,#5                           ;                               1894
001724  001027                                  BNE     45$
001726  016700  000000G                         MOV     REC.BUF,R0                      ;                               2104
001732  042700  170000                          BIC     #170000,R0
001736  001666                                  BEQ     38$
001740  020027  000030                          CMP     R0,#30
```

```
001744  101263                          BHI     38$
001746  012716  000000G                 MOV     #MSGADR,(SP)            ;                       2109
001752  012746  000000G                 MOV     #FMT1,-(SP)
001756  012746  000002                  MOV     #2,-(SP)
001762  010600                          MOV     SP,R0                   ; SP,*
001764  104414                          TRAP    14
001766  012700  177777                  MOV     #-1,R0                  ; *,RC$M.REG            2110
001772  010077  000000G                 MOV     R0,@RC25.ADDR           ; RC$M.REG,*
001776  104444                          TRAP    44
002000  022626                  43$:    CMP     (SP)+,(SP)+             ;                       2108
002002  000530                  44$:    BR      58$                     ;                       2104
002004  020127  000006          45$:    CMP     R1,#6                   ;                       1894
002010  001120                          BNE     56$
002012  016700  000000G                 MOV     REC.BUF,R0              ;                       2126
002016  042700  170000                  BIC     #170000,R0
002022  020027  000001                  CMP     R0,#1
002026  001232                          BNE     38$
002030  005767  000002G                 TST     REC.BUF+2               ;                       2138
002034  001013                          BNE     46$
002036  104443                          TRAP    43                      ;                       2141
002040  000406                          .WORD   406
002042  000000G                         .WORD   SND.BUF
002044  000142                          .WORD   142
002046  000000G                         .WORD   FCT.REQ.MSG
002050  177777                          .WORD   -1
002052  000001                          .WORD   1
002054  000012                          .WORD   12
002056  012700  000000G                 MOV     #SND.BUF,R0             ;                       2142
002062  104434                          TRAP    34
002064  012701  000000G          46$:    MOV     #FCT.BUF,R1             ; *,FCT.WRD             2149
002070  000412                          BR      50$
002072  010100                  47$:    MOV     R1,R0                   ; FCT.WRD,*             2151
002074  104427                          TRAP    27
002076  103004                          BHIS    48$
002100  010011                          MOV     R0,(R1)                 ; R0,FCT.WRD
002102  012702  000001                  MOV     #1,R2                   ; *,EOF
002106  000401                          BR      49$
002110  005002                  48$:    CLR     R2                      ; EOF
002112  062701  000002          49$:    ADD     #2,R1                   ; *,FCT.WRD             2149
002116  020127  000776G         50$:    CMP     R1,#FCT.BUF+776         ; FCT.WRD,*
002122  003763                          BLE     47$
002124  005702                          TST     R2                      ; EOF                   2161
002126  001004                          BNE     51$
002130  026727  000002G 000017          CMP     REC.BUF+2,#17
002136  002404                          BLT     52$
002140  026727  000002G 000017  51$:    CMP     REC.BUF+2,#17
002146  003416                          BLE     54$
002150  012767  177777  000000G 52$:    MOV     #-1,SND.BUF             ;                       2165
002156  004767  000000G                 JSR     PC,SEND.DATA            ;                       2167
002162  006000                          ROR     R0
002164  103002                          BCC     53$
002166  004767  000000G                 JSR     PC,DECODE
002172  012767  006001  000000G 53$:    MOV     #6001,RET.STATUS        ;                       2169
002200  004767  000000G                 JSR     PC,DECODE               ;                       2170
002204  005067  000000G          54$:    CLR     SND.BUF                 ;                       2178
002210  012767  000000G 000002G         MOV     #FCT.BUF,SND.BUF+2      ;                       2179
002216  005067  000004G                 CLR     SND.BUF+4               ;                       2180
```

```
002222  004767  000000G                        JSR     PC,SEND.DATA                    ;                       2182
002226  006000                                  ROR     R0
002230  103002                                  BCC     55$
002232  004767  000000G                        JSR     PC,DECODE
002236  026727  000002G 000017          55$:    CMP     REC.BUF+2,#17                   ;                       2188
002244  001007                                  BNE     58$
002246  104435                                  TRAP    35
002250  000405                                  BR      58$                             ;                       2126
002252  012767  001001  000000G         56$:    MOV     #1001,RET.STATUS                ;                       2203
002260  004767  000000G                 57$:    JSR     PC,DECODE                       ;                       2204
002264  000167  176334                  58$:    JMP     15$                             ;                       1852
002270  062706  000036                  59$:    ADD     #36,SP                          ;                       1611
002274  000207                                  RTS     PC

; Routine Size:  607 words,     Routine Base:  AB$CODE + 0000
; Maximum stack depth per invocation:  23 words



                                        .SBTTL  T1 DOWN LINE LOAD FORMATTER AND MONITOR TASK
000000  004767  175476                  T1::
000000                                  1$:     JSR     PC,$T1                          ;                       2208
000004  104466                                  TRAP    66
000006  006000                                  ROR     R0
000010  103773                                  BLO     1$
000012  000207                                  RTS     PC

; Routine Size:  6 words,       Routine Base:  AB$CODE + 2276
; Maximum stack depth per invocation:  2 words

;         2211  end
;         2212
;         2213  eludom


;                                       OTS external references
                                                .GLOBL  $SAVE3


;                                       PSECT SUMMARY
;
;       Psect Name                      Words     Attributes
;        AB$CODE                          613       RO ,  I  ,  LCL,  REL,  CON


;                               LIBRARY STATISTICS
;
;                                               -------- Symbols --------     Blocks
;       File                                    Total    Loaded   Percent       Read
;
;  SPIDER$USERS:[NEALE.AZTEC]CZRCH0.L16;5
;                                                398       168        42         38
```

```
;                                       COMMAND QUALIFIERS

;       BLISS /PDP11/LIST CZRCH4.B16

; Size:          613 code + 0 data words
; Run Time:        00:23.9
; Elapsed Time:    00:33.5
; Memory Used:  386 pages
; Compilation Complete
```

```
;       0001  MODULE CZRCH5 (%TITLE 'CZRCH RC25 DISK FORMATTER'
;       0002                 IDENT = 'REV A PATCH 00',
;       0003                 ADDRESSING_MODE (RELATIVE) ,
;       0004                 ENVIRONMENT (NOEIS)
;       0005                 ) =
;       0006  BEGIN
;       0007  %sbttl 'MODULE DECLARATIONS'
;       0008  !
;       0009  ! Pretty Declarations
;       0010  !
;       0011  !<blf/lowercase_key>
;       0012  !
;       0013
;       0014  library 'CZRCH0';                          !Define RC25 Formatter library
;       0015
;       0016  require 'BLSMAC.REQ';                      !Define Bliss Macro require file
;       1505
;       1506  !+
;       1507  ! A  forward-routine-declaration declares  a  name  to be  a routine-name whose
;       1508  ! definition is given later in the same block, and associates with that name the
;       1509  ! set   of attributes  needed for  generation  of call  to the  named  routine.
;       1510  !
;       1511  ! The  following is a list of all routines declared within this module and can
;       1512  ! be  noted that this module is only place where global routines are declared.
;       1513  !-
;       1514
;       1515  forward routine
;       1516      LOAD_FILE,                             !Load file from local load media
;       1517      GET_NSD,                               !Get next send descriptor slot index
;       1518      GET_NRD,                               !Get next receive descriptor slot index
;       1519      LOAD_OUT$STD_BUF,                      !Load out standing command buffer
;       1520      GET_CMD$REF,                           !Get unique command reference number
;       1521      DECODE : novalue,                      !Decode return status error code
;       1522      DUP$I_SERVICE : INT_LNK$TYP novalue,   !Dup/UQ port interrupt service routine
;       1523      CTO_WAIT,                              !Command time out wait
;       1524      ABORT,                                 !Abort Dup command
;       1525      GET_DUST_STATUS,                       !Get Dust Status command
;       1526      EX_SUP_PROG,                           !Execute Supplied Program command
;       1527      EX_LOC_PROG,                           !Execute Local Program command
;       1528      SEND_DATA,                             !Send Data command
;       1529      REC_DATA,                              !Receive Data command
;       1530      SET_CNTLR_CHAR,                        !Set Controller Characteristics command
;       1531      ON_LINE,                               !On Line command
;       1532      INT$I_SERVICE : INT_LNK$TYP novalue,   !Initialization sequence interrupt service
;       1533      IS_TIMER,                              !Initialization sequence time-out wait
;       1534      BOOT_RC25,                             !Initialize sequence for RC25 controller
;       1535      INIT_COM_AREA;                         !Initialize UQ Port communication area
;       1536
;       1537  !<BLF/PAGE>
```

```
;          1538  !+
;          1539  ! The psect named "code or $code$" is redefinded here to be called "ac$code".
;          1540  ! This is done to organize formatter routine code into a seperate psect.
;          1541  !-
;          1542  psect
;          1543      code = ac$code;
;          1544
;          1545  !+
;          1546  ! Structure declarations used within this module.
;          1547  !-
;          1548
;          1549  structure
;          1550
;          1551      !+
;          1552      ! RC25  register  accessing  structure.  This structure allows RC25 register
;          1553      ! accessing to be transportable between the PDP-11 and VAX Diagnostic Supervisors.
;          1554      !
;          1555      ! This  also  defines an access algorithm for VAX to allow field reference
;          1556      ! to MBA address space without generating machine checks.
;          1557      !-
;          1558
;          1559      RC25 [O, P, S, E] =
;          1560          begin
;          1561
;          1562          local
;          1563              RC$S_REG;
;          1564
;          1565          RC$S_REG = .(RC25 + %upval*0)<0, %bpval, 0>;
;          1566          RC$S_REG
;          1567          end
;          1568          <P, S, E>;
;          1569
;          1570  !<blf/page>
```

```
;          1571  !+
;          1572  ! External Declaration of  datums declared outside of this module.
;          1573  !-
;          1574
;          1575  external
;          1576      !
;          1577      ! Communications area declarations
;          1578      !
;          1579      COM_AREA : blockvector [REC_ALLOCATE + SND_ALLOCATE + HDR_SIZ, 2, word],
;          1580      HEAD_AREA : ref block [4, word] field (HDR_FIELD),
;          1581      RECEIVE_RING : ref blockvector [REC_ALLOCATE, 2, word] field (DSC_FIELD),
;          1582      SEND_RING : ref blockvector [SND_ALLOCATE, 2, word] field (DSC_FIELD),
;          1583      REC_ENVELOPE : blockvector [REC_ALLOCATE, RB_SIZE + 2, word] field (ENV_FIELD),
;          1584      SND_ENVELOPE : blockvector [SND_ALLOCATE, SB_SIZE + 2, word] field (ENV_FIELD),
;          1585      RET_EN$AD : ref block [RB_SIZE + 2, word] field (ENV_FIELD),
;          1586      REC_BUF : block [RECB_SIZE, word] field (RECB_FIELD),
;          1587      SND_BUF : vector [SNDB_SIZE, word],
;          1588      OUT$STD_BUF : blockvector [REC_ALLOCATE, 2, word] field (OUT$FIELD),
;          1589      !
;          1590      ! Miscellanious external data declarations
;          1591      !
;          1592      NEX_FLAG : word,                                !Non-existent RC25 register flag
;          1593      NRD_SLOT : word,                                !Next receive descriptor slot
;          1594      NSD_SLOT : word,                                !Next send descriptor slot
;          1595      RC25_ADDR : ref RC25 field (ISD_FIELD),         !Controller reg access struct
;          1596      RET_STATUS : word,                              !Global return status location
;          1597      PID_SAVE : vector [2, word],                    !Saves program indicator field
;          1598      VEC_ADDR : word,                                !RC25 interrupt vector address
;          1599      RSVD_STRUCT : vector [4, word],                 !Stores init seq resvered fields
;          1600      ISD_STRUCT : blockvector [4, 2, word] field (ISD_FIELD),    !Init seq data
;          1601      UNIT_NO : word,                                 !P_table unit number to format
;          1602      NXT_CRN : byte,                                 !Stores next cmd ref number
;          1603      !
;          1604      ! Error Messages Structures
;          1605      !
;          1606      PFE_STRUCT : vector [23],                       !Port fatal error msg struct
;          1607      EMSG_STRUCT : vector [23],                      !Error message structure
;          1608      RC_STRUCTURE : vector [39],                     !RC25 SA register fatal error
;          1609      SDUP_STRUCT : vector [7],                       !DUP return status code messages
;          1610      SMSCP_STRUCT : vector [13],                     !MSCP return status code messages
;          1611  !<blf/page>
```

```
;         1612      !
;         1613      ! Formatted ascii strings
;         1614      !
;         1615      PID_FMT,                                  !Progess indicator printing string
;         1616      FMT4,                                     !Micro code version printing format
;         1617      !
;         1618      ! DM code parameter declarations
;         1619      !
;         1620      ! The  following  declarations  are  declared in module azkel6 'DM code
;         1621      ! module'  and point to the starting address of specific DM  code buffer areas.
;         1622      !
;         1623      ! (OVSA is declared in azkel2 and is a memory location however)
;         1624      !
;         1625      ! It  is  a hack but the azfmtr storage allocation must be  edited in manually
;         1626      ! any time the DM code buffer changes.  Get this  value from the output  of
;         1627      ! DMCONV program.  (Bliss wants this allocation value to be a compile time constant).
;         1628      !
;         1629      AZFMTR : vector [8892, word],             !RC25 formatter DM code buffer
;         1630      HDSA,                                     !Host DM code header address
;         1631      DMSA,                                     !Host DM code initial load address
;         1632      OVSA;                                     !Host First overlay address
;         1633
```

```
;          1634  global routine LOAD_FILE (BUF_LOC, FN_EXT, BUF_SIZ) =   !Load file from local load maedia
;          1635
;          1636  !++
;          1637  ! Functional Description :
;          1638  !       This multi-purpose routine is used to read in files from the boot
;          1639  !       device into host memory space at the specified  buffer address.
;          1640  !
;          1641  ! Formal Parameters :
;          1642  !       BUF_LOC         This contains the host memory address where
;          1643  !                       words read in from the boot device are to
;          1644  !                       be loaded.
;          1645  !
;          1646  !       FN_EXT          This contains a pointer to an asciz string
;          1647  !                       of the file name to be read in.
;          1648  !
;          1649  !       BUF_SIZ         This contains the number of words allocated
;          1650  !                       for the buffer where the file is to be read
;          1651  !                       in.  This is used for protect against buffer
;          1652  !                       over runs.
;          1653  ! Implicit Inputs :
;          1654  !       none
;          1655  !
;          1656  ! Implicit Outputs :
;          1657  !       none
;          1658  !
;          1659  ! Compietion Codes :
;          1660  !       FRE_CODE        Is returned if the end-of-file indicator is
;          1661  !                       not returned before the buffer is full.
;          1662  !
;          1663  !       PAS_CODE        Is returned if end-of-file indicator is returned
;          1664  !                       before the buffer is full.
;          1665  !
;          1666  ! Side Effects :
;          1667  !       Data previously loaded in the specified load buffer is
;          1668  !       destroyed by the incomming file from disk.
;          1669  !--
;          1670
;          1671      begin
;          1672
;          1673      local
;          1674          NEOF,                                   !Return status from getword macro
;          1675          EOB;                                    !End of buffer address storage
;          1676
;          1677      OPEN (.FN_EXT);                             !Open the file for input
;          1678      EOB = (.BUF_SIZ*2) + .BUF_LOC;              !Calculate the last buffer address
;          1679
;          1680      !+
;          1681      ! Read the first block from the input file and through
;          1682      ! it away since it only contains RT-11 information.
;          1683      !-
;          1684
;          1685      incru i from 0 to 255 do
;          1686          begin
;          1687          GETWORD (.BUF_LOC);
;          1688          end;
;          1689
;          1690      !+
```

```
;          1691      ! Loop on getting a word from the load file.  After
;          1692      ! increment to the next word by adding %o'2' to the
;          1693      ! buffer load addrss.  Continue getting words until
;          1694      ! the not complete indicator is returned (0) or the
;          1695      ! buffer is over run.  Return an error code if the
;          1696      ! buffer is over run.
;          1697      !-
;          1698
;          1699      do
;          1700          begin
;          1701          NEOF = GETWORD (.BUF_LOC);              !Read next word into .mem_loc
;          1702          BUF_LOC = .BUF_LOC + %o'2';             !Increment to next word
;          1703          end
;          1704      until ( not .NEOF) or (.BUF_LOC eqlu .EOB); !Repeat until eof or buf overrun
;          1705
;          1706      !
;          1707      ! Return an error code if not eof (neof = 1) else close the file and return a pass code.
;          1708      !
;          1709
;          1710      if .NEOF                                    !Was the eof indicator returned
;          1711      then
;          1712          return RET_STATUS = FRE_CODE            !Return error code to caller
;          1713      else
;          1714          begin
;          1715          CLOSE;                                  !Eof was returned so close file
;          1716          end;
;          1717
;          1718      return RET_STATUS = PAS_CODE;               !Return a pass code to the caller
;          1719      end;


                                        .TITLE  CZRCH5 CZRCH RC25 DISK FORMATTER
                                        .IDENT  /REV A /

                                        .GLOBL  COM.AREA, HEAD.AREA, RECEIVE.RING
                                        .GLOBL  SEND.RING, REC.ENVELOPE, SND.ENVELOPE
                                        .GLOBL  RET.EN$AD, REC.BUF, SND.BUF, OUT$STD.BUF
                                        .GLOBL  NEX.FLAG, NRD.SLOT, NSD.SLOT, RC25.ADDR
                                        .GLOBL  RET.STATUS, PID.SAVE, VEC.ADDR
                                        .GLOBL  RSVD.STRUCT, ISD.STRUCT, UNIT.NO
                                        .GLOBL  NXT.CRN, PFE.STRUCT, EMSG.STRUCT
                                        .GLOBL  RC.STRUCTURE, SDUP.STRUCT, SMSCP.STRUCT
                                        .GLOBL  PID.FMT, FMT4, AZFMTR, HDSA, DMSA
                                        .GLOBL  OVSA


                                        .SBTTL  LOAD.FILE MODULE DECLARATIONS
000000                                  .PSECT  AC$CODE,  RO

000000  004167  000000G       LOAD.FILE::
                                JSR     R1,$SAVE3                       ;                               1634
000004  016600  000014                  MOV     14(SP),R0               ; FN.EXT,*                      1677
000010  104434                          TRAP    34
000012  016600  000012                  MOV     12(SP),R0               ; BUF.SIZ,*                     1678
000016  006300                          ASL     R0
000020  016602  000016                  MOV     16(SP),R2               ; BUF.LOC,*
000024  060200                          ADD     R2,R0
```

```
000026  010003                          MOV     R0,R3                   ; *,EOB
000030  005001                          CLR     R1                      ; I                             1685
000032  010200                  1$:     MOV     R2,R0                   ;                               1687
000034  104427                          TRAP    27
000036  103001                          BHIS    2$
000040  010012                          MOV     R0,(R2)                 ; R0,*
000042  005201                  2$:     INC     R1                      ; I                             1685
000044  020127  000377                  CMP     R1,#377                 ; I,*
000050  101770                          BLOS    1$
000052  016600  000016          3$:     MOV     16(SP),R0               ; BUF.LOC,*                     1701
000056  104427                          TRAP    27
000060  103005                          BHIS    4$
000062  010076  000016                  MOV     R0,@16(SP)              ; R0,BUF.LOC
000066  012702  000001                  MOV     #1,R2                   ; *,NEOF
000072  000401                          BR      5$
000074  005002                  4$:     CLR     R2                      ; NEOF
000076  062766  000002  000016  5$:     ADD     #2,16(SP)               ; *,BUF.LOC                     1702
000104  032702  000001                  BIT     #1,R2                   ; *,NEOF                        1704
000110  001403                          BEQ     6$
000112  026603  000016                  CMP     16(SP),R3               ; BUF.LOC,EOB
000116  001355                          BNE     3$
000120  006002                  6$:     ROR     R2                      ; NEOF                          1710
000122  103005                          BCC     7$
000124  012700  005001                  MOV     #5001,R0                ;                               1712
000130  010067  000000G                 MOV     R0,RET.STATUS
000134  000207                          RTS     PC
000136  104435                  7$:     TRAP    35                      ;                               1714
000140  005067  000000G                 CLR     RET.STATUS              ;                               1718
000144  005000                          CLR     R0                      ;                               1671
000146  000207                          RTS     PC                      ;                               1634

; Routine Size:  52 words,      Routine Base:  AC$CODE + 0000
; Maximum stack depth per invocation:  6 words


;         1720
```

```
;          1721  global routine GET_NSD =                        !Chooses the next send slot
;          1722
;          1723  !++
;          1724  ! Functional Description :
;          1725  !       This  routine  will determine  which send ring  descriptor  the port/controller
;          1726  !       is polling  and  returns that  dsc slot number to the calling routine.
;          1727  !       This host program will call this routine each time it wishes to deposit
;          1728  !       another command into the command (send) ring.
;          1729  ! Formal Parameters :
;          1730  !       none
;          1731  ! Implicit Inputs :
;          1732  !       NSD_SLOT :      Global  storage for  the next  send descriptor slot.
;          1733  !                       Stores where the host should place this command for
;          1734  !                       processing by the port/controller.
;          1735  ! Implicit Outputs :
;          1736  !       The   global  storage  'Nsd_slot"  is  updated  to the
;          1737  !       present send slot where the port/controller is polling.
;          1738  ! Completion Codes :
;          1739  !       Returns the contents of 'Nsd_slot" to the calling routine.
;          1740  ! Side Effects :
;          1741  !       none
;          1742  !--
;          1743
;          1744      begin
;          1745      !
;          1746      ! Increment the next send descriptor_slot by one
;          1747      !
;          1748      NSD_SLOT = .NSD_SLOT + 1;
;          1749      !
;          1750      ! Set the slot pointer back to zero if it wraps around to the top of the ring.
;          1751      !
;          1752
;          1753      if .NSD_SLOT gtru SND_ALLOCATE - 1 then NSD_SLOT = ZERO;
;          1754
;          1755      !
;          1756      ! Return the next send descriptor_slot to the caller
;          1757      !
;          1758      return .NSD_SLOT;
;          1759      end;


                                                .SBTTL  GET.NSD MODULE DECLARATIONS
000000  005267  000000G                 GET.NSD::
                                                INC     NSD.SLOT                        ;                1748
000004  026727  000000G 000003                  CMP     NSD.SLOT,#3                     ;                1753
000012  101402                                  BLOS    1$
000014  005067  000000G                         CLR     NSD.SLOT
000020  016700  000000G                 1$:     MOV     NSD.SLOT,R0                     ;                1744
000024  000207                                  RTS     PC                              ;                1721

; Routine Size:  11 words,      Routine Base:  AC$CODE + 0150
; Maximum stack depth per invocation:  0 words


;          1760
```

```
;         1761  global routine GET_NRD =                    !Chooses the next receive slot
;         1762
;         1763  !++
;         1764  ! Functional Description :
;         1765  !       This   routine will determine which receive ring descriptor the port/controller
;         1766  !       is polling and returns that dsc slot number to the calling routine.  This
;         1767  !       host program will call this routine each time it wishes to process another
;         1768  !       receive ring descriptor.
;         1769  ! Formal Parameters :
;         1770  !       none
;         1771  ! Implicit Inputs :
;         1772  !       NRD_SLOT :      Global storage for the next receive descriptor slot.
;         1773  !                       Stores  where  the port should return this commands
;         1774  !                       response indicator.
;         1775  ! Implicit Outputs :
;         1776  !       The global storage 'Nrd_slot" is updated to the present receive slot
;         1777  !       where the port/controller is polling.
;         1778  ! Completion Codes :
;         1779  !       Returns the contents of 'Nrd_slot" to the calling routine.
;         1780  ! Side Effects :
;         1781  !       none
;         1782  !--
;         1783
;         1784      begin
;         1785      !
;         1786      ! Increment the next receive descriptor_slot by one
;         1787      !
;         1788      NRD_SLOT = .NRD_SLOT + 1;
;         1789      !
;         1790      ! Set the slot pointer back to zero if it wraps around to the top of the ring.
;         1791      !
;         1792
;         1793      if .NRD_SLOT gtru REC_ALLOCATE - 1 then NRD_SLOT = ZERO;
;         1794
;         1795      !
;         1796      ! Return the next receive descriptor_slot to the caller
;         1797      !
;         1798      return .NRD_SLOT;
;         1799      end;

                                        .SBTTL  GET.NRD MODULE DECLARATIONS
000000  005267  000000G           GET.NRD::
                                        INC     NRD.SLOT                        ;                       1788
000004  026727  000000G 000003             CMP     NRD.SLOT,#3                     ;                       1793
000012  101402                      BLOS    1$
000014  005067  000000G                    CLR     NRD.SLOT
000020  016700  000000G           1$:      MOV     NRD.SLOT,R0                     ;                       1784
000024  000207                      RTS     PC                              ;                       1761

; Routine Size:  11 words,      Routine Base:  AC$CODE + 0176
; Maximum stack depth per invocation:  0 words


;         1800
```

```
;          1801  global routine LOAD_OUT$STD_BUF (REF_NUM) =     !Load out$std_buffer with this command
;          1802
;          1803  !++
;          1804  ! Functional Description :
;          1805  !       The  outstanding  command  buffer "out$std_buf"  is  used by
;          1806  !       this  host  program to  determine  if an outstanding command
;          1807  !       issued to the  port has  been  processed yet.  This  is done
;          1808  !       by  examining the  receive flag 'Rec_flg' in  a  buffer slot
;          1809  !       for  a '1' which  is  set by  the interrupt service  routine
;          1810  !       during  response ring interrupts.
;          1811  !
;          1812  !       This buffer can be  looked  at as  a window between the port
;          1813  !       driver receiving & processing the response envelopes and the
;          1814  !       host class driver issuing commands to the port.
;          1815  !
;          1816  !       This  routine   loads   into  an  empty out$std_buf slot the
;          1817  !       following values:
;          1818  !
;          1819  !       1.  This commands reference number.
;          1820  !       2.  Clears 'rec_flg' indicating this command is outstanding.
;          1821  !       3.  Clears out the  second  word in slot where the returned
;          1822  !           envelope address will go.
;          1823  !
;          1824  !       IMPORTANT NOTE:
;          1825  !       ---------------
;          1826  !       To  quarentee a command loaded into the out$std_buffer will
;          1827  !       never  be lost  (i.e.  having this  routine return a buffer
;          1828  !       slot not yet   received  by the  interrupt service routine),
;          1829  !       only the  cto_wait (controller  time  out wait) routine  is
;          1830  !       permitted to  return  a out$std_buf slot to the unused pool
;          1831  !       (i.e.  by loading  a slots   first  word  with %o'100000').
;          1832  !       This  routine is therefore guarenteed  to return  an unused
;          1833  !       out$std_buffer slot  when this unique  value  of %o'100000'
;          1834  !       is  found.  To  further  quarentee this, unique command ref
;          1835  !       numbers will never use zero as a reference number.
;          1836  !
;          1837  ! Formal Parameters :
;          1838  !       REF_NUM         This  is the unique reference number of this command set to the port.
;          1839  !
;          1840  ! Implicit Inputs :
;          1841  !       none
;          1842  !
;          1843  ! Implicit Outputs :
;          1844  !       none
;          1845  !
;          1846  ! Completion Codes :
;          1847  !       The out$standing buffer slot index where this command was put
;          1848  !       is routines value and is returned to the caller.
;          1849  !
;          1850  ! Side Effects :
;          1851  !       none
;          1852  !
;          1853  !--
;          1854
;          1855      begin
;          1856
;          1857      !+
```

```
;         1858      ! Search  through  the  out  standing  command  buffer and look for the first
;         1859      ! open slot.  Return this first slot index to the caller if one is found.
;         1860      ! If no open slots are found then return an error code.
;         1861      !-
;         1862
;         1863      incru i from 0 to REC_ALLOCATE - 1 do       !Find the first open slot
;         1864          !
;         1865          ! An open slot is by definition the value %o'100000'  in  the  slots  first  word.
;         1866          !
;         1867
;         1868          if .OUT$STD_BUF [.i, CMD_WRD] eqlu %o'100000'   !Is this slot open
;         1869          then
;         1870              begin
;         1871              OUT$STD_BUF [.i, REC_FLG] = FALSE;  !Clear the received flag
;         1872              OUT$STD_BUF [.i, CMD_REF] = .REF_NUM;       !Load this cmd's ref num
;         1873              OUT$STD_BUF [.i, ENV_ADR] = ZERO;   !Clear the previous env adr
;         1874              return .i;                          !Return buffer index to caller
;         1875              end;
;         1876
;         1877      !
;         1878      ! The buffer is full if the code reaches here.  This should never happen so
;         1879      ! report   an  error  for debug purposes.
;         1880      !
;         1881      return RET_STATUS = OBF_CODE;               !Report an 'out$std buffer full" error
;         1882      end;

                                        .SBTTL  LOAD.OUT$STD.BUF MODULE DECLARATIONS
000000  004167  000000G          LOAD.OUT$STD.BUF::
                                        JSR     R1,$SAVE2                       ;                       1801
000004  005001                          CLR     R1                              ; I                     1863
000006  010100                  1$:     MOV     R1,R0                           ; I,*                   1868
000010  006300                          ASL     R0
000012  006300                          ASL     R0
000014  012702  000000G                 MOV     #OUT$STD.BUF,R2
000020  060002                          ADD     R0,R2
000022  021227  100000                  CMP     (R2),#-100000
000026  001010                          BNE     2$
000030  042712  100000                  BIC     #100000,(R2)                    ;                       1871
000034  116612  000010                  MOVB    10(SP),(R2)                     ; REF.NUM,*             1872
000040  005060  000002G                 CLR     OUT$STD.BUF+2(R0)               ;                       1873
000044  010100                          MOV     R1,R0                           ; I,*                   1870
000046  000207                          RTS     PC
000050  005201                  2$:     INC     R1                              ; I                     1863
000052  020127  000003                  CMP     R1,#3                           ; I,*
000056  101753                          BLOS    1$
000060  012700  002001                  MOV     #2001,R0                        ;                       1881
000064  010067  000000G                 MOV     R0,RET.STATUS
000070  000207                          RTS     PC                              ;                       1801

; Routine Size:  29 words,      Routine Base:  AC$CODE + 0224
; Maximum stack depth per invocation:  4 words


;         1883
```

```
;         1884  global routine GET_CMD$REF =                    !Gets next unique cmd ref number
;         1885
;         1886  !++
;         1887  ! Functional Description :
;         1888  !       A  32 bit  unique non-zero  number   used  to identify host commands.
;         1889  !       Class  drivers  should  supply  a unique  reference number  in  each
;         1890  !       command  that the  send  to a DUP server.  A class driver may supply
;         1891  !       a  zero reference number  if it does not need to associate a command
;         1892  !       with its end message.
;         1893  !
;         1894  !       Command reference  numbers must  be unique across all commands that
;         1895  !       are outstanding on  the  same connection  i.e., they must be unique
;         1896  !       across all outstanding commands  issued by  a  single  class driver
;         1897  !       (Host) to  a  single  DUP  server.   The  class driver may re-use a
;         1898  !       commands  reference  number   when    the  command   is  no  longer
;         1899  !       outstanding -- i.e.,  after  receiving the commands  end message or
;         1900  !       after  re-synchronizing  with  the DUP  server.  Command  reference
;         1901  !       numbers  need not be unique for commands  issued by different class
;         1902  !       drivers --- i.e. commands issued by different  host or commands for
;         1903  !       diffeent DUP  servers  from  the same host.  Therefore  controllers
;         1904  !       must  internally  use the combination of a command reference number
;         1905  !       and the connection on  which the command was received as the unique
;         1906  !       identifier of an outstanding command.
;         1907  !
;         1908  !       This  routine will generate a unique  command reference number and
;         1909  !       will search the out$standing command buffer to see if already uesd.
;         1910  !       The first unused unique command  reference found will  be returned
;         1911  !       to the calling routine.
;         1912  !
;         1913  ! Formal Parameters :
;         1914  !       none
;         1915  !
;         1916  ! Implicit Inputs :
;         1917  !       NXT_CRN         This global location stores the next unique cmd
;         1918  !                       reference number to be used.
;         1919  !
;         1920  ! Implicit Outputs :
;         1921  !       NXT_CRN         This global location is loaded with the next
;         1922  !                       unigue command reference number.
;         1923  !
;         1924  ! Completion Codes :
;         1925  !       The contents of .NXT_CRN is returned to the calling routine.
;         1926  !
;         1927  ! Side Effects :
;         1928  !       none
;         1929  !--
;         1930
;         1931      begin
;         1932
;         1933      local
;         1934          DONE;
;         1935
;         1936      !
;         1937      ! Increment the global unique command reference number before anything is done.
;         1938      !
;         1939      NXT_CRN = .NXT_CRN + 1;
;         1940
```

```
;          1941      !+
;          1942      ! Repeat generating and searching the out$standing command buffer until a
;          1943      ! unique command reference number is found.
;          1944      !-
;          1945
;          1946      do
;          1947          begin
;          1948          BREAK;                                  !Flag any operator control C's
;          1949          !
;          1950          ! Wrap this next command reference number around
;          1951          ! back to one if it is greater then 255 (decimal).
;          1952          !
;          1953
;          1954          if .NXT_CRN gtr 255 then NXT_CRN = 1;
;          1955
;          1956          DONE = TRUE;                            !Clear the all done indicator flag
;          1957
;          1958          !+
;          1959          ! Now  search  the  out$std_buffer for this  command
;          1960          ! reference  number.  If  not  there then done stays
;          1961          ! true  and the loop will  end else increment to the
;          1962          ! next unique command ref number and make done false
;          1963          ! to continue the loop.
;          1964          !-
;          1965
;          1966          incru i from 0 to REC_ALLOCATE - 1 do   !Search buffer for this cmd ref num
;          1967
;          1968              if .OUT$STD_BUF [.i, CMD_REF] eqlu .NXT_CRN !Does it already exist
;          1969              then
;          1970                  begin                           !It already exists
;          1971                  NXT_CRN = .NXT_CRN + 1;         !Try the next sequential cmd ref num
;          1972                  DONE = FALSE;                   !Make code loop again
;          1973                  exitloop;                       !Exit this incr loop
;          1974                  end;
;          1975
;          1976          end
;          1977      until .DONE;                                !Repeat loop until done
;          1978
;          1979      !
;          1980      ! Return the unique command reference number to the caller.
;          1981      !
;          1982      return .NXT_CRN;
;          1983      end;


                                                .SBTTL  GET.CMD$REF MODULE DECLARATIONS
000000  010146                          GET.CMD$REF::
                                                MOV     R1,-(SP)                        ;                       1884
000002  105267  000000G                         INCB    NXT.CRN                         ;                       1939
000006  104422                          1$:     TRAP    22                              ;                       1947
000010  012701  000001                          MOV     #1,R1                           ; *,DONE                1956
000014  005000                                  CLR     R0                              ; I                     1966
000016  126067  000000G 000000G         2$:     CMPB    OUT$STD.BUF(R0),NXT.CRN         ; *(I),*                1968
000024  001004                                  BNE     3$
000026  105267  000000G                         INCB    NXT.CRN                         ;                       1971
000032  005001                                  CLR     R1                              ; DONE                  1972
000034  000405                                  BR      4$                              ;                       1970
```

```
000036  062700  000004          3$:     ADD     #4,R0                   ; *,I                   1966
000042  020027  000014                  CMP     R0,#14                  ; I,*
000046  101763                          BLOS    2$
000050  006001                  4$:     ROR     R1                      ; DONE                  1977
000052  103355                          BCC     1$
000054  005000                          CLR     R0                      ;                       1931
000056  156700  000000G                 BISB    NXT.CRN,R0
000062  012601                          MOV     (SP)+,R1                ;                       1884
000064  000207                          RTS     PC

; Routine Size:  27 words,      Routine Base:  AC$CODE + 0316
; Maximum stack depth per invocation:  3 words

;         1984
```

```
;          1985  global routine DECODE : novalue =                !Decodes failing SA reg data
;          1986
;          1987  !++
;          1988  ! Functional Description :
;          1989  !       Due  to the implimentation of the DUP  and UQ Port protocol there
;          1990  !       are  two levels  at which an issued command to  a port/controller
;          1991  !       can fail and they are:
;          1992  !
;          1993  !         1. The issued command can time out.
;          1994  !
;          1995  !         2. An  error  can be posted in SA register bit 15 by the port  to
;          1996  !            report an error.
;          1997  !
;          1998  !         3. The  issued  command  to  the port/controller can  be executed
;          1999  !            correctly without  any  errors but the response  packet status
;          2000  !            field could have an error or  status other than success posted.
;          2001  !
;          2002  !       These errors or status's  returned  are  all returned to the host
;          2003  !       routine which queued  the  DUP  command  via  the  global storage
;          2004  !       "RET_STATUS". The   host   to  port/controller   communications
;          2005  !       connection  having  the highest priority (ie. if the SA Reg error
;          2006  !       bit  is set the DUP interrupt routine returns a PFE_CODE and this
;          2007  !       code is  passed  up  to  the  calling host routine with out being
;          2008  !       intercepted by any routine on the way up).
;          2009  !
;          2010  !       This  routine  will  then be called when the return from a queued
;          2011  !       command  comes  back with an error code or non successfull status
;          2012  !       code.  This is  by  definition  when bit 0 in the returned status
;          2013  !       is equal to 1.
;          2014  !
;          2015  !       An appropriate  recovery  action will be done for each individual
;          2016  !       error.
;          2017  !
;          2018  ! Formal Parameters :
;          2019  !       none
;          2020  !
;          2021  ! Implicit Inputs :
;          2022  !       RET_STATUS:     Stored in this global storage is the returned error
;          2023  !                       code or  non-successful  status  code from a queued
;          2024  !                       command.
;          2025  !
;          2026  ! Implicit Outputs :
;          2027  !       none
;          2028  !
;          2029  ! Completion Codes :
;          2030  !       none
;          2031  !
;          2032  ! Side Effects :
;          2033  !       All formatter errors are fatal, therefor after execution
;          2034  !       of  this  routine  the  RC25  controller  is initialized
;          2035  !       aborting any DM code running in the controller.
;          2036  !--
;          2037
;          2038      begin
;          2039
;          2040      local
;          2041          SA_VALUE;                                !Save SA register fatal error code
```

```
;          2042
;          2043      !+
;          2044      ! Use the contents of "RET_STATUS" to select what type error or non-successful
;          2045      ! status code is to be processed.
;          2046      !-
;          2047
;          2048      selectoneu .RET_STATUS of
;          2049          set
;          2050          !
;          2051          ! "Communication area initialize" error code
;          2052          !
;          2053          ! This error  code indicates that  the  port did
;          2054          ! not init the com area in the host memory after
;          2055          ! step  2  of   the    initialization   sequence.
;          2056          !
;          2057
;          2058          [CIE_CODE] :                                !Code equals %o'01'
;          2059              begin
;          2060              PRINTB (.EMSG_STRUCT [MSG4]);
;          2061              end;
;          2062          !
;          2063          ! "Port/Controller time out" error code
;          2064          !
;          2065          ! Port/Controller timed out after the specified time out interval.
;          2066          !
;          2067
;          2068          [CTO_CODE] :                                !Code equals %o'11'
;          2069              begin
;          2070              PRINTB (.EMSG_STRUCT [MSG21]);
;          2071              end;
;          2072          !
;          2073          ! "Port fatal error" code
;          2074          !
;          2075          ! The error bit in the SA Register was set when examined in the DUP$I_SERVICE
;          2076          ! routine.  This error indicates a Port fatal error code.
;          2077          !
;          2078
;          2079          [PFE_CODE] :                                !Code equals %o'21'
;          2080              begin
;          2081              SA_VALUE = .RC25_ADDR [RCSA, ERR_CODE];     !Get error code from SA register
;          2082              !
;          2083              ! Is the error code within the RC25 error code range, or is it
;          2084              ! an generic, all controllers, error code?
;          2085              !
;          2086
;          2087              if .SA_VALUE gequ 200
;          2088              then
;          2089                  begin
;          2090                  PRINTB (.RC_STRUCTURE [.SA_VALUE - 200]);       !RC25 error code range
;          2091                  end
;          2092              else
;          2093                  begin
;          2094                  PRINTB (.PFE_STRUCT [.SA_VALUE]);       !Generic error code
;          2095                  end;
;          2096
;          2097              end;
;          2098          !
```

```
;          2099          ! "Return status error" code
;          2100          !
;          2101          ! This indicates that a non-successful return status code was returned  from an issued command.
;          2102          !
;          2103
;          2104          [RSE_CODE] :                                    !Code equals %o'31'
;          2105              begin
;          2106              PRINTB (.EMSG_STRUCT [MSG0]);
;          2107              !
;          2108              ! Look at the UQPORT connection ID field to determine the type of response
;          2109              !
;          2110
;          2111              if .RET_EN$AD [CONN_ID] eqlu DUP
;          2112              then
;          2113                  begin
;          2114                  PRINTB (.SDUP_STRUCT [.RET_EN$AD [STATUS]]);
;          2115                  end
;          2116              else
;          2117                  begin
;          2118                  PRINTB (.SMSCP_STRUCT [.RET_EN$AD [STA_CODE]]);
;          2119                  end;
;          2120
;          2121              end;
;          2122          !
;          2123          ! "Port Portocol violation" error code
;          2124          !
;          2125          ! A protocol violation error was detected during host processing of an issued command.
;          2126          !
;          2127
;          2128          [PVE_CODE] :                                    !Code equals %o'41'
;          2129              begin
;          2130              PRINTB (.EMSG_STRUCT [MSG1]);
;          2131              end;
;          2132          !
;          2133          ! "Remote program died" error code
;          2134          !
;          2135          ! This indicates that the remote program running
;          2136          ! in the DM machine did not responded within the
;          2137          ! designated time out interval and that the progress
;          2138          ! indicator was not increase after subsiquent time out
;          2139          ! delays.  It is assumed that the remote program is dead
;          2140          ! and is treated as a fatal error.
;          2141          !
;          2142
;          2143          [RPD_CODE] :                                    !Code equals %o'51'
;          2144              begin
;          2145              PRINTB (.EMSG_STRUCT [MSG2]);
;          2146              end;
;          2147          !
;          2148          ! "Port to host synchronious error" code
;          2149          !
;          2150
;          2151          [PSE_CODE] :                                    !Code equals %o'61'
;          2152              begin
;          2153              PRINTB (.EMSG_STRUCT [MSG5]);
;          2154              end;
;          2155          !
```

```
;          2156          ! 'Message length error" code
;          2157          !
;          2158
;          2159          [MLE_CODE] :                          !Code equals %o'71'
;          2160              begin
;          2161              PRINTB (.EMSG_STRUCT [MSG6]);
;          2162              end;
;          2163          !
;          2164          ! 'Unknown end code" error code
;          2165          !
;          2166
;          2167          [UEC_CODE] :                          !Code equals %o'101'
;          2168              begin
;          2169              PRINTB (.EMSG_STRUCT [MSG7]);
;          2170              end;
;          2171          !
;          2172          ! "Adaptor purge request" error code
;          2173          !
;          2174
;          2175          [APR_CODE] :                          !Code equals %o'201'
;          2176              begin
;          2177              PRINTB (.EMSG_STRUCT [MSG8]);
;          2178              end;
;          2179          !
;          2180          ! 'Unknown interrupt" error code
;          2181          !
;          2182
;          2183          [UIN_CODE] :                          !Code equals %o'301'
;          2184              begin
;          2185              PRINTB (.EMSG_STRUCT [MSG9]);
;          2186              end;
;          2187          !
;          2188          ! "ATTENTION MSG ENDCODE" error code
;          2189          !
;          2190
;          2191          [ATN_CODE] :                          !Code equals %o'401'
;          2192              begin
;          2193              PRINTB (.EMSG_STRUCT [MSG12]);
;          2194              end;
;          2195          !
;          2196          ! "COMMAND MSG ENDCODE" error code
;          2197          !
;          2198
;          2199          [CMD_CODE] :                          !Code equals %o'501'
;          2200              begin
;          2201              PRINTB (.EMSG_STRUCT [MSG13]);
;          2202              end;
;          2203          !
;          2204          ! "SERIOUS EXCEPTION" error code
;          2205          !
;          2206
;          2207          [SEX_CODE] :                          !Code equals %o'601'
;          2208              begin
;          2209              PRINTB (.EMSG_STRUCT [MSG14]);
;          2210              end;
;          2211          !
;          2212          ! "INVALID COMMAND" error code
```

```
;          2213          !
;          2214
;          2215          [IVC_CODE] :                                !Code equals %o'701'
;          2216              begin
;          2217              PRINTB (.EMSG_STRUCT [MSG15]);
;          2218              end;
;          2219          !
;          2220          ! "UNKNOWN MESSAGE TYPE" error code
;          2221          !
;          2222
;          2223          [UMT_CODE] :                                !Code equals %o'1001'
;          2224              begin
;          2225              PRINTB (.EMSG_STRUCT [MSG16]);
;          2226              end;
;          2227          !
;          2228          ! "UNKNOWN MESSAGE NUMBER" error code
;          2229          !
;          2230
;          2231          [UMN_CODE] :                                !Code equals %o'4001'
;          2232              begin
;          2233              PRINTB (.EMSG_STRUCT [MSG19]);
;          2234              end;
;          2235          !
;          2236          ! Out standing buffer slots are all filled up
;          2237          !
;          2238
;          2239          [OBF_CODE] :                                !Code equals %o'2001'
;          2240              begin
;          2241              PRINTB (.EMSG_STRUCT [MSG17]);
;          2242              end;
;          2243          !
;          2244          ! Out standing command buffer out of sync error
;          2245          !
;          2246
;          2247          [OSE_CODE] :                                !Code equals %o'3001'
;          2248              begin
;          2249              PRINTB (.EMSG_STRUCT [MSG18]);
;          2250              end;
;          2251          !
;          2252          ! File read error from local load media
;          2253          !
;          2254
;          2255          [FRE_CODE] :                                !Code equals %o'5001'
;          2256              begin
;          2257              PRINTB (.EMSG_STRUCT [MSG20]);
;          2258              end;
;          2259          !
;          2260          ! Illegal FCT file length
;          2261          !
;          2262
;          2263          [ILL_FCT] :                                 !Code equals %o'6001'
;          2264              begin
;          2265              PRINTB (.EMSG_STRUCT [MSG22]);
;          2266              end;
;          2267          !
;          2268          ! This is here to trap any unknow return status codes sent to this routine.
;          2269          !
```

```
;          2270
;          2271          [otherwise] :                          !Code equals non of the above
;          2272              begin
;          2273              PRINTB (.EMSG_STRUCT [MSG3]);
;          2274              end;
;          2275          tes;
;          2276
;          2277      !
;          2278      ! All errors are fatal so init the RC25 and jump to the clean-up
;          2279      ! code section to abort this units format.
;          2280      !
;          2281      RC25_ADDR [RCIP, RC_ALL] = ONES;           !Init the controller
;          2282      WRT_RC25 (RCIP, ONES);                     !Init the controller
;          2283      DOC[N;                                     !Jump to the clean-up code section
;          2284      end;


                                        .SBTTL  DECODE MODULE DECLARATIONS
000000  004167  000000G          DECODE::JSR     R1,$SAVE2                       ;                       1985
000004  024646                          CMP     -(SP),-(SP)
000006  016701  000000G                 MOV     RET.STATUS,R1                   ;                       2048
000012  020127  000001                  CMP     R1,#1
000016  001007                          BNE     1$
000020  016746  000010G                 MOV     EMSG.STRUCT+10,-(SP)            ;                       2060
000024  012746  000001                  MOV     #1,-(SP)
000030  010600                          MOV     SP,R0                           ; SP,*
000032  104414                          TRAP    14
000034  000567                          BR      11$                             ;                       2048
000036  020127  000011          1$:     CMP     R1,#11
000042  001007                          BNE     2$
000044  016746  000052G                 MOV     EMSG.STRUCT+52,-(SP)            ;                       2070
000050  012746  000001                  MOV     #1,-(SP)
000054  010600                          MOV     SP,R0                           ; SP,*
000056  104414                          TRAP    14
000060  000567                          BR      13$                             ;                       2048
000062  020127  000021          2$:     CMP     R1,#21
000066  001034                          BNE     4$
000070  016700  000000G                 MOV     RC25.ADDR,R0                    ;                       2081
000074  016066  000002  000002          MOV     2(R0),2(SP)                     ; *,RC$S.REG
000102  016600  000002                  MOV     2(SP),R0                        ; RC$S.REG,SA.VALUE
000106  042700  174000                  BIC     #174000,R0                      ; *,SA.VALUE
000112  020027  000310                  CMP     R0,#310                         ; SA.VALUE,*            2087
000116  103410                          BLO     3$
000120  006300                          ASL     R0                              ;                       2090
000122  016046  177160G                 MOV     RC.STRUCTURE-620(R0),-(SP)
000126  012746  000001                  MOV     #1,-(SP)
000132  010600                          MOV     SP,R0                           ; SP,*
000134  104414                          TRAP    14
000136  000576                          BR      17$                             ;                       2087
000140  006300                  3$:     ASL     R0                              ;                       2094
000142  016046  000000G                 MOV     PFE.STRUCT(R0),-(SP)
000146  012746  000001                  MOV     #1,-(SP)
000152  010600                          MOV     SP,R0                           ; SP,*
000154  104414                          TRAP    14
000156  000566                          BR      17$                             ;                       2048
000160  020127  000031          4$:     CMP     R1,#31
000164  001044                          BNE     7$
```

```
000166  016746  000000G                        MOV     EMSG.STRUCT,-(SP)               ;                               2106
000172  012746  000001                         MOV     #1,-(SP)
000176  010600                                 MOV     SP,R0                           ; SP,*
000200  104414                                 TRAP    14
000202  016702  000000G                        MOV     RET.EN$AD,R2                    ;                               2114
000206  010200                                 MOV     R2,R0                           ; RET.EN$AD,*                   2111
000210  126027  000003  000002                 CMPB    3(R0),#2
000216  001012                                 BNE     5$
000220  016200  000016                         MOV     16(R2),R0                       ;                               2114
000224  006300                                 ASL     R0
000226  016016  000000G                        MOV     SDUP.STRUCT(R0),(SP)
000232  012746  000001                         MOV     #1,-(SP)
000236  010600                                 MOV     SP,R0                           ; SP,*
000240  104414                                 TRAP    14
000242  000413                                 BR      6$                              ;                               2111
000244  116202  000016          5$:            MOVB    16(R2),R2                       ;                               2118
000250  042702  177740                         BIC     #177740,R2
000254  006302                                 ASL     R2
000256  016216  000000G                        MOV     SMSCP.STRUCT(R2),(SP)
000262  012746  000001                         MOV     #1,-(SP)
000266  010600                                 MOV     SP,R0                           ; SP,*
000270  104414                                 TRAP    14
000272  005726                  6$:            TST     (SP)+                           ;                               2105
000274  000567                                 BR      22$                             ;                               2048
000276  020127  000041          7$:            CMP     R1,#41
000302  001007                                 BNE     8$
000304  016746  000002G                        MOV     EMSG.STRUCT+2,-(SP)             ;                               2130
000310  012746  000001                         MOV     #1,-(SP)
000314  010600                                 MOV     SP,R0                           ; SP,*
000316  104414                                 TRAP    14
000320  000567                                 BR      24$                             ;                               2048
000322  020127  000051          8$:            CMP     R1,#51
000326  001007                                 BNE     9$
000330  016746  000004G                        MOV     EMSG.STRUCT+4,-(SP)             ;                               2145
000334  012746  000001                         MOV     #1,-(SP)
000340  010600                                 MOV     SP,R0                           ; SP,*
000342  104414                                 TRAP    14
000344  000567                                 BR      26$                             ;                               2048
000346  020127  000061          9$:            CMP     R1,#61
000352  001007                                 BNE     10$
000354  016746  000012G                        MOV     EMSG.STRUCT+12,-(SP)            ;                               2153
000360  012746  000001                         MOV     #1,-(SP)
000364  010600                                 MOV     SP,R0                           ; SP,*
000366  104414                                 TRAP    14
000370  000567                                 BR      28$                             ;                               2048
000372  020127  000071          10$:           CMP     R1,#71
000376  001007                                 BNE     12$
000400  016746  000014G                        MOV     EMSG.STRUCT+14,-(SP)            ;                               2161
000404  012746  000001                         MOV     #1,-(SP)
000410  010600                                 MOV     SP,R0                           ; SP,*
000412  104414                                 TRAP    14
000414  000567                  11$:           BR      30$                             ;                               2048
000416  020127  000101          12$:           CMP     R1,#101
000422  001007                                 BNE     14$
000424  016746  000016G                        MOV     EMSG.STRUCT+16,-(SP)            ;                               2169
000430  012746  000001                         MOV     #1,-(SP)
000434  010600                                 MOV     SP,R0                           ; SP,*
```

```
000436  104414                          TRAP    14
000440  000576                  13$:    BR      33$                             ;                               2048
000442  020127  000201          14$:    CMP     R1,#201
000446  001007                          BNE     15$
000450  016746  000020G                 MOV     EMSG.STRUCT+20,-(SP)            ;                               2177
000454  012746  000001                  MOV     #1,-(SP)
000460  010600                          MOV     SP,R0                           ; SP,*
000462  104414                          TRAP    14
000464  000564                          BR      33$                             ;                               2048
000466  020127  000301          15$:    CMP     R1,#301
000472  001007                          BNE     16$
000474  016746  000022G                 MOV     EMSG.STRUCT+22,-(SP)            ;                               2185
000500  012746  000001                  MOV     #1,-(SP)
000504  010600                          MOV     SP,R0                           ; SP,*
000506  104414                          TRAP    14
000510  000552                          BR      33$                             ;                               2048
000512  020127  000401          16$:    CMP     R1,#401
000516  001007                          BNE     18$
000520  016746  000030G                 MOV     EMSG.STRUCT+30,-(SP)            ;                               2193
000524  012746  000001                  MOV     #1,-(SP)
000530  010600                          MOV     SP,R0                           ; SP,*
000532  104414                          TRAP    14
000534  000540                  17$:    BR      33$                             ;                               2048
000536  020127  000501          18$:    CMP     R1,#501
000542  001007                          BNE     19$
000544  016746  000032G                 MOV     EMSG.STRUCT+32,-(SP)            ;                               2201
000550  012746  000001                  MOV     #1,-(SP)
000554  010600                          MOV     SP,R0                           ; SP,*
000556  104414                          TRAP    14
000560  000526                          BR      33$                             ;                               2048
000562  020127  000601          19$:    CMP     R1,#601
000566  001007                          BNE     20$
000570  016746  000034G                 MOV     EMSG.STRUCT+34,-(SP)            ;                               2209
000574  012746  000001                  MOV     #1,-(SP)
000600  010600                          MOV     SP,R0                           ; SP,*
000602  104414                          TRAP    14
000604  000514                          BR      33$                             ;                               2048
000606  020127  000701          20$:    CMP     R1,#701
000612  001007                          BNE     21$
000614  016746  000036G                 MOV     EMSG.STRUCT+36,-(SP)            ;                               2217
000620  012746  000001                  MOV     #1,-(SP)
000624  010600                          MOV     SP,R0                           ; SP,*
000626  104414                          TRAP    14
000630  000502                          BR      33$                             ;                               2048
000632  020127  001001          21$:    CMP     R1,#1001
000636  001007                          BNE     23$
000640  016746  000040G                 MOV     EMSG.STRUCT+40,-(SP)            ;                               2225
000644  012746  000001                  MOV     #1,-(SP)
000650  010600                          MOV     SP,R0                           ; SP,*
000652  104414                          TRAP    14
000654  000470                  22$:    BR      33$                             ;                               2048
000656  020127  004001          23$:    CMP     R1,#4001
000662  001007                          BNE     25$
000664  016746  000046G                 MOV     EMSG.STRUCT+46,-(SP)            ;                               2233
000670  012746  000001                  MOV     #1,-(SP)
000674  010600                          MOV     SP,R0                           ; SP,*
000676  104414                          TRAP    14
```

```
000700  000456                          24$:    BR      33$                             ;                               2048
000702  020127  002001                  25$:    CMP     R1,#2001
000706  001007                                  BNE     27$
000710  016746  000042G                         MOV     EMSG.STRUCT+42,-(SP)            ;                               2241
000714  012746  000001                         MOV     #1,-(SP)
000720  010600                                  MOV     SP,R0                           ; SP,*
000722  104414                                  TRAP    14
000724  000444                          26$:    BR      33$                             ;                               2048
000726  020127  003001                  27$:    CMP     R1,#3001
000732  001007                                  BNE     29$
000734  016746  000044G                         MOV     EMSG.STRUCT+44,-(SP)            ;                               2249
000740  012746  000001                         MOV     #1,-(SP)
000744  010600                                  MOV     SP,R0                           ; SP,*
000746  104414                                  TRAP    14
000750  000432                          28$:    BR      33$                             ;                               2048
000752  020127  005001                  29$:    CMP     R1,#5001
000756  001007                                  BNE     31$
000760  016746  000050G                         MOV     EMSG.STRUCT+50,-(SP)            ;                               2257
000764  012746  000001                         MOV     #1,-(SP)
000770  010600                                  MOV     SP,R0                           ; SP,*
000772  104414                                  TRAP    14
000774  000420                          30$:    BR      33$                             ;                               2048
000776  020127  006001                  31$:    CMP     R1,#6001
001002  001007                                  BNE     32$
001004  016746  000054G                         MOV     EMSG.STRUCT+54,-(SP)            ;                               2265
001010  012746  000001                         MOV     #1,-(SP)
001014  010600                                  MOV     SP,R0                           ; SP,*
001016  104414                                  TRAP    14
001020  000406                                  BR      33$                             ;                               2048
001022  016746  000006G                 32$:    MOV     EMSG.STRUCT+6,-(SP)             ;                               2273
001026  012746  000001                         MOV     #1,-(SP)
001032  010600                                  MOV     SP,R0                           ; SP,*
001034  104414                                  TRAP    14
001036  012766  177777  000004          33$:    MOV     #-1,4(SP)                       ; *,RC$S.REG                    2281
001044  012700  177777                         MOV     #-1,R0                          ; *,RC$M.REG                    2282
001050  010077  000000G                         MOV     R0,@RC25.ADDR                   ; RC$M.REG,*
001054  104444                                  TRAP    44
001056  062706  000010                         ADD     #10,SP                          ;                               1985
001062  000207                                  RTS     PC

; Routine Size:  282 words,     Routine Base:  AC$CODE + 0404
; Maximum stack depth per invocation:  10 words


;         2285
```

```
;          2286  global routine DUP$I_SERVICE : INT_LNK$TYP novalue =    !Signals receive queue entry
;          2287
;          2288  !++
;          2289  ! Functional Description :
;          2290  !       The transmission of a message will result in a host interrupt if and
;          2291  !       only if interrupts were armed suitably during initialization and one
;          2292  !       of the following conditions has been met:
;          2293  !
;          2294  !       1.  The message was a command with F=1 and the port's fetching it
;          2295  !           caused  the  command ring to transition from full to not-full.
;          2296  !           (This interrupt means that the host may place another command
;          2297  !           in the ring.)
;          2298  !
;          2299  !       2.  The message was a response with F=1 and the port's depositing
;          2300  !           it caused the response ring to transition from empty to not-
;          2301  !           empty.  (This  interrupt  means  that there is a response for
;          2302  !           the host to process.)
;          2303  !
;          2304  !       3.  The  port  is  interfaced to the host via a bus abapter and a
;          2305  !           command requires  the  port/controller  to  re-access a given
;          2306  !           location  during   data transfer.  (This interrupt means that
;          2307  !           the  port/controller  is  requesting  the  host  to purge the
;          2308  !           indicated chanel of the bus adapter.)
;          2309  !
;          2310  !       This  interrupt  service routine is entered when any of the above
;          2311  !       conditions  occure. When  entered it will be determined what type
;          2312  !       interrupt was executed and take the necessary action.
;          2313  !
;          2314  ! Formal Parameters :
;          2315  !       none
;          2316  !
;          2317  ! Implicit Inputs :
;          2318  !       Nrd_slot:       A global flag which points to the next receive descriptor
;          2319  !                       slot where the port/controller should be polling on and
;          2320  !                       where to expect the first response packet to process.
;          2321  !
;          2322  ! Implicit Outputs :
;          2323  !       Ret_status:     This  global  flag  is the mechinism by which these DUP
;          2324  !                       and  UQ Port protocol routines pass status code back to
;          2325  !                       to  the  host  routine's requesting communications over
;          2326  !                       the  established  connections.   The status returned is
;          2327  !                       decoded by  the  caller  to determine if an error or bad
;          2328  !                       response packet status was discovered.
;          2329  !
;          2330  !       Out$std_buf:    This  buffer  is used to save all commands issued to the
;          2331  !                       port  and are considered outstanding when in this buffer.
;          2332  !                       This interrupt service routine will indicate this command
;          2333  !                       is  nolonger   outstanding by setting the rec_flg in the
;          2334  !                       slot  matching this response envelope command ref number.
;          2335  !
;          2336  ! Completion Codes :
;          2337  !       none
;          2338  !
;          2339  ! Side Effects :
;          2340  !       none
;          2341  !--
;          2342
```

```
;          2343      begin
;          2344
;          2345      local
;          2346          TEMP,                               !Holds nrd_slot + 1 reference
;          2347          FOUND_CMD,                          !Found command flag
;          2348          REF_NUM;                            !Stores response packets cmd ref number
;          2349
;          2350      !+
;          2351      ! Before this  interrupt service routine does anything
;          2352      ! look   at the SA  register for any port fatal errors
;          2353      ! posted.  If there are  errors posted then report the
;          2354      ! error and kick the bucket.
;          2355      !-
;          2356
;          2357      if .RC25_ADDR [RCSA, ERR_BIT]           !Are there any errors posted
;          2358      then
;          2359          begin
;          2360          RET_STATUS = PFE_CODE;              !Indicate the error type
;          2361          DECODE ();                          !Decode and print the error
;          2362          return;                             !Just for show. Decode will kill it
;          2363          end;
;          2364
;          2365      !+
;          2366      ! See what kind of interrupt got us here.
;          2367      !
;          2368      ! We could have a:
;          2369      !
;          2370      !   1. Response   ring   transition    interrupt.
;          2371      !   2. Send  ring  transition interrupt.
;          2372      !   3. A  adaptor  purge request  interrupt  (which is
;          2373      !      illegal  running  under  the  PDP-11 Diagnostic
;          2374      !      supervisor and is flagged as a fatal controller
;          2375      !      error.)
;          2376      !   4. Or an unknown interrupt not known by this program
;          2377      !      which  also  results  in a fatal controller error.
;          2378      !
;          2379      !-
;          2380
;          2381      !
;          2382
;          2383      ! Check to see if we get here because of a response ring
;          2384      ! transition  interrupt.  This is  more likely to be the
;          2385      ! most frequent interrupt so check it first.
;          2386      !
;          2387
;          2388      if .HEAD_AREA [RSP_INT]
;          2389      then
;          2390          begin
;          2391          GET_NRD ();                         !Get the resp slot location to process
;          2392          !
;          2393          ! Check the host  protocol for being out of sequence
;          2394          ! with the controller by  making sure that this slot
;          2395          ! is owned by the host (meaning that there is a resp
;          2396          ! envelope at this ring slot to process.
;          2397          !
;          2398
;          2399          if .RECEIVE_RING [.NRD_SLOT, OWN_BIT] nequ HOST_OWNED   !Is this owned by host
```

```
;          2400          then
;          2401              begin                                   !Host/port is out of sequence
;          2402              RET_STATUS = PSE_CODE;                  !Load a "Port sync error" code
;          2403              DECODE ();                              !Report the error and kick the bucket
;          2404              return;                                 !Just for show Decode kills it
;          2405              end;
;          2406
;          2407          !+
;          2408          ! Per DUP protocol  once interrupted  due  to  a response ring
;          2409          ! interrupt, the host code should process all response packets
;          2410          ! found  in the response  ring.  This while loop will continue
;          2411          ! to process the response packets  in  the response ring until
;          2412          ! none remain.
;          2413          !-
;          2414
;          2415          while TRUE do                               !Process all response packets in ring
;          2416              begin
;          2417              BREAK;                                  !Look for control c's
;          2418              !
;          2419              ! Load the  Reference structure "Ret_en$ad" with the address
;          2420              ! of this response  envelope  to process (The minus %o'4' is
;          2421              ! done   to  address  the first word in the envelope  packet
;          2422              ! and is equal to location "text-4").
;          2423              !
;          2424              RET_EN$AD = (.RECEIVE_RING [.NRD_SLOT, LO_EN$AD]) - %o'4';
;          2425
;          2426              !+
;          2427              ! Test the end packet for its possible three end types.
;          2428              !
;          2429              ! End message opcodes  (also called endcodes) are formed by adding   the end
;          2430              ! message  flag  to  the  command opcode.  For  example, a READ commands end
;          2431              ! message contains the value OP.RED + OP.END in its opcode field. The Invalid
;          2432              ! command  end  message contains just the end message flag (i.e., OP.END) in
;          2433              ! its opcode field.  The serious exception opcode shown above (i.e. OP.SEX +
;          2434              ! OP.END) in its opcode field.
;          2435              !
;          2436              ! Commands opcode bits 6 and 7 indicate the type of message (command, end or
;          2437              ! attention  message.  Command opcodes bits 3 through 5 indicate the command
;          2438              ! catagory  (immediate, sequential  or no-sequential) and whether or not the
;          2439              ! command includes a buffer descriptor.
;          2440              !
;          2441              ! See MSCP document appendix "A-1 NOTE:" for more information on this topic.
;          2442              !-
;          2443
;          2444          selectoneu .RET_EN$AD [TYP$MSG] of  !Select the endpacket size
;          2445              set
;          2446
;          2447              [END$MSG] :                         !Is this an end code packet
;          2448                  begin
;          2449
;          2450                  !+
;          2451                  ! Select off of the endcode to make sure the communications
;          2452                  ! mechanism  transfered the correct number of byte for this
;          2453                  ! end  packet.  If  this  number of bytes transfered is not
;          2454                  ! correct  for  the commands end packet then load the error
;          2455                  ! code  into   return   status,  call decode to report  the
;          2456                  ! error and kick the bucket and die. This endcode is formed
```

```
;          2457                    ! by adding  the  end  message flag %o'200' to the commands
;          2458                    ! opcode.
;          2459                    !-
;          2460
;          2461                    selectoneu .RET_EN$AD [ENDCODE] of
;          2462                        set
;          2463                        !
;          2464                        ! "RECEIVE DATA" command end packet
;          2465                        !
;          2466
;          2467                        [EOP_RED] :
;          2468                            begin
;          2469
;          2470                            if .RET_EN$AD [MSG_LENGTH] nequ ESZ_RED     !Is the byte count correct
;          2471                            then
;          2472                                begin
;          2473                                RET_STATUS = MLE_CODE;  !Return a "message length error code"
;          2474                                DECODE ();          !Report the error and kick the bucket
;          2475                                return;             !Just for show.  Decode kills it
;          2476                                end;
;          2477
;          2478                            end;
;          2479                        !
;          2480                        ! "SEND DATA" command end packet
;          2481                        !
;          2482
;          2483                        [EOP_SED] :
;          2484                            begin
;          2485
;          2486                            if .RET_EN$AD [MSG_LENGTH] nequ ESZ_SED     !Is the byte count correct
;          2487                            then
;          2488                                begin
;          2489                                RET_STATUS = MLE_CODE;  !Return a "message length error code"
;          2490                                DECODE ();          !Report the error and kick the bucket
;          2491                                return;             !Just for show.  Decode kills it
;          2492                                end;
;          2493
;          2494                            end;
;          2495                        !
;          2496                        !" GET DUST STATUS"  command end packet
;          2497                        !
;          2498
;          2499                        [EOP_GDS] :
;          2500                            begin
;          2501
;          2502                            if .RET_EN$AD [MSG_LENGTH] nequ ESZ_GDS     !Is the byte count correct
;          2503                            then
;          2504                                begin
;          2505                                RET_STATUS = MLE_CODE;  !Return a "message length error code"
;          2506                                DECODE ();          !Report the error and kick the bucket
;          2507                                return;             !Just for show.  Decode kills it
;          2508                                end;
;          2509
;          2510                            end;
;          2511                        !
;          2512                        ! "EXECUTE SUPPLIED PROGRAM" command end packet
;          2513                        !
```

```
;          2514
;          2515                        [EOP_ESP] :
;          2516                            begin
;          2517
;          2518                            if .RET_EN$AD [MSG_LENGTH] nequ ESZ_ESP     !Is the byte count correct
;          2519                            then
;          2520                                begin
;          2521                                RET_STATUS = MLE_CODE;  !Return a "message length error code"
;          2522                                DECODE ();              !Report the error and kick the bucket
;          2523                                return;                 !Just for show.  Decode kills it
;          2524                                end;
;          2525
;          2526                            end;
;          2527                        !
;          2528                        ! "EXECUTE LOCAL PROGRAM" command end packet
;          2529                        !
;          2530
;          2531                        [EOP_ELP] :
;          2532                            begin
;          2533
;          2534                            if .RET_EN$AD [MSG_LENGTH] nequ ESZ_ELP     !Is the byte count correct
;          2535                            then
;          2536                                begin
;          2537                                RET_STATUS = MLE_CODE;  !Return a "message length error code"
;          2538                                DECODE ();              !Report the error and kick the bucket
;          2539                                return;                 !Just for show.  Decode kills it
;          2540                                end;
;          2541
;          2542                            end;
;          2543                        !
;          2544                        ! "ABORT PROGRAM" command end packet
;          2545                        !
;          2546
;          2547                        [EOP_ABT] :
;          2548                            begin
;          2549
;          2550                            if .RET_EN$AD [MSG_LENGTH] nequ ESZ_ABT     !Is the byte count correct
;          2551                            then
;          2552                                begin
;          2553                                RET_STATUS = MLE_CODE;  !Return a "message length error code"
;          2554                                DECODE ();              !Report the error and kick the bucket
;          2555                                return;                 !Just for show.  Decode kills it
;          2556                                end;
;          2557
;          2558                            end;
;          2559                        !
;          2560                        ! "SET CONTROLLER CHAR" command end packet
;          2561                        !
;          2562
;          2563                        [EOP_SCC] :
;          2564                            begin
;          2565
;          2566                            if .RET_EN$AD [MSG_LENGTH] nequ ESZ_SCC     !Is the byte count correct
;          2567                            then
;          2568                                begin
;          2569                                RET_STATUS = MLE_CODE;  !Return a "message length error code"
;          2570                                DECODE ();              !Report the error and kick the bucket
```

```
;          2571                                 return;          !Just for show.  Decode kills it
;          2572                                 end;
;          2573
;          2574                             end;
;          2575                         !
;          2576                         ! "ON LINE" command end packet
;          2577                         !
;          2578
;          2579                         [EOP_ONL] :
;          2580                             begin
;          2581
;          2582                             if .RET_EN$AD [MSG_LENGTH] nequ ESZ_ONL     !Is the byte count correct
;          2583                             then
;          2584                                 begin
;          2585                                 RET_STATUS = MLE_CODE;  !Return a "message length error code"
;          2586                                 DECODE ();              !Report the error and kick the bucket
;          2587                                 return;                 !Just for show.  Decode kills it
;          2588                                 end;
;          2589
;          2590                             end;
;          2591                         !
;          2592                         ! The  "OP_END"  end message flag all by its self tells
;          2593                         ! us that the controller is  flagging us  of an illegal
;          2594                         ! command sent over the connection.  Error and kick the
;          2595                         ! bucket.
;          2596                         !
;          2597
;          2598                         [OP_END] :
;          2599                             begin
;          2600                             RET_STATUS = IVC_CODE;
;          2601                             DECODE ();
;          2602                             return;
;          2603                             end;
;          2604                         !
;          2605                         ! The controller is telling us that a serious exception
;          2606                         ! has occured.  Error and kick the bucket.
;          2607                         !
;          2608
;          2609                         [EOP_SEX] :
;          2610                             begin
;          2611                             RET_STATUS = SEX_CODE;
;          2612                             DECODE ();
;          2613                             return;
;          2614                             end;
;          2615                         !
;          2616                         ! Unknown end packet endcode type
;          2617                         !
;          2618
;          2619                         [otherwise] :
;          2620                             begin
;          2621                             RET_STATUS = UEC_CODE;      !Return an "unknown end code"
;          2622                             DECODE ();              !Report the error and kick the bucket
;          2623                             return;                 !Just for show.  Decode kills it
;          2624                             end;
;          2625                         tes;
;          2626
;          2627                     !
```

```
;          2628                    ! The port/controller sent the endpacket over the connection
;          2629                    ! with out any problems.  Now find this commands owner in the
;          2630                    ! out$standing buffer and indicate to them that the command
;          2631                    ! has been received.
;          2632                    !
;          2633                    REF_NUM = .RET_EN$AD [CMD_LREF];    !Get this rec packets cmd ref number
;          2634                    !
;          2635                    ! Search  the outstanding  command buffer for  this commands
;          2636                    ! reference number.
;          2637                    !
;          2638                    ! If  found,  load  the  buffer location with the ret_en$ad
;          2639                    ! and set the received  flag  to signify that  this command
;          2640                    ! has been received by this interrupt service routine.
;          2641                    !
;          2642                    FOUND_CMD = FALSE;          !Clear the found cmd flag
;          2643
;          2644                    incru i from 0 to REC_ALLOCATE - 1 do       !Search the buffer
;          2645
;          2646                        if .OUT$STD_BUF [.i, CMD_REF] eqlu .REF_NUM     !Is this the comd ref
;          2647                        then
;          2648                            begin
;          2649                            OUT$STD_BUF [.i, REC_FLG] = TRUE;   !Indicate command is received
;          2650                            OUT$STD_BUF [.i, ENV_ADR] = .RET_EN$AD;     !Return envelope adrs
;          2651                            FOUND_CMD = TRUE;   !Indicate it was found
;          2652                            exitloop;           !Exit the loop
;          2653                            end;
;          2654
;          2655                        !
;          2656                        ! If  the search through the  command ref
;          2657                        ! buffer failed to find this commands cmd
;          2658                        ! reference number then die.
;          2659                        !
;          2660
;          2661                        if not .FOUND_CMD
;          2662                        then
;          2663                            begin
;          2664                            RET_STATUS = PSE_CODE;
;          2665                            DECODE ();
;          2666                            return;
;          2667                            end;
;          2668
;          2669                        end;                        !End of END$MSG processing
;          2670                    !
;          2671                    ! The  set  controller  characteristics command
;          2672                    ! disabled the reporting of attentions messages
;          2673                    ! so  treat   this  as  a  fatal  error and die.
;          2674                    !
;          2675
;          2676                    [ATT$MSG] :                 !Attention end message type
;          2677                        begin
;          2678                        RET_STATUS = ATN_CODE;
;          2679                        DECODE ();
;          2680                        return;
;          2681                        end;
;          2682                    !
;          2683                    ! It doesn't make any since for this end message
;          2684                    ! packet not to have the end message flag added
```

```
;        2685                    ! to this command opcode as treat it as a fatal
;        2686                    ! error and die.
;        2687                    !
;        2688
;        2689                    [CMD$MSG] :
;        2690                        begin
;        2691                        RET_STATUS = CMD_CODE;
;        2692                        DECODE ();
;        2693                        return;
;        2694                        end;
;        2695                    !
;        2696                    ! This end code type is of unknown origin so
;        2697                    ! treat is as a fatal error and die.
;        2698                    !
;        2699
;        2700                    [otherwise] :
;        2701                        begin
;        2702                        RET_STATUS = UEC_CODE;      !Unknown message type code received
;        2703                        DECODE ();
;        2704                        return;
;        2705                        end;
;        2706                    tes;
;        2707
;        2708                !
;        2709                ! Before  we  leave  put this receive envelope message length
;        2710                ! field  back to the  envelope  size,  in bytes (Per UQ Spec).
;        2711                ! This  size does not include the 2 UQ's words preceeding the
;        2712                ! command text  area.
;        2713                !
;        2714                RET_EN$AD [MSG_LENGTH] = RB_SIZE*2;
;        2715                !
;        2716                ! Return  this receive slot descriptor back to
;        2717                ! the port to fullfill my part of the protocol.
;        2718                !
;        2719                RECEIVE_RING [.NRD_SLOT, OWN_BIT] = PORT_OWNED;
;        2720                !
;        2721                ! Look at the  next response ring descriptor.  If its
;        2722                ! host owned then continue this process else exit the
;        2723                ! loop.  First see if the ring reference has  wrapped
;        2724                ! around to the top of the ring.
;        2725                !
;        2726
;        2727                if .NRD_SLOT + 1 gtru REC_ALLOCATE - 1      !Has the ring ref wrapped around
;        2728                then
;        2729                    TEMP = ZERO                         !Wrap it back to zero dsc slot
;        2730                else
;        2731                    TEMP = .NRD_SLOT + 1;               !Look at the next seq dsc slot
;        2732
;        2733                !
;        2734                ! Now see if the next receive descriptor slot is host owned.
;        2735                !
;        2736
;        2737                if .RECEIVE_RING [.TEMP, OWN_BIT] eqlu HOST_OWNED   !Are we done yet
;        2738                then
;        2739                    GET_NRD ()                          !Get the next resp desc to process
;        2740                else
;        2741                    exitloop;                           !No more to do so exit
```

```
;          2742
;          2743                end;                                    !End of WHILE LOOP
;          2744
;          2745            !
;          2746            ! All response ring descriptors have been processed with out any
;          2747            ! detected errors so return to the main host code with  an pass
;          2748            ! return code. But before we go clear out the interrupt indicators.
;          2749            !
;          2750            HEAD_AREA [RSP_INT] = ZEROS;                !Clear the interrupt indicator location
;          2751            HEAD_AREA [CMD_INT] = ZEROS;                !Clear out the indicator
;          2752            return RET_STATUS = PAS_CODE;               !Return a "pass code
;          2753            end;
;          2754
;          2755        !**********************END OF RESPONSE RING INTERRUPT PROCESSING*********************
;          2756
;          2757        !+
;          2758        ! A send ring transition interrupt could happen if at
;          2759        ! some date only one descriptor slot is allocated for
;          2760        ! commands.
;          2761        !
;          2762        ! Clear the interrupt indicator if this is true and do
;          2763        ! a return with no errors.
;          2764        !-
;          2765
;          2766        if .HEAD_AREA [CMD_INT]                         !Is this a com ring transition interrupt
;          2767        then
;          2768            begin
;          2769            HEAD_AREA [CMD_INT] = ZERO;                 !Clear out the indicator
;          2770            return;                                     !Continue on with the host code
;          2771            end;
;          2772
;          2773        !************************END OF COMMAND RING INTERRUPT PROCESSING********************
;          2774
;          2775        !+
;          2776        ! Check  to see if an adaptor purge is being requested
;          2777        ! by the port/controller in order to complete excution
;          2778        ! of a issued command.  Remember that this is  illegal
;          2779        ! during PDP-11  formatting and is concidered  to be a
;          2780        ! fatal error.
;          2781        !-
;          2782
;          2783        if .HEAD_AREA [ADP_CH] nequ ZERO                !Is the an adaptor purge request?
;          2784        then
;          2785            begin
;          2786            RET_STATUS = APR_CODE;                      !Indicate the error code
;          2787            DECODE ();                                  !Report the error and kick the bucket
;          2788            return;                                     !Just for show. Decode kills it
;          2789            end;
;          2790
;          2791        !************************END OF ADAPTOR PURGE INTERRUPT PROCESSING*********************
;          2792
;          2793        !+
;          2794        ! The host program has been interrupted by an unknown interrupt
;          2795        ! source if the routine program flow reaches here.
;          2796        !
;          2797        ! Load the error code into return status and call decode to take
;          2798        ! appropriate action.
```

```
;         2799      !_
;         2800
;         2801      RET_STATUS = UIN_CODE;
;         2802      DECODE ();
;         2803      return;
;         2804      end;


                                        .SBTTL  DUP$I.SERVICE MODULE DECLARATIONS
000000  010046                  DUP$I.SERVICE::
                                        MOV     R0,-(SP)                        ;                               2286
000002  010146                          MOV     R1,-(SP)
000004  010246                          MOV     R2,-(SP)
000006  010346                          MOV     R3,-(SP)
000010  010446                          MOV     R4,-(SP)
000012  010546                          MOV     R5,-(SP)
000014  016700  000000G                 MOV     RC25.ADDR,R0                    ;                               2357
000020  016046  000002                  MOV     2(R0),-(SP)                     ; *,RC$S.REG
000024  100004                          BPL     1$
000026  012767  000021  000000G         MOV     #21,RET.STATUS                  ;                               2360
000034  000546                          BR      9$                              ;                               2361
000036  016700  000000G         1$:     MOV     HEAD.AREA,R0                    ;                               2388
000042  032760  000001  000006         BIT     #1,6(R0)
000050  001002                          BNE     2$
000052  000167  000550                  JMP     21$
000056  004767  176424          2$:     JSR     PC,GET.NRD                      ;                               2391
000062  016700  000000G                 MOV     NRD.SLOT,R0                     ;                               2399
000066  006300                          ASL     R0
000070  006300                          ASL     R0
000072  066700  000000G                 ADD     RECEIVE.RING,R0
000076  032760  100000  000002         BIT     #100000,2(R0)
000104  001404                          BEQ     4$
000106  012767  000061  000000G 3$:     MOV     #61,RET.STATUS                  ;                               2402
000114  000570                          BR      16$                             ;                               2403
000116  104422                  4$:     TRAP    22                              ;                               2416
000120  016700  000000G                 MOV     NRD.SLOT,R0                     ;                               2424
000124  006300                          ASL     R0
000126  006300                          ASL     R0
000130  066700  000000G                 ADD     RECEIVE.RING,R0
000134  011067  000000G                 MOV     (R0),RET.EN$AD
000140  162767  000004  000000G         SUB     #4,RET.EN$AD
000146  016701  000000G                 MOV     RET.EN$AD,R1                    ;                               2444
000152  116100  000014                  MOVB    14(R1),R0
000156  006200                          ASR     R0
000160  006200                          ASR     R0
000162  006200                          ASR     R0
000164  006200                          ASR     R0
000166  006200                          ASR     R0
000170  006200                          ASR     R0
000172  042700  177774                  BIC     #177774,R0
000176  020027  000002                  CMP     R0,#2
000202  001121                          BNE     14$
000204  005002                          CLR     R2                              ;                               2461
000206  156102  000014                  BISB    14(R1),R2
000212  020227  000205                  CMP     R2,#205
000216  001007                          BNE     6$
000220  021127  000060          5$:     CMP     (R1),#60                        ;                               2470
```

```
000224  001453                          BEQ     10$
000226  012767  000071  000000G         MOV     #71,RET.STATUS                  ;                               2473
000234  000520                          BR      16$                             ;                               2474
000236  020227  000204          6$:     CMP     R2,#204                         ;                               2461
000242  001766                          BEQ     5$                              ;                               2486
000244  020227  000201                  CMP     R2,#201                         ;                               2461
000250  001763                          BEQ     5$                              ;                               2502
000252  020227  000202                  CMP     R2,#202                         ;                               2461
000256  001760                          BEQ     5$                              ;                               2518
000260  020227  000203                  CMP     R2,#203                         ;                               2461
000264  001755                          BEQ     5$                              ;                               2534
000266  020227  000206                  CMP     R2,#206                         ;                               2461
000272  001752                          BEQ     5$                              ;                               2550
000274  020227  000204                  CMP     R2,#204                         ;                               2461
000300  001747                          BEQ     5$                              ;                               2566
000302  020227  000211                  CMP     R2,#211                         ;                               2461
000306  001744                          BEQ     5$                              ;                               2582
000310  020227  000200                  CMP     R2,#200                         ;                               2461
000314  001004                          BNE     7$
000316  012767  000701  000000G         MOV     #701,RET.STATUS                 ;                               2600
000324  000565                          BR      24$                             ;                               2601
000326  020227  000207          7$:     CMP     R2,#207                         ;                               2461
000332  001004                          BNE     8$
000334  012767  000601  000000G         MOV     #601,RET.STATUS                 ;                               2611
000342  000556                          BR      24$                             ;                               2612
000344  012767  000101  000000G   8$:   MOV     #101,RET.STATUS                 ;                               2621
000352  000552                  9$:     BR      24$                             ;                               2622
000354  016700  000000G         10$:    MOV     RET.EN$AD,R0                    ;                               2633
000360  016005  000004                  MOV     4(R0),R5                        ; *,REF.NUM
000364  005004                          CLR     R4                              ; FOUND.CMD                     2642
000366  005000                          CLR     R0                              ; I                             2644
000370  005001                  11$:    CLR     R1                              ;                               2646
000372  156001  000000G                 BISB    OUT$STD.BUF(R0),R1              ; *(I),*
000376  020105                          CMP     R1,R5                           ; *,REF.NUM
000400  001011                          BNE     12$
000402  052760  100000  000000G         BIS     #100000,OUT$STD.BUF(R0)         ; *,*(I)                        2649
000410  016760  000000G 000002G         MOV     RET.EN$AD,OUT$STD.BUF+2(R0)     ; *,*(I)                        2650
000416  012704  000001                  MOV     #1,R4                           ; *,FOUND.CMD                   2651
000422  000405                          BR      13$                             ;                               2648
000424  062700  000004          12$:    ADD     #4,R0                           ; *,I                           2644
000430  020027  000014                  CMP     R0,#14                          ; I,*
000434  101755                          BLOS    11$
000436  032704  000001          13$:    BIT     #1,R4                           ; *,FOUND.CMD                   2661
000442  001016                          BNE     17$
000444  000620                          BR      3$                              ;                               2664
000446  020027  000001          14$:    CMP     R0,#1                           ;                               2444
000452  001004                          BNE     15$
000454  012767  000401  000000G         MOV     #401,RET.STATUS                 ;                               2678
000462  000506                          BR      24$                             ;                               2679
000464  005700                  15$:    TST     R0                              ;                               2444
000466  001326                          BNE     8$
000470  012767  000501  000000G         MOV     #501,RET.STATUS                 ;                               2691
000476  000500                  16$:    BR      24$                             ;                               2692
000500  012777  000074  000000G 17$:    MOV     #74,@RET.EN$AD                  ;                               2714
000506  016700  000000G                 MOV     NRD.SLOT,R0                     ;                               2719
000512  006300                          ASL     R0
000514  006300                          ASL     R0
```

```
000516  066700  000000G                        ADD     RECEIVE.RING,R0
000522  052760  100000  000002                BIS     #100000,2(R0)
000530  016700  000000G                        MOV     NRD.SLOT,R0             ;                                       2727
000534  005200                                 INC     R0
000536  020027  000003                         CMP     R0,#3
000542  101402                                 BLOS    18$
000544  005003                                 CLR     R3                      ; TEMP                                  2729
000546  000401                                 BR      19$                     ;                                       2727
000550  010003                         18$:    MOV     R0,R3                   ; *,TEMP                                2731
000552  010300                         19$:    MOV     R3,R0                   ; TEMP,*                                2737
000554  006300                                 ASL     R0
000556  006300                                 ASL     R0
000560  066700  000000G                        ADD     RECEIVE.RING,R0
000564  032760  100000  000002                BIT     #100000,2(R0)
000572  001004                                 BNE     20$
000574  004767  175706                         JSR     PC,GET.NRD              ;                                       2739
000600  000167  177312                         JMP     4$                      ;                                       2737
000604  016700  000000G                20$:    MOV     HEAD.AREA,R0            ;                                       2750
000610  005060  000006                         CLR     6(R0)
000614  005060  000004                         CLR     4(R0)                   ;                                       2751
000620  005067  000000G                        CLR     RET.STATUS              ;                                       2752
000624  000427                                 BR      25$                     ;                                       2390
000626  016700  000000G                21$:    MOV     HEAD.AREA,R0            ;                                       2766
000632  032760  000001  000004                BIT     #1,4(R0)
000640  001403                                 BEQ     22$
000642  005060  000004                         CLR     4(R0)                   ;                                       2769
000646  000416                                 BR      25$                     ;                                       2768
000650  016700  000000G                22$:    MOV     HEAD.AREA,R0            ;                                       2783
000654  105760  000003                         TSTB    3(R0)
000660  001404                                 BEQ     23$
000662  012767  000201  000000G                MOV     #201,RET.STATUS         ;                                       2786
000670  000403                                 BR      24$                     ;                                       2787
000672  012767  000301  000000G        23$:    MOV     #301,RET.STATUS         ;                                       2801
000700  004767  176010                 24$:    JSR     PC,DECODE               ;                                       2802
000704  005726                         25$:    TST     (SP)+                   ;                                       2286
000706  012605                                 MOV     (SP)+,R5
000710  012604                                 MOV     (SP)+,R4
000712  012603                                 MOV     (SP)+,R3
000714  012602                                 MOV     (SP)+,R2
000716  012601                                 MOV     (SP)+,R1
000720  012600                                 MOV     (SP)+,R0
000722  000002                                 RTI

; Routine Size:  234 words,     Routine Base:  AC$CODE + 1470
; Maximum stack depth per invocation:  13 words


;         2805
```

```
;          2806  global routine CTO_WAIT (TO_VALUE, REF_NUM, BUF$LOC) =  !Controller time out wait
;          2807
;          2808  !++
;          2809  ! Functional Description :
;          2810  !       This routine is called to  wait  for  the port/controller to either
;          2811  !       complete  the  queued command  or time out the command.
;          2812  ! Formal Parameters :
;          2813  !       TO_VALUE          Indicate the time-out interval for this command.
;          2814  !       REF_NUM             This argument contains the unique reference number
;          2815  !                         assigned to this command being timed out by this
;          2816  !                         routine.
;          2817  !       BUF$LOC             This argument points to the out$std_buf location
;          2818  !                         where this command is saved.  At this location the
;          2819  !                         received flag "rec_flg" bit is examined within the
;          2820  !                         the timeout loop and when it equals true will
;          2821  !                         signal that this command has been received by the
;          2822  !                         interrupt service routine.
;          2823  ! Implicit Inputs :
;          2824  !       none
;          2825  ! Implicit Outputs :
;          2826  !       The command  word in the out$std_buffer 'word zero of a command
;          2827  !       slot' is cleared out with the value %o'100000' to indicate this
;          2828  !       is an unused out$std_buffer  slot and  that  it  can  be reused.
;          2829  ! Completion Codes :
;          2830  !    There are  two  levels of return   status  returned   by   this  routine.
;          2831  !       1.   The   DUP interrupt service returns to  this routine a status code
;          2832  !            to indicate the success of the connection/communications mechanism
;          2833  !            to complete  the  queued command.  If the port/controller does not
;          2834  !            time  out  then  this  return status  is returned as this routines
;          2835  !            return status code.
;          2836  !       2.   If  the  port/controller times out  then the SA Register error bit
;          2837  !            is  examined  for the  error  bit set.  If set  then an port fatal
;          2838  !            error  code is  returned to the calling  routine else a controller
;          2839  !            time out error code is returned.
;          2840  !        In  all  cases, if   an error  code is  returned  (bit 0 = 1) then the
;          2841  !       routine  decode  is called   to decode   the  error code  and does the
;          2842  !       necessary recovery actions.
;          2843  !        At  the next higher level of return from this routine is another level
;          2844  !       of  return status    returned.  This   level test  the  success of the
;          2845  !       connection   and  also test the status  field in the returned response
;          2846  !       envelope for  the  success of  the controller to successfully complete
;          2847  !       the requested command.
;          2848  ! Side Effects :
;          2849  !       none
;          2850  !--
;          2851
;          2852      begin
;          2853
;          2854      !+
;          2855      ! Before doing the timeout wait make sure that this buffer location
;          2856      ! that we're suppose to time out actually  contains the command ref
;          2857      ! number  that was sent to us via  the formal argument.  Error  and
;          2858      ! kick the bucket if not the same.
;          2859      !-
;          2860
;          2861      if .OUT$STD_BUF [.BUF$LOC, CMD_REF] nequ .REF_NUM   !Is this the same ref_num
;          2862      then
```

```
;          2863          begin
;          2864          RET_STATUS = OSE_CODE;                  !Indicate the error code
;          2865          DECODE ();                              !Call decode to report the error
;          2866          end;
;          2867
;          2868      !+
;          2869      ! Loop   on  a  one  micro  second  delay for  the  number of times
;          2870      ! requested  by   the  caller.  After  each  delay see  if the flag
;          2871      ! "rec_flg" has  been set yet.  Return  "Ret_status" and clear  the
;          2872      ! command  word  to %o'100000' to   indicate  this command has been
;          2873      ! received  if  this  flag  gets  set  before  the  timer   expires.
;          2874      ! Return a error code if the timer expires before the flag gets set.
;          2875      !-
;          2876
;          2877      incru i from 0 to .TO_VALUE do              !Loop for time-out_value
;          2878          begin
;          2879          DELAY (C_US);                           !Do the one micro second delay
;          2880          !
;          2881          ! Exit routine with the DUP interrupt service routines "ret_status" if
;          2882          ! "rec_flg"  got set before the timer expires.
;          2883          !
;          2884
;          2885          if .OUT$STD_BUF [.BUF$LOC, REC_FLG] eqlu TRUE   !Is this command received yet
;          2886          then
;          2887              begin
;          2888              OUT$STD_BUF [.BUF$LOC, CMD_WRD] = %o'100000';       !Return the slot to the unused state
;          2889              return .RET_STATUS;                 !Return the interrupt service status
;          2890              end;
;          2891
;          2892          !
;          2893          ! Check the SA register for posted port errors just in case the
;          2894          ! port does not interrupt the host when a port error occurs.
;          2895          !
;          2896
;          2897          if .RC25_ADDR [RCSA, ERR_BIT] then return RET_STATUS = PFE_CODE;
;          2898
;          2899          BREAK;                                  !Service any control C's
;          2900          end;
;          2901
;          2902      !
;          2903      ! The port/controller timed out if the code reached  here.  Return an error
;          2904      ! code to the caller and exit the routine.
;          2905      !
;          2906
;          2907      if .RC25_ADDR [RCSA, ERR_BIT]               !Is the SA error bit set
;          2908      then
;          2909          return RET_STATUS = PFE_CODE            !Port timed out with fatal error
;          2910      else
;          2911          return RET_STATUS = CTO_CODE;           !Port just timed out
;          2912
;          2913      end;

                                        .GLOBL  L$DLY

                                        .SBTTL  CTO.WAIT MODULE DECLARATIONS
```

```
000000  004167  000000G                CTO.WAIT::
                                                JSR     R1,$SAVE3                       ;                                       2806
000004  162706  000006                          SUB     #6,SP
000010  016600  000020                          MOV     20(SP),R0                       ; BUF$LOC,*                             2861
000014  006300                                  ASL     R0
000016  006300                                  ASL     R0
000020  012703  000000G                         MOV     #OUT$STD.BUF,R3
000024  060003                                  ADD     R0,R3
000026  005000                                  CLR     R0
000030  151300                                  BISB    (R3),R0
000032  020066  000022                          CMP     R0,22(SP)                       ; *,REF.NUM
000036  001405                                  BEQ     1$
000040  012767  003001  000000G                 MOV     #3001,RET.STATUS                ;                                       2864
000046  004767  175716                          JSR     PC,DECODE                       ;                                       2865
000052  005002                          1$:     CLR     R2                              ; I                                     2877
000054  000436                                  BR      10$
000056  012701  000001                  2$:     MOV     #1,R1                           ; *,$$TMP2                              2879
000062  001411                          3$:     BEQ     6$
000064  016700  000000G                         MOV     L$DLY,R0                        ; *,$$TMP1
000070  001404                                  BEQ     5$
000072  005066  000004                  4$:     CLR     4(SP)                           ; $$TMP
000076  005300                                  DEC     R0                              ; $$TMP1
000100  001374                                  BNE     4$
000102  005301                          5$:     DEC     R1                              ; $$TMP2
000104  000766                                  BR      3$
000106  005713                          6$:     TST     (R3)                            ;                                       2885
000110  100005                                  BPL     7$
000112  012713  100000                          MOV     #-100000,(R3)                   ;                                       2888
000116  016700  000000G                         MOV     RET.STATUS,R0                   ;                                       2887
000122  000427                                  BR      12$
000124  016700  000000G                 7$:     MOV     RC25.ADDR,R0                    ;                                       2897
000130  016066  000002  000002                  MOV     2(R0),2(SP)                     ; *,RC$S.REG
000136  100003                                  BPL     9$
000140  012700  000021                  8$:     MOV     #21,R0
000144  000414                                  BR      11$
000146  104422                          9$:     TRAP    22
000150  005202                                  INC     R2                              ; I                                     2877
000152  020266  000024                  10$:    CMP     R2,24(SP)                       ; I,TO.VALUE
000156  101737                                  BLOS    2$
000160  016700  000000G                         MOV     RC25.ADDR,R0                    ;                                       2907
000164  016016  000002                          MOV     2(R0),(SP)                      ; *,RC$S.REG
000170  100763                                  BMI     8$                              ;                                       2909
000172  012700  000011                          MOV     #11,R0                          ;                                       2911
000176  010067  000000G                 11$:    MOV     R0,RET.STATUS
000202  062706  000006                  12$:    ADD     #6,SP                           ;                                       2806
000206  000207                                  RTS     PC

; Routine Size:  68 words,      Routine Base:  AC$CODE + 2414
; Maximum stack depth per invocation:  9 words


;         2914
```

```
;          2915  global routine ABORT =                          !Aborts remote program
;          2916
;          2917  !++
;          2918  ! Functional Description :
;          2919  !       The  abort program  command is used to terminate the execution of a
;          2920  !       remote  program in an orderly  fashion.  When a successful response
;          2921  !       is   received  to   this command  the remote  program  has  stopped
;          2922  !       executing  and the  server is in idle state.  Note that the sending
;          2923  !       of this command does not preclude further send data or receive data
;          2924  !       exchanges: On the  contrary, the  remote program may be designed to
;          2925  !       send  out termination status and possibly even ask questions during
;          2926  !       its forced-exit sequence.  The time out for this command is a fixed
;          2927  !       10  seconds  and  if    a   response  is  not  received by then the
;          2928  !       connection to  the dust should be terminated.  This command is only
;          2929  !       legal if the dust is in active state.
;          2930  !
;          2931  ! Formal Parameters :
;          2932  !       none
;          2933  !
;          2934  ! Implicit Inputs :
;          2935  !       NSD_SLOT        This  global storage gets  loaded  by  the routine
;          2936  !                       'Get_nsd'  and  in it is stored the next send ring
;          2937  !                       descriptor  slot  where the port/controller should
;          2938  !                       be polling on and the  place  to put this commands
;          2939  !                       command packet.
;          2940  !
;          2941  ! Implicit Outputs :
;          2942  !       none
;          2943  !
;          2944  ! Completion Codes :
;          2945  !       RET_STATUS:     Return status passes back to the calling routine
;          2946  !                       the status of the just issued command.
;          2947  !
;          2948  ! Side Effects :
;          2949  !       Any remote program running in the controllers DM machine will
;          2950  !       be aborted.
;          2951  !--
;          2952
;          2953      begin
;          2954
;          2955      local
;          2956          REF_NUM,                                !Stores unique cmd ref number
;          2957          ABO_BUF$LOC,                            !Stores out$standing cmd buffer location
;          2958          TEMP;                                   !A place to put the read IP register data
;          2959
;          2960      !
;          2961      ! Before we load up the command packet up with all this good information get
;          2962      ! thenext send descriptor slot and a unique command reference number.
;          2963      !
;          2964      GET_NSD ();                                 !Get the next send desc slot
;          2965      REF_NUM = GET_CMD$REF ();                   !Get a unique command ref num
;          2966      !
;          2967      ! UQ Port command envelope Header field definition
;          2968      !
;          2969      SND_ENVELOPE [.NSD_SLOT, MSG_LENGTH] = SZ_ABT;      !Load the length of envelope
;          2970      SND_ENVELOPE [.NSD_SLOT, CREDITS] = ONE;    !Load credits
;          2971      SND_ENVELOPE [.NSD_SLOT, MSG_TYPE] = 0;     !Load message type
```

```
;          2972      SND_ENVELOPE [.NSD_SLOT, CONN_ID] = DUP;     !Load connection ID
;          2973      !
;          2974      ! DUP command envelope field definition
;          2975      !
;          2976      SND_ENVELOPE [.NSD_SLOT, CMD_LREF] = .REF_NUM;      !Define referance number
;          2977      SND_ENVELOPE [.NSD_SLOT, CMD_HREF] = ZERO;  !Hi order ref number
;          2978      SND_ENVELOPE [.NSD_SLOT, UN_LUSED] = ZERO;  !Unused low order
;          2979      SND_ENVELOPE [.NSD_SLOT, UN_HUSED] = ZERO;  !Unused hi order
;          2980      SND_ENVELOPE [.NSD_SLOT, OPCODE] = OP_ABT;  !Load opcod
;          2981      SND_ENVELOPE [.NSD_SLOT, RSVD] = ZERO;      !Reserved field
;          2982      SND_ENVELOPE [.NSD_SLOT, MODIFIER] = ZERO;
;          2983      !
;          2984      ! Call   the  load  out$standing  command buffer routine
;          2985      ! and  load  this command  into  the buffer.  The return
;          2986      ! from this routine will point us to the buffer location
;          2987      ! where  this command  is  stored.  Later we can look at
;          2988      ! this  location to see if the interrupt service routine
;          2989      ! has received and process it.
;          2990      !
;          2991      ABO_BUF$LOC = LOAD_OUT$STD_BUF (.REF_NUM);  !Load the command
;          2992
;          2993      if .ABO_BUF$LOC eqlu OBF_CODE then DECODE ();       !Error if buffer is full
;          2994
;          2995      !
;          2996      ! Set the ownership bit to 1 giving this slot to the port/controller
;          2997      !
;          2998      SEND_RING [.NSD_SLOT, OWN_BIT] = PORT_OWNED;
;          2999      !
;          3000      ! Read the IP register to stimulate port polling
;          3001      !
;          3002      TEMP = .RC25_ADDR [RCIP, RC_ALL];
;          3003      !
;          3004      ! Time  out the  port/controller processing  the command.
;          3005      !
;          3006      ! The   first   test   tests the connections  ability to
;          3007      ! respond to  this command without  any errors in the SA
;          3008      ! register and for the command not timing out.
;          3009      !
;          3010      ! The  second tests the  DUP server for good status.  If
;          3011      ! bad status is sent back then an error code is returned
;          3012      ! to the calling routine where the routine "decode" will
;          3013      ! decode  and take the  appropriate recovery.  The  time
;          3014      ! out  routine will loop on delaying and checking the hi
;          3015      ! bit of the  first word in  the  out$std_buf for a true.
;          3016      ! When true signals us that the interrupt service routine
;          3017      ! has received  the endpacket  and  no connection errors
;          3018      ! were detected.
;          3019      !
;          3020
;          3021      if CTO_WAIT (3000, .REF_NUM, .ABO_BUF$LOC) then DECODE ();  !Is return an error
;          3022
;          3023      !
;          3024      ! Get  the return envelope  address  from the  out$std_buf
;          3025      ! at  this commands  buffer location  and check the packet
;          3026      ! for good status error and die if bad status was returned
;          3027      !
;          3028      RET_EN$AD = .OUT$STD_BUF [.ABO_BUF$LOC, ENV_ADR];   !Get the ret env adr
```

```
;          3029      !
;          3030      ! Now test for good status
;          3031      !
;          3032
;          3033      if .RET_EN$AD [STATUS] nequ ZERO          !Test the status
;          3034      then
;          3035          return RET_STATUS = RSE_CODE          !Return a "Response status err" code
;          3036      else
;          3037          return .RET_STATUS;                   !This ret_status is good or bad
;          3038
;          3039      end;


                                        .SBTTL  ABORT MODULE DECLARATIONS
000000  004167  000000G           ABORT:: JSR     R1,$SAVE2                       ;                       2915
000004  005746                    TST     -(SP)
000006  004767  175312            JSR     PC,GET.NSD                      ;                       2964
000012  004767  175454            JSR     PC,GET.CMD$REF                  ;                       2965
000016  010002                    MOV     R0,R2                           ; *,REF.NUM
000020  016746  000000G           MOV     NSD.SLOT,-(SP)                  ;                       2969
000024  012746  000054            MOV     #54,-(SP)
000030  004767  000000G           JSR     PC,BL$MUL
000034  012760  000014  000000G   MOV     #14,SND.ENVELOPE(R0)
000042  012701  000002G           MOV     #SND.ENVELOPE+2,R1              ;                       2970
000046  060001                    ADD     R0,R1
000050  112711  000001            MOVB    #1,(R1)                         ;                       2971
000054  112761  000002  000001    MOVB    #2,1(R1)                        ;                       2972
000062  010260  000004G           MOV     R2,SND.ENVELOPE+4(R0)           ; REF.NUM,*             2976
000066  005060  000006G           CLR     SND.ENVELOPE+6(R0)              ;                       2977
000072  005060  000010G           CLR     SND.ENVELOPE+10(R0)             ;                       2978
000076  005060  000012G           CLR     SND.ENVELOPE+12(R0)             ;                       2979
000102  112760  000006  000014G   MOVB    #6,SND.ENVELOPE+14(R0)          ;                       2980
000110  105060  000015G           CLRB    SND.ENVELOPE+15(R0)             ;                       2981
000114  005060  000016G           CLR     SND.ENVELOPE+16(R0)             ;                       2982
000120  010216                    MOV     R2,(SP)                         ; REF.NUM,*             2991
000122  004767  175252            JSR     PC,LOAD.OUT$STD.BUF
000126  010001                    MOV     R0,R1                           ; *,ABO.BUF$LOC
000130  020127  002001            CMP     R1,#2001                        ; ABO.BUF$LOC,*         2993
000134  001002                    BNE     1$
000136  004767  175416            JSR     PC,DECODE
000142  016700  000000G     1$:   MOV     NSD.SLOT,R0                     ;                       2998
000146  006300                    ASL     R0
000150  006300                    ASL     R0
000152  066700  000000G           ADD     SEND.RING,R0
000156  052760  100000  000002    BIS     #100000,2(R0)
000164  017766  000000G 000004    MOV     @RC25.ADDR,4(SP)                ; *,RC$S.REG            3002
000172  016600  000004            MOV     4(SP),R0                        ; RC$S.REG,TEMP
000176  012716  005670            MOV     #5670,(SP)                      ;                       3021
000202  010246                    MOV     R2,-(SP)                        ; REF.NUM,*
000204  010146                    MOV     R1,-(SP)                        ; ABO.BUF$LOC,*
000206  004767  177356            JSR     PC,CTO.WAIT
000212  022626                    CMP     (SP)+,(SP)+
000214  006000                    ROR     R0
000216  103002                    BCC     2$
000220  004767  175334            JSR     PC,DECODE
000224  010100              2$:   MOV     R1,R0                           ; ABO.BUF$LOC,*         3028
000226  006300                    ASL     R0
```

```
000230  006300                                  ASL     R0
000232  016067  000002G 000000G                 MOV     OUT$STD.BUF+2(R0),RET.EN$AD
000240  016000  000002G                         MOV     OUT$STD.BUF+2(R0),R0            ;                       3033
000244  005760  000016                          TST     16(R0)
000250  001405                                  BEQ     3$
000252  012700  000031                          MOV     #31,R0                          ;                       3035
000256  010067  000000G                         MOV     R0,RET.STATUS
000262  000402                                  BR      4$                              ;                       2953
000264  016700  000000G                 3$:     MOV     RET.STATUS,R0
000270  062706  000006                  4$:     ADD     #6,SP                           ;                       2915
000274  000207                                  RTS     PC

; Routine Size:  95 words,     Routine Base:  AC$CODE + 2624
; Maximum stack depth per invocation:  9 words

;        3040
```

```
;       3041  global routine GET_DUST_STATUS =                !Gets DUP server status
;       3042
;       3043  !++
;       3044  ! Functional Description :
;       3045  !       This  command allows  the host program to interrogate the DUP server
;       3046  !       to  determine its  caracteristics, its  state  and the  state of the
;       3047  !       program  currently running  (if any).  It is legal in either idle or
;       3048  !       active  state  and  does  not affect  the state of server.  It has a
;       3049  !       fixed timeout interval of 3 seconds.  If the response times out, the
;       3050  !       host should break the connection.
;       3051  !
;       3052  ! Formal Parameters :
;       3053  !       none
;       3054  !
;       3055  ! Implicit Inputs :
;       3056  !       NSD_SLOT        This  global storage gets  loaded  by  the routine
;       3057  !                       'Get_nsd'  and  in it is stored the next send ring
;       3058  !                       descriptor  slot  where the port/controller should
;       3059  !                       be polling on and the  place  to put this commands
;       3060  !                       command packet.
;       3061  !
;       3062  ! Implicit Outputs :
;       3063  !       none
;       3064  !
;       3065  ! Completion Codes :
;       3066  !       RET_STATUS:     Return status passes back to the calling routine
;       3067  !                       the status of the just issued command.
;       3068  !
;       3069  ! Side Effects :
;       3070  !--
;       3071
;       3072      begin
;       3073
;       3074      local
;       3075          REF_NUM,                                  !Stores unique cmd ref number
;       3076          GDS_BUF$LOC,                              !Stores out$standing cmd buffer location
;       3077          TEMP;                                     !A place to put the IP read data
;       3078
;       3079      !
;       3080      ! Before we load up the command packet up with all this good information get
;       3081      ! the next send descriptor slot and a unique command reference number.
;       3082      !
;       3083      GET_NSD ();                                   !Get the next send desc slot
;       3084      REF_NUM = GET_CMD$REF ();                     !Get a unique command ref num
;       3085      !
;       3086      ! UQ Port command envelope Header field definition
;       3087      !
;       3088      SND_ENVELOPE [.NSD_SLOT, MSG_LENGTH] = SZ_GDS;      !Load the envelope size
;       3089      SND_ENVELOPE [.NSD_SLOT, CREDITS] = ONE;    !Load the credit size
;       3090      SND_ENVELOPE [.NSD_SLOT, MSG_TYPE] = 0;     !Load the message type (Sequential)
;       3091      SND_ENVELOPE [.NSD_SLOT, CONN_ID] = DUP;    !Load the connection ID
;       3092      !
;       3093      ! DUP generic command envelope field definition
;       3094      !
;       3095      SND_ENVELOPE [.NSD_SLOT, CMD_LREF] = .REF_NUM;      !Load command reference number
;       3096      SND_ENVELOPE [.NSD_SLOT, CMD_HREF] = ZERO;  !Command reference low order
;       3097      SND_ENVELOPE [.NSD_SLOT, UN_[USED] = ZERO;  !Low order unused
```

```
;          3098      SND_ENVELOPE [.NSD_SLOT, UN_HUSED] = ZERO;  !Hi order unused
;          3099      SND_ENVELOPE [.NSD_SLOT, OPCODE] = OP_GDS;  !Load opcode
;          3100      SND_ENVELOPE [.NSD_SLOT, RSVD] = ZERO;      !Reserved field
;          3101      SND_ENVELOPE [.NSD_SLOT, MODIFIER] = ZERO;  !Load modifier field
;          3102      !
;          3103      ! Call   the  load  out$standing  command buffer routine
;          3104      ! and  load  this command  into  the buffer.  The return
;          3105      ! from this routine will point us to the buffer location
;          3106      ! where  this command  is  stored.  Later we can look at
;          3107      ! this  location to see if the interrupt service routine
;          3108      ! has received and process it.
;          3109      !
;          3110      GDS_BUF$LOC = LOAD_OUT$STD_BUF (.REF_NUM);  !Load the command
;          3111
;          3112      if .GDS_BUF$LOC eqlu OBF_CODE then DECODE ();       !Error if buffer is full
;          3113
;          3114      !
;          3115      ! Set the ownership bit to 1 giving this slot to the port/controller
;          3116      !
;          3117      SEND_RING [.NSD_SLOT, OWN_BIT] = PORT_OWNED;
;          3118      !
;          3119      ! Read the IP register to stimulate port polling
;          3120      !
;          3121      TEMP = .RC25_ADDR [RCIP, RC_ALL];
;          3122      !
;          3123      ! Time  out the  port/controller processing  the command.
;          3124      !
;          3125      ! The   first   test   tests the connections  ability to
;          3126      ! respond to  this command without  any errors in the SA
;          3127      ! register and for the command not timing out.
;          3128      !
;          3129      ! The  second tests the  DUP server for good status.  If
;          3130      ! bad status is sent back then an error code is returned
;          3131      ! to the calling routine where the routine "decode" will
;          3132      ! decode  and take the  appropriate recovery.  The  time
;          3133      ! out  routine will loop on delaying and checking the hi
;          3134      ! bit of the  first word in  the  out$std_buf for a true.
;          3135      ! When true signals us that the interrupt service routine
;          3136      ! has received  the endpacket  and  no connection errors
;          3137      ! were detected.
;          3138      !
;          3139
;          3140      if CTO_WAIT (3500, .REF_NUM, .GDS_BUF$LOC) then DECODE ();  !Is return an error
;          3141
;          3142      !
;          3143      ! Get  the return envelope  address  from the  out$std_buf
;          3144      ! at  this commands  buffer location  and check the packet
;          3145      ! for good status error and die if bad status was returned
;          3146      !
;          3147      RET_EN$AD = .OUT$STD_BUF [.GDS_BUF$LOC, ENV_ADR];   !Get the ret env adr
;          3148      !
;          3149      ! Now test for good status
;          3150      !
;          3151
;          3152      if .RET_EN$AD [STATUS] nequ ZERO            !Test the status
;          3153      then
;          3154          return RET_STATUS = RSE_CODE            !Return a "Response status err" code
```

```
;         3155      else
;         3156          return .RET_STATUS;                   !This ret_status is good or bad
;         3157
;         3158      end;


                                        .SBTTL  GET.DUST.STATUS MODULE DECLARATIONS
000000  004167  000000G           GET.DUST.STATUS::
                                        JSR     R1,$SAVE2                       ;                       3041
000004  005746                          TST     -(SP)
000006  004767  175014                  JSR     PC,GET.NSD                      ;                       3083
000012  004767  175156                  JSR     PC,GET.CMD$REF                  ;                       3084
000016  010002                          MOV     R0,R2                           ; *,REF.NUM
000020  016746  000000G                 MOV     NSD.SLOT,-(SP)                  ;                       3088
000024  012746  000054                  MOV     #54,-(SP)
000030  004767  000000G                 JSR     PC,BL$MUL
000034  012760  000014  000000G         MOV     #14,SND.ENVELOPE(R0)
000042  012701  000002G                 MOV     #SND.ENVELOPE+2,R1              ;                       3089
000046  060001                          ADD     R0,R1
000050  112711  000001                  MOVB    #1,(R1)                         ;                       3090
000054  112761  000002  000001         MOVB    #2,1(R1)                        ;                       3091
000062  010260  000004G                 MOV     R2,SND.ENVELOPE+4(R0)           ; REF.NUM,*             3095
000066  005060  000006G                 CLR     SND.ENVELOPE+6(R0)              ;                       3096
000072  005060  000010G                 CLR     SND.ENVELOPE+10(R0)             ;                       3097
000076  005060  000012G                 CLR     SND.ENVELOPE+12(R0)             ;                       3098
000102  112760  000001  000014G         MOVB    #1,SND.ENVELOPE+14(R0)          ;                       3099
000110  105060  000015G                 CLRB    SND.ENVELOPE+15(R0)             ;                       3100
000114  005060  000016G                 CLR     SND.ENVELOPE+16(R0)             ;                       3101
000120  010216                          MOV     R2,(SP)                         ; REF.NUM,*             3110
000122  004767  174754                  JSR     PC,LOAD.OUT$STD.BUF
000126  010001                          MOV     R0,R1                           ; *,GDS.BUF$LOC
000130  020127  002001                  CMP     R1,#2001                        ; GDS.BUF$LOC,*         3112
000134  001002                          BNE     1$
000136  004767  175120                  JSR     PC,DECODE
000142  016700  000000G           1$:   MOV     NSD.SLOT,R0                     ;                       3117
000146  006300                          ASL     R0
000150  006300                          ASL     R0
000152  066700  000000G                 ADD     SEND.RING,R0
000156  052760  100000  000002         BIS     #100000,2(R0)
000164  017766  000000G 000004         MOV     @RC25.ADDR,4(SP)                ; *,RC$S.REG            3121
000172  016600  000004                  MOV     4(SP),R0                        ; RC$S.REG,TEMP
000176  012716  006654                  MOV     #6654,(SP)                      ;                       3140
000202  010246                          MOV     R2,-(SP)                        ; REF.NUM,*
000204  010146                          MOV     R1,-(SP)                        ; GDS.BUF$LOC,*
000206  004767  177060                  JSR     PC,CTO.WAIT
000212  022626                          CMP     (SP)+,(SP)+
000214  006000                          ROR     R0
000216  103002                          BCC     2$
000220  004767  175036                  JSR     PC,DECODE
000224  010100                    2$:   MOV     R1,R0                           ; GDS.BUF$LOC,*         3147
000226  006300                          ASL     R0
000230  006300                          ASL     R0
000232  016067  000002G 000000G         MOV     OUT$STD.BUF+2(R0),RET.EN$AD
000240  016000  000002G                 MOV     OUT$STD.BUF+2(R0),R0            ;                       3152
000244  005760  000016                  TST     16(R0)
000250  001405                          BEQ     3$
000252  012700  000031                  MOV     #31,R0                          ;                       3154
```

```
000256  010067  000000G                        MOV     R0,RET.STATUS
000262  000402                                 BR      4$                      ;                       3072
000264  016700  000000G              3$:       MOV     RET.STATUS,R0
000270  062706  000006               4$:       ADD     #6,SP                   ;                       3041
000274  000207                                 RTS     PC

; Routine Size:  95 words,      Routine Base:  AC$CODE + 3122
; Maximum stack depth per invocation:  9 words


;        3159
```

```
;        3160  global routine EX_SUP_PROG =                    !Executes supplied program
;        3161
;        3162  !++
;        3163  ! Functional Description :
;        3164  !       This  command  causes  the  server  to  transfer the program from host
;        3165  !       memory  to  an  area  in  the controller and start its execution.  The
;        3166  !       host  supplies   the   address   and   length  (in  bytes) of a buffer
;        3167  !       containing  the   program   header   and  initial  load;  the starting
;        3168  !       of the program, its memory requirements and any relocation information
;        3169  !       needed  to  run under the server are in the program header in a format
;        3170  !       which  is none of the host business.  This commmand is only legal when
;        3171  !       the  server is in the idle state and return of a successful end packet
;        3172  !       puts the server into to active state.
;        3173  !
;        3174  !       The time out interval for this command is 30 seconds.
;        3175  !
;        3176  ! Formal Parameters :
;        3177  !       none
;        3178  !
;        3179  ! Implicit Inputs :
;        3180  !       NSD_SLOT        This  global storage gets  loaded  by  the routine
;        3181  !                       'Get_nsd'  and  in it is stored the next send ring
;        3182  !                       descriptor  slot  where the port/controller should
;        3183  !                       be polling on and the  place  to put this commands
;        3184  !                       command packet.
;        3185  !
;        3186  !
;        3187  ! Implicit Outputs :
;        3188  !       AZFMTR:         Azfmtr is the vector produced by DMCONV program and
;        3189  !                       is decalared in module AZKEL6.
;        3190  !       DMSA:           These three bound addresses point to specific area
;        3191  !       OVSA:           in the DM code buffer 'azfmtr' and are used to
;        3192  !       HDSA:           define the buffer descriptors within this command.
;        3193  !
;        3194  ! Completion Codes :
;        3195  !       RET_STATUS:     Return status passes back to the calling routine
;        3196  !                       the status of the just issued command.
;        3197  !
;        3198  ! Side Effects :
;        3199  !       The DM machine in the controller goes from the idle state to the
;        3200  !       active state on return of a successful return packet.
;        3201  !--
;        3202
;        3203      begin
;        3204
;        3205      local
;        3206          REF_NUM,                                !Stores unique cmd ref number
;        3207          ESP_BUF$LOC,                            !Stores out$standing cmd buffer location
;        3208          TEMP;                                   !A place to put the read IP register data
;        3209
;        3210      !
;        3211      ! Before we load up the command packet up with all this good information get
;        3212      ! the next send  descriptor slot and a unique command reference number.
;        3213      !
;        3214      GET_NSD ();                                 !Get the next send desc slot
;        3215      REF_NUM = GET_CMD$REF ();                   !Get a unique command ref num
;        3216      !
```

```
;        3217      ! UQ Port command envelope Header field definition
;        3218      !
;        3219      SND_ENVELOPE [.NSD_SLOT, MSG_LENGTH] = SZ_ESP;      !Load the message length
;        3220      SND_ENVELOPE [.NSD_SLOT, CREDITS] = ONE;    !Load the credits field
;        3221      SND_ENVELOPE [.NSD_SLOT, MSG_TYPE] = 0;     !Define the msg type 'Sequential'
;        3222      SND_ENVELOPE [.NSD_SLOT, CONN_ID] = DUP;    !Define the conection ID
;        3223      !
;        3224      ! DUP generic command envelope field definition
;        3225      !
;        3226      SND_ENVELOPE [.NSD_SLOT, CMD_LREF] = .REF_NUM;      !Load command ref number
;        3227      SND_ENVELOPE [.NSD_SLOT, CMD_HREF] = ZERO;  !Zero Hi order word of cmd ref
;        3228      SND_ENVELOPE [.NSD_SLOT, UN_CUSED] = ZERO;  !Not used in DUP implimentation
;        3229      SND_ENVELOPE [.NSD_SLOT, UN_HUSED] = ZERO;  !Not used in DUP implimentation
;        3230      SND_ENVELOPE [.NSD_SLOT, OPCODE] = OP_ESP;  !Load the command op-code
;        3231      SND_ENVELOPE [.NSD_SLOT, RSVD] = ZERO;      !Not used
;        3232      SND_ENVELOPE [.NSD_SLOT, MODIFIER] = ZERO;
;        3233      !
;        3234      ! Command specfic command envelope field definition
;        3235      !
;        3236      ! Byte count of initial transfer (from bytes 0-3 of the program header).
;        3237      !
;        3238      SND_ENVELOPE [.NSD_SLOT, BLO_CNT] = .AZFMTR [WRD0]; !Byte count low word
;        3239      SND_ENVELOPE [.NSD_SLOT, BHI_CNT] = .AZFMTR [WRD1]; !Byte count high word
;        3240      !
;        3241      ! Buffer descriptor definition for initial load.  First
;        3242      ! byte  of  this  buffer  is byte 0 of  program header.
;        3243      !
;        3244      SND_ENVELOPE [.NSD_SLOT, BPA_LO] = HDSA;    !Low unibus adrs <0-15>
;        3245      SND_ENVELOPE [.NSD_SLOT, BPA_HI] = ZERO;    !Unibus adrs bits <16-17>
;        3246      SND_ENVELOPE [.NSD_SLOT, QBUS_EXT] = ZERO;  !Q_bus extention adrs
;        3247      SND_ENVELOPE [.NSD_SLOT, RSV] = ZERO;       !Reserved field
;        3248      SND_ENVELOPE [.NSD_SLOT, UBA_CHAN] = ZERO;  !Unibus adaptor channel number
;        3249      SND_ENVELOPE [.NSD_SLOT, RSV0] = ZERO;      !These next four words are not
;        3250      SND_ENVELOPE [.NSD_SLOT, RSV1] = ZERO;      !used in the DUP implementation
;        3251      SND_ENVELOPE [.NSD_SLOT, RSV2] = ZERO;      !
;        3252      SND_ENVELOPE [.NSD_SLOT, RSV3] = ZERO;      !
;        3253      !
;        3254      ! These next field definitions are the same as above except they are for the
;        3255      ! overlay buffer descriptors.  To make life easy for me I'll use the same names
;        3256      ! and just prefix them with a $ for uniqueness.
;        3257      !
;        3258      ! The overlay area immediately follows the initial load image in the program image.
;        3259      !
;        3260      SND_ENVELOPE [.NSD_SLOT, $BPA_LO] = .OVSA;  !Low unibus adrs <0-15>
;        3261      SND_ENVELOPE [.NSD_SLOT, $BPA_HI] = ZERO;   !Unibus adrs bits <16-17>
;        3262      SND_ENVELOPE [.NSD_SLOT, $QBUS_EXT] = ZERO; !Q_bus extention adrs
;        3263      SND_ENVELOPE [.NSD_SLOT, $RSV] = ZERO;      !Reserved field
;        3264      SND_ENVELOPE [.NSD_SLOT, $UBA_CHAN] = ZERO; !Unibus adaptor channel number
;        3265      SND_ENVELOPE [.NSD_SLOT, $RSV0] = ZERO;     !These next four words are not
;        3266      SND_ENVELOPE [.NSD_SLOT, $RSV1] = ZERO;     !used in the DUP implementation
;        3267      SND_ENVELOPE [.NSD_SLOT, $RSV2] = ZERO;     !
;        3268      SND_ENVELOPE [.NSD_SLOT, $RSV3] = ZERO;     !
;        3269      !
;        3270      ! Call   the  load  out$standing  command buffer routine
;        3271      ! and  load  this command  into  the buffer.  The return
;        3272      ! from this routine will point us to the buffer location
;        3273      ! where  this command  is  stored.  Later we can look at
```

```
;         3274      ! this  location to see if the interrupt service routine
;         3275      ! has received and process it.
;         3276      !
;         3277      ESP_BUF$LOC = LOAD_OUT$STD_BUF (.REF_NUM);  !Load the command
;         3278
;         3279      if .ESP_BUF$LOC eqlu OBF_CODE then DECODE ();       !Error if buffer is full
;         3280
;         3281      !
;         3282      ! Set the ownership bit to 1 giving this slot to the port/controller
;         3283      !
;         3284      SEND_RING [.NSD_SLOT, OWN_BIT] = PORT_OWNED;
;         3285      !
;         3286      ! Read the IP register to stimulate port polling
;         3287      !
;         3288      TEMP = .RC25_ADDR [RCIP, RC_ALL];
;         3289      !
;         3290      ! Time  out the  port/controller processing  the command.
;         3291      !
;         3292      ! The   first   test   tests the connections  ability to
;         3293      ! respond to  this command without  any errors in the SA
;         3294      ! register and for the command not timing out.
;         3295      !
;         3296      ! The  second tests the  DUP server for good status.  If
;         3297      ! bad status is sent back then an error code is returned
;         3298      ! to the calling routine where the routine "decode" will
;         3299      ! decode  and take the  appropriate recovery.  The  time
;         3300      ! out  routine will loop on delaying and checking the hi
;         3301      ! bit of the  first word in  the  out$std_buf for a true.
;         3302      ! When true signals us that the interrupt service routine
;         3303      ! has received  the endpacket  and  no connection errors
;         3304      ! were detected.
;         3305      !
;         3306
;         3307      if CTO_WAIT (3500, .REF_NUM, .ESP_BUF$LOC) then DECODE ();  !Is return an error
;         3308
;         3309      !
;         3310      ! Get  the return envelope  address  from the  out$std_buf
;         3311      ! at  this commands  buffer location  and check the packet
;         3312      ! for good status error and die if bad status was returned
;         3313      !
;         3314      RET_EN$AD = .OUT$STD_BUF [.ESP_BUF$LOC, ENV_ADR];   !Get the ret env adr
;         3315      !
;         3316      ! Now test for good status
;         3317      !
;         3318
;         3319      if .RET_EN$AD [STATUS] nequ ZERO            !Test the status
;         3320      then
;         3321          return RET_STATUS = RSE_CODE            !Return a "Response status err" code
;         3322      else
;         3323          return .RET_STATUS;                     !This ret_status is good or bad
;         3324
;         3325      end;

                                        .SBTTL  EX.SUP.PROG MODULE DECLARATIONS
000000  004167  000000G          EX.SUP.PROG::
                                        JSR     R1,$SAVE2                       ;                       3160
```

```
000004  005746                          TST     -(SP)
000006  004767  174516                  JSR     PC,GET.NSD              ;                               3214
000012  004767  174660                  JSR     PC,GET.CMD$REF          ;                               3215
000016  010002                          MOV     R0,R2                   ; *,REF.NUM
000020  016746  000000G                 MOV     NSD.SLOT,-(SP)          ;                               3219
000024  012746  000054                  MOV     #54,-(SP)
000030  004767  000000G                 JSR     PC,BL$MUL
000034  012760  000050  000000G         MOV     #50,SND.ENVELOPE(R0)
000042  012701  000002G                 MOV     #SND.ENVELOPE+2,R1      ;                               3220
000046  060001                          ADD     R0,R1
000050  112711  000001                  MOVB    #1,(R1)                 ;                               3221
000054  112761  000002  000001         MOVB    #2,1(R1)                ;                               3222
000062  010260  000004G                 MOV     R2,SND.ENVELOPE+4(R0)   ; REF.NUM,*                     3226
000066  005060  000006G                 CLR     SND.ENVELOPE+6(R0)      ;                               3227
000072  005060  000010G                 CLR     SND.ENVELOPE+10(R0)     ;                               3228
000076  005060  000012G                 CLR     SND.ENVELOPE+12(R0)     ;                               3229
000102  112760  000002  000014G         MOVB    #2,SND.ENVELOPE+14(R0)  ;                               3230
000110  105060  000015G                 CLRB    SND.ENVELOPE+15(R0)     ;                               3231
000114  005060  000016G                 CLR     SND.ENVELOPE+16(R0)     ;                               3232
000120  016760  000000G  000020G        MOV     AZFMTR,SND.ENVELOPE+20(R0)  ;                           3238
000126  016760  000002G  000022G        MOV     AZFMTR+2,SND.ENVELOPE+22(R0)  ;                         3239
000134  012760  000000G  000024G        MOV     #HDSA,SND.ENVELOPE+24(R0)  ;                            3244
000142  012701  000026G                 MOV     #SND.ENVELOPE+26,R1     ;                               3245
000146  060001                          ADD     R0,R1
000150  105011                          CLRB    (R1)                    ;                               3247
000152  105061  000001                  CLRB    1(R1)                   ;                               3248
000156  005060  000030G                 CLR     SND.ENVELOPE+30(R0)     ;                               3249
000162  005060  000032G                 CLR     SND.ENVELOPE+32(R0)     ;                               3250
000166  005060  000034G                 CLR     SND.ENVELOPE+34(R0)     ;                               3251
000172  005060  000036G                 CLR     SND.ENVELOPE+36(R0)     ;                               3252
000176  016760  000000G  000040G        MOV     OVSA,SND.ENVELOPE+40(R0)  ;                             3260
000204  012701  000042G                 MOV     #SND.ENVELOPE+42,R1     ;                               3261
000210  060001                          ADD     R0,R1
000212  105011                          CLRB    (R1)                    ;                               3263
000214  105061  000001                  CLRB    1(R1)                   ;                               3264
000220  005060  000044G                 CLR     SND.ENVELOPE+44(R0)     ;                               3265
000224  005060  000046G                 CLR     SND.ENVELOPE+46(R0)     ;                               3266
000230  005060  000050G                 CLR     SND.ENVELOPE+50(R0)     ;                               3267
000234  005060  000052G                 CLR     SND.ENVELOPE+52(R0)     ;                               3268
000240  010216                          MOV     R2,(SP)                 ; REF.NUM,*                     3277
000242  004767  174336                  JSR     PC,LOAD.OUT$STD.BUF
000246  010001                          MOV     R0,R1                   ; *,ESP.BUF$LOC
000250  020127  002001                  CMP     R1,#2001                ; ESP.BUF$LOC,*                 3279
000254  001002                          BNE     1$
000256  004767  174502                  JSR     PC,DECODE
000262  016700  000000G          1$:     MOV     NSD.SLOT,R0             ;                               3284
000266  006300                          ASL     R0
000270  006300                          ASL     R0
000272  066700  000000G                 ADD     SEND.RING,R0
000276  052760  100000  000002         BIS     #100000,2(R0)
000304  017766  000000G  000004         MOV     @RC25.ADDR,4(SP)        ; *,RC$S.REG                    3288
000312  016600  000004                  MOV     4(SP),R0                ; RC$S.REG,TEMP
000316  012716  006654                  MOV     #6654,(SP)              ;                               3307
000322  010246                          MOV     R2,-(SP)                ; REF.NUM,*
000324  010146                          MOV     R1,-(SP)                ; ESP.BUF$LOC,*
000326  004767  176442                  JSR     PC,CTO.WAIT
000332  022626                          CMP     (SP)+,(SP)+
```

```
000334  006000                          ROR     R0
000336  103002                          BCC     2$
000340  004767  174420                  JSR     PC,DECODE
000344  010100                  2$:     MOV     R1,R0           ; ESP.BUF$LOC,*                 3314
000346  006300                          ASL     R0
000350  006300                          ASL     R0
000352  016067  000002G 000000G         MOV     OUT$STD.BUF+2(R0),RET.EN$AD
000360  016000  000002G                 MOV     OUT$STD.BUF+2(R0),R0            ;               3319
000364  005760  000016                  TST     16(R0)
000370  001405                          BEQ     3$
000372  012700  000031                  MOV     #31,R0                  ;                       3321
000376  010067  000000G                 MOV     R0,RET.STATUS
000402  000402                          BR      4$                      ;                       3203
000404  016700  000000G          3$:    MOV     RET.STATUS,R0
000410  062706  000006           4$:    ADD     #6,SP                   ;                       3160
000414  000207                          RTS     PC

; Routine Size:  135 words,     Routine Base:  AC$CODE + 3420
; Maximum stack depth per invocation:  9 words


;        3326
```

```
;       3327  global routine EX_LOC_PROG =                    !Executes local program
;       3328
;       3329  !++
;       3330  ! Functional Description :
;       3331  !       Receipt of this  command  causes the controller to search its local
;       3332  !       media  for  the named  program, load  and execute it.  Receipt of a
;       3333  !       successful response by the host means that the program is executing
;       3334  !       and the server is in the active state.  The time out value for this
;       3335  !       command is specified in the get dust response
;       3336  !
;       3337  ! Formal Parameters :
;       3338  !       none
;       3339  !
;       3340  ! Implicit Inputs :
;       3341  !       NSD_SLOT        This  global storage gets  loaded  by  the routine
;       3342  !                       'Get_nsd'  and  in it is stored the next send ring
;       3343  !                       descriptor  slot  where the port/controller should
;       3344  !                       be polling on and the  place  to put this commands
;       3345  !                       command packet.
;       3346  !
;       3347  ! Implicit Outputs :
;       3348  !       none
;       3349  !
;       3350  ! Completion Codes :
;       3351  !       RET_STATUS:     Return status passes back to the calling routine
;       3352  !                       the status of the just issued command.
;       3353  !
;       3354  ! Side Effects :
;       3355  !       The DM machine in the controller goes from the idle state to the
;       3356  !       active state on return of a successful return packet.
;       3357  !--
;       3358
;       3359      begin
;       3360
;       3361      local
;       3362          REF_NUM,                                !Stores unique cmd ref number
;       3363          ELP_BUF$LOC,                            !Stores out$standing cmd buffer location
;       3364          TEMP;                                   !A place to store the read IP register data
;       3365
;       3366      !
;       3367      ! Before we load up the command packet up with  all this good information get
;       3368      ! the next send descriptor slot and a unique command reference number.
;       3369      !
;       3370      GET_NSD ();                                 !Get the next send desc slot
;       3371      REF_NUM = GET_CMD$REF ();                   !Get a unique command ref num
;       3372      !
;       3373      ! UQ Port command envelope Header field definition
;       3374      !
;       3375      SND_ENVELOPE [.NSD_SLOT, MSG_LENGTH] = SZ_ELP;      !Load the message size
;       3376      SND_ENVELOPE [.NSD_SLOT, CREDITS] = ONE;    !Load the credit size
;       3377      SND_ENVELOPE [.NSD_SLOT, MSG_TYPE] = 0;     !Define the msg typ 'Sequential'
;       3378      SND_ENVELOPE [.NSD_SLOT, CONN_ID] = DUP;    !Define the connectio ID
;       3379      !
;       3380      ! DUP generic command envelope field definition
;       3381      !
;       3382      SND_ENVELOPE [.NSD_SLOT, CMD_LREF] = .REF_NUM;      !Load the command ref number
;       3383      SND_ENVELOPE [.NSD_SLOT, CMD_HREF] = ZERO;  !Zero the Hi order cmd ref num
```

```
;        3384      SND_ENVELOPE [.NSD_SLOT, UN_LUSED] = ZERO;  !Not used in DUP implimentation
;        3385      SND_ENVELOPE [.NSD_SLOT, UN_HUSED] = ZERO;  !Not used in DUP implimentation
;        3386      SND_ENVELOPE [.NSD_SLOT, OPCODE] = OP_ELP;  !Load this commands op-code
;        3387      SND_ENVELOPE [.NSD_SLOT, RSVD] = ZERO;      !Not used field
;        3388      SND_ENVELOPE [.NSD_SLOT, MODIFIER] = ZERO;  !Define modifiers for this cmd
;        3389      !
;        3390      ! Command specfic command envelope field definition
;        3391      !
;        3392      SND_ENVELOPE [.NSD_SLOT, PN_0] = ZERO;      !Program name word 0
;        3393      SND_ENVELOPE [.NSD_SLOT, PN_1] = ZERO;      !Program name word 1
;        3394      SND_ENVELOPE [.NSD_SLOT, PN_2] = ZERO;      !Program name word 2
;        3395      !
;        3396      ! Call   the  load  out$standing  command buffer routine
;        3397      ! and  load  this command  into  the buffer.  The return
;        3398      ! from this routine will point us to the buffer location
;        3399      ! where  this command  is  stored.  Later we can look at
;        3400      ! this  location to see if the interrupt service routine
;        3401      ! has received and process it.
;        3402      !
;        3403      ELP_BUF$LOC = LOAD_OUT$STD_BUF (.REF_NUM);  !Load the command
;        3404
;        3405      if .ELP_BUF$LOC eqlu OBF_CODE then DECODE ();       !Error if buffer is full
;        3406
;        3407      !
;        3408      ! Set the ownership bit to 1 giving this slot to the port/controller
;        3409      !
;        3410      SEND_RING [.NSD_SLOT, OWN_BIT] = PORT_OWNED;
;        3411      !
;        3412      ! Read the IP register to stimulate port polling
;        3413      !
;        3414      TEMP = .RC25_ADDR [RCIP, RC_ALL];
;        3415      !
;        3416      ! Time  out the  port/controller processing  the command.
;        3417      !
;        3418      ! The   first   test   tests the connections  ability to
;        3419      ! respond to  this command without  any errors in the SA
;        3420      ! register and for the command not timing out.
;        3421      !
;        3422      ! The  second tests the  DUP server for good status.  If
;        3423      ! bad status is sent back then an error code is returned
;        3424      ! to the calling routine where the routine "decode" will
;        3425      ! decode  and take the  appropriate recovery.  The  time
;        3426      ! out  routine will loop on delaying and checking the hi
;        3427      ! bit of the  first word in  the  out$std_buf for a true.
;        3428      ! When true signals us that the interrupt service routine
;        3429      ! has received  the endpacket  and  no connection errors
;        3430      ! were detected.
;        3431      !
;        3432
;        3433      if CTO_WAIT (3000, .REF_NUM, .ELP_BUF$LOC) then DECODE ();  !Is return an error
;        3434
;        3435      !
;        3436      ! Get  the return envelope  address  from the  out$std_buf
;        3437      ! at  this commands  buffer location  and check the packet
;        3438      ! for good status error and die if bad status was returned
;        3439      !
;        3440      RET_EN$AD = .OUT$STD_BUF [.ELP_BUF$LOC, ENV_ADR];   !Get the ret env adr
```

```
;          3441      !
;          3442      ! Now test for good status
;          3443      !
;          3444
;          3445      if .RET_EN$AD [STATUS] nequ ZERO          !Test the status
;          3446      then
;          3447          return RET_STATUS = RSE_CODE          !Return a "Response status err" code
;          3448      else
;          3449          return .RET_STATUS;                   !This ret_status is good or bad
;          3450
;          3451      end;


                                        .SBTTL  EX.LOC.PROG MODULE DECLARATIONS
000000  004167  000000G           EX.LOC.PROG::
                                        JSR     R1,$SAVE2                       ;                       3327
000004  005746                          TST     -(SP)
000006  004767  174100                  JSR     PC,GET.NSD                      ;                       3370
000012  004767  174242                  JSR     PC,GET.CMD$REF                  ;                       3371
000016  010002                          MOV     R0,R2                           ; *,REF.NUM
000020  016746  000000G                 MOV     NSD.SLOT,-(SP)                  ;                       3375
000024  012746  000054                  MOV     #54,-(SP)
000030  004767  000000G                 JSR     PC,BL$MUL
000034  012760  000060  000000G         MOV     #60,SND.ENVELOPE(R0)
000042  012701  000002G                 MOV     #SND.ENVELOPE+2,R1              ;                       3376
000046  060001                          ADD     R0,R1
000050  112711  000001                  MOVB    #1,(R1)                         ;                       3377
000054  112761  000002  000001         MOVB    #2,1(R1)                        ;                       3378
000062  010260  000004G                 MOV     R2,SND.ENVELOPE+4(R0)           ; REF.NUM,*             3382
000066  005060  000006G                 CLR     SND.ENVELOPE+6(R0)              ;                       3383
000072  005060  000010G                 CLR     SND.ENVELOPE+10(R0)             ;                       3384
000076  005060  000012G                 CLR     SND.ENVELOPE+12(R0)             ;                       3385
000102  112760  000003  000014G         MOVB    #3,SND.ENVELOPE+14(R0)          ;                       3386
000110  105060  000015G                 CLRB    SND.ENVELOPE+15(R0)             ;                       3387
000114  005060  000016G                 CLR     SND.ENVELOPE+16(R0)             ;                       3388
000120  005060  000020G                 CLR     SND.ENVELOPE+20(R0)             ;                       3392
000124  005060  000022G                 CLR     SND.ENVELOPE+22(R0)             ;                       3393
000130  005060  000024G                 CLR     SND.ENVELOPE+24(R0)             ;                       3394
000134  010216                          MOV     R2,(SP)                         ; REF.NUM,*             3403
000136  004767  174024                  JSR     PC,LOAD.OUT$STD.BUF
000142  010001                          MOV     R0,R1                           ; *,ELP.BUF$LOC
000144  020127  002001                  CMP     R1,#2001                        ; ELP.BUF$LOC,*         3405
000150  001002                          BNE     1$
000152  004767  174170                  JSR     PC,DECODE
000156  016700  000000G           1$:   MOV     NSD.SLOT,R0                     ;                       3410
000162  006300                          ASL     R0
000164  006300                          ASL     R0
000166  066700  000000G                 ADD     SEND.RING,R0
000172  052760  100000  000002         BIS     #100000,2(R0)
000200  017766  000000G 000004         MOV     @RC25.ADDR,4(SP)                ; *,RC$S.REG            3414
000206  016600  000004                  MOV     4(SP),R0                        ; RC$S.REG,TEMP
000212  012716  005670                  MOV     #5670,(SP)                      ;                       3433
000216  010246                          MOV     R2,-(SP)                        ; REF.NUM,*
000220  010146                          MOV     R1,-(SP)                        ; ELP.BUF$LOC,*
000222  004767  176130                  JSR     PC,CTO.WAIT
000226  022626                          CMP     (SP)+,(SP)+
000230  006000                          ROR     R0
```

```
000232  103002                          BCC     2$
000234  004767  174106                  JSR     PC,DECODE
000240  010100                  2$:     MOV     R1,R0                   ; ELP.BUF$LOC,*                 3440
000242  006300                          ASL     R0
000244  006300                          ASL     R0
000246  016067  000002G 000000G         MOV     OUT$STD.BUF+2(R0),RET.EN$AD
000254  016000  000002G                 MOV     OUT$STD.BUF+2(R0),R0    ;                               3445
000260  005760  000016                  TST     16(R0)
000264  001405                          BEQ     3$
000266  012700  000031                  MOV     #31,R0                  ;                               3447
000272  010067  000000G                 MOV     R0,RET.STATUS
000276  000402                          BR      4$                      ;                               3359
000300  016700  000000G          3$:    MOV     RET.STATUS,R0
000304  062706  000006           4$:    ADD     #6,SP                   ;                               3327
000310  000207                          RTS     PC

; Routine Size:  101 words,     Routine Base:  AC$CODE + 4036
; Maximum stack depth per invocation:  9 words


;         3452
```

```
;       3453  global routine SEND_DATA =                    !Performs host-->port communications
;       3454
;       3455  !++
;       3456  ! Functional Description :
;       3457  !       These  commands are  used to  communicate between  the initiating host
;       3458  !       program  and   the  remote  program.  Both  send  and receive commands
;       3459  !       specify   a  host buffer descriptor  and a byte count.  In the case of
;       3460  !       send data, the information in the buffer is read by the remote program
;       3461  !       and  a send data response sent back to the host to acknowledge receipt.
;       3462  !       In   the case  of receive data the remote program writes data into the
;       3463  !       buffer  up  to the amount specified by the byte count and then sends a
;       3464  !       receive data  response to  the host  to notify it of the transmission.
;       3465  !
;       3466  !       The  send data  and receive   data commands  are  only  legal when the
;       3467  !       server   is   in the  active state.  If  the remote program terminates
;       3468  !       abnormally, putting   the server   back  in the idle stae, outstanding
;       3469  !       send  data  and receive  data commands may be lost.  In the event that
;       3470  !       the  specified timeout  interval is  exceeded, the host program should
;       3471  !       issue   a get   dust  staus  command to  see if the  remote program is
;       3472  !       still    running  (is.   the  dup  server is  active);  if it  is, the
;       3473  !       progress   indicator should  be  remembered and  the  timeout interval
;       3474  !       should   be re-installed.  If   the second   timeout expires without a
;       3475  !       response and   a second   get  dust status shows  the  remote  program
;       3476  !       having  made   no progress   in the interim then the program should be
;       3477  !       considered broken and should be aborted.
;       3478  !
;       3479  ! Formal Parameters :
;       3480  !       none
;       3481  !
;       3482  ! Implicit Inputs :
;       3483  !       NSD_SLOT        This  global storage gets  loaded  by  the routine
;       3484  !                       'Get_nsd'  and  in it is stored the next send ring
;       3485  !                       descriptor  slot  where the port/controller should
;       3486  !                       be polling on and the  place  to put this commands
;       3487  !                       command packet.
;       3488  !
;       3489  ! Implicit Outputs :
;       3490  !       none
;       3491  !
;       3492  ! Completion Codes :
;       3493  !       RET_STATUS:     Return status passes back to the calling routine
;       3494  !                       the status of the just issued command.
;       3495  !
;       3496  ! Side Effects :
;       3497  !       none
;       3498  !--
;       3499
;       3500      begin
;       3501
;       3502      local
;       3503          REF_NUM,                                !Stores unique cmd ref number
;       3504          SND_BUF$LOC,                            !Stores out$standing cmd buffer location
;       3505          TEMP;                                   !A place to put read IP register data
;       3506
;       3507      !
;       3508      ! Before  we load up the command packet up with all this good information
;       3509      ! get the next send descriptor slot and a unique command reference number.
```

```
;          3510      !
;          3511      GET_NSD ();                                   !Get the next send desc slot
;          3512      REF_NUM = GET_CMD$REF ();                     !Get a unique command ref num
;          3513      !
;          3514      ! UQ Port command envelope Header field definition
;          3515      !
;          3516      SND_ENVELOPE [.NSD_SLOT, MSG_LENGTH] = SZ_SED;      !Load the message size
;          3517      SND_ENVELOPE [.NSD_SLOT, CREDITS] = ONE;      !Load the credit size
;          3518      SND_ENVELOPE [.NSD_SLOT, MSG_TYPE] = 0;       !Define the message typ 'Sequential
;          3519      SND_ENVELOPE [.NSD_SLOT, CONN_ID] = DUP;      !Define the connection ID
;          3520      !
;          3521      ! DUP generic command envelope field definition
;          3522      !
;          3523      SND_ENVELOPE [.NSD_SLOT, CMD_LREF] = .REF_NUM;      !Load command reference number
;          3524      SND_ENVELOPE [.NSD_SLOT, CMD_HREF] = ZERO;    !Zero Hi order cmd ref number
;          3525      SND_ENVELOPE [.NSD_SLOT, UN_[USED] = ZERO;    !Not used in DUP implimentation
;          3526      SND_ENVELOPE [.NSD_SLOT, UN_HUSED] = ZERO;    !Not used in DUP implimentation
;          3527      SND_ENVELOPE [.NSD_SLOT, OPCODE] = OP_SED;    !Load this commands op-code
;          3528      SND_ENVELOPE [.NSD_SLOT, RSVD] = ZERO;        !Not used field
;          3529      SND_ENVELOPE [.NSD_SLOT, MODIFIER] = ZERO;    !Define the commands modifiers
;          3530      !
;          3531      ! Command specfic command envelope field definition
;          3532      !
;          3533      ! Byte count of transfer
;          3534      !
;          3535      SND_ENVELOPE [.NSD_SLOT, BLO_CNT] = SNDB_SIZE;      !Byte count low word
;          3536      SND_ENVELOPE [.NSD_SLOT, BHI_CNT] = ZERO;     !Byte count high word
;          3537      !
;          3538      ! Buffer descriptor definition
;          3539      !
;          3540      SND_ENVELOPE [.NSD_SLOT, BPA_LO] = SND_BUF; !Buffer physical adrs <0-15>
;          3541      SND_ENVELOPE [.NSD_SLOT, BPA_HI] = ZERO;      !Buffer physical adrs bits <16-17>
;          3542      SND_ENVELOPE [.NSD_SLOT, QBUS_EXT] = ZERO;    !Q_bus extention adrs
;          3543      SND_ENVELOPE [.NSD_SLOT, RSV] = ZERO;         !Reserved field
;          3544      SND_ENVELOPE [.NSD_SLOT, UBA_CHAN] = ZERO;    !Unibus adaptor channel number
;          3545      SND_ENVELOPE [.NSD_SLOT, RSV0] = ZERO;        !These next four words are not
;          3546      SND_ENVELOPE [.NSD_SLOT, RSV1] = ZERO;        !used in the UQ Port implementation
;          3547      SND_ENVELOPE [.NSD_SLOT, RSV2] = ZERO;        !
;          3548      SND_ENVELOPE [.NSD_SLOT, RSV3] = ZERO;        !
;          3549      !
;          3550      ! Call the  load  out$standing command buffer routine and load this command
;          3551      ! into the buffer.  The return from this routine will point us to the buffer location
;          3552      ! where  this command  is  stored.  Later we  can  look at this location to
;          3553      ! see if the interrupt service routine has received and process it.
;          3554      !
;          3555      SND_BUF$LOC = LOAD_OUT$STD_BUF (.REF_NUM);  !Load the command
;          3556
;          3557      if .SND_BUF$LOC eqlu OBF_CODE then DECODE ();       !Error if buffer is full
;          3558
;          3559      !
;          3560      ! Set the ownership bit to 1 giving this slot to the port/controller
;          3561      !
;          3562      SEND_RING [.NSD_SLOT, OWN_BIT] = PORT_OWNED;
;          3563      !
;          3564      ! Read the IP register to stimulate port polling
;          3565      !
;          3566      TEMP = .RC25_ADDR [RCIP, RC_ALL];
```

```
;        3567
;        3568      !+
;        3569      ! Timc out the port/controller for the response from this command.
;        3570      !
;        3571      ! If the controller times out then:
;        3572      !   1. See  what  kind  of  error was returned.  If the error
;        3573      !      is  a type other than a CTO_CODE (controller time out)
;        3574      !      then  call  routine  Decode which does the appropriate
;        3575      !      action based on the error.
;        3576      !
;        3577      !   2. If  the  returned  error  is an CTO_CODE then do a get
;        3578      !      dust  status  and check the progress indicator to look
;        3579      !      for an increase, indicating that the remote program is
;        3580      !      still running and is not dead.
;        3581      !
;        3582      !      If   the indicator hasn't changed then assume that the
;        3583      !      remote  program  is  dead  and return an error code of
;        3584      !      RPD_CODE (remote  program  dead  code)  and  exit.
;        3585      !
;        3586      !      If the  indicator  has  changed  then  assume that the
;        3587      !      remote  program  is  still running, save a copy of its
;        3588      !      value and  reinstate the controller time out delay and
;        3589      !      repeat the loop.
;        3590      !
;        3591      !      As long as the progress indicator in the remote program
;        3592      !      is still increasing this loop will be repeated for ever.
;        3593      !
;        3594      ! If  the  controller doesn't time then return with the return
;        3595      ! code returned from routine CTO_WAIT () which could be either
;        3596      ! a  success  or  error  code  by definition of this host code.
;        3597      !-
;        3598
;        3599      while TRUE do                                   !Repeat for ever
;        3600          begin
;        3601          BREAK;                                      !Flag control C's
;        3602          !
;        3603          ! Do a controller time out and  determine if the controller
;        3604          ! has processed the command or if a fatal error has occured.
;        3605          !
;        3606
;        3607          if CTO_WAIT (4000, .REF_NUM, .SND_BUF$LOC)      !Is return an error
;        3608          then
;        3609              begin
;        3610              !
;        3611              ! If the return status code eql's a CTO_CODE then see if the remote
;        3612              ! program is still running. If it is then save the progress indicator
;        3613              ! and repeat  the  loop else call routine Decode ().
;        3614              !
;        3615
;        3616              if .RET_STATUS eqlu CTO_CODE            !Is this a controller time out
;        3617              then
;        3618                  begin
;        3619
;        3620                  if GET_DUST_STATUS () then DECODE ();   !Get the dust status
;        3621
;        3622                  if .RET_EN$AD [PLO_IND] gtru .PID_SAVE [0]      !Any progress been made
;        3623                  then
```

```
;          3624                        begin
;          3625                        PID_SAVE [0] = .RET_EN$AD [PLO_IND];        !Still running save Pid
;          3626                        PID_SAVE [1] = .RET_EN$AD [PHI_IND];
;          3627                        PRINTB (PID_FMT, .PID_SAVE [1], .PID_SAVE [0]);
;          3628                        end
;          3629                    else
;          3630
;          3631                        if .RET_EN$AD [PHI_IND] gtru .PID_SAVE [1]
;          3632                        then
;          3633                            begin
;          3634                            PID_SAVE [0] = .RET_EN$AD [PLO_IND];    !Still running save Pid
;          3635                            PID_SAVE [1] = .RET_EN$AD [PHI_IND];
;          3636                            PRINTB (PID_FMT, .PID_SAVE [1], .PID_SAVE [0]);
;          3637                            end
;          3638                        else
;          3639                            return RET_STATUS = RPD_CODE;   !No progress so flag error
;          3640
;          3641                    end
;          3642                else
;          3643                    !
;          3644                    ! The return status code was not a controller time out code so something
;          3645                    ! else is wrong.  Call the routine Decode () to find out what went wrong.
;          3646                    !
;          3647                    DECODE ()
;          3648
;          3649                end
;          3650            else
;          3651                begin
;          3652                !
;          3653                ! The command has been received by the interrupt service.
;          3654                !
;          3655                ! Get  this commands return  envelope address out of the
;          3656                ! out$std_buf and check for good return status error and
;          3657                ! die if bad status.
;          3658                !
;          3659                RET_EN$AD = .OUT$STD_BUF [.SND_BUF$LOC, ENV_ADR];   !Get the ret env adr
;          3660                !
;          3661                ! Test for good status
;          3662                !
;          3663
;          3664                if .RET_EN$AD [STATUS] nequ ZERO    !Test the status
;          3665                then
;          3666                    return RET_STATUS = RSE_CODE    !Return a "Response status err" code
;          3667                else
;          3668                    return .RET_STATUS;             !This ret_status is good or bad
;          3669
;          3670                end;
;          3671
;          3672            end;
;          3673
;          3674        return .RET_STATUS;                         !It won't compile without this here
;          3675        end;


                                        .SBTTL  SEND.DATA MODULE DECLARATIONS
000000  004167  000000G           SEND.DATA::
                                        JSR     R1,$SAVE3                       ;                       3453
```

```
000004  005746                          TST     -(SP)
000006  004767  173566                  JSR     PC,GET.NSD              ;                               3511
000012  004767  173730                  JSR     PC,GET.CMD$REF          ;                               3512
000016  010003                          MOV     R0,R3                   ; *,REF.NUM
000020  016746  000000G                 MOV     NSD.SLOT,-(SP)          ;                               3516
000024  012746  000054                  MOV     #54,-(SP)
000030  004767  000000G                 JSR     PC,BL$MUL
000034  012760  000034  000000G         MOV     #34,SND.ENVELOPE(R0)
000042  012701  000002G                 MOV     #SND.ENVELOPE+2,R1      ;                               3517
000046  060001                          ADD     R0,R1
000050  112711  000001                  MOVB    #1,(R1)                 ;                               3518
000054  112761  000002  000001         MOVB    #2,1(R1)                ;                               3519
000062  010360  000004G                 MOV     R3,SND.ENVELOPE+4(R0)   ; REF.NUM,*                     3523
000066  005060  000006G                 CLR     SND.ENVELOPE+6(R0)      ;                               3524
000072  005060  000010G                 CLR     SND.ENVELOPE+10(R0)     ;                               3525
000076  005060  000012G                 CLR     SND.ENVELOPE+12(R0)     ;                               3526
000102  112760  000004  000014G         MOVB    #4,SND.ENVELOPE+14(R0)  ;                               3527
000110  105060  000015G                 CLRB    SND.ENVELOPE+15(R0)     ;                               3528
000114  005060  000016G                 CLR     SND.ENVELOPE+16(R0)     ;                               3529
000120  012760  000045  000020G         MOV     #45,SND.ENVELOPE+20(R0) ;                               3535
000126  005060  000022G                 CLR     SND.ENVELOPE+22(R0)     ;                               3536
000132  012760  000000G 000024G         MOV     #SND.BUF,SND.ENVELOPE+24(R0) ;                          3540
000140  012701  000026G                 MOV     #SND.ENVELOPE+26,R1     ;                               3541
000144  060001                          ADD     R0,R1
000146  105011                          CLRB    (R1)                    ;                               3543
000150  105061  000001                  CLRB    1(R1)                   ;                               3544
000154  005060  000030G                 CLR     SND.ENVELOPE+30(R0)     ;                               3545
000160  005060  000032G                 CLR     SND.ENVELOPE+32(R0)     ;                               3546
000164  005060  000034G                 CLR     SND.ENVELOPE+34(R0)     ;                               3547
000170  005060  000036G                 CLR     SND.ENVELOPE+36(R0)     ;                               3548
000174  010316                          MOV     R3,(SP)                 ; REF.NUM,*                     3555
000176  004767  173452                  JSR     PC,LOAD.OUT$STD.BUF
000202  010002                          MOV     R0,R2                   ; *,SND.BUF$LOC
000204  020227  002001                  CMP     R2,#2001                ; SND.BUF$LOC,*                 3557
000210  001002                          BNE     1$
000212  004767  173616                  JSR     PC,DECODE
000216  016700  000000G         1$:     MOV     NSD.SLOT,R0             ;                               3562
000222  006300                          ASL     R0
000224  006300                          ASL     R0
000226  066700  000000G                 ADD     SEND.RING,R0
000232  052760  100000  000002         BIS     #100000,2(R0)
000240  017766  000000G 000004         MOV     @RC25.ADDR,4(SP)        ; *,RC$S.REG                    3566
000246  016600  000004                  MOV     4(SP),R0                ; RC$S.REG,TEMP
000252  104422                  2$:     TRAP    22                      ;                               3600
000254  012716  007640                  MOV     #7640,(SP)              ;                               3607
000260  010346                          MOV     R3,-(SP)                ; REF.NUM,*
000262  010246                          MOV     R2,-(SP)                ; SND.BUF$LOC,*
000264  004767  175554                  JSR     PC,CTO.WAIT
000270  022626                          CMP     (SP)+,(SP)+
000272  006000                          ROR     R0
000274  103074                          BCC     8$
000276  026727  000000G 000011         CMP     RET.STATUS,#11          ;                               3616
000304  001065                          BNE     7$
000306  004767  176240                  JSR     PC,GET.DUST.STATUS      ;                               3620
000312  006000                          ROR     R0
000314  103002                          BCC     3$
000316  004767  173512                  JSR     PC,DECODE
```

```
000322  016701  000000G                3$:     MOV     RET.EN$AD,R1                    ;                                       3626
000326  010100                                  MOV     R1,R0                           ; RET.EN$AD,*                           3622
000330  016000  000024                        MOV     24(R0),R0
000334  020067  000000G                       CMP     R0,PID.SAVE
000340  101417                                BLOS    4$
000342  010067  000000G                       MOV     R0,PID.SAVE                     ;                                       3625
000346  016167  000026  000002G               MOV     26(R1),PID.SAVE+2               ;                                       3626
000354  010016                                MOV     R0,(SP)                         ; PID.SAVE,*                            3627
000356  016746  000002G                       MOV     PID.SAVE+2,-(SP)
000362  012746  000000G                       MOV     #PID.FMT,-(SP)
000366  012746  000003                        MOV     #3,-(SP)
000372  010600                                MOV     SP,R0                           ; SP,*
000374  104414                                TRAP    14
000376  000422                                BR      5$                              ;                                       3624
000400  026167  000026  000002G       4$:     CMP     26(R1),PID.SAVE+2               ;                                       3631
000406  101421                                BLOS    6$
000410  010067  000000G                       MOV     R0,PID.SAVE                     ;                                       3634
000414  016167  000026  000002G               MOV     26(R1),PID.SAVE+2               ;                                       3635
000422  010016                                MOV     R0,(SP)                         ; PID.SAVE,*                            3636
000424  016746  000002G                       MOV     PID.SAVE+2,-(SP)
000430  012746  000000G                       MOV     #PID.FMT,-(SP)
000434  012746  000003                        MOV     #3,-(SP)
000440  010600                                MOV     SP,R0                           ; SP,*
000442  104414                                TRAP    14
000444  062706  000006                5$:     ADD     #6,SP                           ;                                       3633
000450  000700                                BR      2$                              ;                                       3631
000452  012700  000051                6$:     MOV     #51,R0                          ;                                       3639
000456  000420                                BR      9$
000460  004767  173350                7$:     JSR     PC,DECODE                       ;                                       3647
000464  000672                                BR      2$                              ;                                       3607
000466  010200                        8$:     MOV     R2,R0                           ; SND.BUF$LOC,*                         3659
000470  006300                                ASL     R0
000472  006300                                ASL     R0
000474  016067  000002G 000000G               MOV     OUT$STD.BUF+2(R0),RET.EN$AD
000502  016000  000002G                       MOV     OUT$STD.BUF+2(R0),R0            ;                                       3664
000506  005760  000016                        TST     16(R0)
000512  001405                                BEQ     10$
000514  012700  000031                        MOV     #31,R0                          ;                                       3666
000520  010067  000000G                9$:     MOV     R0,RET.STATUS
000524  000402                                BR      11$                             ;                                       3651
000526  016700  000000G                10$:    MOV     RET.STATUS,R0
000532  062706  000006                11$:    ADD     #6,SP                           ;                                       3453
000536  000207                                RTS     PC

; Routine Size:  176 words,     Routine Base:  AC$CODE + 4350
; Maximum stack depth per invocation:  12 words


;         3676
```

```
;       3677  global routine REC_DATA =                    !Performs host-->port communications
;       3678
;       3679  !++
;       3680  ! Functional Description :
;       3681  !       These   commands  are used  to communicate between the initiating host
;       3682  !       program  and the  remote   program.  Both   send  and receive commands
;       3683  !       specify a  host buffer  descriptor  and a byte count.  In the case of
;       3684  !       send data, the information in the buffer is read by the remote program
;       3685  !       and  a send data response sent back to the host to acknowledge receipt.
;       3686  !       In  the  case of  receive data the remote program writes data into the
;       3687  !       buffer  up  to the amount specified by the byte count and then sends a
;       3688  !       receive   data  response to the host to notify it of the transmission.
;       3689  !
;       3690  !       The   send data   and  receive data  commands  are only legal when the
;       3691  !       server  is  in the   active state.  If   the remote program terminates
;       3692  !       abnormally, putting   the server  back  in the  idle stae, outstanding
;       3693  !       send  data  and receive  data commands may be lost.  In the event that
;       3694  !       the  specified  timeout interval  is exceeded, the host program should
;       3695  !       issue  a get   dust staus   command   to see if  the remote program is
;       3696  !       still   running   (is.  the  dup  server  is active); if   it  is, the
;       3697  !       progress   indicator   should be   remembered and the timeout interval
;       3698  !       should  be re-installed.  If   the second   timeout  expires without a
;       3699  !       response and a   second  get dust  status  shows the  remote program
;       3700  !       having   made no  progress   in the interim then the program should be
;       3701  !       considered broken and should be aborted.
;       3702  !
;       3703  ! Formal Parameters :
;       3704  !       none
;       3705  !
;       3706  ! Implicit Inputs :
;       3707  !       NSD_SLOT        This  global storage gets  loaded  by  the routine
;       3708  !                       'Get_nsd'  and  in it is stored the next send ring
;       3709  !                       descriptor  slot  where the port/controller should
;       3710  !                       be polling on and the  place  to put this commands
;       3711  !                       command packet.
;       3712  !
;       3713  ! Implicit Outputs :
;       3714  !       none
;       3715  !
;       3716  ! Completion Codes :
;       3717  !       RET_STATUS:     Return status passes back to the calling routine
;       3718  !                       the status of the just issued command.
;       3719  !
;       3720  ! Side Effects :
;       3721  !       none
;       3722  !--
;       3723
;       3724      begin
;       3725
;       3726      local
;       3727          REF_NUM,                                !Stores unique cmd ref number
;       3728          REC_BUF$LOC,                            !Stores out$standing cmd buffer location
;       3729          TEMP;                                   !A place to put read IP register data
;       3730
;       3731      !
;       3732      ! Before we load  up the command packet up with all this good information
;       3733      ! get the next send descriptor slot and a unique command reference number.
```

```
;          3734      !
;          3735      GET_NSD ();                                     !Get the next send desc slot
;          3736      REF_NUM = GET_CMD$REF ();                       !Get a unique command ref num
;          3737      !
;          3738      ! UQ Port command envelope Header field definition
;          3739      !
;          3740      SND_ENVELOPE [.NSD_SLOT, MSG_LENGTH] = SZ_RED;      !Load message length
;          3741      SND_ENVELOPE [.NSD_SLOT, CREDITS] = ONE;    !Load credit size
;          3742      SND_ENVELOPE [.NSD_SLOT, MSG_TYPE] = 0;     !Define message type 'Sequential'
;          3743      SND_ENVELOPE [.NSD_SLOT, CONN_ID] = DUP;    !Define connection ID
;          3744      !
;          3745      ! DUP generic command envelope field definition
;          3746      !
;          3747      SND_ENVELOPE [.NSD_SLOT, CMD_LREF] = .REF_NUM;      !Load command reference number
;          3748      SND_ENVELOPE [.NSD_SLOT, CMD_HREF] = ZERO;  !Zero Hi order cmd ref num
;          3749      SND_ENVELOPE [.NSD_SLOT, UN_[USED] = ZERO;  !Not used in DUP implimentation
;          3750      SND_ENVELOPE [.NSD_SLOT, UN_HUSED] = ZERO;  !Not used in DUP implimentation
;          3751      SND_ENVELOPE [.NSD_SLOT, OPCODE] = OP_RED;  !Load this commands op-code
;          3752      SND_ENVELOPE [.NSD_SLOT, RSVD] = ZERO;      !Not used field
;          3753      SND_ENVELOPE [.NSD_SLOT, MODIFIER] = ZERO;  !Define this commands modifiers
;          3754      !
;          3755      ! Command specfic command envelope field definition
;          3756      !
;          3757      ! Byte count of transfer
;          3758      !
;          3759      SND_ENVELOPE [.NSD_SLOT, BLO_CNT] = RECB_SIZE;      !Byte count low word
;          3760      SND_ENVELOPE [.NSD_SLOT, BHI_CNT] = ZERO;   !Byte count high word
;          3761      !
;          3762      ! Buffer descriptor definition
;          3763      !
;          3764      SND_ENVELOPE [.NSD_SLOT, BPA_LO] = REC_BUF; !Low unibus adrs <0-15>
;          3765      SND_ENVELOPE [.NSD_SLOT, BPA_HI] = ZERO;    !Unibus aqrs bits <16-17>
;          3766      SND_ENVELOPE [.NSD_SLOT, QBUS_EXT] = ZERO;  !Q_bus extention adrs
;          3767      SND_ENVELOPE [.NSD_SLOT, RSV] = ZERO;       !Reserved field
;          3768      SND_ENVELOPE [.NSD_SLOT, UBA_CHAN] = ZERO;  !Unibus adaptor channel nunber
;          3769      SND_ENVELOPE [.NSD_SLOT, RSV0] = ZERO;      !These next four words are not
;          3770      SND_ENVELOPE [.NSD_SLOT, RSV1] = ZERO;      !used in the UQ Port implementation
;          3771      SND_ENVELOPE [.NSD_SLOT, RSV2] = ZERO;      !
;          3772      SND_ENVELOPE [.NSD_SLOT, RSV3] = ZERO;      !
;          3773      !
;          3774      ! Call the load out$standing command buffer routine and load this command
;          3775      ! into the buffer.  The return from this routine will point  us  to   the
;          3776      ! buffer location where this command is stored. Later we can look at this
;          3777      ! location to see if the interrupt service routine has received and process
;          3778      ! it.
;          3779      !
;          3780      REC_BUF$LOC = LOAD_OUT$STD_BUF (.REF_NUM);  !Load the command
;          3781
;          3782      if .REC_BUF$LOC eqlu OBF_CODE then DECODE ();       !Error if buffer is full
;          3783
;          3784      !
;          3785      ! Set the ownership bit to 1 giving this slot to the port/controller.
;          3786      !
;          3787      SEND_RING [.NSD_SLOT, OWN_BIT] = PORT_OWNED;
;          3788      !
;          3789      ! Read the IP register to stimulate port polling
;          3790      !
```

```
;          3791      TEMP = .RC25_ADDR [RCIP, RC_ALL];
;          3792
;          3793      !+
;          3794      ! Time out the port/controller for the response from this command.
;          3795      !
;          3796      ! If the controller times out then:
;          3797      !   1. See  what  kind  of  error was returned.  If the error
;          3798      !      is  a type other than a CTO_CODE (controller time out)
;          3799      !      then  call  routine  Decode which does the appropriate
;          3800      !      action based on the error.
;          3801      !
;          3802      !   2. If  the  returned  error  is an CTO_CODE then do a get
;          3803      !      dust  status  and check the progress indicator to look
;          3804      !      for an increase, indicating that the remote program is
;          3805      !      still running and is not dead.
;          3806      !
;          3807      !      If  the  indicator hasn't changed then assume that the
;          3808      !      remote  program  is  dead  and return an error code of
;          3809      !      RPD_CODE (remote program dead code) and exit.
;          3810      !
;          3811      !      If  the  indicator  has  changed  then assume that the
;          3812      !      remote  program  is  still running, save a copy of its
;          3813      !      value and  reinstate the controller time out delay and
;          3814      !      repeat the loop.
;          3815      !
;          3816      !      As long as the progress indicator in the remote program
;          3817      !      is still increasing this loop will be repeated for ever.
;          3818      !
;          3819      ! If  the  controller doesn't time then return with the return code
;          3820      ! returned from routine CTO_WAIT () which could be either a success
;          3821      ! or error code by definition of this host code.
;          3822      !-
;          3823
;          3824      while TRUE do                                   !Repeat for ever
;          3825          begin
;          3826          BREAK;                                      !Flag control C's
;          3827          !
;          3828          ! Do a controller time out and  determine if the controller
;          3829          ! has processed the command or if a fatal error has occured.
;          3830          !
;          3831
;          3832          if CTO_WAIT (4000, .REF_NUM, .REC_BUF$LOC)      !Is return an error
;          3833          then
;          3834              begin
;          3835              !
;          3836              ! If the return status code eql's a CTO_CODE then see if the remote
;          3837              ! program is still running.  If it is then save the progress indicator
;          3838              ! and repeat the loop else call routine Decode ().
;          3839              !
;          3840
;          3841              if .RET_STATUS eqlu CTO_CODE            !Is this a controller time out
;          3842              then
;          3843                  begin
;          3844
;          3845                  if GET_DUST_STATUS () then DECODE ();   !Get the dust status
;          3846
;          3847                  if .RET_EN$AD [PLO_IND] gtru .PID_SAVE [0]      !Any progress been made
```

```
;          3848                    then
;          3849                        begin
;          3850                        PID_SAVE [0] = .RET_EN$AD [PLO_IND];        !Still running save Pid
;          3851                        PID_SAVE [1] = .RET_EN$AD [PHI_IND];
;          3852                        PRINTB (PID_FMT, .PID_SAVE [1], .PID_SAVE [0]);
;          3853                        end
;          3854                    else
;          3855
;          3856                        if .RET_EN$AD [PHI_IND] gtru .PID_SAVE [1]
;          3857                        then
;          3858                            begin
;          3859                            PID_SAVE [0] = .RET_EN$AD [PLO_IND];    !Still running save Pid
;          3860                            PID_SAVE [1] = .RET_EN$AD [PHI_IND];
;          3861                            PRINTB (PID_FMT, .PID_SAVE [1], .PID_SAVE [0]);
;          3862                            end
;          3863                        else
;          3864                            return RET_STATUS = RPD_CODE;   !No progress so flag error
;          3865
;          3866                    end
;          3867                else
;          3868                    !
;          3869                    ! The return status code was not a controller time out code so something
;          3870                    ! else is wrong.  Call the routine Decode () to find out what went wrong.
;          3871                    !
;          3872                        DECODE ()
;          3873
;          3874                    end
;          3875                else
;          3876                    begin
;          3877                    !
;          3878                    ! The command has been received by the interrupt service.
;          3879                    !
;          3880                    ! Get this  commands return  envelope address out of the
;          3881                    ! out$std_buf and check for good return status error and
;          3882                    ! die if bad status.
;          3883                    !
;          3884                    RET_EN$AD = .OUT$STD_BUF [.REC_BUF$LOC, ENV_ADR];   !Get the ret env adr
;          3885                    !
;          3886                    ! Test for good status
;          3887                    !
;          3888
;          3889                    if .RET_EN$AD [STATUS] nequ ZERO    !Test the status
;          3890                    then
;          3891                        return RET_STATUS = RSE_CODE    !Return a "Response status err" code
;          3892                    else
;          3893                        return .RET_STATUS;             !This ret_status is good or bad
;          3894
;          3895                    end;
;          3896
;          3897                end;
;          3898
;          3899            return .RET_STATUS;                         !It won't compile without this here
;          3900            end;


                                        .SBTTL  REC.DATA MODULE DECLARATIONS
000000  004167  000000G              REC.DATA::
```

```
                                                    JSR     R1,$SAVE3                       ;                                                       3677
000004  005746                                      TST     -(SP)
000006  004767  173026                              JSR     PC,GET.NSD                      ;                                                       3735
000012  004767  173170                              JSR     PC,GET.CMD$REF                  ;                                                       3736
000016  010003                                      MOV     R0,R3                           ; *,REF.NUM
000020  016746  000000G                             MOV     NSD.SLOT,-(SP)                  ;                                                       3740
000024  012746  000054                              MOV     #54,-(SP)
000030  004767  000000G                             JSR     PC,BL$MUL
000034  012760  000034  000000G                     MOV     #34,SND.ENVELOPE(R0)
000042  012701  000002G                             MOV     #SND.ENVELOPE+2,R1              ;                                                       3741
000046  060001                                      ADD     R0,R1
000050  112711  000001                              MOVB    #1,(R1)                         ;                                                       3742
000054  112761  000002  000001                      MOVB    #2,1(R1)                        ;                                                       3743
000062  010360  000004G                             MOV     R3,SND.ENVELOPE+4(R0)           ; REF.NUM,*                                             3747
000066  005060  000006G                             CLR     SND.ENVELOPE+6(R0)              ;                                                       3748
000072  005060  000010G                             CLR     SND.ENVELOPE+10(R0)             ;                                                       3749
000076  005060  000012G                             CLR     SND.ENVELOPE+12(R0)             ;                                                       3750
000102  112760  000005  000014G                     MOVB    #5,SND.ENVELOPE+14(R0)          ;                                                       3751
000110  105060  000015G                             CLRB    SND.ENVELOPE+15(R0)             ;                                                       3752
000114  005060  000016G                             CLR     SND.ENVELOPE+16(R0)             ;                                                       3753
000120  012760  000170  000020G                     MOV     #170,SND.ENVELOPE+20(R0)        ;                                                       3759
000126  005060  000022G                             CLR     SND.ENVELOPE+22(R0)             ;                                                       3760
000132  012760  000000G 000024G                     MOV     #REC.BUF,SND.ENVELOPE+24(R0)    ;                                                       3764
000140  012701  000026G                             MOV     #SND.ENVELOPE+26,R1             ;                                                       3765
000144  060001                                      ADD     R0,R1
000146  105011                                      CLRB    (R1)                            ;                                                       3767
000150  105061  000001                              CLRB    1(R1)                           ;                                                       3768
000154  005060  000030G                             LLR     SND.ENVELOPE+30(R0)             ;                                                       3769
000160  005060  000032G                             CLR     SND.ENVELOPE+32(R0)             ;                                                       3770
000164  005060  000034G                             CLR     SND.ENVELOPE+34(R0)             ;                                                       3771
000170  005060  000036G                             CLR     SND.ENVELOPE+36(R0)             ;                                                       3772
000174  010316                                      MOV     R3,(SP)                         ; REF.NUM,*                                             3780
000176  004767  172712                              JSR     PC,LOAD.OUT$STD.BUF
000202  010002                                      MOV     R0,R2                           ; *,REC.BUF$LOC
000204  020227  002001                              CMP     R2,#2001                        ; REC.BUF$LOC,*                                         3782
000210  001002                                      BNE     1$
000212  004767  173056                              JSR     PC,DECODE
000216  016700  000000G                 1$:         MOV     NSD.SLOT,R0                     ;                                                       3787
000222  006300                                      ASL     R0
000224  006300                                      ASL     R0
000226  066700  000000G                             ADD     SEND.RING,R0
000232  052760  100000  000002                      BIS     #100000,2(R0)
000240  017766  000000G 000004                      MOV     @RC25.ADDR,4(SP)                ; *,RC$S.REG                                            3791
000246  016600  000004                              MOV     4(SP),R0                        ; RC$S.REG,TEMP
000252  104422                              2$:     TRAP    22                              ;                                                       3825
000254  012716  007640                              MOV     #7640,(SP)                      ;                                                       3832
000260  010346                                      MOV     R3,-(SP)                        ; REF.NUM,*
000262  010246                                      MOV     R2,-(SP)                        ; REC.BUF$LOC,*
000264  004767  175014                              JSR     PC,CTO.WAIT
000270  022626                                      CMP     (SP)+,(SP)+
000272  006000                                      ROR     R0
000274  103074                                      BCC     8$
000276  026727  000000G 000011                      CMP     RET.STATUS,#11                  ;                                                       3841
000304  001065                                      BNE     7$
000306  004767  175500                              JSR     PC,GET.DUST.STATUS              ;                                                       3845
000312  006000                                      ROR     R0
000314  103002                                      BCC     3$
```

```
000316  004767  172752                          JSR     PC,DECODE
000322  016701  000000G                 3$:     MOV     RET.EN$AD,R1            ;                               3851
000326  010100                                  MOV     R1,R0                   ; RET.EN$AD,*                   3847
000330  016000  000024                          MOV     24(R0),R0
000334  020067  000000G                         CMP     R0,PID.SAVE
000340  101417                                  BLOS    4$
000342  010067  000000G                         MOV     R0,PID.SAVE             ;                               3850
000346  016167  000026  000002G                 MOV     26(R1),PID.SAVE+2       ;                               3851
000354  010016                                  MOV     R0,(SP)                 ; PID.SAVE,*                    3852
000356  016746  000002G                         MOV     PID.SAVE+2,-(SP)
000362  012746  000000G                         MOV     #PID.FMT,-(SP)
000366  012746  000003                          MOV     #3,-(SP)
000372  010600                                  MOV     SP,R0                   ; SP,*
000374  104414                                  TRAP    14
000376  000422                                  BR      5$                      ;                               3849
000400  026167  000026  000002G         4$:     CMP     26(R1),PID.SAVE+2       ;                               3856
000406  101421                                  BLOS    6$
000410  010067  000000G                         MOV     R0,PID.SAVE             ;                               3859
000414  016167  000026  000002G                 MOV     26(R1),PID.SAVE+2       ;                               3860
000422  010016                                  MOV     R0,(SP)                 ; PID.SAVE,*                    3861
000424  016746  000002G                         MOV     PID.SAVE+2,-(SP)
000430  012746  000000G                         MOV     #PID.FMT,-(SP)
000434  012746  000003                          MOV     #3,-(SP)
000440  010600                                  MOV     SP,R0                   ; SP,*
000442  104414                                  TRAP    14
000444  062706  000006                 5$:     ADD     #6,SP                   ;                               3858
000450  000700                                  BR      2$                      ;                               3856
000452  012700  000051                 6$:     MOV     #51,R0                  ;                               3864
000456  000420                                  BR      9$
000460  004767  172610                 7$:     JSR     PC,DECODE               ;                               3872
000464  000672                                  BR      2$                      ;                               3832
000466  010200                         8$:     MOV     R2,R0                   ; REC.BUF$LOC,*                 3884
000470  006300                                  ASL     R0
000472  006300                                  ASL     R0
000474  016067  000002G 000000G                 MOV     OUT$STD.BUF+2(R0),RET.EN$AD
000502  016000  000002G                         MOV     OUT$STD.BUF+2(R0),R0    ;                               3889
000506  005760  000016                          TST     16(R0)
000512  001405                                  BEQ     10$
000514  012700  000031                          MOV     #31,R0                  ;                               3891
000520  010067  000000G                 9$:     MOV     R0,RET.STATUS
000524  000402                                  BR      11$                     ;                               3876
000526  016700  000000G                 10$:    MOV     RET.STATUS,R0
000532  062706  000006                 11$:    ADD     #6,SP                   ;                               3677
000536  000207                                  RTS     PC

; Routine Size:  176 words,     Routine Base:  AC$CODE + 5110
; Maximum stack depth per invocation:  12 words


;          3901
```

```
;        3902  global routine SET_CNTLR_CHAR =                !Sets control characteristics
;        3903
;        3904  !++
;        3905  ! Functional Description :
;        3906  !       The SET CONTROLLER CHARACTERISTICS command is used to set host
;        3907  !       settable   unit   characteristics  and  obtain  those  unit
;        3908  !       characteristics  that are  essential  for  proper class driver
;        3909  !       operation.  This    command  never  alters  the  unit's  state
;        3910  !       (''unit-online'',   ''unit-available'',  ''unit-offline'').   It  is
;        3911  !       meaningless  to  set  host settable characteristics for a unit
;        3912  !       that is ''unit-available'' or ''unit-offline''.
;        3913  !
;        3914  ! Formal Parameters :
;        3915  !       none
;        3916  !
;        3917  ! Implicit Inputs :
;        3918  !       NSD_SLOT        This  global storage gets  loaded  by  the routine
;        3919  !                       'Get_nsd'  and  in it is stored the next send ring
;        3920  !                       descriptor  slot  where the port/controller should
;        3921  !                       be polling on and the  place  to put this commands
;        3922  !                       command packet.
;        3923  !
;        3924  !
;        3925  ! Implicit Outputs :
;        3926  !       none
;        3927  !
;        3928  ! Completion Codes :
;        3929  !       RET_STATUS:     Return status passes back to the calling routine
;        3930  !                       the status of the just issued command.
;        3931  !
;        3932  ! Side Effects :
;        3933  !       Any previously defined controller characteristics will possibly
;        3934  !       be altered after execution of this command.
;        3935  !--
;        3936
;        3937      begin
;        3938
;        3939      local
;        3940          REF_NUM,                                !Stores unique cmd ref number
;        3941          SCC_BUF$LOC,                            !Stores out$standing cmd buffer location
;        3942          TEMP;                                   !A place to put read IP register data
;        3943
;        3944      !
;        3945      ! Before  we load up the command packet up with all this good information
;        3946      ! get the next send descriptor slot and a unique command reference number.
;        3947      !
;        3948      GET_NSD ();                                 !Get the next send desc slot
;        3949      REF_NUM = GET_CMD$REF ();                   !Get a unique command ref num
;        3950      !
;        3951      ! UQ Port command envelope Header field definition
;        3952      !
;        3953      SND_ENVELOPE [.NSD_SLOT, MSG_LENGTH] = SZ_SCC;      !Load message length
;        3954      SND_ENVELOPE [.NSD_SLOT, CREDITS] = ONE;    !Load credit size
;        3955      SND_ENVELOPE [.NSD_SLOT, MSG_TYPE] = 0;     !Define message type 'Sequential'
;        3956      SND_ENVELOPE [.NSD_SLOT, CONN_ID] = MSCP;   !Define connection ID
;        3957      !
;        3958      ! MSCP generic command envelope field definition
```

```
3959      !
3960      SND_ENVELOPE [.NSD_SLOT, CMD_LREF] = .REF_NUM;      !Load command reference number
3961      SND_ENVELOPE [.NSD_SLOT, CMD_HREF] = ZERO;   !Zero Hi order cmd ref num
3962      SND_ENVELOPE [.NSD_SLOT, UN_[USED] = ZERO;   !Not used in DUP implimentation
3963      SND_ENVELOPE [.NSD_SLOT, UN_HUSED] = ZERO;   !Not used in DUP implimentation
3964      SND_ENVELOPE [.NSD_SLOT, OP[ODE] = OP_SCC;   !Load this commands op-code
3965      SND_ENVELOPE [.NSD_SLOT, RSVD] = ZERO;       !Not used field
3966      SND_ENVELOPE [.NSD_SLOT, MODIFIER] = ZERO;   !Define this commands modifiers
3967      !
3968      ! Command specfic command envelope field definition
3969      !
3970      SND_ENVELOPE [.NSD_SLOT, MSCP_VER] = ZERO;   !MSCP version
3971      SND_ENVELOPE [.NSD_SLOT, CTL_FLAGS] = ZERO; !Controller flags
3972      SND_ENVELOPE [.NSD_SLOT, HOST_TOV] = ZERO;   !Host time out value
3973      SND_ENVELOPE [.NSD_SLOT, RS$VD] = ZERO;      !Reserved
3974      SND_ENVELOPE [.NSD_SLOT, T$D_0] = ZERO;      !Time and Date word 0
3975      SND_ENVELOPE [.NSD_SLOT, T$D_1] = ZERO;      !Time and Date word 1
3976      SND_ENVELOPE [.NSD_SLOT, T$D_2] = ZERO;      !Time and Date word 2
3977      SND_ENVELOPE [.NSD_SLOT, T$D_3] = ZERO;      !Time and Date word 3
3978      SND_ENVELOPE [.NSD_SLOT, CDP_LO] = ZERO;     !Cntlr dep parameter lo word
3979      SND_ENVELOPE [.NSD_SLOT, CDP_HI] = ZERO;     !Cntlr dep parameter hi wrd
3980      !
3981      ! Call the load out$standing command buffer routine and load this command
3982      ! into the buffer.  The return from this routine will  point  us  to  the
3983      ! buffer location where this command is stored.  Later we can look at this
3984      ! location to see if the interrupt service routine has received and process     it.
3985      !
3986      SCC_BUF$LOC = LOAD_OUT$STD_BUF (.REF_NUM);  !Load the command
3987
3988      if .SCC_BUF$LOC eqlu OBF_CODE then DECODE ();       !Error if buffer is full
3989
3990      !
3991      ! Set the ownership bit to 1 giving this slot to the port/controller
3992      !
3993      SEND_RING [.NSD_SLOT, OWN_BIT] = PORT_OWNED;
3994      !
3995      ! Read the IP register to stimulate port polling
3996      !
3997      TEMP = .RC25_ADDR [RCIP, RC_ALL];
3998      !
3999      ! Time  out the  port/controller processing  the command.
4000      !
4001      ! The   first   test   tests the connections  ability to
4002      ! respond to  this command without  any errors in the SA
4003      ! register and for the command not timing out.
4004      !
4005      ! The  second tests the  DUP server for good status.  If
4006      ! bad status is sent back then an error code is returned
4007      ! to the calling routine where the routine "decode" will
4008      ! decode  and take the  appropriate recovery.  The  time
4009      ! out  routine will loop on delaying and checking the hi
4010      ! bit of the  first word in  the  out$std_buf for a true.
4011      ! When true signals us that the interrupt service routine
4012      ! has received  the endpacket  and  no connection errors
4013      ! were detected.
4014      !
4015
```

```
;        4016      if CTO_WAIT (3000, .REF_NUM, .SCC_BUF$LOC) then DECODE ();  !Is return an error
;        4017
;        4018      !
;        4019      ! Get  the return envelope  address  from the  out$std_buf
;        4020      ! at  this commands  buffer location  and check the packet
;        4021      ! for good status error and die if bad status was returned
;        4022      !
;        4023      RET_EN$AD = .OUT$STD_BUF [.SCC_BUF$LOC, ENV_ADR];   !Get the ret env adr
;        4024      !
;        4025      ! Now test for good status
;        4026      !
;        4027
;        4028      if .RET_EN$AD [STATUS] nequ ZERO            !Test the status
;        4029      then
;        4030          return RET_STATUS = RSE_CODE            !Return a "Response status err" code
;        4031      else
;        4032          return .RET_STATUS;                     !This ret_status is good or bad
;        4033
;        4034      end;


                                        .SBTTL  SET.CNTLR.CHAR MODULE DECLARATIONS
000000  004167  000000G          SET.CNTLR.CHAR::
                                        JSR     R1,$SAVE2                       ;                       3902
000004  005746                          TST     -(SP)
000006  004767  172266                  JSR     PC,GET.NSD                      ;                       3948
000012  004767  172430                  JSR     PC,GET.CMD$REF                  ;                       3949
000016  010002                          MOV     R0,R2                           ; *,REF.NUM
000020  016746  000000G                 MOV     NSD.SLOT,-(SP)                  ;                       3953
000024  012746  000054                  MOV     #54,-(SP)
000030  004767  000000G                 JSR     PC,BL$MUL
000034  012760  000040  000000G         MOV     #40,SND.ENVELOPE(R0)
000042  012701  000002G                 MOV     #SND.ENVELOPE+2,R1              ;                       3954
000046  060001                          ADD     R0,R1
000050  112711  000001                  MOVB    #1,(R1)                         ;                       3955
000054  105061  000001                  CLRB    1(R1)                           ;                       3956
000060  010260  000004G                 MOV     R2,SND.ENVELOPE+4(R0)           ; REF.NUM,*             3960
000064  005060  000006G                 CLR     SND.ENVELOPE+6(R0)              ;                       3961
000070  005060  000010G                 CLR     SND.ENVELOPE+10(R0)             ;                       3962
000074  005060  000012G                 CLR     SND.ENVELOPE+12(R0)             ;                       3963
000100  112760  000004  000014G         MOVB    #4,SND.ENVELOPE+14(R0)          ;                       3964
000106  105060  000015G                 CLRB    SND.ENVELOPE+15(R0)             ;                       3965
000112  005060  000016G                 CLR     SND.ENVELOPE+16(R0)             ;                       3966
000116  005060  000020G                 CLR     SND.ENVELOPE+20(R0)             ;                       3970
000122  005060  000022G                 CLR     SND.ENVELOPE+22(R0)             ;                       3971
000126  005060  000024G                 CLR     SND.ENVELOPE+24(R0)             ;                       3972
000132  005060  000026G                 CLR     SND.ENVELOPE+26(R0)             ;                       3973
000136  005060  000030G                 CLR     SND.ENVELOPE+30(R0)             ;                       3974
000142  005060  000032G                 CLR     SND.ENVELOPE+32(R0)             ;                       3975
000146  005060  000034G                 CLR     SND.ENVELOPE+34(R0)             ;                       3976
000152  005060  000036G                 CLR     SND.ENVELOPE+36(R0)             ;                       3977
000156  005060  000040G                 CLR     SND.ENVELOPE+40(R0)             ;                       3978
000162  005060  000042G                 CLR     SND.ENVELOPE+42(R0)             ;                       3979
000166  010216                          MOV     R2,(SP)                         ; REF.NUM,*             3986
000170  004767  172160                  JSR     PC,LOAD.OUT$STD.BUF
000174  010001                          MOV     R0,R1                           ; *,SCC.BUF$LOC
000176  020127  002001                  CMP     R1,#2001                        ; SCC.BUF$LOC,*         3988
```

```
000202  001002                          BNE     1$
000204  004767  172324                  JSR     PC,DECODE
000210  016700  000000G           1$:    MOV     NSD.SLOT,R0             ;                               3993
000214  006300                          ASL     R0
000216  006300                          ASL     R0
000220  066700  000000G                 ADD     SEND.RING,R0
000224  052760  100000  000002          BIS     #100000,2(R0)
000232  017766  000000G 000004          MOV     @RC25.ADDR,4(SP)        ; *,RC$S.REG                    3997
000240  016600  000004                  MOV     4(SP),R0                ; RC$S.REG,TEMP
000244  012716  005670                  MOV     #5670,(SP)              ;                               4016
000250  010246                          MOV     R2,-(SP)                ; REF.NUM,*
000252  010146                          MOV     R1,-(SP)                ; SCC.BUF$LOC,*
000254  004767  174264                  JSR     PC,CTO.WAIT
000260  022626                          CMP     (SP)+,(SP)+
000262  006000                          ROR     R0
000264  103002                          BCC     2$
000266  004767  172242                  JSR     PC,DECODE
000272  010100                  2$:     MOV     R1,R0                   ; SCC.BUF$LOC,*                 4023
000274  006300                          ASL     R0
000276  006300                          ASL     R0
000300  016067  000002G 000000G         MOV     OUT$STD.BUF+2(R0),RET.EN$AD
000306  016000  000002G                 MOV     OUT$STD.BUF+2(R0),R0    ;                               4028
000312  005760  000016                  TST     16(R0)
000316  001405                          BEQ     3$
000320  012700  000031                  MOV     #31,R0                  ;                               4030
000324  010067  000000G                 MOV     R0,RET.STATUS
000330  000402                          BR      4$                      ;                               3937
000332  016700  000000G           3$:    MOV     RET.STATUS,R0
000336  062706  000006           4$:    ADD     #6,SP                   ;                               3902
000342  000207                          RTS     PC

; Routine Size:  114 words,     Routine Base:  AC$CODE + 5650
; Maximum stack depth per invocation:  9 words

;         4035
```

```
;        4036  global routine ON_LINE =                    !Makes a unit come online to a host
;        4037
;        4038  !++
;        4039  ! Functional Description :
;        4040  !       The  online  command  is  used  to  bring  a  unit  "unit-online,  set
;        4041  !       host   settable   unit   characteristics   and  obtain   those  unit
;        4042  !       characteristics    that    are    essential  for  proper  class driver
;        4043  !       operation.  The    unit  is  spun-up,   if    necessary, and  is heads
;        4044  !       are    loaded   prior   to   returning    the   online  command's  end
;        4045  !       message.  Host    settable  characteristics    are   set exactly as if
;        4046  !       a  set  unit    characteristics    command were issued.  Host settable
;        4047  !       characteristics   are set after the unit has been successfully spun-up
;        4048  !       and  any  other  validity  checks have succeded.  Note that the unit's
;        4049  !       host settable characteristics are not altered if the unit is   already
;        4050  !       "unit-online".
;        4051  !
;        4052  ! Formal Parameters :
;        4053  !       none
;        4054  !
;        4055  ! Implicit Inputs :
;        4056  !       NSD_SLOT        This  global storage gets  loaded  by  the routine
;        4057  !                       'Get_nsd'  and  in it is stored the next send ring
;        4058  !                       descriptor  slot  where the port/controller should
;        4059  !                       be polling on and the  place  to put this commands
;        4060  !                       command packet.
;        4061  !
;        4062  ! Implicit Outputs :
;        4063  !       none
;        4064  !
;        4065  ! Completion Codes :
;        4066  !       RET_STATUS:     Return status passes back to the calling routine
;        4067  !                       the status of the just issued command.
;        4068  !
;        4069  ! Side Effects :
;        4070  !       Any previously defined controller characteristics will possibly
;        4071  !       be altered after execution of this command.
;        4072  !--
;        4073
;        4074      begin
;        4075
;        4076      local
;        4077          REF_NUM,                                !Stores unique cmd ref number
;        4078          ONL_BUF$LOC,                            !Stores out$standing cmd buffer location
;        4079          TEMP;                                   !A place to put read IP register data
;        4080
;        4081      !
;        4082      ! Before we load  up the command packet up with all this good information
;        4083      ! get the next send descriptor slot and a unique command reference number.
;        4084      !
;        4085      GET_NSD ();                               !Get the next send desc slot
;        4086      REF_NUM = GET_CMD$REF ();                 !Get a unique command ref num
;        4087      !
;        4088      ! UQ Port command envelope Header field definition
;        4089      !
;        4090      SND_ENVELOPE [.NSD_SLOT, MSG_LENGTH] = SZ_ONL;      !Load message length
;        4091      SND_ENVELOPE [.NSD_SLOT, CREDITS] = ONE;    !Load credit size
;        4092      SND_ENVELOPE [.NSD_SLOT, MSG_TYPE] = 0;     !Define message type 'Sequential'
```

```
;        4093      SND_ENVELOPE [.NSD_SLOT, CONN_ID] = MSCP;   !Define connection ID
;        4094      !
;        4095      ! MSCP generic command envelope field definition
;        4096      !
;        4097      SND_ENVELOPE [.NSD_SLOT, CMD_LREF] = .REF_NUM;      !Load command reference number
;        4098      SND_ENVELOPE [.NSD_SLOT, CMD_HREF] = ZERO;  !Zero Hi order cmd ref num
;        4099      SND_ENVELOPE [.NSD_SLOT, UNIT_NUM] = .UNIT_NO;      !Select unit to bring online
;        4100      SND_ENVELOPE [.NSD_SLOT, UN_HUSED] = ZERO;  !Not used in DUP implimentation
;        4101      SND_ENVELOPE [.NSD_SLOT, OPCODE] = OP_ONL;  !Load this commands op-code
;        4102      SND_ENVELOPE [.NSD_SLOT, RSVD] = ZERO;      !Not used field
;        4103      SND_ENVELOPE [.NSD_SLOT, MODIFIER] = ZERO;  !Define this commands modifiers
;        4104      !
;        4105      ! Command specfic command envelope field definition
;        4106      !
;        4107      SND_ENVELOPE [.NSD_SLOT, RSV$D] = ZERO;     !Reserved
;        4108      SND_ENVELOPE [.NSD_SLOT, UNT_FLAGS] = ZERO; !Unit flag field
;        4109      SND_ENVELOPE [.NSD_SLOT, RSVD$0] = ZERO;    !Reserved field
;        4110      SND_ENVELOPE [.NSD_SLOT, RSVD$1] = ZERO;    !Reserved field
;        4111      SND_ENVELOPE [.NSD_SLOT, RSVD$2] = ZERO;    !Reserved field
;        4112      SND_ENVELOPE [.NSD_SLOT, RSVD$3] = ZERO;    !Reserved field
;        4113      SND_ENVELOPE [.NSD_SLOT, RSVD$4] = ZERO;    !Reserved field
;        4114      SND_ENVELOPE [.NSD_SLOT, RSVD$5] = ZERO;    !Reserved field
;        4115      SND_ENVELOPE [.NSD_SLOT, DDP_LO] = ZERO;    !Device dependent parameter
;        4116      SND_ENVELOPE [.NSD_SLOT, DDP_HI] = ZERO;    !Device dependent parameter
;        4117      SND_ENVELOPE [.NSD_SLOT, SHADOW_UNIT] = ZERO;       !Shadow unit
;        4118      SND_ENVELOPE [.NSD_SLOT, COPY_SPEED] = ZERO;        !Copy speed
;        4119      !
;        4120      ! Call   the  load  out$standing  command buffer routine
;        4121      ! and  load  this command  into  the buffer.  The return
;        4122      ! from this routine will point us to the buffer location
;        4123      ! where  this command  is  stored.  Later we can look at
;        4124      ! this  location to see if the interrupt service routine
;        4125      ! has received and process it.
;        4126      !
;        4127      ONL_BUF$LOC = LOAD_OUT$STD_BUF (.REF_NUM);  !Load the command
;        4128
;        4129      if .ONL_BUF$LOC eqlu OBF_CODE then DECODE ();       !Error if buffer is full
;        4130
;        4131      !
;        4132      ! Set the ownership bit to 1 giving this slot to the port/controller
;        4133      !
;        4134      SEND_RING [.NSD_SLOT, OWN_BIT] = PORT_OWNED;
;        4135      !
;        4136      ! Read the IP register to stimulate port polling
;        4137      !
;        4138      TEMP = .RC25_ADDR [RCIP, RC_ALL];
;        4139      !
;        4140      ! Time  out the  port/controller processing  the command.
;        4141      !
;        4142      ! The   first   test   tests the connections  ability to
;        4143      ! respond to  this command without  any errors in the SA
;        4144      ! register and for the command not timing out.
;        4145      !
;        4146      ! The  second tests the  DUP server for good status.  If
;        4147      ! bad status is sent back then an error code is returned
;        4148      ! to the calling routine where the routine "decode" will
;        4149      ! decode  and take the  appropriate recovery.  The  time
```

```
;          4150      ! out  routine will loop on delaying and checking the hi
;          4151      ! bit of the  first word in  the  out$std_buf for a true.
;          4152      ! When true signals us that the interrupt service routine
;          4153      ! has received  the endpacket  and  no connection errors
;          4154      ! were detected.
;          4155      !
;          4156
;          4157      if CTO_WAIT (ONE_MINUTE, .REF_NUM, .ONL_BUF$LOC) then DECODE ();    !Is return an error
;          4158
;          4159      !
;          4160      ! Get  the return envelope  address  from the  out$std_buf
;          4161      ! at  this commands  buffer location  and check the packet
;          4162      ! for good status error and die if bad status was returned
;          4163      !
;          4164      RET_EN$AD = .OUT$STD_BUF [.ONL_BUF$LOC, ENV_ADR];   !Get the ret env adr
;          4165      !
;          4166      ! Now test for good status
;          4167      !
;          4168
;          4169      if .RET_EN$AD [STATUS] nequ ZERO            !Test the status
;          4170      then
;          4171          return RET_STATUS = RSE_CODE            !Return a "Response status err" code
;          4172      else
;          4173          return .RET_STATUS;                     !This ret_status is good or bad
;          4174
;          4175      end;


                                        .SBTTL  ON.LINE MODULE DECLARATIONS
000000  004167  000000G          ON.LINE::
                                        JSR     R1,$SAVE2                       ;                                       4036
000004  005746                          TST     -(SP)
000006  004767  171722                  JSR     PC,GET.NSD                      ;                                       4085
000012  004767  172064                  JSR     PC,GET.CMD$REF                  ;                                       4086
000016  010002                          MOV     R0,R2                           ; *,REF.NUM
000020  016746  000000G                 MOV     NSD.SLOT,-(SP)                  ;                                       4090
000024  012746  000054                  MOV     #54,-(SP)
000030  004767  000000G                 JSR     PC,BL$MUL
000034  012760  000044  000000G         MOV     #44,SND.ENVELOPE(R0)
000042  012701  000002G                 MOV     #SND.ENVELOPE+2,R1              ;                                       4091
000046  060001                          ADD     R0,R1
000050  112711  000001                  MOVB    #1,(R1)                         ;                                       4092
000054  105061  000001                  CLRB    1(R1)                           ;                                       4093
000060  010260  000004G                 MOV     R2,SND.ENVELOPE+4(R0)           ; REF.NUM,*                             4097
000064  005060  000006G                 CLR     SND.ENVELOPE+6(R0)              ;                                       4098
000070  016760  000000G  000010G        MOV     UNIT.NO,SND.ENVELOPE+10(R0)     ;                                       4099
000076  005060  000012G                 CLR     SND.ENVELOPE+12(R0)             ;                                       4100
000102  112760  000011  0000!4G        MOVB    #11,SND.ENVELOPE+14(R0)         ;                                       4101
000110  105060  000015G                 CLRB    SND.ENVELOPE+15(R0)             ;                                       4102
000114  005060  000016G                 CLR     SND.ENVELOPE+16(R0)             ;                                       4103
000120  005060  000020G                 CLR     SND.ENVELOPE+20(R0)             ;                                       4107
000124  005060  000022G                 CLR     SND.ENVELOPE+22(R0)             ;                                       4108
000130  005060  000024G                 CLR     SND.ENVELOPE+24(R0)             ;                                       4109
000134  005060  000026G                 CLR     SND.ENVELOPE+26(R0)             ;                                       4110
000140  005060  000030G                 CLR     SND.ENVELOPE+30(R0)             ;                                       4111
000144  005060  000032G                 CLR     SND.ENVELOPE+32(R0)             ;                                       4112
000150  005060  000034G                 CLR     SND.ENVELOPE+34(R0)             ;                                       4113
```

```
000154  005060  000036G                        CLR     SND.ENVELOPE+36(R0)             ;                                       4114
000160  005060  000040G                        CLR     SND.ENVELOPE+40(R0)             ;                                       4115
000164  005060  000042G                        CLR     SND.ENVELOPE+42(R0)             ;                                       4116
000170  005060  000044G                        CLR     SND.ENVELOPE+44(R0)             ;                                       4117
000174  005060  000046G                        CLR     SND.ENVELOPE+46(R0)             ;                                       4118
000200  010216                                MOV     R2,(SP)                         ; REF.NUM,*                             4127
000202  004767  171602                        JSR     PC,LOAD.OUT$STD.BUF
000206  010001                                MOV     R0,R1                           ; *,ONL.BUF$LOC
000210  020127  002001                        CMP     R1,#2001                        ; ONL.BUF$LOC,*                         4129
000214  001002                                BNE     1$
000216  004767  171746                        JSR     PC,DECODE
000222  016700  000000G              1$:     MOV     NSD.SLOT,R0                     ;                                       4134
000226  006300                                ASL     R0
000230  006300                                ASL     R0
000232  066700  000000G                        ADD     SEND.RING,R0
000236  052760  100000  000002                BIS     #100000,2(R0)
000244  017766  000000G 000004                MOV     @RC25.ADDR,4(SP)                ; *,RC$S.REG                            4138
000252  016600  000004                        MOV     4(SP),R0                        ; RC$S.REG,TEMP
000256  012716  165140                        MOV     #-12640,(SP)                    ;                                       4157
000262  010246                                MOV     R2,-(SP)                        ; REF.NUM,*
000264  010146                                MOV     R1,-(SP)                        ; ONL.BUF$LOC,*
000266  004767  173706                        JSR     PC,CTO.WAIT
000272  022626                                CMP     (SP)+,(SP)+
000274  006000                                ROR     R0
000276  103002                                BCC     2$
000300  004767  171664                        JSR     PC,DECODE
000304  010100                        2$:     MOV     R1,R0                           ; ONL.BUF$LOC,*                         4164
000306  006300                                ASL     R0
000310  006300                                ASL     R0
000312  016067  000002G 000000G               MOV     OUT$STD.BUF+2(R0),RET.EN$AD
000320  016000  000002G                        MOV     OUT$STD.BUF+2(R0),R0            ;                                       4169
000324  005760  000016                        TST     16(R0)
000330  001405                                BEQ     3$
000332  012700  000031                        MOV     #31,R0                          ;                                       4171
000336  010067  000000G                        MOV     R0,RET.STATUS
000342  000402                                BR      4$                              ;                                       4074
000344  016700  000000G              3$:     MOV     RET.STATUS,R0
000350  062706  000006              4$:     ADD     #6,SP                           ;                                       4036
000354  000207                                RTS     PC

; Routine Size:  119 words,    Routine Base:  AC$CODE + 6214
; Maximum stack depth per invocation:  9 words


;        4176
```

```
;         4177  global routine INT$I_SERVICE : INT_LNK$TYP novalue =    !Init sequence interrupt catcher
;         4178
;         4179  !++
;         4180  ! Functional Description :
;         4181  !       During the initialization sequence the IE bit is defined to be
;         4182  !       a zero.  This means that the host is not requesting interrupts at
;         4183  !       the completion of steps 1-3.
;         4184  !
;         4185  !       Note that no initerrupt will be generated at the completion of
;         4186  !       step  4  since  this step rquires only a small number of time.
;         4187  !
;         4188  !       This interrupt service routine serves to catch any interrupts that the
;         4189  !       controller  might  issue   during   the  initialization sequence.  The
;         4190  !       interrupt is ignored and control is returned.
;         4191  !
;         4192  !       This interrupt service routine is also used during the RC25 register
;         4193  !       existence test in determining whether P_Table RC25 registers exist.
;         4194  !
;         4195  ! Formal Parameters :
;         4196  !       none
;         4197  !
;         4198  ! Implicit Inputs :
;         4199  !       NEX_FLAG        A flag which is loaded with zeros during the RC25 register
;         4200  !                       existence test and set to all ones by this routine in the
;         4201  !                       event of attempts to read a non-existent RC25 controller.
;         4202  !
;         4203  ! Implicit Outputs :
;         4204  !       NEX_FLAG        Is returned with all ones in the event of RC25 non-existent
;         4205  !                       register access attempts.
;         4206  !
;         4207  ! Completion Codes :
;         4208  !       none
;         4209  !
;         4210  ! Side Effects :
;         4211  !       none
;         4212  !--
;         4213
;         4214      begin
;         4215      NEX_FLAG = ONES;                          !Indicate this interrupt occured
;         4216      return;
;         4217      end;


                                                .SBTTL  INT$I.SERVICE MODULE DECLARATIONS
000000  012767  177777  000000G       INT$I.SERVICE::
                                                MOV     #-1,NEX.FLAG                    ;       4215
000006  000002                                  RTI                                     ;       4177

; Routine Size:  4 words,       Routine Base:  AC$CODE + 6572
; Maximum stack depth per invocation:  0 words


;         4218
```

```
;          4219  global routine IS_TIMER (SEQ_NO) =                !Init sequence time out
;          4220
;          4221  !++
;          4222  ! Functional Description :
;          4223  !       Steps 1-3 of the init sequence, each are required to complete within
;          4224  !       10 seconds.  If any of these steps fails to complete within that period,
;          4225  !       this is to be treated as a host detected fatal error.
;          4226  !
;          4227  !       This routine will do one us delays for a total of 10 seconds.  After
;          4228  !       each delay the step field is examined to see if this init sequence has completed.
;          4229  !
;          4230  ! Formal Parameters :
;          4231  !       SEQ_NO: Indicated which init step is presently being performed within the RC25 init sequence.
;          4232  !
;          4233  ! Implicit Inputs :
;          4234  !       none
;          4235  !
;          4236  ! Implicit Outputs :
;          4237  !       none
;          4238  !
;          4239  ! Completion Codes :
;          4240  !       TRUE:   Indicates to the calling routine that the indicated init sequence step has timed out.
;          4241  !
;          4242  !       FALSE:  Indicates to the calling routine that the indicated init sequence
;          4243  !               step has not timed out.
;          4244  !
;          4245  ! Side Effects :
;          4246  !       If the init sequence step times out and an error is posted in the sa register
;          4247  !       then the routine decode will be call.
;          4248  !--
;          4249
;          4250      begin
;          4251
;          4252      local
;          4253          TO_VALUE : word,                            !Step time out value
;          4254          STEP_VAL : word;                            !Temp storage of step value
;          4255
;          4256      STEP_VAL = ZERO;                                !Make sure the loc is zeroed out
;          4257      !
;          4258      ! Select the step value expected from this init sequence step.
;          4259      !
;          4260
;          4261      selectoneu .SEQ_NO of                           !Select the binary step value
;          4262          set
;          4263
;          4264          [0] :
;          4265              begin
;          4266              STEP_VAL = %b'0001';                    !Step 1 binary value
;          4267              TO_VALUE = 20000;                       !Timeout step one for 60 seconds
;          4268              end;
;          4269
;          4270          [1] :
;          4271              begin
;          4272              STEP_VAL = %b'0010';                    !Step 2 binary value
;          4273              TO_VALUE = 5000;                        !Timeout step two for 10 seconds
;          4274              end;
;          4275
```

```
;          4276          [2] :
;          4277              begin
;          4278              STEP_VAL = %b'0100';                !Step 3 binary value
;          4279              TO_VALUE = 5000;                    !Timeout step 3 for 10 seconds
;          4280              end;
;          4281
;          4282          [3] :
;          4283              begin
;          4284              STEP_VAL = %b'1000';                !Step 4 binary value
;          4285              TO_VALUE = 5000;                    !Timeout step 4 for 10 seconds
;          4286              end;
;          4287          tes;
;          4288
;          4289      !
;          4290      ! Loop  on the 100 micro second delay until either the expected step field
;          4291      ! is read in the SA register or the step times out.
;          4292      !
;          4293
;          4294      incru TIM_OUT from 0 to .TO_VALUE do        !Loop on C_US delay's
;          4295          begin
;          4296          DELAY (C_US);                           !Do the delay
;          4297          !
;          4298          ! Check the step bit to see if it is set yet. If it is set then return
;          4299          ! a false indicating the completion else continue delaying.
;          4300          !
;          4301
;          4302          if .RC25_ADDR [RCSA, STP_FIELD] eqlu .STEP_VAL then return FALSE;
;          4303
;          4304          BREAK;                                  !Service any control C's
;          4305          end;
;          4306
;          4307      ;+
;          4308      ! This step has not completed within the specified time interval.  Test
;          4309      ! the sa register for any errors posted and report errors if any. Return
;          4310      ! a true to the caller indicating the error.
;          4311      !-
;          4312
;          4313      if .RC25_ADDR [RCSA, ERR_BIT]               !Is the error bit set
;          4314      then
;          4315          begin
;          4316          RET_STATUS = PFE_CODE;                  !Indicate the port/fatal error code
;          4317          DECODE ();                              !Report the error
;          4318          end;
;          4319
;          4320      return TRUE;                                !Return a failure to the caller
;          4321      end;


                                        .SBTTL  IS.TIMER MODULE DECLARATIONS
000000  004167  000000G          IS.TIMER::
                                        JSR     R1,$SAVE4                       ;                       4219
000004  162706  000006                  SUB     #6,SP
000010  005002                          CLR     R2                              ; STEP.VAL              4256
000012  016600  000022                  MOV     22(SP),R0                       ; SEQ.NO,*              4261
000016  001005                          BNE     1$
000020  012702  000001                  MOV     #1,R2                           ; *,STEP.VAL            4266
000024  012703  047040                  MOV     #47040,R3                       ; *,TO.VALUE            4267
```

```
000030  000423                          BR      5$                              ;                                       4261
000032  020027  000001                1$:   CMP     R0,#1
000036  001003                          BNE     2$
000040  012702  000002                      MOV     #2,R2                           ; *,STEP.VAL                            4272
000044  000413                          BR      4$                              ;                                       4273
000046  020027  000002                2$:   CMP     R0,#2                           ;                                       4261
000052  001003                          BNE     3$
000054  012702  000004                      MOV     #4,R2                           ; *,STEP.VAL                            4278
000060  000405                          BR      4$                              ;                                       4279
000062  020027  000003                3$:   CMP     R0,#3                           ;                                       4261
000066  001004                          BNE     5$
000070  012702  000010                      MOV     #10,R2                          ; *,STEP.VAL                            4284
000074  012703  011610                4$:   MOV     #11610,R3                       ; *,TO.VALUE                            4285
000100  005004                        5$:   CLR     R4                              ; TIM.OUT                               4294
000102  000436                          BR      11$
000104  012701  000001                6$:   MOV     #1,R1                           ; *,$$TMP2                              4296
000110  001411                        7$:   BEQ     10$
000112  016700  000000G                     MOV     L$DLY,R0                        ; *,$$TMP1
000116  001404                          BEQ     9$
000120  005066  000004                8$:   CLR     4(SP)                           ; $$TMP
000124  005300                          DEC     R0                              ; $$TMP1
000126  001374                          BNE     8$
000130  005301                        9$:   DEC     R1                              ; $$TMP2
000132  000766                          BR      7$
000134  016700  000000G               10$:   MOV     RC25.ADDR,R0                    ;                                       4302
000140  016066  000002  000002             MOV     2(R0),2(SP)                     ; *,RC$S.REG
000146  010201                          MOV     R2,R1                           ; STEP.VAL,*
000150  016600  000002                      MOV     2(SP),R0                        ; RC$S.REG,*
000154  006200                          ASR     R0
000156  006200                          ASR     R0
000160  006200                          ASR     R0
000162  000300                          SWAB    R0
000164  042700  177760                      BIC     #177760,R0
000170  020001                          CMP     R0,R1
000172  001421                          BEQ     13$
000174  104422                          TRAP    22
000176  005204                          INC     R4                              ; TIM.OUT                               4294
000200  020403                       11$:   CMP     R4,R3                           ; TIM.OUT,TO.VALUE
000202  101740                          BLOS    6$
000204  016700  000000G                     MOV     RC25.ADDR,R0                    ;                                       4313
000210  016016  000002                      MOV     2(R0),(SP)                      ; *,RC$S.REG
000214  100005                          BPL     12$
000216  012767  000021  000000G             MOV     #21,RET.STATUS                  ;                                       4316
000224  004767  171352                      JSR     PC,DECODE                       ;                                       4317
000230  012700  000001                12$:   MOV     #1,R0                           ;                                       4250
000234  000401                          BR      14$
000236  005000                       13$:   CLR     R0                              ;                                       4219
000240  062706  000006                14$:   ADD     #6,SP
000244  000207                          RTS     PC

; Routine Size:  83 words,      Routine Base:  AC$CODE + 6602
; Maximum stack depth per invocation:  10 words


;         4322
```

```
;        4323  global routine BOOT_RC25 =                    !Performs RC25 init sequence
;        4324
;        4325  !++
;        4326  ! Functional Description :
;        4327  !       This   routine performs the  initialization  sequence  of the RC25
;        4328  !       RC25 controller.
;        4329  !
;        4330  !       The initialization procedure serves to:
;        4331  !
;        4332  !       1.  Identify   the parameters   of the host-resident communications
;        4333  !           region to the port.
;        4334  !
;        4335  !       2.  Provide    a   confidence   check of port/controller  integrity.
;        4336  !
;        4337  !       3.  Bring  the  port/controller online  to the  host (note that the
;        4338  !           devices  attached  to the controller  are  not  thereby brought
;        4339  !           online to the class driver.)
;        4340  !
;        4341  ! Formal Parameters :
;        4342  !       none
;        4343  !
;        4344  ! Implicit Inputs :
;        4345  !       ISD_STRUCT      Stores the init sequence read and write data defined
;        4346  !                       for this program and controller.
;        4347  !
;        4348  ! Implicit Outputs :
;        4349  !       none
;        4350  !
;        4351  ! Completion Codes :
;        4352  !       Success:  Is returned to the calling routine if this initialization
;        4353  !                 sequence was executed successfully.
;        4354  !
;        4355  !       Failure:  Is  returned to the callng routine if this initialization
;        4356  !                 sequence was not executed successfully.
;        4357  !
;        4358  ! Side Effects :
;        4359  !       Any DM code that might have been running in the DM machine will be
;        4360  !       aborted.
;        4361  !
;        4362  !       Any outstanding commands or response pertaining to a process using
;        4363  !       the controller will be lost.
;        4364  !--
;        4365
;        4366      begin
;        4367
;        4368      local
;        4369          TEMP : word;                        !Temporary storage location
;        4370
;        4371      !+
;        4372      ! The  host begins  the  initialization  sequence
;        4373      ! either  by  issuing  a  bus init  or by writing
;        4374      ! any  value into the IP register;  the port must
;        4375      ! guarantee  that the  host will read zeros in SA
;        4376      ! on  the  next bus  cycle.  Initialization  then
;        4377      ! sequences   through  steps 1-4 as per UQSSP.DOC
;        4378      ! Version 1.5.
;        4379      !
```

```
;        4380      ! Write  to  the  IP register and  start the init
;        4381      ! sequence going.
;        4382      !-
;        4383
;        4384      WRT_RC25 (RCIP, ONES);                    !Begin init sequence
;        4385
;        4386      !+
;        4387      ! This incr loop performs all four steps of the
;        4388      ! initialization sequence described above.  The
;        4389      ! SA  write  and  read  data is preset into the
;        4390      ! structure     ISD_STRUCT    and  stands   for
;        4391      ! "Initialization Sequence Data_STRUCT".
;        4392      !  -              -          -
;        4393      !
;        4394      ! If    a step  time  out error occures the test
;        4395      ! invoking  this routine will take the necessary
;        4396      ! retry procedure. A  return code  of failure is
;        4397      ! returned.
;        4398      !
;        4399      ! If  any SA register  compare error is detected after
;        4400      ! a step completion the routine Decode will decode the
;        4401      ! error  and load statistical tables up pertanate data.
;        4402      !
;        4403      !-
;        4404
;        4405      incru SEQ_NO from STEP1 to STEP4 do       !Do the four init seq steps
;        4406          begin
;        4407          !
;        4408          ! Wait for the controller to load the SA reg up with the step data.
;        4409          !
;        4410
;        4411          if IS_TIMER (.SEQ_NO)                 !Did the Controller time out
;        4412          then
;        4413              begin
;        4414              !
;        4415              ! DO SOME STAT TABLE UP DATA TO SHOW THE TIME OUT
;        4416              !
;        4417              PRINTB (.EMSG_STRUCT [MSG10]);
;        4418              return FAILURE;                   !Notify DRS> init of the failure
;        4419              end;
;        4420
;        4421          !
;        4422          ! The controller did not time out so read the SA register
;        4423          ! for  the expected step data and compare it to the good
;        4424          ! data stored in ISD_STRUCT.
;        4425          !
;        4426          ! If the read SA data is not what we expect then  return a
;        4427          ! failure code.
;        4428          !
;        4429          ! Note that the reserved fields read in the SA register are
;        4430          ! or'ed with all ones to mask out the field before compared
;        4431          ! to the expected data stored in the structure "ISD_STRUCT".
;        4432          !
;        4433          TEMP = ((.RC25_ADDR [RCSA, RC_ALL]) or (.RSVD_STRUCT [.SEQ_NO]));
;        4434
;        4435          if .TEMP nequ .ISD_STRUCT [.SEQ_NO, ISRD, ISR_ALL]      !Compare read to expected
;        4436          then
```

```
;          4437                begin
;          4438                !
;          4439                ! Load some satistical table up with some data to indicate that the
;          4440                ! init sequence had some trouble.
;          4441                !
;          4442                PRINTB (.EMSG_STRUCT [MSG11]);
;          4443                return FAILURE;                         !Return a failure code
;          4444                end;
;          4445
;          4446            !
;          4447            ! If this is step four then print this u-code version number.
;          4448            !
;          4449
;          4450            if .SEQ_NO eqlu STEP4 then PRINTB (FMT4, .RC25_ADDR [RCSA, S4R_VER]);
;          4451
;          4452            !
;          4453            ! This step read data is what we expected so write the SA register
;          4454            ! with this steps write data stored in ISD_STRUCT.
;          4455            !
;          4456            WRT_RC25 (RCSA, .ISD_STRUCT [.SEQ_NO, ISWRT, ISW_ALL]);
;          4457            end;
;          4458
;          4459        !
;          4460        ! The controller initialization sequence was done successfully so return a success code.
;          4461        !
;          4462        return SUCCESS;
;          4463        end;


                                        .SBTTL  BOOT.RC25 MODULE DECLARATIONS
000000  004167  000000G          BOOT.RC25::
                                        JSR     R1,$SAVE3                       ;                               4323
000004  024646                          CMP     -(SP),-(SP)
000006  012700  177777                  MOV     #-1,R0                          ; *,RC$M.REG                    4384
000012  010077  000000G                 MOV     R0,@RC25.ADDR                   ; RC$M.REG,*
000016  005002                          CLR     R2                              ; SEQ.NO                        4405
000020  010246                  1$:     MOV     R2,-(SP)                        ; SEQ.NO,*                      4411
000022  004767  177504                  JSR     PC,IS.TIMER
000026  005726                          TST     (SP)+
000030  006000                          ROR     R0
000032  103007                          BCC     2$
000034  016746  000024G                 MOV     EMSG.STRUCT+24,-(SP)            ;                               4417
000040  012746  000001                  MOV     #1,-(SP)
000044  010600                          MOV     SP,R0                           ; SP,*
000046  104414                          TRAP    14
000050  000427                          BR      3$                              ;                               4411
000052  016700  000000G          2$:     MOV     RC25.ADDR,R0                    ;                               4433
000056  016066  000002  000002          MOV     2(R0),2(SP)                     ; *,RC$S.REG
000C64  010200                          MOV     R2,R0                           ; SEQ.NO,*
000066  006300                          ASL     R0
000070  016603  000002                  MOV     2(SP),R3                        ; RC$S.REG,TEMP
000074  056003  000000G                 BIS     RSVD.STRUCT(R0),R3              ; *,TEMP
000100  010201                          MOV     R2,R1                           ; SEQ.NO,*                      4435
000102  006301                          ASL     R1
000104  006301                          ASL     R1
000106  020361  000000G                 CMP     R3,ISD.STRUCT(R1)               ; TEMP,*
000112  001410                          BEQ     4$
```

```
000114  016746  000026G                        MOV     EMSG.STRUCT+26,-(SP)            ;                               4442
000120  012746  000001                          MOV     #1,-(SP)
000124  010600                                  MOV     SP,R0                           ; SP,*
000126  104414                                  TRAP    14
000130  022626                          3$:     CMP     (SP)+,(SP)+                     ;                               4435
000132  000437                                  BR      6$                              ;                               4437
000134  020227  000003                  4$:     CMP     R2,#3                           ; SEQ.NO,*                      4450
000140  001017                                  BNE     5$
000142  016700  000000G                         MOV     RC25.ADDR,R0
000146  016016  000002                          MOV     2(R0),(SP)                      ; *,RC$S.REG
000152  011646                                  MOV     (SP),-(SP)                      ; RC$S.REG,*
000154  042716  177760                         BIC     #177760,(SP)
000160  012746  000000G                         MOV     #FMT4,-(SP)
000164  012746  000002                          MOV     #2,-(SP)
000170  010600                                  MOV     SP,R0                           ; SP,*
000172  104414                                  TRAP    14
000174  062706  000006                          ADD     #6,SP
000200  016101  000002G                 5$:     MOV     ISD.STRUCT+2(R1),R1             ; *,RC$M.REG                    4456
000204  016700  000000G                         MOV     RC25.ADDR,R0
000210  010160  000002                          MOV     R1,2(R0)                        ; RC$M.REG,*
000214  005202                                  INC     R2                              ; SEQ.NO                        4405
000216  020227  000003                          CMP     R2,#3                           ; SEQ.NO,*
000222  101676                                  BLOS    1$
000224  012700  000001                          MOV     #1,R0                           ;                               4366
000230  000401                                  BR      7$
000232  005000                          6$:     CLR     R0                              ;                               4323
000234  022626                          7$:     CMP     (SP)+,(SP)+
000236  000207                                  RTS     PC

; Routine Size:  80 words,      Routine Base:  AC$CODE + 7050
; Maximum stack depth per invocation:  11 words


;         4464
```

```
;       4465  global routine INIT_COM_AREA =                !Inits DUP Protocol commumication area
;       4466
;       4467  !++
;       4468  ! Functional Description :
;       4469  !       After initialization step 3 the port controller clears out
;       4470  !       the communication area's ring buffers.
;       4471  !
;       4472  !       This routine first makes sure that this protocol is accom-
;       4473  !       plished by the port before proceeding.
;       4474  !
;       4475  !       If the port did its part of the protocol then the communic-
;       4476  !       ations  area is initialized as follows:
;       4477  !
;       4478  !         1. Defines from  the  contigious  data storage structure
;       4479  !            "COM_AREA" the  header  area  address,  receive ring
;       4480  !            address  and  the send ring address (these structures
;       4481  !            are  initially  declared  as reference structures and
;       4482  !            require  an address  to be  defined  as its value per
;       4483  !            BLISS language conventions).
;       4484  !
;       4485  !         2. Clears  the  interrupt  indicators and adaptor  purge
;       4486  !            (ring  base  -1, -2, -3, -4)  defined as  'HEAD_AREA".
;       4487  !
;       4488  !         3. Loads the receive and send descriptors with the values:
;       4489  !               a. Envelope low, high and Q_bus address
;       4490  !               b. Reserved field
;       4491  !               c. Flag bit
;       4492  !               d. Ownership bit
;       4493  !
;       4494  !          4. Load the receive envelope message length field with the
;       4495  !             buffer size in bytes.
;       4496  !
;       4497  !          5. Initialize the Out$standing command buffer to reflect
;       4498  !             that all slots are unused.
;       4499  !
;       4500  ! Formal Parameters :
;       4501  !       none
;       4502  !
;       4503  ! Implicit Inputs :
;       4504  !       HEAD_AREA, RECEIVE_RING, SEND_RING, COM_AREA
;       4505  !
;       4506  ! Implicit Outputs :
;       4507  !               The communication area as a result of this routine will be initialized
;       4508  !               for host program to remote program communications per DUP and
;       4509  !               UQSSP specifications.
;       4510  !
;       4511  ! Completion Codes :
;       4512  !       TRUE:   Error code to indicate the port controller has
;       4513  !               not  fullfilled  its  part of the DUP protocol.
;       4514  !
;       4515  !       FALSE:  An error  code to  indicate the port controller
;       4516  !               has fullfilled its  part of  the DUP  protocol.
;       4517  !
;       4518  ! Side Effects :
;       4519  !       none
;       4520  !--
;       4521
```

```
;         4522      begin
;         4523
;         4524      !+
;         4525      ! Make sure that the controller has done its part of
;         4526      ! the DUP protocol by clearing out the ring buffers.
;         4527      ! If  the rings are not cleared out then return with
;         4528      ! an error code of true.
;         4529      !-
;         4530
;         4531      incru i from 2 to RING_SIZE - 1 do          !Test all blocks for zeros
;         4532
;         4533          incru j from WRD0 to WRD1 do            !Test all words for zeros
;         4534              !
;         4535              ! Test this word for zeros.  If not zeros then exit
;         4536              ! this routine  with  an "communication area  init"
;         4537              ! error  code  to  indicate the Protocol violation.
;         4538              !
;         4539
;         4540              if .COM_AREA [.i, .j, WORD_REF] nequ ZERO then return CIE_CODE;
;         4541
;         4542      !+
;         4543      ! The  port did its  part of the protocol so now
;         4544      ! define  the address locations of the HEAD_AREA,
;         4545      ! RECEIVE_RING and SEND_RING from the contigious
;         4546      ! storage declared by COM_AREA.
;         4547      !-
;         4548
;         4549      HEAD_AREA = COM_AREA;                       !Define the Header area
;         4550      RECEIVE_RING = COM_AREA [REC_BASE];         !Define the receive ring area
;         4551      SEND_RING = COM_AREA [SND_BASE];            !Define the send ring area
;         4552
;         4553      !+
;         4554      ! Not quite sure if the port has to clear out
;         4555      ! the  header area of the communications area
;         4556      ! so  I'll  clear it  out  here  just in case.
;         4557      !-
;         4558
;         4559      incru i from WRD0 to WRD3 do
;         4560          HEAD_AREA [.i, WORD_REF] = ZEROS;
;         4561
;         4562      !+
;         4563      ! Load up the Send Ring descriptors with an envelope address,
;         4564      ! define  the "Flag bit" to = 1 (interrupt requested), define
;         4565      ! the  "Ownership bit"  to  = 0 (owned by host)  and load the
;         4566      ! Reserved field with zeros (per DUP spec).
;         4567      !-
;         4568
;         4569      incru i from 0 to SND_ALLOCATE - 1 do
;         4570          begin
;         4571          SEND_RING [.i, LO_EN$AD] = SND_ENVELOPE [.i, CMD_LREF]; !Low-order envelope adress for all sys
;         4572          SEND_RING [.i, HI_EN$AD] = ZERO;        !High-order portion of an 18-bit U/Q bus adrs
;         4573          SEND_RING [.i, QB_EXT] = ZERO;          !Q_bus extention
;         4574          SEND_RING [.i, D$RSVD] = ZERO;          !Reserved field
;         4575          SEND_RING [.i, FLAG_BIT] = SET_FLG;     !Flag bit whose meaning varies depending on dsc state
;         4576          SEND_RING [.i, OWN_BIT] = HOST_OWNED;   !Indicates whether dsc is host or port owned
;         4577          end;
;         4578
```

```
;          4579      !+
;          4580      ! Load  up the  Receive Ring descriptors with an envelope
;          4581      ! address, define the "Ownership bit" = 1 (owned by port),
;          4582      ! define the "Flag bit" to = 1 (Interrupts requested) and
;          4583      ! the reserved field set to zeros (per DUP spec).
;          4584      !-
;          4585
;          4586      incru i from 0 to REC_ALLOCATE - 1 do
;          4587          begin
;          4588          RECEIVE_RING [.i, LO_EN$AD] = REC_ENVELOPE [.i, CMD_LREF];
;          4589          RECEIVE_RING [.i, HI_EN$AD] = ZEROS;
;          4590          RECEIVE_RING [.i, QB_EXT] = ZEROS;
;          4591          RECEIVE_RING [.i, D$RSVD] = ZEROS;
;          4592          RECEIVE_RING [.i, FLAG_BIT] = SET_FLG;
;          4593          RECEIVE_RING [.i, OWN_BIT] = PORT_OWNED;
;          4594          end;
;          4595
;          4596      !
;          4597      ! Reset the communications area pointer to their initial state.
;          4598      !
;          4599      NRD_SLOT = -1;                              !Start ring pointer at zero
;          4600      NSD_SLOT = -1;                              !Start ring pointer at zero
;          4601      NXT_CRN = ZERO;                             !Start unique cmd ref num at one
;          4602
;          4603      !+
;          4604      ! Set the response envelope message length size equal
;          4605      ! to  the buffer  size in bytes starting at text + 0.
;          4606      !-
;          4607
;          4608      incru i from 0 to REC_ALLOCATE - 1 do
;          4609          REC_ENVELOPE [.i, MSG_LENGTH] = RB_SIZE*2;      !Convert to bytes before loading
;          4610
;          4611      !+
;          4612      ! Init the outstanding command buffer as follows:
;          4613      !   1.  Indicate that all slots are unused by loading
;          4614      !       the unique value %o'100000'.
;          4615      !   2.  Clear the envelope adrs words to zero.
;          4616      !-
;          4617
;          4618      incru i from 0 to REC_ALLOCATE - 1 do
;          4619          begin
;          4620          OUT$STD_BUF [.i, CMD_WRD] = %o'100000'; !Define the slot as unused
;          4621          OUT$STD_BUF [.i, ENV_ADR] = ZERO;       !Clear out the envelope adrs field
;          4622          end;
;          4623
;          4624      !
;          4625      ! No errors detected by this routine so return with an non-error code of false.
;          4626      !
;          4627      return PAS_CODE;
;          4628      end;


                                        .SBTTL  INIT.COM.AREA MODULE DECLARATIONS
000000  004167  000000G       INIT.COM.AREA::
                                        JSR     R1,$SAVE3                       ;                       4465
000004  012701  000004                  MOV     #4,R1                           ; *,I                   4531
000010  005002                  1$:     CLR     R2                              ; J                     4533
```

```
000012  010100                  2$:     MOV     R1,R0                           ; I,*                   4540
000014  060200                          ADD     R2,R0                           ; J,*
000016  006300                          ASL     R0
000020  005760  000000G                 TST     COM.AREA(R0)
000024  001403                          BEQ     3$
000026  012700  000001                  MOV     #1,R0
000032  000207                          RTS     PC
000034  005202                  3$:     INC     R2                              ; J                     4533
000036  020227  000001                  CMP     R2,#1                           ; J,*
000042  101763                          BLOS    2$
000044  062701  000002                  ADD     #2,R1                           ; *,I                   4531
000050  020127  000022                  CMP     R1,#22                          ; I,*
000054  101755                          BLOS    1$
000056  012767  000000G 000000G         MOV     #COM.AREA,HEAD.AREA             ;                       4549
000064  012767  000010G 000000G         MOV     #COM.AREA+10,RECEIVE.RING       ;                       4550
000072  012767  000030G 000000G         MOV     #COM.AREA+30,SEND.RING          ;                       4551
000100  005000                          CLR     R0                              ; I                     4559
000102  010001                  4$:     MOV     R0,R1                           ; I,*                   4560
000104  066701  000000G                 ADD     HEAD.AREA,R1
000110  005011                          CLR     (R1)
000112  062700  000002                  ADD     #2,R0                           ; *,I                   4559
000116  020027  000006                  CMP     R0,#6                           ; I,*
000122  101767                          BLOS    4$
000124  005003                          CLR     R3                              ; I                     4569
000126  010301                  5$:     MOV     R3,R1                           ; I,*                   4571
000130  006301                          ASL     R1
000132  006301                          ASL     R1
000134  010102                          MOV     R1,R2
000136  066702  000000G                 ADD     SEND.RING,R2
000142  010346                          MOV     R3,-(SP)                        ; I,*
000144  012746  000054                  MOV     #54,-(SP)
000150  004767  000000G                 JSR     PC,BL$MUL
000154  062700  000004G                 ADD     #SND.ENVELOPE+4,R0
000160  010012                          MOV     R0,(R2)
000162  010100                          MOV     R1,R0                           ;                       4572
000164  066700  000000G                 ADD     SEND.RING,R0
000170  062700  000002                  ADD     #2,R0
000174  012710  040000                  MOV     #40000,(R0)                     ;                       4576
000200  022626                          CMP     (SP)+,(SP)+                     ;                       4570
000202  005203                          INC     R3                              ; I                     4569
000204  020327  000003                  CMP     R3,#3                           ; I,*
000210  101746                          BLOS    5$
000212  005002                          CLR     R2                              ; I                     4586
000214  010201                  6$:     MOV     R2,R1                           ; I,*                   4588
000216  006301                          ASL     R1
000220  006301                          ASL     R1
000222  010103                          MOV     R1,R3
000224  066703  000000G                 ADD     RECEIVE.RING,R3
000230  010200                          MOV     R2,R0                           ; I,*
000232  000300                          SWAB    R0
000234  106000                          RORB    R0
000236  006000                          ROR     R0
000240  006000                          ROR     R0
000242  142700  000077                  BICB    #77,R0
000246  062700  000004G                 ADD     #REC.ENVELOPE+4,R0
000252  010013                          MOV     R0,(R3)
000254  010100                          MOV     R1,R0                           ;                       4589
```

```
000256  066700  000000G                        ADD     RECEIVE.RING,R0
000262  062700  000002                         ADD     #2,R0
000266  012710  140000                         MOV     #140000,(R0)            ;                       4593
000272  005202                                 INC     R2                      ; I                     4586
000274  020227  000003                         CMP     R2,#3                   ; I,*
000300  101745                                 BLOS    6$
000302  012767  177777  000000G                MOV     #-1,NRD.SLOT            ;                       4599
000310  012767  177777  000000G                MOV     #-1,NSD.SLOT            ;                       4600
000316  105067  000000G                        CLRB    NXT.CRN                 ;                       4601
000322  005000                                 CLR     R0                      ; I                     4608
000324  012760  000074  000000G        7$:     MOV     #74,REC.ENVELOPE(R0)    ; *,*(I)                4609
000332  062700  000100                         ADD     #100,R0                 ; *,I                   4608
000336  020027  000300                         CMP     R0,#300                 ; I,*
000342  101770                                 BLOS    7$
000344  005000                                 CLR     R0                      ; I                     4618
000346  012760  100000  000000G        8$:     MOV     #-100000,OUT$STD.BUF(R0)        ; *,*(I)        4620
000354  005060  000002G                        CLR     OUT$STD.BUF+2(R0)       ; *(I)                  4621
000360  062700  000004                         ADD     #4,R0                   ; *,I                   4618
000364  020027  000014                         CMP     R0,#14                  ; I,*
000370  101766                                 BLOS    8$
000372  005000                                 CLR     R0                      ;                       4522
000374  000207                                 RTS     PC                      ;                       4465

; Routine Size:  127 words,    Routine Base:  AC$CODE + 7310
; Maximum stack depth per invocation:  7 words


;        4629
;        4630  end
;        4631
;        4632  eludom


;                                OTS external references
                                        .GLOBL  $SAVE4, $SAVE3, $SAVE2, BL$MUL


;                                PSECT SUMMARY
;
;       Psect Name                       Words     Attributes
;        AC$CODE                          2019       RO ,  I  ,  LCL,  REL,  CON


;                              LIBRARY STATISTICS
;
;                                        -------- Symbols --------    Blocks
;       File                             Total    Loaded   Percent      Read
;
; SPIDER$USERS:[NEALE.AZTEC]CZRCH0.L16;5
;                                          398       278        69        55
```

```
;                                       COMMAND QUALIFIERS

;       BLISS /PDP11/LIST CZRCH5.B16

; Size:         2019 code + 0 data words
; Run Time:       01:27.2
; Elapsed Time:   01:52.4
; Memory Used:  267 pages
; Compilation Complete
```

```
0001  MODULE CZRCH7   (%TITLE 'CZRCH RC25 DISK FORMATTER'
0002                  IDENT = 'REV A PATCH 00',
0003                  ADDRESSING_MODE (RELATIVE),
0004                  ENVIRONMENT (NOEIS)) =
0005  BEGIN
0006
0007  %SBTTL 'LAST ADDRESS AND SETUP SECTION'
0008  !
0009  ! Pretty Declarations
0010  !
0011  !<blf/lowercase_key>
0012  !
0013
0014  LIBRARY 'CZRCH0';               !Define RC25 Formatter library
0015
0016  REQUIRE 'BLSMAC.REQ';           !Define Bliss macro require file
1505
1506  !+
1507  ! The LASTAD macro must be the final statement (except .end) in  a  pro-
1508  ! gram.  The call generates an even address reflecting the first word of
1509  ! memory unused by the program.
1510  !-
1511
1512  LASTAD
1513
1514  !+
1515  ! Hardcoded P-TABLES
1516  !
1517  ! These optional hardware P-TABLES are located  (when  present)  between
1518  ! the  "LASTAD" macro and the ".END" statement.  These hardware P-TABLES
1519  ! are above and beyond the default hardware P-TABLE located in the  main
1520  ! body  of the program.  These P-TABLES wind up appended to the BIN file
1521  ! of the diagnostic, just as though the supervisor or the  "SETUP"  utility
1522  ! had  built them there.  Thus the diagnostic can be "pre-parameterized"
1523  ! by the programmer.
1524  !
1525  ! If this hardcoded P_TABLE section is not wanted then define "number" in
1526  ! the BGNSETUP macro to zero and omitt BGNTAB and ENDTAB macros.
1527  !
1528  ! Coding sample is as follows:
1529  !
1530  !     LASTAD
1531  !
1532  !     BGNSETUP (Number)         !Number of P-TABLES
1533  !
1534  !     BGNPTAB
1535  !     (DATA)
1536  !     (DATA)
1537  !     (DATA)
1538  !     ENDPTAB
1539  !
1540  !     BGNPTAB
1541  !     (DATA)
1542  !     (DATA)
1543  !     (DATA)
1544  !     ENDPTAB
1545  !
```

```
;         1546  !     ENDSETUP
;         1547  !     .END
;         1548  !-
;         1549
;         1550  BGNSETUP (0);
;         1551  !
;         1552  ! No optional P_Tables are defined
;         1553  ! within this program.
;         1554  !
;         1555  ENDSETUP


                                        .TITLE  CZRCH7 CZRCH RC25 DISK FORMATTER
                                        .IDENT  /REV A /


000000                                  .PSECT  $XYZ$,  RO
000000  000004'                 BL$LAS::.WORD   T$FREE
000002  000000C                         .WORD   <<T$FREE-<BL$LAS+4>>/2>
000004  000000                  T$FREE::.WORD   0

        000004'                 L$LAST==        BL$LAS+4
        000000                  T$PIHV==        0


                                        .SBTTL  $END.LINK LAST ADDRESS AND SETUP SECTION
000000  000207                  $END.LINK::
                                        RTS     PC                              ;       1504

; Routine Size:  1 word,        Routine Base:  $XYZ$ + 0006
; Maximum stack depth per invocation:  0 words

;         1556  END
;         1557  ELUDOM


;                                       PSECT SUMMARY
;
;       Psect Name                      Words     Attributes
;        $XYZ$                            4       RO ,  I  ,  LCL,  REL,  CON


;                               LIBRARY STATISTICS
;
;                                       -------- Symbols --------     Blocks
;       File                            Total    Loaded   Percent      Read
;
;  SPIDER$USERS:[NEALE.AZTEC]CZRCH0.L16;5
;                                        398         2         0        13
```

```
;                                       COMMAND QUALIFIERS

;       BLISS /PDP11/LIST CZRCH7.B16

; Size:         1 code + 3 data words
; Run Time:        00:06.4
; Elapsed Time:    00:08.5
; Memory Used:  99 pages
; Compilation Complete
CZRCHA.EXE   Memory allocation map  TKB M40.02      Page 1
                    11-JUL-83   16:09


Partition name : DUMMY
Identification : REV A
Task  UIC      : [300,12]
Task attributes: -HD
Total address windows: 1.
Task  image  size  : 15552. words
Task address limits: 002000 076577
R-W disk blk limits: 000002 000076 000075 00061.

*** Root segment: CZRCH2


R/W mem  limits: 002000 076577 074600 31104.
Disk blk limits: 000002 000076 000075 00061.


Memory allocation synopsis:

Section                                         Title  Ident  File
-------                                         -----  -----  ----
. BLK.:(RW,I,LCL,REL,CON)       002000 000000 00000.
AA$COD:(RO,I,LCL,REL,CON)       002000 001336 00734.
                                002000 000166 00118.  CZRCH2 REV A  CZRCH2.OBJ;1
                                002166 001150 00616.  CZRCH3 REV A  CZRCH3.OBJ;1
AB$COD:(RO,I,LCL,REL,CON)       003336 002312 01226.
                                003336 002312 01226.  CZRCH4 REV A  CZRCH4.OBJ;1
AC$COD:(RO,I,LCL,REL,CON)       005650 007706 04038.
                                005650 007706 04038.  CZRCH5 REV A  CZRCH5.OBJ;1
AD$COD:(RO,I,LCL,REL,CON)       015556 000002 00002.
                                015556 000002 00002.  CZRCH6 REV A  CZRCH6.OBJ;1
BL$COD:(RO,I,LCL,REL,CON)       015560 000424 00276.
                                015560 000316 00206.  B16MUL V3.0   NEISLB.OLB;4
                                016076 000106 00070.  B16SAV V3.0   NEISLB.OLB;4
$DMCOD:(RO,D,GBL,REL,CON)       016204 042570 17784.
                                016204 042570 17784.  CZRCH6 REV A  CZRCH6.OBJ;1
$GLOB$:(RO,D,GBL,REL,CON)       060774 002554 01388.
                                060774 002554 01388.  CZRCH2 REV A  CZRCH2.OBJ;1
$PLIT$:(RO,D,GBL,REL,CON)       063550 013016 05646.
                                063550 013016 05646.  CZRCH2 REV A  CZRCH2.OBJ;1
$XYZ$ :(RO,I,LCL,REL,CON)       076566 000010 00008.
                                076566 000010 00008.  CZRCH7 REV A  CZRCH7.OBJ;1
```

ABORT	010474-R	BOOT.F	075434-R	DFPTBL	002140-R	ERRTYP	002126-R	FMT4	063754-R	GP$1	002252-R	HW.Q1.	076076-R
ABO.MS	075204-R	BOOT.R	014720-R	DMSA	016244-R	EX.LOC	011706-R	FMT5	064040-R	GP$2	002262-R	HW.Q2.	076134-R
ACTIVE	075640-R	BR.LEV	063512-R	DUMMY	015556-R	EX.SUP	011270-R	FMT6	064150-R	GP$3	002272-R	HW.Q3.	076172-R
AZFMTR	016204-R	COM.AR	060774-R	DUP$I.	007340-R	FCT.BU	061732-R	FMT7	064246-R	GP$4	002304-R	HW.Q4.	076230-R
BL$DIV	016004-R	CRLF	064416-R	D$PCNT	002122-R	FCT.RE	076016-R	GET.CM	006166-R	GP$5	002322-R	HW.UNI	002146-R
BL$LAS	076566-R	CTO.WA	010264-R	EMSG.S	070430-R	FLG.WR	063462-R	GET.DU	010772-R	HDSA	016204-R	HW.VEC	002142-R
BL$MOD	016016-R	DATETX	063446-R	ERRBLK	002134-R	FMT1	063550-R	GET.NR	006046-R	HEAD.A	061044-R	INACTI	075722-R
BL$MUL	015560-R	DATMSG	075012-R	ERRMSG	002132-R	FMT2	063556-R	GET.NS	006020-R	HW.BR.	002144-R	INIT.C	015160-R
BL$SHF	016030-R	DECODE	006254-R	ERRNBR	002130-R	FMT3	063646-R	GOOD.N	075342-R	HW.IP.	002140-R	INT$I.	014442-R

```
ISD.ST 063530-R  L$DISP 002124-R  L$HPTP 002022-R  L$PROT 002160-R  NEX.FL 063464-R  RECEIV 061046-R  SW.Q2. 076332-R
IS.TIM 014452-R  L$DLY  002116-R  L$HRDL 002250-R  L$PRT  002112-R  NO.ADD 075044-R  REC.BU 062732-R  SW.Q3. 076422-R
LOAD.F 005650-R  L$DTP  002040-R  L$HW   002140-R  L$REPP 002062-R  NRD.SL 063504-R  REC.DA 012760-R  SW.Q4. 076506-R
LOAD.O 006074-R  L$DTYP 002034-R  L$HWLE 002136-R  L$REV  002010-R  NSD.SL 063502-R  REC.EN 061052-R  SW.UNA 002154-R
LUN    063474-R  L$DU   003314-R  L$ICP  002104-R  L$RPT  002334-R  NXT.CR 063470-R  RET.EN 063444-R  TO.MAN 075264-R
L$ACP  002110-R  L$DUT  002072-R  L$INIT 003236-R  L$SFTL 002320-R  ON.LIN 014064-R  RET.ST 063472-R  T$FREE 076572-R
L$APT  002036-R  L$DVTY 002214-R  L$LADP 002026-R  L$SOFT 002322-R  OUT$ST 063424-R  RINGBA 061004-R  T$PTHV 000000
L$AU   003326-R  L$EF   002052-R  L$LAST 076572-R  L$SPC  002056-R  OVSA   063466-R  RSVD.S 063520-R  T1     005634-R
L$AUT  002070-R  L$ENVI 002044-R  L$LOAD 002100-R  L$SPCP 002020-R  PFE.ST 066430-R  SDUP.S 074316-R  UNIT.N 063514-R
L$AUTO 003250-R  L$ERRT 002126-R  L$LUN  002074-R  L$SPTP 002024-R  PID.FM 064314-R  SEND.D 012220-R  VEC.AD 063510-R
L$CCP  002106-R  L$ETP  002102-R  L$MREV 002050-R  L$STA  002030-R  PID.SA 063476-R  SEND.R 061050-R  XCRLF  064422-R
L$CLEA 003302-R  L$EXP1 002046-R  L$NAME 002000-R  L$SW   002154-R  PORT.I 075564-R  SET.CN 013520-R  $END.L 076574-R
L$CO   002032-R  L$EXP4 002064-R  L$NDHR 002316-R  L$SWLE 002152-R  PROTO. 075516-R  SFPTBL 002154-R  $SAVE2 016076-R
L$DEPO 002011-R  L$EXP5 002066-R  L$NDHW 002150-R  L$TEST 002114-R  PTBL.P 063516-R  SMSCP. 074760-R  $SAVE3 016112-R
L$DESC 002166-R  L$HARD 002252-R  L$NDSF 002330-R  L$TIML 002014-R  PWR.MS 075122-R  SND.BU 063312-R  $SAVE4 016130-R
L$DESP 002076-R  L$HIME 002120-R  L$NDSW 002156-R  L$UNIT 002012-R  RC.STR 073764-R  SND.EN 061452-R  $SAVE5 016150-R
L$DEVP 002060-R  L$HPCP 002016-R  L$PRIO 002042-R  MSGADR 062734-R  RC25.A 063506-R  SW.Q1. 076266-R

*** Task builder statistics:

    Total work file references: 15216.
    Work  file  reads: 0.
    Work  file writes: 0.
    Size of core pool: 5486. words (21. pages)
    Size of work file: 2304. words (9. pages)

    Elapsed time:00:00:14
```

CZRCHA CREATED BY TKB ON 11-JUL-83 AT 16:09 PAGE 1

GLOBAL CROSS REFERENCE CREF V01

```
SYMBOL  VALUE      REFERENCES...

ABORT   010474-R     CZRCH4  # CZRCH5
ABO.MS  075204-R  # CZRCH2    CZRCH3
ACTIVE  075640-R  # CZRCH2    CZRCH4
AZFMTR  016204-R     CZRCH3    CZRCH5  # CZRCH6
BL$DIV  016004-R  # B16MUL
BL$LAS  076566-R  # CZRCH7
BL$MOD  016016-R  # B16MUL
BL$MUL  015560-R  # B16MUL    CZRCH5
BL$SHF  016030-R  # B16MUL
BOOT.F  075434-R  # CZRCH2    CZRCH4
BOOT.R  014720-R     CZRCH4  # CZRCH5
BR.LEV  063512-R  # CZRCH2    CZRCH3
COM.AR  060774-R  # CZRCH2    CZRCH5
CRLF    064416-R  # CZRCH2    CZRCH3    CZRCH4
CTO.WA  010264-R  # CZRCH5
DATETX  063446-R  # CZRCH2    CZRCH3    CZRCH4
DATMSG  075012-R  # CZRCH2    CZRCH3    CZRCH4
DECODE  006254-R     CZRCH3    CZRCH4  # CZRCH5
DFPTBL  002140-R  # CZRCH2
DMSA    016244-R     CZRCH5  # CZRCH6
DUMMY   015556-R  # CZRCH6
DUP$I.  007340-R     CZRCH4  # CZRCH5
D$PCNT  002122-R  # CZRCH2
EMSG.S  070430-R  # CZRCH2    CZRCH5
ERRBLK  002134-R  # CZRCH2
ERRMSG  002132-R  # CZRCH2
ERRNBR  002130-R  # CZRCH2
ERRTYP  002126-R  # CZRCH2
EX.LOC  011706-R     CZRCH4  # CZRCH5
EX.SUP  011270-R     CZRCH4  # CZRCH5
FCT.BU  061732-R  # CZRCH2    CZRCH4
FCT.RE  076016-R  # CZRCH2    CZRCH4
FLG.WR  063462-R  # CZRCH2    CZRCH3    CZRCH4
FMT1    063550-R  # CZRCH2    CZRCH4
FMT2    063556-R  # CZRCH2    CZRCH3
FMT3    063646-R  # CZRCH2    CZRCH3
FMT4    063754-R  # CZRCH2    CZRCH5
FMT5    064040-R  # CZRCH2    CZRCH4
FMT6    064150-R  # CZRCH2    CZRCH4
FMT7    064246-R  # CZRCH2    CZRCH4
GET.CM  006166-R  # CZRCH5
GET.DU  010772-R     CZRCH4  # CZRCH5
GET.NR  006046-R  # CZRCH5
GET.NS  006020-R  # CZRCH5
GOOD.N  075342-R  # CZRCH2    CZRCH3
GP$1    002252-R  # CZRCH3
GP$2    002262-R  # CZRCH3
GP$3    002272-R  # CZRCH3
GP$4    002304-R  # CZRCH3
GP$5    002322-R  # CZRCH3
HDSA    016204-R     CZRCH5  # CZRCH6
HEAD.A  061044-R  # CZRCH2    CZRCH5
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SYMBOL  VALUE      REFERENCES...

HW.BR.  002144-R  # CZRCH2
HW.IP.  002140-R  # CZRCH2
HW.Q1.  076076-R  # CZRCH2    CZRCH3
HW.Q2.  076134-R  # CZRCH2    CZRCH3
HW.Q3.  076172-R  # CZRCH2    CZRCH3
HW.Q4.  076230-R  # CZRCH2    CZRCH3
HW.UNI  002146-R  # CZRCH2
HW.VEC  002142-R  # CZRCH2
INACTI  075722-R  # CZRCH2    CZRCH4
INIT.C  015160-R    CZRCH4  # CZRCH5
INT$I.  014442-R    CZRCH4  # CZRCH5
ISD.ST  063530-R  # CZRCH2    CZRCH3    CZRCH4    CZRCH5
IS.TIM  014452-R  # CZRCH5
LOAD.F  005650-R    CZRCH3  # CZRCH5
LOAD.O  006074-R  # CZRCH5
LUN     063474-R  # CZRCH2    CZRCH3    CZRCH4
L$ACP   002110-R  # CZRCH2
L$APT   002036-R  # CZRCH2
L$AU    003326-R    CZRCH2  # CZRCH3
L$AUT   002070-R  # CZRCH2
L$AUTO  003250-R    CZRCH2  # CZRCH3
L$CCP   002106-R  # CZRCH2
L$CLEA  003302-R    CZRCH2  # CZRCH3
L$CO    002032-R  # CZRCH2
L$DEPO  002011-R  # CZRCH2
L$DESC  002166-R    CZRCH2  # CZRCH3
L$DESP  002076-R  # CZRCH2
L$DEVP  002060-R  # CZRCH2
L$DISP  002124-R  # CZRCH2
L$DLY   002116-R  # CZRCH2    CZRCH5
L$DTP   002040-R  # CZRCH2
L$DTYP  002034-R  # CZRCH2
L$DU    003314-R    CZRCH2  # CZRCH3
L$DUT   002072-R  # CZRCH2
L$DVTY  002214-R    CZRCH2  # CZRCH3
L$EF    002052-R  # CZRCH2
L$ENVI  002044-R  # CZRCH2
L$ERRT  002126-R  # CZRCH2
L$ETP   002102-R  # CZRCH2
L$EXP1  002046-R  # CZRCH2
L$EXP4  002064-R  # CZRCH2
L$EXP5  002066-R  # CZRCH2
L$HARD  002252-R    CZRCH2  # CZRCH3
L$HIME  002120-R  # CZRCH2
L$HPCP  002016-R  # CZRCH2
L$HPTP  002022-R  # CZRCH2
L$HRDL  002250-R  # CZRCH3
L$HW    002140-R  # CZRCH2
L$HWLE  002136-R  # CZRCH2
L$ICP   002104-R  # CZRCH2
L$INIT  003236-R    CZRCH2  # CZRCH3
L$LADP  002026-R  # CZRCH2
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GLOBAL CROSS REFERENCE CREF V01

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SYMBOL  VALUE      REFERENCES...

L$LAST  076572-R     CZRCH2  # CZRCH7
L$LOAD  002100-R  # CZRCH2
L$LUN   002074-R  # CZRCH2
L$MREV  002050-R  # CZRCH2
L$NAME  002000-R  # CZRCH2
L$NDHR  002316-R  # CZRCH3
L$NDHW  002150-R  # CZRCH2
L$NDSF  002330-R  # CZRCH3
L$NDSW  002156-R  # CZRCH2
L$PRIO  002042-R  # CZRCH2
L$PROT  002160-R  # CZRCH2
L$PRT   002112-R  # CZRCH2
L$REPP  002062-R  # CZRCH2
L$REV   002010-R  # CZRCH2
L$RPT   002334-R     CZRCH2  # CZRCH3
L$SFTL  002320-R  # CZRCH3
L$SOFT  002322-R     CZRCH2  # CZRCH3
L$SPC   002056-R  # CZRCH2
L$SPCP  002020-R  # CZRCH2
L$SPTP  002024-R  # CZRCH2
L$STA   002030-R  # CZRCH2
L$SW    002154-R  # CZRCH2
L$SWLE  002152-R  # CZRCH2
L$TEST  002114-R  # CZRCH2
L$TIML  002014-R  # CZRCH2
L$UNIT  002012-R  # CZRCH2     CZRCH3
MSGADR  062734-R  # CZRCH2     CZRCH4
NEX.FL  063464-R  # CZRCH2     CZRCH4     CZRCH5
NO.ADD  075044-R  # CZRCH2     CZRCH3
NRD.SL  063504-R  # CZRCH2     CZRCH4     CZRCH5
NSD.SL  063502-R  # CZRCH2     CZRCH4     CZRCH5
NXT.CR  063470-R  # CZRCH2     CZRCH4     CZRCH5
ON.LIN  014064-R     CZRCH4  # CZRCH5
OUT$ST  063424-R  # CZRCH2     CZRCH5
OVSA    063466-R  # CZRCH2     CZRCH3     CZRCH5
PFE.ST  066430-R  # CZRCH2     CZRCH5
PID.FM  064314-R  # CZRCH2     CZRCH5
PID.SA  063476-R  # CZRCH2     CZRCH4     CZRCH5
PORT.I  075564-R  # CZRCH2     CZRCH4
PROTO.  075516-R  # CZRCH2     CZRCH4
PTBL.P  063516-R  # CZRCH2     CZRCH3     CZRCH4
PWR.MS  075122-R  # CZRCH2     CZRCH3
RC.STR  073764-R  # CZRCH2     CZRCH5
RC25.A  063506-R  # CZRCH2     CZRCH3     CZRCH4     CZRCH5
RECEIV  061046-R  # CZRCH2     CZRCH5
REC.BU  062732-R  # CZRCH2     CZRCH4     CZRCH5
REC.DA  012760-R     CZRCH4  # CZRCH5
REC.EN  061052-R  # CZRCH2     CZRCH5
RET.EN  063444-R  # CZRCH2     CZRCH4     CZRCH5
RET.ST  063472-R  # CZRCH2     CZRCH4     CZRCH5
RINGBA  061004-R  # CZRCH2
RSVD.S  063520-R  # CZRCH2     CZRCH5
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SYMBOL  VALUE      REFERENCES...

SDUP.S  074316-R  # CZRCH2    CZRCH5
SEND.D  012220-R    CZRCH4  # CZRCH5
SEND.R  061050-R  # CZRCH2    CZRCH5
SET.CN  013520-R    CZRCH4  # CZRCH5
SFPTBL  002154-R  # CZRCH2
SMSCP.  074760-R  # CZRCH2    CZRCH5
SND.BU  063312-R  # CZRCH2    CZRCH4    CZRCH5
SND.EN  061452-R  # CZRCH2    CZRCH5
SW.Q1.  076266-R  # CZRCH2    CZRCH3
SW.Q2.  076332-R  # CZRCH2    CZRCH3
SW.Q3.  076422-R  # CZRCH2    CZRCH3
SW.Q4.  076506-R  # CZRCH2    CZRCH3
SW.UNA  002154-R  # CZRCH2    CZRCH3    CZRCH4
TO.MAN  075264-R  # CZRCH2    CZRCH3
T$FREE  076572-R  # CZRCH7
T$PTHV  000000      CZRCH2  # CZRCH7
T1      005634-R    CZRCH2  # CZRCH4
UNIT.N  063514-R  # CZRCH2    CZRCH3    CZRCH4    CZRCH5
VEC.AD  063510-R  # CZRCH2    CZRCH3    CZRCH4    CZRCH5
XCRLF   064422-R  # CZRCH2    CZRCH3
$END.L  076574-R  # CZRCH7
$SAVE2  016076-R    B16MUL  # B16SAV    CZRCH5
$SAVE3  016112-R  # B16SAV    CZRCH4    CZRCH5
$SAVE4  016130-R  # B16SAV    CZRCH5
$SAVE5  016150-R    B16MUL  # B16SAV
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