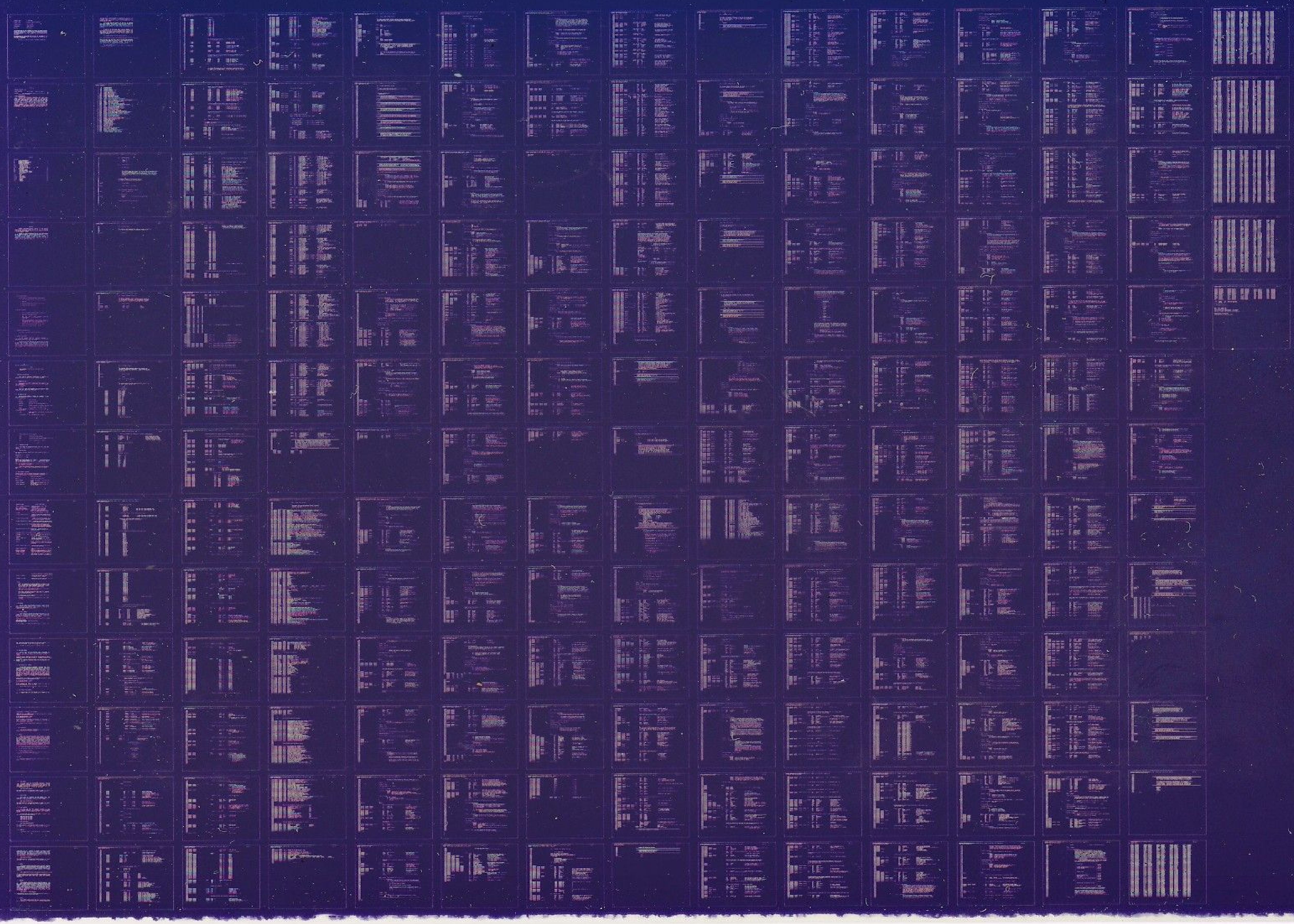
DEUNA

DELUA

DEUNA NI EXER
CZUACC0

AH-T228C-MC
1 OF 1 OCT 1985

digital
MADE IN USA



```
PRODUCT CODE:          AC-T227C MC

PRODUCT NAME:          CZUACCO DEUNA NI EXERCISER

PRODUCT DATE:          JULY 3, 1985

MAINTAINER:            JAMES CRITSER

AUTHOR:                GARY MCCOY
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HISTORY

ORIGINAL RELEASE: 1981

FIRST REVISION: JULY 3,1985 Dennis R. Racca

REASON: The NIE functional specification has been significantly enhanced.

CHANGES/ENHANCEMENTS:

The NIE listen and bounce commands, both new, were added. Nearly all routines were modified in some way to either clean them up or make them conform to the new NIE functional specification. Also, a set of routines was added that will allow the NIE to make use of extended memory made available to it by the advent of new releases of the XXDP+ monitor. These routines let the NIE drive the PDP-11's memory management unit. The addition of more memory has eased limitations imposed by memory size while allowing the enlargement of NIE data structures. More available memory allows future enhancements to this version of the NIE.

CONTENTS

ABSTRACT

CZUACC is the XXDP+ monitor version of the Network Interconnect Exerciser (NIE) written to use the Digital Ethernet LSI Unibus Adapter (DELUA) or the Digital Ethernet to Unibus adapter (DEUNA).

The NIE is a tool designed to aid in the maintenance of an Ethernet network. Its functions are twofold. First, and foremost, the NIE verifies the connectivity (or lack of) of nodes on the network by testing their ability to communicate with one another. Second, the NIE provides a network monitoring capability that allows a user to get a sampling of the traffic on the NI.

1 SYSTEM REQUIREMENTS

The NIE has the following hardware requirements:

- PDP-11/24,34A,44,70,84 with functioning clock
- 256K RAM
- DELUA or DEUNA Unibus Ethernet Controller
- H4000 Ethernet Transceiver

2 RELATED DOCUMENTS

1. PDP-11 DIAGNOSTIC DESIGN GUIDE (EL-ENDIA-11)
2. NIE Functional Specification
3. DEC STD 134-0, The Digital Ethernet Specification, A-DS-EL00134-0-0, Rev. A, 6-Mar-1984
4. DECnet Digital Network Architecture, Phase 4, Maintenance Operations Functional Specification, AA-X436A-TK, Ver. 3.0.0, December 1983
5. DEUNA User's Guide, EK-DEUNA-UG-001, 1983
6. DELUA User's Guide, EK-DELUA-UG-PRE

3 DIAGNOSTIC PREREQUISITES

There are no prerequisites for the NIE to run.

4 PROGRAM ASSUMPTIONS

The NIE assumes that all required hardware is functioning correctly, with the exception of the Ethernet controller which it will check for errors.

This version of the NIE must be run with V2.0 or later of the XXDP+ monitor. The extended memory features of the NIE make use of capabilities afforded it by using the extended XXDP+ system, labeled XXDPXM.SYS on XXDP+ system media. All processors supported by this version of the NIE come equipped with the necessary memory required by the NIE and the extended monitor.

NOTE

THIS VERSION OF THE NIE WILL NOT WORK WITHOUT XXDPXM.SYS

5 OPERATING INSTRUCTIONS

This section contains information on loading and starting the NIE, as well as the NIE command language.

5.1 LOADING THE NIE

You must have an XXDP+ system media that contains the file CZUACC.BIN. Boot the media and at the XXDP+ prompt, type the following:

```
.R CZUACC
```

This will cause the Diagnostic Run-Time Services (DRS) along with the NIE to be loaded into PDP-11 memory. XXDP+ will then pass control over to the DRS.

5.2 NIE AND THE DRS

Though the DRS offers a number of commands to the user, when running the NIE only a subset are relevant. These are the following:

STArt	- Start the NIE
REStart	- restart the NIE
CONtinue	- continue running the NIE after a ↑C
DISplay	- display contents of hardware parameter table
EXIt	- exit the DRS to the XXDP+ monitor

START, RESTART, and CONTINUE may be used with the following switches:

/NOR	- tells the DRS to not perform checksums after DRS traps
/FLA:flaglist	- sets all DRS flags in flaglist

those flags that may be used are:

```
IER            - inhibit all error reports

IBE            - inhibit all error reports except first level

IXE            - inhibit extended error reports
```

5.2.1 STARTING THE NIE -

After XXDP+ has passed control to the DRS, the DRS issues its prompt and waits for instructions. To start the NIE type:

```
DR>START/NOR
```

The following dialogue should take place between the DRS and the user:

```
Change HW (L)  ? ...type Y

# UNITS (D)  ? ... type 1

unit 0
WHAT IS THE PCSRO ADDRESS? (O)  174510 ? ... type PCSRO address
WHAT IS THE VECTOR ADDRESS? (O)  120 ? ... type vector address
WHAT IS THE PRIORITY LEVEL? (O)  5 ? ... type priority level
```

NOTE: for the last three questions a return will cause
      the default to be used.

After this dialogue control is passed to the NIE which will print an identification message and give its prompt -- NIE>

5.3 NIE COMMAND LANGUAGE

COMMAND SUMMARY FOR THE NETWORK INTERCONNECT EXERCISER (NIE)
(it is only necessary to type the letters in brackets)

```
[H]elp or ?               - type this help text.

[E]xit                    - return to the supervisor.

[SH]ow [N]odes            - prints information in current node
                            table.
[SH]ow [M]essage          - prints selected message type, size,
                            and copies.
[SH]ow [C]ounters         - prints the low level counters of
                            the HOST NODE.
```

```
[S]how [L]isten                   - print listen data

[R]un [L]ooppair/[P]ass=nn - runs the looppair test, pass
                            defaults to 1
[R]un [A]ll/[P]ass=nn      - runs the node-to-node test
[R]un [D]irect/[P]ass=nn   - runs the direct loop test
[BO]unce /<addr list>     - allows the  user to select a
                            path for loopforwarding a packet.

[L]isten                  - listen for all packets on the NI.

[L]isten [P]rotocol/nnnn   - listen to the NI for packets using
                            protocol type nnnn and display those
                            packets.

[L]isten [S]ource/<addr>    - listen to the NI for packets which
                             have the source address indicated.

[L]isten [D]estination/<addr> - listen to the NI for packets which
                             have the destination address indicated.

[L]isten [S]ource/<addr>/[D]estination/<addr>/[P]rotocol/nnnn -
                             listen to the NI for packets which
                             have source and destination addresses
                             and the protocol type as indicated.

[M]essage/[TY]pe=a/[S]ize=n/[C]opies=m - allows the user to
                            modify the default message type, size
                            and copy count

[M]essage /[TE]xt =%<hex data string> - input user defined hex
                                        data
[M]essage /[TE]xt ="<ascii data string> - input user defined ascii
                                        data
[M]essage                 - sets default message parameters

[NOD]es /<addr list>       - enters 1 or more physical address
                            into the node table.
[SU]mmary                 - prints a summary of the test results.

[B]uild                   - builds a table of remote node physical
                            addresses by listening to ID messages
                            on the NI.

[C]lear [N]ode/<addr list> - removes nodes listed in the address
                            list from the node table.

[C]lear [N]ode/[A]ll      - clears all nodes from the current node
                            table.
[C]lear [M]essage         - sets all message parameters to default.
[C]lear [L]isten          - clears the accumulated listen data.
[C]lear [S]ummary         - clears the table of summary test data.

[I]dentify <addr>         - uses request ID function to identify a
                            remote node on the NI. The address may
```

```
                             be either a physical or logical address.

[SA]ve <filespec>           - writes the current node table into the
                              file specified by filespec.

[U]NSAVE <filespec>         - updates the current node table from the
                              file specified by filespec.
```

Notes:

1. <addr> is a physical or logical address of a node on the NI. The physical address consists of a string of 12 hex digits which may have embedded spaces and dashes. Logical addresses range from N1 to N2000 (Octal)

2. <addr list> is a list of physical and logical addresses. Addresses must be separated by commas.

3. Pass count, optionally specified within the run command, is a positive decimal number. Specifying -1 causes the test to loop indefinitely.

4. A protocol type is described by 4 hex digits which may have embedded spaces or dashes.

5. <filespec> is a character string specifying a valid XXDP+ file name.

6 NIE ERRORS

The DRS offers four classes of errors: soft errors, hard errors, device fatal errors, and system fatal errors. (For a detailed explanation of each, refer to the PDP-11 Diagnostic Design Guide, section 7.5.7)

6.1 NIE SOFT ERRORS

Soft errors for the NIE are those errors that do not hinder the further operation of the NIE. These errors will generally be caused by the inability of nodes to communicate on the NI. An example of a soft error follows:

```
CZUAC soft error  00034 on unit 00 test 001 sub 000 PC: 050264

LOOP DIRECT FAILED
FAILING NODE ADDRESS: AA-00-03-01-07-42
DATA PATTERN: ASCII
```

In this example, an attempt was made to loop a packet with the given data through the node with the given address. The node did not respond, so the failure was duly noted.

The NIE will always continue operation from a soft error.

6.2 NIE HARD ERRORS

There is only one error that has been classified as hard for the NIE. It occurs when the NIE has attempted to transmit a packet three times on the NI without success; it follows:

```
CZUAC hard error  00015 on unit 00 test 001 sub 000 PC: 032714
TRANSMIT FAILED AFTER THREE ATTEMPTS -- ETHERNET EXTREMELY LOADED
```

The NIE will continue from this error, but the fact that the network is very busy should be taken into consideration for further testing.

6.3 NIE DEVICE FATAL ERRORS

Device fatal errors are hardware failures that will inhibit further successful operation of the NIE. There are two pieces of hardware that will cause a device fatal error upon failure, the DEUNA or DELUA and the system clock. Since the DEUNA or DELUA is the hardware used to communicate over the NI, its failure will, of course, have drastic consequences for the NIE. The system clock is used by the NIE to time operations, such as timeouts for pending packet receptions. If it fails, the NIE quite possibly will hang-up waiting for events. An example of a device fatal error follows:

```
CZUAC DVC FTL error 00011 on unit 00 test 001 sub 001 PC: 032014
DEUNA/DELUA WILL NOT READ DESCRIPTOR RINGS

PC OF CALLING ROUTINE = 032324
pass aborted for this unit
```

In this example, the DEUNA or DELUA could not read the descriptor presented to it by the NIE.

Device fatal errors will cause a return to the DRS.

6.4 NIE SYSTEM FATAL ERRORS

A system fatal error for the NIE is an attempt by the NIE to report when it has sustained an error due to inaccuracies in software. For example:

```
CZUAC SYS FTL error 00014 on unit 00 test 001 sub 000 PC: 032702
TRANSMIT RING BOOKKEEPING ERROR

PC OF CALLING ROUTINE = 32324
pass aborted for this unit
```

In this example, the NIE has encountered an inaccuracy in what it believes the transmit ring looks like and what the device believes it looks like.

These are very severe errors resulting in a return to the URS.

7 TEST SUMMARIES

This section contains information on different NIE tests as well as the NIE BUILD command.

7.1 BUILD

Before any node testing can be done a table of nodes to test must be created. The BUILD command is the method by which this is done. When BUILD is issued, the NIE listens for system IDs of nodes on the NI. As nodes are heard from they are added to the node table. The node table contains a node's current physical address, its default physical address, its DECnet address (if it has one), a logical node number by which the node may be addressed, and the type of Ethernet controller at that node (e.g. DEQNA). The BUILD continues until one of the following conditions occurs:

1. 40 minutes have passed since the beginning of the BUILD

2. No node has been heard from in the past 10 minutes, or

3. the user types a control-C

The SHOW NODES command may be used to display the information contained in the node table.

7.2 RUN

RUN will invoke one of the following four tests: DIRECT, PATTERN, LOOPPAIR, or ALL.

7.2.1 RUN DIRECT -

This test uses the Maintenance Operation Protocol (MOP) loopback protocol to loop packets from the host node (the one on which the NIE is running) to each node in the node table. This verifies the ability of the node under test to communicate on the NI. To run this test type:

```
NIE> RUN DIRECT/PASS=N
```

The /PASS qualifier indicates the number of times to invoke the test. If it is not specified it will default to one.

7.2.2 RUN PATTERN -

This test is identical to RUN DIRECT with the exception that it will lcop a packet of each message type to each node in the node table. To run this test type:

```
NIE> RUN PATTERN/PASS=N
```

The /PASS qualifier indicates the number of times to invoke the test. If it is not specified it wiil default to one.

7.2.3 RUN LOOPPAIR -

This test uses the MOP loopback protocol to loop packets between adjacent pairs of nodes in the node table. It tests nodes' ability to communicate with other nodes on the NI.

If there were four nodes in the table -- N1-N4 -- then the series of loop tests would be:

```
HOST->N1->N2->N1->HOST
HOST->N2->N3->N2->HOST
HOST->N3->N4->N3->HOST
HOST->N4->N1->N4->HOST
```

To run this test type:

```
NIE> RUN LOOPPAIR/PASS=N
```

The /PASS qualifier indicates the number of times to invoke the test. If it is not specified it will default to one.

7.2.4 RUN ALL -

The RUN ALL test is a two part test. First the DIRECT loop test is run. Second, a packet is looped, via MOP loopback protocol, to each pair of nodes in the node table. The second part is only run if all nodes respond in the direct loop test. The function of the test is to verify that the two nodes on the farthest ends of the NI can communicate with each other. To run this test type:

```
        NIE> RUN ALL/PASS=N
```

The /PASS qualifier indicates the number of times to invoke the test. If it is not specified it will default to one.

7.3 BOUNCE

The bounce command also makes use of the MOP loopback protocol packet. It will allow the user to specify a path on which a loopback packet will travel. It allows the user the flexibility of testing explicit communications paths between nodes without the overhead of the RUN command. An example follows:

```
        NIE> BOUNCE/NO,AA-00-04-00-08-10,N37,AA-00-04-00-27-10,N12
```

If this command were given then the NIE would attempt to loop a packet along the path specified. Note the mixing of logical node names (from the node table) and Ethernet addresses.

7.4 IDENTIFY

This command allows the user to identify nodes on the NI. When issued, the NIE will send a request ID to the node specified in the command line and, if the node replies to the request, d splays the information contained in the node's reply. Some, but not all, of this information would be the nodes current physical address, its default physical address, the type of controller attached to that node, and the maintenance operations it is capable of performing. To use this command type:

```
        NIE> IDENTIFY <node-address>
```

<node-address> may be either an Ethernet physical address or a logical node name from the node table.

7.5 LISTEN

The LISTEN command allows the user to passively listen to a sampling of traffic on the NI. For this command the user may specify packet filters for destination, source, and protocol type. If a packet is successfully received and it passes the user specified filters, it will be added to a log maintained by the NIE.

This listen log will contain 30 entries of packets that have passed the filters. Each entry will contain the destination, source, protocol type, and character count of the packet that passed the filter, along with a count of the number of times a packet with those exact characteristics was received.

In addition to the listen log a source address list will be maintained by the NIE that contains up to 30 entries. Each entry will contain a source address from a packet that has passed the specified filters along with a count of the number of times that packets with that source address have passed the filters.

The LISTEN command has the following format:

```
NIE> LISTEN SOURCE/<src-adr>/DESTINATION/<dest-adr>/PROTOCOL/<prot-type>
```

where <src-adr> and <dest-adr> may be Ethernet node addresses or logical node names and <prot-type> is a hexadecimal string representing a protocol type (e.g. 90-00). Any or ´ll of the filters may be included or excluded. The only way to terminate the listen command is by typing control-C.

The SHOW LISTEN command may be used to display the information in the logs.

Table of contents

```
                        .SBTTL  PROGRAM HEADER

                        ;       .ENABL  ABS,AMA
                        ;       .= 2000
                                .ENABL  AMA


                        .SBTTL  Program Macros


                                ;I$STACK macro
                                ;-------------

                                ;+++
                                ;The I$STACK macro facilitates initializing the R6 (hardware) stack
                                ;and the R5 (parameter) stack.  R5 is set to the stack low limit
                                ;(STAKLO) and the parameter stack grows upward.  R6 is set to the
                                ;stack high limit (STAKHI) and the hardware stack grows downward.
                                ;If there is a stack over-run, it will be detected by the PREG14
                                ;routine.
                                ;---

                        ;++
                        ; THE PROGRAM HEADER IS THE INTERFACE BETWEEN
                        ; THE DIAGNOSTIC PROGRAM AND THE SUPERVISOR.
                        ;--

000000                          POINTER BGNRPT


000000                          HEADER  CZUAC,C,0,0,1,PRI07



                        ;
                        ; NAMES OF DEVICES SUPPORTED BY PROGRAM
                        ;
000122                          DEVTYP  <DEUNA,DELUA>


                        ; TEST DESCRIPTION
                        ;
000136                          DESCRIPT        <CZUAC DEUNA,DELUA NI EXERCISER>
                                .EVEN



                        ;
                        ; FORMAT STATEMENTS USED IN PRINT CALLS
                        ;



```

```
                          .SBTTL  DISPATCH TABLE

                          ;++
                          ; THE DISPATCH TABLE CONTAINS THE STARTING ADDRESS OF EACH TEST.
                          ; IT IS USED BY THE SUPERVISOR TO DISPATCH TO EACH TEST.
                          ;--

000176                            DISPATCH 1

```

```
                                  .SBTTL  DEFAULT HARDWARE P-TABLF


                                  ;++
                                  ; THE DEFAULT HARDWARE P-TABLE CONTAINS DEFAULT VALUES OF
                                  ; THE TEST-DEVICE PARAMETERS.  THE STRUCTURE OF THIS TABLE
                                  ; IS IDENTICAL TO THE STRUCTURE OF THE HARDWARE P-TABLES,
                                  ; AND IS USED AS A "TEMPLATE" FOR BUILDING THE P-TABLES.
                                  ;--

000202                                    BGNHW   DFPTBL

000204  174510                            .WORD   174510                  ; CSR
000206  000120                            .WORD   120                     ; VECTOR
000210  000240                            .WORD   PRI05                   ; PRIORITY


000212                                    ENDHW
```

```
   493
   494                                  .SBTTL  SOFTWARE P-TABLE
   495
   496                                  ;++
   497                                  ; THE SCFTWARE TABLE CONTAINS VARIOUS DATA USED BY THE
   498                                  ; PROGRAM AS OPERATIONAL PARAMETERS.  THESE PARAMETERS ARE
   499                                  ; SET UP AT ASSEMBLY TIME AND MAY BE VARIED BY THE OPERATOR
   500                                  ; AT RUN TIME.
   501                                  ;--
   502
   503 000212                                   BGNSW   SFPTBL
   504
   512
   513 000214                                   ENDSW
   514
   515                                  .SBTTL  GLOBAL EQUATES SECTION
   516
   526
   527
   528                                  ;++
   529                                  ; THE GLOBAL EQUATES SECTION CONTAINS PROGRAM EQUATES THAT
   530                                  ; ARE USED IN MORE THAN ONE TEST.;--
   531
   546
   547 000214                                   EQUALS
                                        ;
                                        ; BIT DIFINITIONS
                                        ;
                100000                  BIT15== 100000
                040000                  BIT14== 40000
                020000                  BIT13== 20000
                010000                  BIT12== 10000
                004000                  BIT11== 4000
                002000                  BIT10== 2000
                001000                  BIT09== 1000
                000400                  BIT08== 400
                000200                  BIT07== 200
                000100                  BIT06== 100
                000040                  BIT05== 40
                000020                  BIT04== 20
                000010                  BIT03== 10
                000004                  BIT02== 4
                000002                  BIT01== 2
                000001                  BIT00== 1
                                        ;
                001000                  BIT9==  BIT09
                000400                  BIT8==  BIT08
                000200                  BIT7==  BIT07
                000100                  BIT6==  BIT06
                000040                  BIT5==  BIT05
                000020                  BIT4==  BIT04
                000010                  BIT3==  BIT03
                000004                  BIT2==  BIT02
                000002                  BIT1==  BIT01
                000001                  BIT0==  BIT00
                                        ;
                                        ; EVENT FLAG DEFINITIONS
```

```
                                ;   EF32:EF17 RESERVED FOR SUPERVISOR TO PROGRAM COMMUNICATION
                                ;
        000040                  EF.START==      32.                             ; START COMMAND WAS ISSUED
        000037                  EF.RESTART==    31.                             ; RESTART COMMAND WAS ISSUED
        000036                  EF.CONTINUE==   30.                             ; CONTINUE COMMAND WAS ISSUED
        000035                  EF.NEW==        29.                             ; A NEW PASS HAS BEEN STARTED
        000034                  EF.PWR==        28.                             ; A POWER-FAIL/POWER-UP OCCURRED
                                ;
                                ;
                                ; PRIORITY LEVEL DEFINITIONS
                                ;
        000340                  PRI07== 340
        000300                  PRI06== 300
        000240                  PRI05== 240
        000200                  PRI04== 200
        000140                  PRI03== 140
        000100                  PRI02== 100
        000040                  PRI01== 40
        000000                  PRI00== 0
                                ;
                                ;OPERATOR FLAG BITS
                                ;
        000004                  EVL==        4
        000010                  LOT==       10
        000020                  ADR==       20
        000040                  IDU==       40
        000100                  ISR==      100
        000200                  UAM==      200
        000400                  BOE==      400
        001000                  PNT==     1000
        002000                  PRI==     2000
        004000                  IXE==     4000
        010000                  IBE==    10000
        020000                  IER==    20000
        040000                  LOE==    40000
        100000                  HOE==   100000
```

```

                            ;;;EQUATES FOR FLAG WORD;;;;;

        000000                      CTARGT==0
        000001                      CASIST==1
        000002                      CSHCTR==2               ;ARG TYPE FOR 'SHOW COUNTERS' CMD
        000004                      CCLNAD==4               ;ARG TYPE FOR 'CLEAR NODE/ADR' CMD
        000010                      CCLNAL==8.              ;ARG TYPE FOR 'CLEAR NODE/ALL' CMD
        000020                      CEXIT==16.

                            ;;;CLOCK ENABLE VALUES TO BE LOADED IN CLK'S CSR;;;

        000100                      LCLKEN==100             ; L-Clock CSR value to enable the clock
        000111                      PCLKEN==111             ; P-Clock CSR value to enable the clock
        001600                      PCLKCT==1600            ; P-Clock count set register for counter

                            ; SPECIAL CLI CODES FOR "CHAR" ARGUEMENT IN CLI CALLS
                            ;   (COMMAND LINE INTERPRETER DEFINITIONS)
        000000                      CLIERR= 0
        000001                      CLIEXI= 1
        000002                      CLIBR = 2
        000003                      CLIBIF= 3
        000004                      CLISPA= 4
        000005                      CLINUM= 5
        000006                      CLIALP= 6
        000010                      CLIOCT= 8.
        000011                      CLIDEC= 9.
        000012                      CLISTR= 10.

                            ;DEFS FOR COMMAND LINE INTERPRETATION ACTION VALUES

        000000                      NULL=0
        000001                      HELP=1
        000002                      NODE=2
        000003                      BUILD=3
        000004                      CRUN=4
        000005                      CPATRN=5
        000006                      CSAVE=6
        000007                      SUMMRY=7
        000010                      IDENT=10
        000011                      EXIT=11
        000012                      NOTNUF=12
        000013                      CEXADR=13
        000014                      CSAVR4=14
        000015                      CNODE=15
        000016                      CALPHA=16
        000017                      CONES=17
        000020                      CZEROS=20
        000021                      C1ALT=21
        000022                      C0ALT=22
        000023                      CCCITT=23
        000024                      COPRSL=24
        000025                      CTYPE=25
        000026                      CSIZE=26
        000027                      CCPYS=27
        000030                      CNDADR=30
        000031                      CNODAL=31
```

```
000032                          CRNALL=32
000033                          CLUPPR=33
000034                          CSHMSG=34
000035                          CCLMSG=35
000036                          CCNTR=36
000037                          CNDLOG=37
000040                          CFUNCT=40
000041                          CUNSAV=41
000042                          CCLSUM=42
000043                          CDIR=43
000044                          CDEFLT=44
000045                          CUNSVF=45
000046                          SETQIK=46
000047                          CLRQIK=47
000050                          NCMPAR=50
000051                          INIBNC=51
000052                          BOUNCE=52
000053                          BNCLOG=53
000054                          SOUADR=54
000055                          DESADR=55
000056                          CEXPRO=56
000057                          LISTEN=57
000060                          CSLIST=60
000061                          CCLIST=61

000000                          ALPHA==0                        ;MESSAGE TYPE VALUES
000001                          ONES==1
000002                          ZEROS==2
000003                          ONEALT==3
000004                          ZROALT==4
000005                          CCITT==5
000006                          OPRSEL==6

                        ;
                        ;       GLOBAL EQUATES FOR THE DEUNA/DELUA DRIVER
                        ;
                        ;Port Control and Status Register 0


100000                  SERI    ==      BIT15           ; STATUS ERROR INTERRUPT
040000                  PCEI    ==      BIT14           ; PORT COMMAND ERROR INTERRUPT
020000                  RXI     ==      BIT13           ; RECEIVE RING INTERRUPT
010000                  TXI     ==      BIT12           ; TRANSMIT RING INTERRUPT
004000                  DNI     ==      BIT11           ; DONE INTERRUPT
002000                  RCBI    ==      BIT10           ; RECEIVE BUFFER UNAVAILABLE
000400                  USCI    ==      BIT08           ; UNSOLICITED STATE CHANGE INTERRUPT
000400                  FATI    ==      BIT08           ; FATAL ERROR INTERERUPT
000200                  INTR    ==      BIT07           ; INTERRUPT SUMMARY <15:08>
000100                  INTE    ==      BIT06           ; INTERRUPT ENABLE
000040                  RSET    ==      BIT05           ; DEUNA/DELUA RESET

                                ; PORT COMMANDS in bit 3 to bit 0
                                ; ------------------------------

000001                          GETPCB == bit00                 ; Get Address of Port Control Block
000002                          GETFNT == bit01                 ; Get Command in Port Control Block
000003                          PNOP == bit00!bit01             ; No operation performed
```

```
        000004                  STRT  == bit02                  ;  Enable XMIT and RCVR
        000005                  BOOT == bit02!bit00             ;  Boot , -> Prim load state,
                                                                ;   initate downline load

        000010                  PDMD == bit03                   ; polling demand/wake up bit
        000011                  TMRO == bit03!bit00             ; sanity timer enable ( =1 its on)
        000012                  TMRF == bit03!bit01             ; Sanity Timer Off
        000015                  RSTT == bit03!bit02!bit00       ; reset sanity timer
        000017                  STOP == bit03!bit02!bit01!bit00 ; Suspend DEUNA/DELUA operation



                        ;Port Control and Status Register 1


        100000                  XPWR == bit15                   ; transceiver power ok
        040000                  ICAB == bit14                   ; port to link cable ok

                                ; self test error code in bit 13 to bit 08
        000200                  PCTO  == bit07                  ; port command timeout

        000010                  RMTC == bit03                   ; remote console reserved (=1)

                                ; port state in bit 2 to bit 0

        000000                  RESET == 0                      ;  000 reset state
        000001                  PRIMLD== bit00                  ;  001 primary load state
        000002                  READY== bit01                   ;  010 ready state
        000003                  RUN ==  bit01!bit00             ;  011 running state

        000005                  UNIHLT == bit02!bit00           ;  101 unibus halted state
        000006                  NIHLT  == bit02!bit01           ;  110 ni halted state
        000007                  NIUNI  == bit02!bit01!bit00     ;  111 ni and unibus halted state



                        ;Port Control and Status Register 2

                                ; lower 16 address bits of the port control block base
                                ; address pointer  in bit 15 to bit 0

                        ;Port Control and Status Register 3

                                ; upper 2 address bits of the port control block base
                                ; address pointer  in bit 1 to bit 0

                        ;Port Functions

                                ; function codes are as follows

        000000                     PFNOP == 0                   ; no operation performed
        000002                     RDDEFA == bit01              ; read default physical address

        000004                     RDPHYA == bit02              ; read physical address
        000005                     WDPHYA == bit02!bit00        ; write physical address

        000006                     RDMULA == bit02!bit01        ; read list of multicast addresses
        000007                          WDMULA == bit02!bit01!bit00  ; write list of multicast addresses

        000010                          RDRNGS  == bit03             ; read both the rcvr and xmit rings
        000011                          WDRNGS  == bit03!bit00       ; write both the rcvr and xmit rings

        000012                          RDCNTS  == bit03!bit01       ; read counters
        000013                          CLRCNTS == bit03!bit01!bit00 ; read and clear counters

        000014                          RDMODE == bit03!bit02        ; read internal link mode register
        000015                          WDMODE == bit03!bit02!bit00  ; write internal link mode register

        000016                          RDSTA  == bit03!bit02!bit01  ; read port status
        000017                          CLRSTA == bit03!bit02!bit01!bit00
                                                                     ; read and clear port status

        000020                          DMPMEM == bit04              ; dump internal memory
        000021                          LDMEM  == bit04!bit00        ; load internal memory

        000022                          RDSYS  == bit04!bit01        ; read system id parameters
        000023                          WDSYS  == bit04!bit01!bit00  ; write system id parameters

                                ;
                                ;       Ethernet frame  offsets
                                ;


        000016                  header  ==      14.             ; offset (size) to end of  header in bytes

        000000                  destin  ==      0               ; destination address
        000006                  sourcc  ==      6               ; source address
        000014                  protoT  ==      12.             ; protocol type field

                                ;               -------------------------
                                ;               !  destination address  !
                                ;               -------------------------
                                ;               !       (6 bytes)       !
                                ;               -------------------------
                                ;               !                       !
                                ;               -------------------------
                                ;       +6      !    source  address    !
                                ;               -------------------------
                                ;               !       (6 bytes)       !
                                ;               -------------------------
                                ;               !                       !
                                ;               -------------------------
                                ;       +12.    !    protocall type     !
                                ;               -------------------------
                                ;       +14.    !         data          !
                                ;               -------------------------
                                ;               !       more data       !
                                ;


                                ;+
                                ;       Xmit ring descriptor definitions
                                ;-

                                ; TDRB+0
```

```
                        ;
                        ;       nothing needed

                        ; TDRB+2
                        ;
                        ;       nothing needed


                        ; TDRB+4
                        ;

        000400                  enp     ==      bit08           ; end of frame flag
        001000                  stp     ==      bit09           ; stop of frame flag
        002000                  def     ==      bit10           ; defferring frame flag
        004000                  one     ==      bit11           ; xmit successful after one retry
        010000                  more    ==      bit12           ; xmit successful after more than
                                                                ;       one retry
        040000                  errs    ==      bit14           ; ERROR SUMMARY BIT
        100000                  own     ==      bit15           ; ownership bit (=1 DEUNA/DELUA, =0 host)

                        ; TDRB+6

        002000                  rtry    ==      bit10           ; retry error bit
        004000                  lcar    ==      bit11           ; lost carrier error bit
        010000                  lcol    ==      bit12           ; late collision error bit

        040000                  ubto    ==      bit14           ; unibus timeout error bit
        100000                  bufl    ==      bit15           ; buffer length error bit

                        ;+
                        ;       Rcvr ring descriptor defintions
                        ;-

                        ; RDRB+0
                        ;
                        ;       nothing needed

                        ; RDRB+2
                        ;
                        ;       nothing needed


                        ; RDRB+4
                        ;

                                ; --> indicates same as for transmit ring descriptor base

        004000                  crc     ==      bit11           ; crc error in received frame
        010000                  oflo    ==      bit12           ; message overflow
        020000                  fram    ==      bit13           ; framing error

                                ;errs   ==      bit14           ; ERROR SUMMARY BIT
                                ;own    ==      bit15           ; ownership bit (=1 DEUNA/DELUA, =0 host)

                        ; RDRB+6

        020000                  nchn    ==      bit13           ; set to indicate DEUNA/DELUA in no
```

```
                                                                ; buffer chain on rcvr mode

                                 ;ubto   ==      bit14          ; unibus timeout error bit
                                 ;bufl   ==      bit15          ; buffer length error bit

        002756           xpklen  == 1518.                       ; transmit frame length
        002756           rpklen  == 1518.                       ; recieve frame length
        000004           no.ntr  == 4                           ; number of entries in xmit rings
        000010           no.nrr  == 8.                          ; number of entries in receive rings
        000016           LBCOU   == 16                          ; offset to byte count for this frame type
        000020           LISCOU  == 20                          ; offset to count for listen log entry
        000022           LISENT  == 22                          ; length of one entry in listen log
        000006           ADRCOU  == 6                           ; offset to count for address list entry
        000010           ADRENT  == 10                          ; length of one entry in address list


                         ;
                         ; System ID reply message offsets
                         ;
        000022                   sircpt == 22
        000024                   siffid == 24
        000016                   siccou == 16
                         ;
                         ; Device type defs
                         ;
        000001                   IDTUNA == 1            ; DEUNA
        000003                   IDTCNA == 3            ; DECNA
        000005                   IDTQNA == 5            ; DEQNA
        000011                   IDTLUA == 11           ; DELUA
        000013                   IDTCSA == 13           ; DECSA - PLUTO
        000021                   IDTSRV == 21           ; DSRVA - POSEIDON
                         ;
                         ; Loop Direct Offsets
                         ;
        000016                   ldskip == 16           ; offset to skip count
        000020                   ldfct1 == 20           ; offset to forward function code
        000022                   ldadr1 == 22           ; offset to forward address
        000030                   ldfct2 == 30           ; offset to reply function code
        000032                   ldadr2 == 32           ; offset to reply address
        000022                   ldata  == 22           ; number of bytes of data buffer occupied by
                                                        ; loop header

                         ;
                         ; Full Assist Offsets
                         ;
        000016                   faskip == 16           ; offset to skip count
        000020                   fafct1 == 20           ; offset to first forward function code
        000022                   faadr1 == 22           ; offset to first forward address
        000030                   fafct2 == 30           ; offset to second forward function code
        000032                   faadr2 == 32           ; offset to second forward address
        000040                   fafct3 == 40           ; offset to third forward function code
        000042                   faadr3 == 42           ; offset to third forward address
        000050                   fafct4 == 50           ; offset to reply function code
        000052                   faadr4 == 52           ; offset to reply address
        000032                   fdata1 == 32           ; length of loopback header
        000042                   fdata2 == 42           ; length of loopback header for full assist
                         ;
```

```
                                ; Counter Offsets
                                ;
        000002                          c.secs == 2
        000004                          c.prec == 4
        000010                          c.mrec == 10
        000014                          c.rerb == 14
        000016                          c.rerr == 16
        000020                          c.rdat == 20
        000024                          c.rmdb == 24
        000030                          c.rlin == 30
        000032                          c.rlex == 32
        000034                          c.pxmt == 34
        000040                          c.mxmt == 40
        000044                          c.pxm3 == 44
        000050                          c.pxm2 == 50
        000054                          c.pxmd == 54
        000060                          c.xdat == 60
        000064                          c.xmdb == 64
        000066                          c.xabb == 66
        000070                          c.xabt == 70
        000074                          c.coll == 74

                                ;--+
                                ;       The following equates are for use with the memory management hardware
                                ;       and its associated routines
                                ;--+
        172350                          KPAR4   ==      172350          ; address of KPAR4
        172352                          KPAR5   ==      172352          ; address of KPAR5
        172354                          KPAR6   ==      172354          ; address of KPAR6

        001000                          NKPAR4  ==      001000          ; original value for KPAR4
        001200                          NKPAR5  ==      001200          ; original value for KPAR5
        002400                          TKPAR6  ==      002400          ; value for KPAR6 to do write rings
                                                                        ; function only

        177572                          MMCSR0  ==      177572          ; address of MMU CSR0
        000001                          MMUENA  ==      000001          ; mask to enable MMU
        000000                          MMUDIS  ==      000000          ; mask to disable MMU

                                ;--+
                                ;       The following values will be used as new values for KPAR4 and KPAR5
                                ;       registers, which, will then point to the page that contains the
                                ;       indicated structures
                                ;--+
        002000                          ORRING  ==        2000          ; offset to receive ring
        002400                          OTRING  ==        2400          ; offset to transmit ring
        002600                          ONTAB   ==        2600          ; offset to node table
        003000                          OSTAB   ==        3000          ; offset to summary table
        003400                          OLLOG   ==        3400          ; offset to listen log

        000000                          BA      ==           0          ; base address for call to BUFREQ
        000001                          EA      ==           1          ; extended bits(18:16) for call to BUFREQ


                                ;--+
                                ;       The following equates are virtual addresses of data structures that
                                ;       are mapped into extended memory.  Since KPAR4 and KPAR5 are the only
                                ;       two page address registers that are being used to remap to extended
```

```
    948                                         ;       memory, the virtual addresses of the data structures will be in the
    949                                         ;       range 100000(0) - 137776(0).
    950                                         ;--+
    951          100000                                 NODTBL  ==      100000          ; address of node table
    952          110000                                 NODEND  ==      110000          ; address of end of node table
    953          110000                                 DEFTBL  ==      110000          ; address of default address table
    954          120000                                 DEFEND  ==      120000          ; address of end of default table
    955          010000                                 DEFNOD  ==      010000          ; distance between node and default addr.
    956          100000                                 STATBL  ==      100000          ; address of summary table
    957          126000                                 STAEND  ==      126000          ; address of end of summary table
    958          100000                                 LISLOG  ==      100000          ; address of listen log
    959          101034                                 LISEND  ==      101034          ; address of end of listen log
    960          101034                                 ADRLIS  ==      101034          ; address of listen address list
    961          101414                                 ADREND  ==      101414          ; address of end of listen address list
    962          100000                                 RRING   ==      100000          ; address of receive ring
    963          100000                                 XRING   ==      100000          ; address of transmit ring
    964
    965                                         ;--+
    966                                         ;       The next equates are the actual 18-bit physical addresses of the
    967                                         ;       the first transmit and receive buffers, respectively
    968                                         ;--+
    969          040050                                 X11501  ==      040050          ; address bits <17:01> ...
    970          000001                                 X11716  ==      000001          ; ... of first transmit buffer
    971          000120                                 R11501  ==      000120          ; address bits <17:01> ...
    972          000001                                 R11716  ==      000001          ; ... of first receive buffer
    973
    974                                         ;--+
    975                                         ;       And now the virtual addresses of the first transmit and receive
    976                                         ;       buffers, respectively.
    977                                         ;--+
    978
    979          100050                                 XBUFV1  ==      100050          ; virtual addr. of first transmit buffer
    980          100120                                 RBUFV1  ==      100120          ; virtual addr. of first receive buffer
    981
    982
    983                                         .SBTTL  GLOBAL DATA SECTION
    984
    985                                         ;++
    986                                         ; THE GLOBAL DATA SECTION CONTAINS DATA THAT ARE USED
    987                                         ; IN MORE THAN ONE TEST.
    988                                         ;--
    989                                         ;COMMAND LINE BUFFER, DATA LOCATIONS AND MESSAGES FOR ACTION ROUTINES
    990
    991 000214                                  STACKS: .BLKW   100.            ; PARAMETER STACK -- USED TO PASS PROCEDURE ARGS
    992 000524  000000                          DEVICE: .WORD   0               ;DEFAULT TO DEUNA
    993 000526                                  FILLIN: .BLKB   132.            ;BUFFER FOR SINGLE LINE READ FROM FILE
    994 000732                                  CMDBUF: .BLKB   72.             ;BUFFER FOR OPERATOR COMMANDS
    995 001042                                  CBOBUF: .BLKB   17.             ;BUFFER TO HOLD INPUT ASCII ADDRESS/PROTOCOL TYPE STRING
    996                                                 .EVEN
    997 001064  000000                          KEYWD1: .WORD   0               ;
    998 001066  000000                          KEYWD2: .WORD   0
    999 001070  000000                          ADRBUF: .WORD   0               ;BUFFER FOR NODE ADDRESS
   1000 001072  000000                                  .WORD   0
   1001 001074  000000                                  .WORD   0
   1002 001076                                  SOUFIL::
   1003 001076  000000                                  .WORD   0               ;BUFFER FOR SOURCE FILTER FOR LISTEN COMMAND
   1004 001100  000000                                  .WORD   0
```

```
 1005 001102  000000                    .WORD   0
 1006 001104                    DESFIL::
 1007 001104  000000                    .WORD   0               ;BUFFER FOR DESTINATION FILTER FOR LISTEN COMMAND
 1008 001106  000000                    .WORD   0
 1009 001110  000000                    .WORD   0
 1010 001112                    PROFIL::
 1011 001112  000000                    .WORD   0               ;BUFFER FOR PROTOCOL FILTER FOR LISTEN COMMAND
 1012 001114  000000                    .WORD   0
 1013
 1014 001116                    STRBUF: .BLKB   18.             ;BUFFER FOR ALPHANUM. ADDRESS STRING
 1015 001140                    STRBU1: .BLKB   18.
 1016 001162  000000            LOGVAL: .WORD   0               ;LOGICAL NODE VALUE
 1017 001164  000000            TYPADR: .WORD   0               ;ADDR. OF LOC. OF ASCII STRING THAT DESCRIBES NODE TYPE
 1018 001166  000000            CBOADR: .WORD   0               ;POINTER FOR BEGINING OF ADDRESS STRING
 1019 001170  000000            P$TYPE: .WORD   0               ;LOC. TO HOLD MESSAGE TYPE
 1020 001172  000000            P$SIZE: .WORD   0               ;LOC. TO HOLD MESSAGE SIZE
 1021 001174  000000            P$CPYS: .WORD   0               ;LOC. TO HOLD NO. OF MESSAGE COPIES
 1022 001176  000000            P$PASS: .WORD   0               ;LOC. TO HOLD NO. OF PASSES
 1023 001200  000000            NODTY:  .WORD   0               ;LOC. TO HOLD NODE TYPE FOR NODE TABLE SETUP
 1024 001202  000000            SLOT::  .WORD   0               ;USED BY NODE TABLE SUBROUTINES
 1025 001204  000000            SLOT1:: .WORD   0               ;FOR DEFAULT NODE ADDRESSES
 1026 001206  177777            ILLADR: .WORD   177777          ;ILLEGAL ADDRESS FOR COMPARISON
 1027 001210  177777                    .WORD   177777          ; (MUST NOT BE PHYSICALLY SEPARATED FROM
 1028 001212  177777                    .WORD   177777          ; END OF SAVTBL)
 1029                                                           ; of an incoming frame
 1030 001214                    LISBUF: .BLKW   7               ; buffer to hold destination, source, and p.t.
 1031 001232  100000            LISNXT: .WORD   LISLOG          ; pointer to next open location in log
 1032 001234  000000            LISNUM: .WORD   0               ; number of listen commands since log was started
 1033 001236  000000            LPACNM: .WORD   0               ; number of frames that passed filter
 1034 001240  000000            LBYTEC: .WORD   0               ; byte count of a received frame
 1035 001242  000000            LISMIN: .WORD   0               ; total elapsed time of listen command sequence
 1036 001244  000000            LISSEC: .WORD   0               ;
 1037 001246  000000            LOGFMN: .WORD   0               ; minutes to fill log (zero if not full)
 1038 001250  000000            LOGFSC: .WORD   0               ; seconds to fill log (zero if not full)
 1039 001252     000            LISFUL: .BYTE   0               ; flag to indicate if the log was filled
 1040 001253     000            SOUFLG: .BYTE   0               ; flag indicating presence of source filter
 1041 001254     000            DESFLG: .BYTE   0               ; flag indicating presence of destination filter
 1042 001255     000            PROFLG: .BYTE   0               ; flag indicating presence of protocol type filter
 1043                                    .EVEN
 1044 001256  101034            ADRNXT: .WORD   ADRLIS          ; pointer to next free location in addr. list
 1045
 1046                           ;COMMAND LINE TRAVERSE LOCATIONS (USED BY "P$TRV")
 1047
 1048 001260  000000            P$BUFA: .WORD   0               ;LOC. TO HOLD ADDR. OF CMD LINE BUFFER
 1049 001262  000000            P$TREE: .WORD   0               ;LOC. TO HOLD ADDR. OF PARSING TREE
 1050 001264  000000            P$ACT:  .WORD   0               ;LOC. TO HOLD ADDR. OF ACTION ROUTINE
 1051 001266  000000            P$CNT:  .WORD   0               ;LOC. TO BE A COUNTER LOCATION
 1052 001270  000000            P$NUM:  .WORD   0               ;LOC. TO HOLD NUMERIC VALUE FROM PARSE
 1053 001272  000000            P$RADX: .WORD   0               ;LOC. TO HOLD RADIX(LO) & </-(HI BYTE)
 1054 001274     000            P$LIST: .BYTE   0               ;INDICATES THAT THE LISTEN COMMAND WAS ENTERED
 1055 001275     000            P$BLD:  .BYTE   0               ;INDICATES THAT THE BUILD COMMAND WAS ENTERED
 1056 001276     000            P$HLP:  .BYTE   0               ; -1 if help command was typed
 1057 001277     000            P$HEX:  .BYTE   0               ; indicate operator data is hex
 1058 001300     000            P$NNUF: .BYTE   0               ;RETURN =0 IF ENOUGH OF COMMAND FOUND
 1059 001301     000            P$GDBD: .BYTE   0               ;RETURN CODE 0 IF NO ERROR FOUND
 1060 001302     000            P$AERR: .BYTE   0               ;RETURN 0 IF 12 DIGIT ADDRESS ENTERED
 1061 001303     000            P$NCMP: .BYTE   0               ;NO DATA COMPARE FLAG
```

```
001304     000                   P$MERR: .BYTE   0                  ;RETURN -1 IF ERROR IN OPERATOR SELECTED
                                                                    ;MESSAGE INPUT OCCURED, 0 FOR COOD INPUT
001305     000                   P$TEXT: .BYTE   0                  ; indicates text, not address to TRVADR routine
001306     000                   P$BONC: .BYTE   0                  ; indicate we are processing bounce command

                                 .EVEN
001310  005732'                  HLPTAB: .WORD   HELP1
001312  006033'                          .WORD   HELP2
001314  006126'                          .WORD   HELP3
001316  006177'                          .WORD   HELP4
001320  006250'                          .WORD   HELP5
001322  006350'                          .WORD   HELP6
001324  006463'                          .WORD   HELP7
001326  006574'                          .WORD   HELP8
001330  006664'                          .WORD   HELP9
001332  006753'                          .WORD   HELP10
001334  007044'                          .WORD   HELP11
001336  007142'                          .WORD   HELP12
001340  007247'                          .WORD   HELP13
001342  007346'                          .WORD   HELP14
001344  007440'                          .WORD   HELP15
001346  007453'                          .WORD   HELP16
001350  007542'                          .WORD   HELP17
001352  007645'                          .WORD   HELP18
001354  007715'                          .WORD   HELP19
001356  010020'                          .WORD   HELP20
001360  010076'                          .WORD   HELP21
001362  010161'                          .WORD   HELP22
001364  010262'                          .WORD   HELP23
001366  010362'                          .WORD   HELP24
001370  010473'                          .WORD   HELP25
001372  010601'                          .WORD   HELP26
001374  010673'                          .WORD   HELP27
001376  011001'                          .WORD   HELP28
001400  011105'                          .WORD   HELP29
001402  011207'                          .WORD   HELP30
001404  011326'                          .WORD   HELP31
001406  011376'                          .WORD   HELP32
001410  011505'                          .WORD   HELP33
001412  000000                   HLPEND: .WORD   0

001414  017322'                  MSGTAB: .WORD   MSGTY0                     ;MESSAGE TYPE ASCII ADDRESS TABLE
001416  017330'                          .WORD   MSGTY1
001420  017335'                          .WORD   MSGTY2
001422  017343'                          .WORD   MSGTY3
001424  017350'                          .WORD   MSGTY4
001426  017355'                          .WORD   MSGTY5
001430  017363'                          .WORD   MSGTY6

                                 ; THIS SECTION DEFINES THE DATA PATTERNS USED BY THE EXERCISER

001432                           MSGCNT::
001432  000130                   MSG0C:  .WORD   EMSG0-MSG00                ; THE NUMBER OF BYTES IN EACH MESSAGE
001434  000001                   MSG1C:  .WORD   EMSG1-MSG01
001436  000001                   MSG2C:  .WORD   EMSG2-MSG02
001440  000001                   MSG3C:  .WORD   EMSG3-MSG03
001442  000001                   MSG4C:  .WORD   EMSG4-MSG04
```

```
  1119 001444  000100                   MSG5C:  .WORD   EMSG5-MSG05
  1120 001446  000000                   MSG6C:  .WORD   0
  1121
  1122 001450                           MSGAD::
  1123 001450  001466'                          .WORD   MSG00
  1124 001452  001616'                          .WORD   MSG01
  1125 001454  001617'                          .WORD   MSG02
  1126 001456  001620'                          .WORD   MSG03
  1127 001460  001621'                          .WORD   MSG04
  1128 001462  001622'                          .WORD   MSG05
  1129 001464  001722'                          .WORD   OPSLBF
  1130
  1131 001466     040     041     042   MSG00:: .ascii  \ !"#$%&'()*+,-/0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ\
       001471     043     044     045
       001474     046     047     050
       001477     051     052     053
       001502     054     055     057
       001505     060     061     062
       001510     063     064     065
       001513     066     067     070
       001516     071     072     073
       001521     074     075     076
       001524     077     100     101
       001527     102     103     104
       001532     105     106     107
       001535     110     111     112
       001540     113     114     115
       001543     116     117     120
       001546     121     122     123
       001551     124     125     126
       001554     127     130     131
       001557     132
  1132 001560     133     135     136           .ascii  \[]↑-abcdefghijklmnopqrstuvwxyz\        ; alphanumeric
       001563     055     141     142
       001566     143     144     145
       001571     146     147     150
       001574     151     152     153
       001577     154     155     156
       001602     157     160     161
       001605     162     163     164
       001610     165     166     167
       001613     170     171     172
  1133 001616                           EMSG0::
  1134 001616     377                   MSG01:: .byte   377                             ; message of all ones
  1135 001617                           EMSG1::
  1136 001617     000                   MSG02:: .byte   0                               ; message of all zeros
  1137 001620                           EMSG2::
  1138 001620     252                   MSG03:: .byte   252                             ; message of alternating ones
  1139 001621                           EMSG3::
  1140 001621     125                   MSG04:: .byte   125                             ; message of alternating zeros
  1141 001622                           EMSG4::
  1142 001622                           MSG05::                                         ; CCITT 511 bit test pattern
  1143 001622  177603  157427  031011           .word   177603,157427,031011,047321,163715,105221
       001630  047321  163715  105221
  1144 001636  143325  142304  040041           .word   143325,142304,040041,104116,052606,172334
       001644  104116  052606  172334
  1145 001652  105025  123754  111337           .word   105025,123754,111337,111523,030030,145064
```

```
001660  111523  030030  145064
001666  137642  143531  063617            .word   137642,143531,063617,135075,066730,026575
001674  135075  066730  026575
001702  052012  053627  070071            .word   052012,053627,070071,151172,165044,031605
001710  151172  165044  031605
001716  166632  016147                    .word   166632,016147
001722                            EMSG5::
001722                            OPSLBF: .blkb   66.             ;BUFFER FOR OPERATOR SELECTED MESSAGE TYPE


002024  000000                    CFLAG:  .WORD   0                               ;ACTION ROUTINE CMD ARGUMENT FLAG

                                  ;;CLOCK TABLES, EVENT LOG AND POINTERS
002026  000000                    CLKCSR: .WORD   0               ; Clock CSR address
002030  000000                    CLKBR:  .WORD   0               ; Clock interrupt level
002032  000000                    CLKVEC: .WORD   0               ; Clock interrupt vector
002034  000074                    CLKHZ:  .WORD   60.             ; Clock's frequency in Hertz
002036  000000                    CLKEN:  .WORD   0               ; Clock's CSR value to intrpt. enable it

002040  000000                    TIMMIN: .WORD   0               ; Place to keep time-since-start
002042  000000                    TIMSEC: .WORD   0
002044  000000                    TIMTCK: .WORD   0               ; Place to keep no. of ticks/sec.

002046  000000                    TIMER1: .WORD   0               ; Event timer #1 (ticks)
002050  000000                    TIMER2: .WORD   0               ; Event timer #2 (ticks)
002052  000000                    TIMERS: .WORD   0               ; Event timer #3 (seconds)
                                          .EVEN
                                  ;
                                  ; STUFF FOR DECNET ADDRESS DECODING
                                  ;
002054  000000                    DECNET:: .WORD  0
002056  000000                    AREA::   .WORD  0

                                  ;
                                  ; POINTERS FOR BOUNCE COMMAND
                                  ;
002060  000000                    BNCPKT: .WORD   0                               ;points to frame descriptor
002062  000000                    BNCBUF: .WORD   0                               ; points to buffer
002064  000000                    BNCCNT: .WORD   0               ; count of number of bytes used in bounce buffer



                                  ;--+
                                  ;       pointers for transmit and receive rings
                                  ;--+

002066  100000                    xrgsrt::.word   XRING           ; first entry in transmit ring
002070  100000                    rrgsrt::.word   RRING           ; first entry in recieve ring
002072  100000                    xrgcur::.word   XRING           ; current entry in transmit ring
002074  100000                    rrgcur::.word   RRING           ; current entry in recieve ring
002076  100000                    xrgnxt::.word   XRING           ; next entry in transmit ring
002100  100000                    rrgnxt::.word   RRING           ; next entry in recieve ring
002102  100036                    xrglst::.word   XRING+36        ; last entry in transmit ring
002104  100106                    rrglst::.word   RRING+106       ; last entry in receive ring


                                  ;*****************************************************************************8
```

```
                        ;
                        ;INFORMATION ABOUT THE CURRENT UNIT AS OBTAINED FROM THE HARDWARE P-TABLE
                        ;
                        ;****************************************************************************************
*******

                                                ;PCSRs of current slot
002106  000000          PCSR0:: .WORD           ;  address of PCSR0     (port command field
002110  000000          PCSR1:: .WORD           ;                 1     (state & self test fields
002112  000000          PCSR2:: .WORD           ;                 2     (pcb address lo 15 bits
002114  000000          PCSR3:: .WORD           ;                 3     (pcb address hi 2 bits

002116  000000          PCSR0C::.WORD   0       ;PCSR0 CONTENTS
002120  000000          PCSR1C::.WORD   0       ;PCSR1 CONTENTS
002122  000000          PCSR2C::.WORD   0       ;PCSR2 CONTENTS
002124  000000          PCSR3C::.WORD   0       ;PCSR3 CONTENTS


002126  000000          UNACSR::.WORD   0       ;CSR
002130  000000          UNAVEC::.WORD   0       ;VECTOR
002132  000000          UNAPRI::.WORD   0       ;PRIORITY

002134  000000          FRESIZ::.WORD   0       ;POINTER TO WORD CONTAINING SIZE OF FREE MEMORY
002136  000000          FREMEM::.WORD   0       ;POINTER TO FREE MEMORY SPACE

002140  000000          UNIT::  .WORD   0       ;CURRENT UNIT NUMBER BEING TESTED

                        ;
                        ; broadcast address - FF-FF-FF-FF-FF-FF
                        ;
002142  177777                  brdadr:         .word   -1
002144  177777                                  .word   -1
002146  177777                                  .word   -1

                        ;       Port control block function structures

                                                ;port control block
002150  000000          PCBB0:: .word   0       ;       port function
002152  000000          PCBB2:: .word   0       ;       port function dependent parameters
002154  000000          PCBB4:: .word   0       ;       port function dependent parameters
002156  000000          PCBB6:: .word   0       ;       port function dependent parameters

                        ;               function table

002160  002230'         FUNTAB::        .word   $PNOP           ; no op
002162  000000                          .word   0               ; fill in the hole
002164  002232'                         .word   $RDDE           ; read default physical address
002166  000000                          .word   0               ; fill in another hole
002170  002242'                         .word   $RDPH           ; read physical address
002172  002252'                         .word   $WDPH           ; write physical address
002174  002262'                         .word   $RDMC           ; read multicast address list
002176  002322'                         .word   $WDMC           ; write multicast address list
002200  002362'                         .word   $RDRN           ; read descriptor rings
002202  002406'                         .word   $WDRN           ; write descriptor rings
002204  002432'                         .word   $RDCN           ; read counters
002206  002546'                         .word   $CLRC           ; read and clear counters
002210  002556'                         .word   $RDMO           ; read mode
002212  002566'                         .word   $WDMO           ; write mode
```

```
002214  002576'                                           .word   $RDST           ; read status
002216  002606'                                           .word   $CLRS           ; read and clear status
002220  002616'                                           .word   $DMEM           ; dump internal memory
002222  002640'                                           .word   $LMEM           ; load internal memory
002224  002650'                                           .word   $RDSY           ; read sys id parameters
002226  002660'                                           .word   $WTSY           ; write sys id parameters

                                  ;+
                                  ;       PNOP == 0                       ; port no-operation
                                  ;-
                                  .even
002230  000000                            $pnop::         .word 0         ; no-op

                                  ;+
                                  ;       RDDEFA == bit01                 ; read default physical address
                                  ;-
                                  .even

002232  000002                            $rdde::         .word   2       ; pcbb+0 function read default
002234  000000                            depadr::        .word   0       ; pcbb+2      physical address
002236  000000                                            .word   0       ; pcbb+4
002240  000000                                            .word   0       ; pcbb+6

                                  ;+
                                  ;       RDPHYA == bit02                 ; read physical address
                                  ;-
                                  .even

002242  000004                            $rdph::         .word   4       ; pcbb+0 read current (active)
002244  000000                            phyadr::        .word   0       ; pcbb+2      physical address
002246  000000                                            .word   0       ; pcbb+4
002250  000000                                            .word   0       ; pcbb+6

                                  ;+
                                  ;       WDPHYA == bit02!bit00           ; write physical address
                                  ;-
                                  .even
002252  000005                            $wdph::         .word   5       ; pcbb+0 write physical address
002254  000000                                            .word   0       ; pcbb+2
002256  000000                                            .word   0       ; pcbb+4
002260  000000                                            .word   0       ; pcbb+6

                                  ;+
                                  ;       RDMULA == bit02!bit01           ; read multicast address list
                                  ;-

                                  .even
002262  000006                            $RDMC::         .word   6       ; function code
002264  002272'                                           .word   ucb6    ; ucbb address
002266  000000                                            .word   0       ; pcbb+4
002270  000000                                            .word   0       ; pcbb+6

002272                                    UCB6::          .blkw   12.     ; enough room for 4 addresses

                                  ;+
                                  ;       WDMULA == bit02!bit01!bit00     ; write multicast address list
                                  ;-
```

```

                                .even
002322  000007                          $WDMC::         .word   7       ; function code
002324  002332'                                         .word   ucb7    ; ucbb address
002326  000400                                          .word   400     ; length of list = 1
002330  000000                                          .word   0       ; pcbb+6

002332  000253                          ucb7::          .word   253     ; multicast address for loopback
002334  001000                                          .word   1000
002336  000000                                           word   0
002340                                                   blkw   9.      ; room for three more addresses

                                ;+
                                ;          RDRNGS == bit03              ; read both the rcvr and xmit rings
                                ;

                                .even
002362  000010                          $RDRN::         .WORD   10      ; FUNCTION CODE
002364  002372'                                         .word UCB10     ; ucbb address
002366  000000                                          .word   0       ; null
002370  000000                                          .word   0       ; null

                                .even

002372  140000                          ucb10::         .word XRING+40000       ; ucbb
002374  002000                                          .word 2000      ; ucbb+2
002376  000000                                          .word   0       ; ucbb+4
002400  100000                                          .word RRING     ; ucbb+6
002402  002000                                          .word 2000      ; ucbb+10
002404  000000                                          .word   0       ; ucbb+12


                                ;+
                                ;          WDRNGS  == bit03!bit00       ; write both the rcvr and xmit rings
                                ;-

                                .even

002406  000011                          $WDRN::         .WORD   11      ; FUNCTION CODE
002410  002416'                                         .word   UCB11   ; ucbb address
002412  000000                                          .word   0       ; null
002414  000000                                          .word   0       ; null

                                .even

002416                                  ucb11::
002416  040000                                          .word   40000   ; transmit ring base address
002420     001                                          .byte   1       ; hi bits of transmit ring base address
002421     005                                          .byte   5       ; five words per ring entry (1 for port driver)
002422  000004                                          .word   NO.NTR  ; four transmit descriptors in the ring

002424  000000                                          .word   0       ; receive ring base address
002426     001                                          .byte   1       ; hi bits of receive ring base address
002427     005                                          .byte   5       ; five words per ring entry (1 for port driver)
002430  000010                                          .word   NO.NRR  ; eight receive descriptors in the ring


```

```

                                 ;+
                                 ;          RDCNTS  == bit03!bit01         ; read counters
                                 ;

                                 .even
002432  000012                           $RDCN::          .WORD   12       ; FUNCTION
002434  002442'                                           .word   UCB12    ; ucbb address

                                                                           ; DEFAULT COUNT OF COUNTER LIST
                                                                                   ;       40 (octal)
002436  000000                                            .word   0        ; null

002440  000110                                            .word   110      ;  CTRLEN
                                                                           ;

                                 .even

002442                                   ucb13::
002442  000000                           ucb12::          .word   0        ; ucbb
002444  000000                                            .word   0        ; ucbb+2
002446  000000                                            .word   0        ; ucbb+4
002450  000000                                            .word   0        ; ucbb+6
002452  000000                                            .word   0        ; ucbb+10
002454  000000                                            .word   0        ; ucbb+12
002456  000000                                            .word   0        ; ucbb+14
002460  000000                                            .word   0        ; ucbb+16
002462  000000                                            .word   0        ; ucbb+20
002464  000000                                            .word   0        ; ucbb+22
002466  000000                                            .word   0        ; ucbb+24
002470  000000                                            .word   0        ; ucbb+26
002472  000000                                            .word   0        ; ucbb+30
002474  000000                                            .word   0        ; ucbb+32
002476  000000                                            .word   0        ; ucbb+34
002500  000000                                            .word   0        ; ucbb+36
002502  000000                                            .word   0        ; ucbb+40
002504  000000                                            .word   0        ; ucbb+42
002506  000000                                            .word   0        ; ucbb+44
002510  000000                                            .word   0        ; ucbb+46
002512  000000                                            .word   0        ; ucbb+50
002514  000000                                            .word   0        ; ucbb+52
002516  000000                                            .word   0        ; ucbb+54
002520  000000                                            .word   0        ; ucbb+56
002522  000000                                            .word   0        ; ucbb+60
002524  000000                                            .word   0        ; ucbb+62
002526  000000                                            .word   0        ; ucbb+64
002530  000000                                            .word   0        ; ucbb+66
002532  000000                                            .word   0        ; ucbb+70
002534  000000                                            .word   0        ; ucbb+72
002536  000000                                            .word   0        ; ucbb+74
002540  000000                                            .word   0        ; ucbb+76
002542  000000                                            .word   0        ; ucbb+100
002544  000000                                            .word   0        ; ucbb+102

                                 ;+
                                 ;          CLRCNTS == bit03!bit01!bit00 ; read and clear counters
                                 ;-
```

```

                                  .even

002546  000013                             $clrc::         .WORD   13      ; FUNCTION
002550  002442'                                            .word UCB13     ; ucbb address
                                                                           ; DEFAULT COUNT OF COUNTER LIST
002552  000000                                             .word   0       ; null
002554  000040                                             .word   40      ;  (# OF WORDS IN LIST = UPPER BYTE)
                                                                           ; MAX NUMBER VALUE = 32 (decimal) =
                                                                           ;       40 (octal)


                                           ;( for  ucb13::  see ucb 12 above)


                                  ;+
                                  ;            RDMODE == bit03!bit02         ; read internal link mode register
                                  ;-

                                  .even
002556  000014                             $rdmo::         .word   14      ; function code
002560  000000                                             .word   0       ; a 16 bit copy of the
                                                                           ; bits to read the una internal
                                                                           ;       mode register
002562  000000                                             .word   0       ; null
002564  000000                                             .word   0       ; null

                                  ;+
                                  ;            WDMODE == bit03!bit02!bit00   ; write internal link mode register
                                  ;-

                                  .even
002566  000015                             $wdmo::         .word   15      ; function code
002570  000000                                             .word   0       ; a 16 bit copy of the
                                                                           ; bits to write the una internal
                                                                           ;       mode register
002572  000000                                             .word   0       ; null
002574  000000                                             .word   0       ; null


                                  ;+
                                  ;            RDSTA  == bit03!bit02!bit01   ; read port status
                                  ;-

                                  .even
002576  000016                             $rdst::         .word   16      ; function code
002600  000000                             status::        .word   0       ; a list of ERRORS and STATUS
002602  000000                                             .word   0       ; lower byte = # of multicast adrs
                                                                           ;       maximum supported by UNA
                                                                           ; upper byte = # of multicast adrs
                                                                           ;       currently supported by UNA
002604  000000                                             .word   0       ; word = maximum # of words in
                                                                           ;       ucb for counters
                                                                           ;       as currently perceived
                                                                           ;       by the UNA

                                  ;+
                                ;          CLRSTA  == bit03!bit02!bit01/bit0
                                ;-                                          ; read and clear write port status

                                .even
002606  000017                          $clrs::          .word   17         ; function code
002610  000000                                           .word   0          ; a list of ERRORS and STATUS
002612  000000                                           .word   0          ; lower byte = # of multicast adrs
                                                                            ;        maximum supported by UNA
                                                                            ; upper byte = # of multicast adrs
                                                                            ;        currently suppor'ed by DEUNA/DELUA
002614  000000                                           .word   0          ; word = maximum # of words in
                                                                            ;        ucb for counters
                                                                            ;        as currently perceived
                                                                            ;        by the DEUNA/DELUA

                                ;+
                                ;          DMPMEM == bit04                  ; dump internal memory
                                ;-

                                .even
002616  000020                          $dmem::          .word   20         ; function code
002620  002626'                                          .word   ucb20      ; ucbb address
002622  000000                                           .word   0          ; MBZ
002624  000000                                           .word   0          ; MBZ

002626                                  ucb20::
002626  000000                          ucb21::          .word   0          ; function length (no of words to xfer)
002630  000000                                           .word   0          ; hdbb - host memory data block address
002632  000000                                           .word   0          ; internal DEUNA address ...
002634  021040                                           .word   21040      ; ... changed if DELUA
002636  000000                                           .word   0          ; extra word for IDBB<23:0> -- if DELUA

                                ;+
                                ;          LDMEM  == bit04!bit00            ; load DEUNA/DELUA internal memory
                                ;-

                                .even
002640  000021                          $lmem::          .word   21         ; function code
002642  002626'                                          .word   ucb21      ; ucbb address
002644  000000                                           .word   0
002646  000000                                           .word   0

                                ;+
                                ;          RDSYS  == bit04!bit01            ; read system id
                                ;-

                                .even
002650  000022                          $rdsy::          .word   22         ; function code
002652  002670'                                          .word   ucb22      ; ucbb address
002654  000000                                           .word   0
002656  000033                                           .word   27.        ; length of id message
                                ;+
                                ;          WTSYS  == bit04!bit01!bit00      ; write system id
                                ;-

                                .even
002660  000023                          $wtsy::          .word   23         ; function code
```

```
002662 002670'                                       .word   ucb23   ; ucbb address
002664 000000                                        .word   0
002666 000033                                        .word   27.     ; length of id message

002670                                ucb22:
002670 000000                         ucb23:         .word   0       ;udbb+0
002672 000000                                        .word   0       ;udbb+2
002674 000000                                        .word   0       ;udbb+4
002676 000000                                        .word   0       ;udbb+6
002700 000000                                        .word   0       ;udbb+10
002702 000000                                        .word   0       ;udbb+12
002704 000000                                        .word   0       ;udbb+14
002706 000000                                        .word   0       ;udbb+16
002710 000000                                        .word   0       ;udbb+20
002712 000000                                        .word   0       ;udbb+22
002714 000000                                        .word   0       ;udbb+24
002716 000000                                        .word   0       ;udbb+26
002720 000000                                        .word   0       ;udbb+30
002722 000000                                        .word   0       ;udbb+32
002724 000000                                        .word   0       ;udbb+34
002726 000000                                        .word   0       ;udbb+36
002730 000000                                        .word   0       ;udbb+40
002732 000000                                        .word   0       ;udbb+42
002734 000000                                        .word   0       ;udbb+44
002736 000000                                        .word   0       ;udbb+46
002740 000000                                        .word   0       ;udbb+50
002742 000000                                        .word   0       ;udbb+52
002744 000000                                        .word   0       ;udbb+54
002746 000000                                        .word   0       ;udbb+56
002750 000000                                        .word   0       ;udbb+60
002752 000000                                        .word   0       ;udbb+62
002754 000000                                        .word   0       ;udbb+64

002756 000000                 UDBB::  .WORD   0      ;UNIBUS DATA BLOCK BASE
002760 000000                         .WORD   0      ;+2
002762 000000                         .WORD   0      ;+4
002764 000000                         .WORD   0      ;+6

                              ;
                              ;       SUMMARY DATA COUNTERS
                              ;

002766 000000                 s.rec:: .word   0                      ; messages received
002770 000000                 s.nrec::.word   0                      ; messages not received
002772 000000                 s.len:: .word   0                      ; length errors
002774 000000                 s.comp::.word   0                      ; compare errors
002776 000000                 s.byte::.word   0                      ; bytes compared
003000 000000                 s.xfer::.word   0                      ; bytes transfered

                              ;
                              ;       DEUNA/DELUA DRIVER AND ASSOCIATED SUBROUTINES DATA
                              ;

003002 000000                 fatflg::.word   0                      ; fatal error flag
003004 000000                 pceflg::.word   0                      ; port command error flag
003006 000000                 nircnt::.word   0                      ; DEUNA/DELUA recieve message counter
003010 000000                 xflag:: .word   0                      ; frame transmitted flag
```

```
 1599 003012  000000                  dniflg::.word   0                      ; done interrupt flag
 1600 003014  000000                  rbfcnt::.word   0                      ; recieve buffers lost counter
 1601 003016  000000                  bcount::.word   0                      ; unexplained interrupts counter
 1602 003020  000000                  errflg::.word   0                      ; error flag
 1603 003022  000000                  timout::.word   0                      ; time out counter
 1604 003024  000000                  retrys::.word   0                      ; counter for frames failing due to rtry error
 1605 003026  000000                  rcverr::.word   0                      ; counts no. of buffers received with  errors
 1606 003030  000000                  rcvbuf::.word   0                      ; counts no. of good buffers received
 1607 003032  000000                  count:: .word   0                      ; used in BLDBUF subroutine as counter
 1608 003034  000220                  prot00::.word   000220                 ; protocall type for loopback messages
 1609 003036  001140                  prot02::.word   001140                 ; protocall type for remote console
 1610 003040                          tempbl::.blkw   24                     ; reserve space to hold a system id field
 1611 003110  000000                  temp::  .word   0                      ; used in XMIT as temporary storage
 1612 003112  000000                  temp1:: .word   0                      ; used for temporary storage
 1613 003114  000000                  temp2:: .word   0                      ; used for temporary storage
 1614 003116  000000                  temp3:: .word   0                      ; used for temporary storage
 1615 003120  000000                  xfer::  .word   0                      ; stores 'bytes transfered'
 1616 003122  000000                  cpycnt::.word   0                      ; 'no. of copies' counter for looping
 1617 003124  000000                  pccall::.word   0                      ; stores pc of calling routine for error reports
 1618 003126  000000                  buflen::.word   0                      ; stores transmit buffer length
 1619 003130  000000                  cmpbuf::.word   0                      ; stores location of data buffer to be compared
 1620 003132                          patch:: .blkw   40.                    ; 40 words for program patch
 1621
 1622                                 ;
 1623                                 ; Request ID Message Format
 1624                                 ;
 1625
 1626 003252                          reqid::
 1627 003252  000003                          .word   3                      ; byte count (=3 for request id)
 1628 003254  000005                          .word   5                      ; function code for request id
 1629 003256  051115                          .word   ^MR                    ; reciept number
 1630
 1631                                 ;
 1632                                 ; Loop Direct Message
 1633                                 ;
 1634
 1635                                 .even
 1636
 1637 003260                          LOPDIR::
 1638 003260  000000                          .word   0                      ; skip count
 1639 003262  000002                          .word   2                      ; function = forward data
 1640 003264  000000  000000  000000          .word   0,0,0                  ; local node address
 1641 003272  000001                          .word   1                      ; function = reply
 1642 003274  000000  000000  000000          .word   0,0,0                  ; local node address
 1643
 1644                                 ;
 1645                                 ; Transmit assist message
 1646                                 ;
 1647
 1648 003302                          TASIST::
 1649 003302  000000                          .word   0                      ; skip count
 1650 003304  000002                          .word   2                      ; function = forward data
 1651 003306  000000  000000  000000          .word   0,0,0                  ; transmit assist address
 1652 003314  000002                          .word   2                      ; function = forward data
 1653 003316  000000  000000  000000          .word   0,0,0                  ; local node address
 1654 003324  000001                          .word   1                      ; function = reply
 1655 003326  000000  000000  000000          .word   0,0,0                  ; local node address
```

```

                                    ;
                                    ; Recieve assist message
                                    ;

003334                              RASIST::
003334  000000                              .word   0                   ; skip count
003336  0C0002                              .word   2                   ; function = forward data
003340  000000  000000  000000              .word   0,0,0               ; transmit assist address
003346  000002                              .word   2                   ; function = forward data
003350  000000  000000  0G0000              .word   0,0,0               ; local node address
003356  000001                              .word   1                   ; function = reply
003360  000000  000000  000000              .word   0,0,0               ; local node address

                                    ;
                                    ; Full assist message
                                    ;

003366                              FASIST::
003366  000000                              .word   0                   ; skip count
003370  000002                              .word   2                   ; function = forward data
003372  000000  000000  000000              .word   0,0,0               ; target node address
003400  000002                              .word   2                   ; function = forward data
003402  000000  000000  000000              .word   0,0,0               ; assist node address
0C3410  000002                              .word   2                   ; function = forward data
003412  000000  000000  000000              .word   0,0,0               ; local node address
003420  000001                              .word   1                   ; function = reply
003422  000000  000000  000000              .word   0,0,0               ; local node address


                                    .SBTTL  COMMAND LINE ACTION TREE

                                    ;SAMPLE CLI TREE NODE  (ALWAYS AT LEAST 1 WORD)

                                    ; -----------------------
                                    ; ! ACTION  ! CHAR CODE !
                                    ; -----------------------
                                    ; !  MISS DISPLACEMENT  !      ONLY IF "MISS" ARGUMENT DEFINED
                                    ; -----------------------
                                    ; !  NEXT MODE DISPLMNT !      ONLY IF "ASCII" ARGUMENT DEFINED
                                    ; -----------------------
                                    ; !  ASCIZ MATCH STRING !      ONLY IF "ASCII" ARGUMENT DEFINED
                                    ; !        (.EVEN)      !
                                    ; -----------------------
                                    .NLIST  ME
003430                              CLITRE:

                                    ;FIRST KEYWORD
003430                                      CLI     CLISPA,0,N10$               ;SKIP ANY LEADING SPACES
003434                              N10$:   CLI     <'?>,HELP,N12$              ;IS THE FIRST NON-SP CHAR. A "?"
003440                                      CLI     CLISPA,0,N11$               ; skip spaces
003444                              N11$:   CLI     CLISPA,0,N50$               ; error if non-space characters left
003450                              N12$:   CLI     CLISTR,HELP,N14$,<'HELP'>   ;ELSE IS FIRST WORD A "HELP"
003464                                      CLI     CLISPA,0,N13$               ; skip spaces after executing
003470                              N13$:   CLI     CLISPA,0,N50$               ; error if nonspace chars left
003474                              N14$:   CLI     CLISTR,NOTNUF,N16$,<'NODE'> ;ELSE IS FIRST WORD A "NODE"
003510                                      CLI     CLIBR,0,N80$                ;  IF YES, BR N80$
```

```
003514   N16$:   CLI    <'B>,NOTNUF,N18$                   ; is char a b?
003520           CLI    CLISTR,BUILD,N17$,<'UILD'>         ;ELSE IS FIRST WORD A "BUILD"
003534           CLI    CLIBR,0,N70$                       ;  IF YES, SEE BR N70$
003540   N17$:   CLI    CLISTR,0,N50$,<'OUNCE'>            ; IS IT BOUNCE COMMAND?
003554           CLI    CLIBR,0,N300$                      ; branch if it is
003560   N18$:   CLI    CLISTR,NOTNUF,N20$,<'RUN'>         ;ELSE IS FIRST WORD A "RUN"
003572           CLI    CLIBR,0,N180$                      ;  IF YES, BR N180$
003576   N20$:   CLI    <'S>,NOTNUF,N25$                   ;ELSE IS FIRST CHAR. A "S"
003602           CLI    CLISTR,0,N22$,<'HOW'>              ;  IF YES IS REST OF WORD "HOW"
003614           CLI    CLIBR,0,N100$                      ;    IF YES,BR N100$
003620   N22$:   CLI    CLISTR,SUMMRY,N23$,<'UMMARY'>      ;  ELSE IS REST OF WORD "UMMARY"
003636           CLI    CLIEXI,0                           ;    IF YES, DO "SUMM" AND EXIT
003640   N23$:   CLI    CLISTR,0,N24$,<'AVE'>              ;  ELSE IS REST OF WORD "AVE"
003652           CLI    CLISPA,CSAVR4,N231$                ;    SKIP SPACES
003656   N231$:  CLI    CLIEXI,CSAVE                       ;    DO SAVE AND EXIT
003660   N24$:   CLI    CLIERR,0                           ;  ELSE "ILL COMMAND"
003662           CLI    CLIEXI,0                           ;  EXIT
003664   N25$:   CLI    CLISTR,NOTNUF,N26$,<'CLEAR'>       ;ELSE IS FIRST WORD A "CLEAR"
003700           CLI    CLIBR,0,N120$                      ;  IF YES, BR N120$
003704   N26$:   CLI    CLISTR,NOTNUF,N28$,<'IDENTIFY'>    ;ELSE IS FIRST WORD "IDENTIFY"
003724           CLI    CLIBR,0,N140$                      ;  IF YES, GET ADDRS, BR N140$
003730   N28$:   CLI    CLISTR,NOTNUF,N29$,<'MESSAGE'>     ;ELSE IS FIRST WORD  MESSAGE"
003746           CLI    CLIBR,0,N160$                      ;  IF YES, BR N160$
003752   N29$:   CLI    CLISTR,0,N30$,<'UNSAVE'>           ;ELSE IS FIRST WORD "UNSAVE"
0C3770           CLI    CLIBR,0,N210$                      ;  IF YES, BR TO N210$
003774   N30$:   CLI    CLISTR,EXIT,N31$,<'EXIT'>          ;ELSE IS FIRST WORD "EXIT"
004010           CLI    CLIEXI,0                           ;  IF YES EXIT
004012   N31$:   CLI    CLISTR,NOTNUF,N32$,<'FUNCTION'>    ;ELSE IS FIRST WORD "FUNCTION"
004032           CLI    CLIBR,0,N200$                      ;  IF YES, BR N200$
004036   N32$:   CLI    CLISTR,LISTEN,N50$,<'LISTEN'>      ;ELSE IS FIRST WORD "LISTEN"
004054           CLI    CLIBR,0,N145$                      ;  IF YES, BR N145$
004060   N50$:   CLI    CLIERR,0                           ;OTHERWISE "ILL CMD",
004062           CLI    CLIEXI,0                           ;  EXIT

         ;SECOND KEYWORD FOR BUILD COMMAND

004064   N70$:   CLI    CLISPA,0,N72$                      ; SKIP LEADING SPACES
004070   N72$:   CLI    <'/>,NULL,N50$                     ; ERR IF ILLEGAL QUALIFIER
004074           CLI    CLISPA,0,N74$                      ; skip spaces
004100   N74$:   CLI    CLISTR,SETQIK,N50$,<'QUICK'>       ; SET QUCK BUILD FLAG IF QUICK
004114           CLI    CLISPA,0,N76$                      ; skip spaces
004120   N76$:   CLI    CLISPA,0,N50$                      ; error if more to command
004124   N78$:   CLI    CLIEXI,0                           ; EXIT

         ;SECOND KEYWORD (ADR/TYPE) FOR NODE COMMAND

004126   N80$:   CLI    CLISPA,0,N81$                      ;SKIP ANY LEADING SPACES
004132   N81$:   CLI    CLIBR,CSAVR4,N82$                  ;SAVE STRING POINTER LOCATION
004136   N82$:   CLI    CLIBR,NODE,N90$                    ;PARSE THROUGH ADDRESS,CHECK
                                                           ;FOR TARGET OR ASSIST, DO NODE
004142   N90$:   CLI    CLIBIF,0,N50$                      ;TAKE ERROR BRANCH IF ERROR EXISTS
004146   N95$:   CLI    CLIEXI,0                           ;EXIT

         ;SECOND KEYWORD FOR SHOW COMMAND

004150   N100$:  CLI    CLISPA,0,N101$                     ;SKIP LEADING SPACES
004154   N101$:  CLI    CLISTR,CNODE,N102$,<'NODES'>       ;IS NEXT WORD "NODES"
```

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004170                 CLI     CLIBR,0,N110$                     ;  IF YES, SET FLAG, BR N110$
004174        N102$:   CLI     CLISTR,CSHMSG,N104$,<'MESSAGE'>   ;ELSE IS NEXT WORD "MESSAGE"
004212                 CLI     CLIBR,0,N110$                     ;  IF YES ,SET FLAG, BR N110$
004216        N104$:   CLI     CLISTR,CCNTR,N106$,<'COUNTERS'>   ;ELSE IS NEXT WORD "COUNTERS"
004236                 CLI     CLIBR,0,N110$                     ; GO TO COUNTERS ROUTINE
004242        N106$:   CLI     CLISTR,CSLIST,N108$,<'LISTEN'>    ;ELSE IS NEXT WORD "LISTEN"
004260                 CLI     CLIBR,0,N110$                     ;  DO LISTEN ROUTINE AND BRANCH
004264        N108$:   CLI     CLIBR,0,N50$                      ;ELSE "ILL COMMAND"
004270        N110$:   CLI     CLISPA,0,N112$                    ; skip spaces
004274        N112$:   CLI     CLISPA,0,N50$                     ; error if more to command
004300                 CLI     CLIEXI,0                          ;EXIT

              ;SECOND KEYWORD FOR CLEAR COMMAND

004302        N120$:   CLI     CLISPA,0,N121$                    ;SKIP LEADING SPACES
004306        N121$:   CLI     CLISTR,0,N130$,<'NODE'>           ;IS NEXT WORD "NODE"
004322                 CLI     CLISPA,0,N122$                    ;  IF YES SKIP SPACES
004326        N122$:   CLI     <'/>,CSAVR4,N50$                  ;  LOOK FOR DELIMETER, ELSE "ILL COM"
004332        N1122$:  CLI     CLISPA,0,N1124$                   ; skip spaces
004336        N1124$:  CLI     <'A>,0,N123$                      ;  IS NEXT CHAR. AN "A"
004342                 CLI     CLISTR,CNODAL,N124$,<'LL'>        ;     IF YES, IS WORD "ALL"
004354                 CLI     CLIBR,0,N135$                     ;        IF YES, SET FLAG,BR N135$
004360        N123$:   CLI     <'N>,0,N124$                      ;  ELSE IS NEXT CHAR. AN "N"
004364                 CLI     CLISPA,0,N1123$                   ; skip spaces
004370        N1123$:  CLI     CLIOCT,0,N50$                     ;     IF YES, STORE NODE LOGICAL NAME
004374                 CLI     CLIBR,CNDLOG,N127$                ;     BR TO CLR. NODE LOGICAL ROUTINE
004400        N124$:   CLI     CLIBR,CEXADR,N126$                ;  ELSE, EXTRACT ADDRESS
004404        N126$:   CLI     CLIBR,CNDADR,N127$                ;  SET FLAG
004410        N127$:   CLI     CLISPA,0,N128$                    ; skip spaces
004414        N128$:   CLI     54,0,N129$                        ; is there more?
004420                 CLI     CLIBR,0,N1122$                    ; yes
004424        N129$:   CLI     CLISPA,0,N50$                     ; no, error if more text
004430        N130$:   CLI     CLISTR,CCLMSG,N132$,<'MESSAGE'>   ;ELSE IS NEXT WORD "MESSAGE"
004446                 CLI     CLIBR,0,N135$                     ;  IF YES, SET FLAG, BR N135$
004452        N132$:   CLI     CLISTR,CCLSUM,N134$,<'SUMMARY'>   ;ELSE IS NEXT WORD "SUMMARY"
004470                 CLI     CLIBR,0,N135$                     ;  IF YES, CLEAR TABLE AND EXIT
004474        N134$:   CLI     CLISTR,CCLIST,N136$,<'LISTEN'>    ;ELSE IS NEXT WORD "LISTEN"
004512                 CLI     CLIBR,0,N135$                     ;  IF YES, CLEAR LOG AND EXIT
004516        N136$:   CLI     CLIERR,0                          ;ELSE, "ILL COMMAND".
004520        N135$:   CLI     CLIEXI,0                          ;EXIT

              ;ADDRESS FOR IDENTIFY COMMAND

004522        N140$:   CLI     CLISPA,0,N141$                    ;SKIP LEADING SPACES
004526        N141$:   CLI     <'N>,0,N142$                      ; Is this a logical address
004532                 CLI     CLIOCT,0,N50$                     ; YES, get octal value ...
004536                 CLI     CLIBR,BNCLOG,N1412$               ; ... and look up value in nodetable
004542        N1412$:  CLI     CLIBIF,0,N50$                     ; exit on error
004546                 CLI     CLIBR,0,N143$                     ;
004552        N142$:   CLI     CLIBR,CSAVR4,N1421$               ;SAVE POINTER TO FIRST CHAR. OF ADDRESS
004556        N1421$:  CLI     CLIBR,CEXADR,N1431$               ;GET ADDRESS
004562        N1431$:  CLI     CLIBIF,0,N50$                     ; exit on error
004566                 CLI     CLIBR,0,N143$                     ;
004572        N143$:   CLI     CLIEXI,IDENT                      ;DO "IDENTIFY", EXIT


004574        N145$:   CLI     CLISPA,0,N146$                    ;SKIP LEADING SPACES
```

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004600     N146$:  CLI     <'/>,0,N1461$                     ; PARSE THROUGH OPTIONAL "/"
004604     N1461$: CLI     CLISTR,0,N151$,<'SOURCE'>         ;IS NEXT WORD "SOURCE"
004622             CLI     <'/>,0,N50$                       ;  NEXT CHAR. MUST BE A "/"
004626             CLI     <'N>,0,N1491$                     ;  IS THIS A LOGICAL ADDRESS?
004632             CLI     CLISPA,0,N147$                    ;     YES SKIP SPACES
004636     N147$:  CLI     CLIOCT,0,N50$                     ;     EXTRACT NUMBER, ERROR IF NONE
004642             CLI     CLIBR,BNCLOG,N148$                ;     GET ADDRESS FROM NODE TABLE
004646     N148$:  CLI     CLIBR,SOUADR,N145$                ;     SAVE ADDR. IN SOURCE FILTER AND CONT.
004652     N1491$: CLI     CLIBR,CSAVR4,N149$                ;     SAVE R4
004656     N149$:  CLI     CLIBR,CEXADR,N150$                ;     EXTRACT ADDRESS
004662     N150$:  CLI     CLIBIF,0,N50$                     ;     DON'T CONTINUE IF ERROR
004666             CLI     CLIBR,SOUADR,N145$                ;     SAVE ADDR. IN SOURCE FILTER AND CONT.
004672     N151$:  CLI     CLISTR,0,N156$,<'DESTINATION'>    ;ELSE IS NEXT WORD "DESTINATION"?
004714             CLI     <'/>,0,N50$                       ;  NEXT CHAR. MUST BE A "/"
004720             CLI     <'N>,0,N1541$                     ;  IS THIS A LOGICAL ADDRESS?
004724             CLI     CLISPA,0,N152$                    ;     YES, SKIP SPACES
004730     N152$:  CLI     CLIOCT,0,N50$                     ;     EXTRACT NUMBER, ERROR IF NONE
004734             CLI     CLIBR,BNCLOG,N153$                ;     GET ADDR. FROM NODE TABLE
004740     N153$:  CLI     CLIBR,DESADR,N145$                ;     SAVE ADDR. IN DEST. FILTER AND CONT.
004744     N1541$: CLI     CLIBR,CSAVR4,N154$                ;     SAVE R4
004750     N154$:  CLI     CLIBR,CEXADR,N155$                ;     EXTRACT ADDRESS
004754     N155$:  CLI     CLIBIF,0,N50$                     ;     DON'T CONTINUE IF ERROR
004760             CLI     CLIBR,DESADR,N145$                ;     SAVE ADDR. IN DEST. FILTER AND CONT.
004764     N156$:  CLI     CLISTR,0,N50$,<'PROTOCOL'>        ;ELSE NEXT WORD MUST BE "PROTOCOL" OR ERROR
005004             CLI     <'/>,0,N50$                       ;  NEXT CHAR. MUST BE A "/"
005010             CLI     CLIBR,CSAVR4,N157$                ;  SAVE R4
005014     N157$:  CLI     CLIBR,CEXPRO,N145$                ;  EXTRACT PROTOCOL TYPE AND CONT.

           ;REMAINING COMMAND LINE FOR MESSAGE COMMAND

005020     N160$:  CLI     CLISPA,0,N161$                    ;SKIP LEADING SPACES
005024     N161$:  CLI     <'/>,0,N178$                      ;IF CHAR. "/", CONT., ELSE BR N178$
005030             CLI     CLISTR,0,N170$,<'TYPE'>           ;IS NEXT WORD "TYPE"
005044             CLI     <'=>,0,N50$                       ;  IF YES, FOLLOWED BY "="?
005050             CLI     CLISTR,CALPHA,N162$,<'ASCII'>     ;     IF "ASCII", SET FLAG
005064             CLI     CLIBR,0,N168$                     ;     CONTINUE AT N168$
005070     N162$:  CLI     CLISTR,CONES,N163$,<'ONES'>       ;     IF "ONES", SET FLAG
005104             CLI     CLIBR,0,N168$                     ;     CONTINUE AT N168$
005110     N163$:  CLI     CLISTR,CZEROS,N164$,<'ZEROS'>     ;     IF "ZEROS", SET FLAG
005124             CLI     CLIBR,0,N168$                     ;     CONTINUE AT N168$
005130     N164$:  CLI     CLISTR,C1ALT,N165$,<'1ALT'>       ;     IF "1ALT", SET FLAG
005144             CLI     CLIBR,0,N168$                     ;     CONTINUE AT N168$
005150     N165$:  CLI     CLISTR,C0ALT,N166$,<'0ALT'>       ;     IF "0ALT", SET FLAG
005164             CLI     CLIBR,0,N168$                     ;     CONTINUE AT N168$
005170     N166$:  CLI     CLISTR,CCCITT,N167$,<'CCITT'>     ;     IF "CCITT", SET FLAG
005204             CLI     CLIBR,0,N168$                     ;     CONTINUE AT N168$
005210     N167$:  CLI     CLISTR,CSAVR4,N50$,<'TEXT'>       ;     IF NOT TEXT, ERROR
005224             CLI     <'=>,COPRSL,N50$                  ;     IF "OPERATOR", SET FLAG
005230             CLI     CLIBR,0,N168$                     ;     AND INPUT SPECIFIED STRING
005234     N168$:  CLI     CLIBR,CTYPE,N160$                 ;  DO "TYPE", CHECK FOR MORE INPUT
005240     N170$:  CLI     CLISTR,0,N175$,<'SIZE'>           ;ELSE IS WORD "SIZE"
005254             CLI     CLISPA,0,N1701$                   ; skip spaces
005260     N1701$: CLI     <'=>,0,N50$                       ;  IF YES, FOLLOWED BY "="?
005264             CLI     CLISPA,0,N1702$                   ; skip spaces
005270     N1702$: CLI     CLIDEC,CSIZE,N50$                 ;    STORE NUMBER IN M$SIZE
005274             CLI     CLIBR,0,N160$                     ;  CHECK FOR MORE INFO
005300     N175$:  CLI     CLISTR,0,N176$,<'COPIES'>         ;ELSE IS WORD "COPIES"
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005316                   CLI     CLISPA,0,N1751$                 ; skip spaces
005322          N1751$:  CLI     <'=>,0,N50$                     ;  IF YES, FOLLOWED BY "="?
005326                   CLI     CLISPA,0,N1752$                 ; skip spaces
005332          N1752$:  CLI     CLIDEC,CCPYS,N50$               ;     STORE NUMBER IN M$CPYS
005336                   CLI     CLIBR,0,N160$                   ;  CHECK FOR MORE INFO
005342          N176$:   CLI     CLISTR,NCMPAR,N177$,<'NOCOMPARE'> ; IF NO DATA CHECKING, SET FLAG
005362                   CLI     CLIBR,0,N160$                   ; CONTINUE PROCESSING
005366          N177$:   CLI     CLISTR,0,N178$,<'TEXT'>         ; branch not "text" command?
005402                   CLI     CLISPA,0,N1771$                 ; skip spaces
005406          N1771$:  CLI     <'=>,CSAVR4,N50$                ; error if wrong delimiter
005412                   CLI     CLISPA,0,N1772$                 ; skip spaces
005416          N1772$:  CLI     CLIBR,COPRSL,N1773$             ; get message
005422          N1773$:  CLI     CLIBR,0,N160$                   ; process next command
005426          N178$:   CLI     CLIBR,0,N50$                    ;ELSE "ILL COMMAND"

                ;SECOND KEYWORD FOR RUN COMMAND

005432          N180$:   CLI     CLISPA,0,N181$                  ;SKIP LEADING SPACES
005436          N181$:   CLI     CLISTR,CLUPPR,N182$,<'LOOPPAIR'>        ;IS NEXT WORD "LOOPPAIR"
005456                   CLI     CLIBR,0,N185$                   ;  IF YES, SET "LOOPPAIR" FLAG
005462          N182$:   CLI     CLISTR,CRNALL,N183$,<'ALL'>     ;ELSE IS NEXT WORD "ALL"
005474                   CLI     CLIBR,0,N185$                   ;  IF YES, SET "ALL" FLAG
005500          N183$:   CLI     CLISTR,CDIR,N184$,<'DIRECT'>    ;ELSE IS NEXT WORD "DIRECT"
005516                   CLI     CLIBR,0,N185$                   ;  IF YES, SET "DIRECT" FLAG
005522          N184$:   CLI     CLISTR,CPATRN,N50$,<'PATTERN'>  ;ELSE IS NEXT WORD "PATTERN"
005540          N185$:   CLI     CLIBR,CDEFLT,N186$              ;SEE IF DEFAULT OF 1 PASS
005544          N186$:   CLI     CLISPA,0,N1861$                 ; skip spaces
005550          N1861$:  CLI     <'/>,0,N190$                    ;PARSE THROUGH SWITCH
005554                   CLI     CLISPA,0,N1862$                 ; skip spaces
005560          N1862$:  CLI     CLISTR,0,N50$,<'PASS'>          ; error if not "pass"
[illegible]              CLI     CLISPA,0,N1863$                 ; skip spaces
[illegible]     N1863$:  CLI     <'=>,0,N50$                     ;PARSE THROUGH "="
005604                   CLI     CLISPA,0,N1864$                 ; skip spaces
005610          N1864$:  CLI     CLIDEC,0,N50$                   ;GET PASS COUNT
005614          N190$:   CLI     CLIEXI,CRUN                     ;RUN TEST AND EXIT

                ;REMAINING COMMAND LINE FOR FUNCTION COMMAND

005616          N200$:   CLI     CLISPA,0,N201$                  ; SKIP SPACES
005622          N201$:   CLI     CLIOCT,CFUNCT,N50$              ; GET OCTAL NUMBER AND DO FUNCT
005626                   CLI     CLIEXI,0                        ; EXIT

                ;REMAINING COMMAND LINE FOR UNSAVE COMMAND

005630          N210$:   CLI     CLISPA,CSAVR4,N50$              ; SAVE POINTER TO FILE NAME
005634                   CLI     CLIEXI,CUNSVF                   ; DO UNSAVE FROM FILE AND EXIT


                ;
                ; REST OF BOUNCE COMMAND
                ;
005636          N300$:   CLI     CLISPA,0,N310$                  ; skip spaces
005642          N310$:   CLI     <'/>,0,N50$                     ; error if not correct delimiter
005646          N315$:   CLI     CLISPA,0,N320$                  ; skip spaces
005652          N320$:   CLI     <'N>,0,N331$                    ; error if illegal character
005656          N330$:   CLI     CLIOCT,0,N50$                   ; extract number, error if none
005662                   CLI     CLIBR,BNCLOG,N335$              ; get address from node table
005666          N331$:   CLI     CLIBR,CSAVR4,N332$              ; save r4
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005672                    N332$:  CLI     CLIBR,CEXADR,N335$              ; extract address
005676                    N335$:  CLI     CLIBIF,0,N50$                   ; don't continue if error
005702                            CLI     CLIBR,BOUNCE,N340$              ; put address into buffer
005706                    N340$:  CLI     CLISPA,0,N350$                  ; skip spaces
005712                    N350$:  CLI     054,0,N50$                      ; error if not end and not comma
005716                            CLI     CLIBR,0,N315$                   ; process next input

                          ;*****************************************************************************************
                          ;       THE ERRTBL MACRO IS REQUIRED IF YOU INTEND TO REPORT ERRORS USING
                          ;       THE "ERROR" MACRO.  THE ERRTBL MACRO EXPANDS INTO FOUR WORDS THAT
                          ;       ARE USED BY THE RUNTIME SERVICES DURING AN ERROR CALL: ERROR TYPE,
                          ;       ERROR NUMBER, ADDRESS OF ERROR MESSAGE AND ADDRESS OF MESSAGE
                          ;       BLOCK.  THERE MUST BE ONLY ONE ERRTBL IN ANY PROGRAM.  THIS SECTION
                          ;       IS OPTIONAL.  REMOVE IF IT IF YOU ARE NOT GOING TO USE THE ERROR
                          ;       MACRO.  CHANGE THE POINTER MACRO TO REFLECT THIS SECTION'S DEL-
                          ;       ETION IF YOU REMOVE IT.
                          ;*****************************************************************************************

005722                            ERRTBL
005722  000000            ERRTYP::        .WORD   0
005724  000000            ERRNBR::        .WORD   0
005726  000000            ERRMSG::        .WORD   0
005730  000000            ERRBLK::        .WORD   0
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```
                                     .SBTTL  GLOBAL TEXT SECTION

                                     ;++
                                     ; THE GLOBAL TEXT SECTION CONTAINS FORMAT STATEMENTS,
                                     ; MESSAGES, AND ASCII INFORMATION THAT ARE USED IN
                                     ; MORE THAN ONE TEST.
                                     ;--
               .nlist bin ;;;;;
005732  HELP1:  .ASCIZ  \%N%ACOMMAND SUMMARY FOR THE NETWORK INTERCONNECT EXERCISER (NIE)\
006033  HELP2:  .ASCIZ  \%N%A(it is only necessary to type the letters in brackets)\
006126  HELP3:  .ASCIZ  \%N2%A[H]elp or ?        - types this help text.\
006177  HELP4:  .ASCIZ  \%N2%A[E]xit             - return to the supervisor.\
006250  HELP5:  .ASCIZ  \%N2%A[SH]ow [N]odes     - prints information in current node table.\
006350  HELP6:  .ASCIZ  \%N2%A[SH]ow [M]essage   - prints the selected message type, size and copies.\
006463  HELP7:  .ASCIZ  \%N2%A[SH]ow [C]ounters  - prints the low level counters of the HOST NODE.\
006574  HELP8:  .ASCIZ  \%N2%A[R]un [L]ooppair/Pass=nn - runs the looppair test.\
006664  HELP9:  .ASCIZ  \%N2%A[R]un [A]ll/Pass=nn - runs the node-to-node test.\
006753  HELP10: .ASCIZ  \%N2%A[R]un [D]irect/Pass=nn - runs the loop direct test.\
007044  HELP11: .ASCIZ  \%N2%A[R]un [P]attern/Pass=nn - runs the message pattern test.\
007142  HELP12: .ASCIZ  \%N2%A[M]essage/[T]ype=a/[S]ize=n/[C]opies=m - allows the operator to\
007247  HELP13: .ASCIZ  \%N%Amodify the default message type, size and copy parameters.\
007346  HELP14: .ASCIZ  \%N2%A[N]ode adr - enters a physical address into the node\
007440  HELP15: .ASCIZ  \%N%Atable.\
007453  HELP16: .ASCIZ  \%N2%A[SU]mmary - prints a summary of the test results.\
007542  HELP17: .ASCIZ  \%N2%A[B]uild - builds a table of remote node physical addresses by\
007645  HELP18: .ASCIZ  \%N%Alistening to ID messages on the NI.\
007715  HELP19: .ASCIZ  \%N2%A[C]lear [N]ode/adr - removes the node specified by either adr\
010020  HELP20: .ASCIZ  \%N%Aor node logical name from the node table.\
010076  HELP21: .ASCIZ  \%N2%A[C]lear [N]ode/[Al]l - clears the node table.\
010161  HELP22: .ASCIZ  \%N2%A[C]lear [M]essage - sets all message parameters to default.\
010262  HELP23: .ASCIZ  \%N2%A[C]lear [S]ummary - clears the table of summary test data.\
010362  HELP24: .ASCIZ  \%N2%A[I]dentify adr - uses the request ID function to identify NI nodes.\
010473  HELP25: .ASCIZ  \%N2%A[Sa]ve filename - Saves the contents of the node table to a file\
010601  HELP26: .ASCIZ  \%N2%A[U]nsave filename - restores node table from a file.\
010673  HELP27: .ASCIZ  \%N2%A[L]isten [S]ource/adr/[D]estination/adr/[P]rotocol/protocol type\
011001  HELP28: .ASCIZ  \%N2%A         - listens for frames that pass the specified filters.\
011105  HELP29: .ASCIZ  \%N%S8%ANotes: 1) adr is the physical address of a node on the NI.\
011207  HELP30: .ASCIZ  \%N%S8%A       2) Pass count is a decimal number between 1 and 65534. A default\
011326  HELP31: .ASCIZ  \%N%S8%A          value of 1 is assumed.\
011376  HELP32: .ASCIZ  \%N%S8%A          Specifying -1 causes the test to be run indefinately.\
011505  HELP33: .ASCIZ  \%N%S8%A       3) filename is an xxdp file.\
                .EVEN

011560  OPNERR: .ASCIZ  /%N%A?Unable to Open "%T%A"?/
011614  CLI$PM: .ASCIZ  <12><15>/NIE>/                    ;NIE PROMPT
011623  CLIERM: .ASCIZ  /%N%A?ILL CMD-BAD SYNTAX?/
011654  CLINUF: .ASCIZ  /%N%A?INCOMPLETE COMMAND?/
011705  CLINBG: .ASCIZ  /%N%A?NUMBER TOO BIG?/
011732  CLIBRX: .ASCIZ  /%N%A?BAD RADIX?/
011752  LINHLP: .ASCIZ  /%T%N/
011757  LDRESP: .ASCIZ  /%N%ANODE %T%A HAS RESPONDED./
012014  RECERR: .ASCIZ  /%N%AFRAME RECEIVED WITH DEUNA,DELUA ERROR./
012067  RTRYER: .ASCIZ  /%N%ATRANSMISSION ABORTED -- EXCESSIVE COLLISIONS./
012151  BLDMSG: .ASCIZ  /%N%D2%A Node addresses added, elapsed time: %D2%A minutes./
012244  BLDDON: .ASCIZ  /%N%A Build completed after %D2%A minutes./
012316  ILADMS: .ASCII  /%N%ACannot use Broadcast address (FF-FF-FF-FF-FF-FF)/
012402  ILADM1: .ASCIZ  /%N%Afor loop testing. Address was not added to node table.%N/
```

```
 2020 012477  CADRER: .ASCIZ  /%N%APlease enter twelve hexadecimal digits./
 2021 012553  CPROER: .ASCIZ  /%N%APlease enter four hexadecimal digits./
 2022 012625  NULSTR: .ASCIZ  /%N%AA zero length string was entered./
 2023 012673  NODADR: .ASCIZ  /%N%T/
 2024 012700  DEFADR: .ASCIZ  /%S3%T/
 2025 012706  LOGNAM: .ASCIZ  /%S3%AN%O4/
 2026 012720  NODTYP: .ASCIZ  /%S3%T/
 2027 012726  NETADR: .ASCIZ  /%S3%D2%A.%D3%S4/
 2028 012746  UNA:    .ASCIZ  /%ADEUNA/
 2029 012756  QNA:    .ASCIZ  /%ADEQNA/
 2030 012766  LUA:    .ASCIZ  /%ADELUA/
 2031 012776  CNA:    .ASCIZ  /%ADECNA/
 2032 013006  SCA:    .ASCIZ  /%ADECSA/
 2033 013016  SRV:    .ASCIZ  /%ADECserver/
 2034 013032  UNKNWN: .ASCIZ  /%A?????/
 2035 013042  NTBHDR: .ASCIZ  \%N%A   CURRENT ADR         DEFAULT ADR       NAME    DECnet   DEVICE %N\
 2036 013152  DTBHDR: .ASCIZ  /   CURRENT ADR         DEFAULT ADR      NAME   DEVICE/
 2037 013241  EMPSLT: .ASCIZ  /EMPTY SLOT/<015><012>
 2038 013256  SPACES: .ASCIZ  /      /
 2039 013265  LISHD1: .ASCIZ  \%N%A   DESTINATION           SOURCE         PROT TYPE    CHAR COUNT\
 2040 013371  LISHD2: .ASCIZ  /%S3%A# OF RECEIPTS%N/
 2041 013416  NEWLI1: .ASCIZ  /%N/
 2042 013421  NEWLI2: .ASCIZ  <015><012>
 2043 013424  DADDR:  .ASCIZ  /%N%T/
 2044 013431  SADDR:  .ASCIZ  /%S3%T/
 2045 013437  PTYPE:  .ASCIZ  /%S6%T/
 2046 013445  CHARAC: .ASCIZ  /%S6%D4/
 2047 013454  LCOUNT: .ASCIZ  /%S11%D6/
 2048 013464  LFMSG:  .ASCIZ  /%N2%AListen log was filled after %D2%A minutes %D2%A seconds%N/
 2049 013563  LEMSG:  .ASCIZ  /%N2%AListen log is empty!/
 2050 013615  ALEMPT: .ASCIZ  /%N2%AAddress list is empty, also./
 2051 013657  ALHDR:  .ASCIZ  /%N2%A SOURCE ADDRESS        COUNT%N/
 2052 013723  AADDR:  .ASCIZ  /%N%T%S4%D6/
 2053 013736  LTMSG:  .ASCIZ  /%N2%ATotal elapsed listen time: %Z2%A:%Z2%A.  Listen commands: %D2/
 2054 014041  TABFUL: .ASCIZ  /%N%AThe %T%A table is filled to capacity!/
 2055 014113  TABEMT: .ASCIZ  /%N%AThe %T%A table is currently empty!/
 2056 014162  NOD:    .ASCIZ  /NODE/
 2057 014167  SUMM:   .ASCIZ  /SUMMARY/
 2058 014177  CLRMSG: .ASCIZ  /%N%AThe message parameters have been reset to:/
 2059 014256  CPYLMT: .ASCIZ  /%N%AThe number of copies must be between 1 and 255./
 2060 014342  SIZLMT: .ASCIZ  /%N%AThe message size [data] must be between 32 and 1466 bytes./
 2061 014441  NOCMPR: .ASCIZ  /%N%AThe address marked for deletion was not in the table./
 2062 014533  UNBOND: .ASCIZ  /%N%AAn unbounded "operator input" string was entered./
 2063 014621  ADRDEL: .ASCIZ  /%N%AThe address has been deleted from the node table./
 2064 014707  LOGDEL: .ASCIZ  /%N%ANode N%O4%A has been deleted from the node table./
 2065 014775  NTBLOV: .ASCIZ  /%N%ANode table too small for all input - table truncated/
 2066 015066  TABCLR: .ASCIZ  /%N%AThe %T%A table has been cleared./
 2067 015133  UNSMSG: .ASCIZ  /%N%AThe node table has been %T/
 2068 015172  SAVED:  .ASCIZ  /SAVED./
 2069 015201  RESTOR: .ASCIZ  /RESTORED./
 2070 015213  MSGPRM: .ASCIZ  /%N%AThe current message parameters are:/
 2071 015263  MSG1:   .ASCIZ  /%N%AThe collection of all node addresses could take as long as 40 minutes,/
 2072 015376  MSG11:  .ASCIZ  /%N%Ahowever, if no new nodes are added to the table for a 10 minute period/
 2073 015511  MSG12:  .ASCIZ  /%N%Athe collection will stop.%N/
 2074 015551  MSG2:   .ASCIZ  /%N%AYOU ENTERED NODE: %T/
 2075 015602  MSG3:   .ASCIZ  /%N%ATHE SPECIFIED ADDRESS IS: %T/
 2076 015643  MSG4:   .ASCIZ  /%N%ATYPE=%T%A,SIZE=%D4%A,COPIES=%D3/
```

```
                        .EVEN
015710  HDMSG1: .ASCIZ  /%N%A ETHERNET DEFAULT ADDRESS (HEX):  %T/
015761  HDMSG2: .ASCIZ  /%N2%A ROM MICROCODE VERSION (DECIMAL): %D3/
016034  HDMSG3: .ASCIZ  /%N2%A SWITCH PACK SET FOR :/
016070  HDMSG4: .ASCIZ  /%N%A         REMOTE AND POWER UP BOOT ENABLED/
016145  HDMSG5: .ASCIZ  /%N%A         REMOTE BOOT ENABLED WITH ROM/
016216  HDMSG6: .ASCIZ  /%N%A         REMOTE BOOT ENABLED/
016256  HDMSG7: .ASCIZ  /%N%A         REMOTE BOOT DISABLED/
016317  HDMSG8: .ASCIZ  /%N%A         SELF TEST LOOP ENABLED/
016362  HDMSG9: .ASCIZ  /%N%A         SELF TEST LOOP DISABLED/
                .EVEN
        ;
        ;       TEST MESSAGES AND ARGUMENTS
        ;

016426  PASABT: .ASCIZ  /%N%A PASS ABORTED!/
016451  TSTMS1: .ASCIZ  /%N%T%A TEST -- /
016471  TSTMS2: .ASCIZ  /%N%T%A Node: %AN%04%N/
016517  TSTMS3: .ASCIZ  /%T%A ERROR/
016532  TSTMS4: .ASCIZ  /%N%T%A Node: %AN%04%A %T%A Node: %AN%04/
016602  OK:     .ASCIZ  /%A - Response ok%N/
016625  OKRE:   .ASCIZ  /%N%A - Receive assist - response ok%N/
016673  OKTR:   .ASCIZ  /%N%A - Transmit assist - Response ok%N/
016742  OKFU:   .ASCIZ  /%N%A - Full assist - Response ok%N/
017005  MESPAT: .ASCIZ  /%N%AERROR OCCURED WITH %T%A MESSAGE TYPE/
017056  MESPA1: .ASCIZ  /%A Data Pattern: %T/
017102  ALLNOD: .ASCIZ  /ALL NODE/
017113  LUPAIR: .ASCIZ  /LOOPPAIR/
017124  DIRECT: .ASCIZ  /LOOP DIRECT/
017140  FULAST: .ASCIZ  /FULL ASSIST/
017154  TRAST:  .ASCIZ  /TRANSMIT ASSIST/
017174  RECAST: .ASCIZ  /RECEIVE ASSIST/
017213  PATTRN: .ASCIZ  /MESSAGE PATTERN/
017233  NORESP: .ASCIZ  /NO RESPONSE/
017247  RETRY:  .ASCIZ  /EXCESSIVE COLLISION/
017273  LENGTH: .ASCIZ  /LENGTH/
017302  COMPAR: .ASCIZ  /DATA COMPARISON/
                .EVEN

017322  MSGTY0: .ASCIZ  /ASCII/                 ;MESSAGE TYPES
017330  MSGTY1: .ASCIZ  /ONES/
017335  MSGTY2: .ASCIZ  /ZEROS/
017343  MSGTY3: .ASCIZ  /1ALT/
017350  MSGTY4: .ASCIZ  /0ALT/
017355  MSGTY5: .ASCIZ  /CCITT/
017363  MSGTY6: .ASCIZ  /TEXT/
017370  CMDTY1: .ASCIZ  /EXIT/                  ;COMMAND TYPES
017375  CMDTY2: .ASCIZ  /SUMMARY/
017405  CMDTY3: .ASCIZ  /BUILD/
017413  CMDTY4: .ASCIZ  /SHOW/
017420  CMDTY5: .ASCIZ  /RUN/
017424  CMDTY6: .ASCIZ  /MESSAGE/
017434  CMDTY7: .ASCIZ  /NODE/
017441  CMDTY8: .ASCIZ  /CLEAR/
017447  CMDTY9: .ASCIZ  /REQUEST ID/
017462  ARGTY1: .ASCIZ  /NODES/                 ;ARGUMENT TYPES
017470  ARGTY2: .ASCIZ  /MESSAGES/
```

```
017501  ARGTY3: .ASCIZ  /COUNTERS/
017512  ARGTY4: .ASCIZ  /LOOPPAIR/
017523  ARGTY5: .ASCIZ  /ALL/
017527  ARGTY6: .ASCIZ  /Assist/
017536  ARGTY7: .ASCIZ  /Target/
                .EVEN

        ;
        ;       UNA COUNTER INFORMATION MESSAGES
        ;

017546  cntr00: .asciz  /%N%S5%ACONTENTS OF NODE %T%A INTERNAL COUNTERS:/
017626  cntr01: .asciz  /%N2%ASECONDS SINCE LAST ZEROED:%S15%Z5/
017675  cntr02: .asciz  /%N%AFRAMES RECEIVED:%S20%T/
017730  cntr03: .asciz  /%N%AMULTICAST FRAMES RECEIVED:%S10%T/
017775  cntr04: .asciz  /%N%AFRAMES REC'D WITH ERROR - BITMAP:%S10%B3/
020052  cntr05: .asciz  /%N%AFRAMES RECEIVED WITH ERROR:%S14%Z5/
020121  cntr06: .asciz  /%N%ADATA BYTES RECEIVED:%S16%T/
020160  cntr07: .asciz  /%N%AMULTICAST DATA BYTES RECEIVED:%S6%T/
020230  cntr08: .asciz  /%N%ARECEIVED FRAMES LOST-INTERNAL:%S11%Z5/
020302  cntr09: .asciz  /%N%ARECEIVED FRAMES LOST -LOCAL:%S13%Z5/
020352  cntr10: .asciz  /%N%AFRAMES TRANSMITTED:%S17%T/
020410  cntr11: .asciz  /%N%AMULTICAST FRAMES TRANSMITTED:%S7%T/
020457  cntr12: .asciz  /%N%AFRAMES TRANSMITTED 3+ TRYS:%S9%T/
020524  cntr13: .asciz  /%N%AFRAMES TRANSMITTED 2 TRYS:%S10%T/
020571  cntr14: .asciz  /%N%AFRAMES DEFFERED:%S20%T/
020624  cntr15: .asciz  /%N%ADATA BYTES TRANSMITTED:%S13%T/
020666  cntr16: .asciz  /%N%AMULTICAST BYTES TRANSMITTED:%S8%T/
020734  cntr17: .asciz  /%N%ATRANSMIT FRAMES ABORTED-BITMAP:%S9%B6/
021006  cntr18: .asciz  /%N%ATRANSMIT FRAMES ABORTED:%S17%Z5/
021052  cntr19: .asciz  /%N%AXMIT COLLISION CHECK FAILURE:%S12%Z5/
021123  cntr20: .asciz  /%N%APORT DRIVER ERRORS:%S22%Z5/
021162  cntr21: .asciz  /%N%ABABBLE COUNTER:%S26%Z5/

        ;
        ;       ERROR MESSAGES FOR DEUNA/DELUA DRIVER
        ;

021215  emsg01: .asciz  /DELUA,DEUNA PORT COMMAND ERROR/
021254  emsg02: .asciz  /DELUA,DEUNA FATAL ERROR/
021304  emsg03: .asciz  /UNEXPLAINED DELUA,DEUNA INTERRUPT/
021346  emsg04: .asciz  /UNKNOWN DELUA,DEUNA ERROR/
021400  emsg05: .asciz  /DELUA,DEUNA WON'T READ PCB ADDRESS/
021443  emsg06: .asciz  /UNABLE TO READ PHYSICAL ADDRESS/
021503  emsg07: .asciz  /DELUA,DEUNA WILL NOT GO INTO RUNNING STATE/
021556  emsg08: .asciz  /TIMEOUT!--TRANSMIT FLAG NOT SET/
021616  emsg09: .asciz  /PDMD PORT COMMAND ERROR/
021646  emsg10: .asciz  /TRANSMIT RING BOOKKEEPING ERROR/
021706  emsg14: .asciz  /MESSAGE SIZE TOO BIG FOR MAX. FRAME LENGTH/
021761  emsg15: .asciz  /DNI DID NOT SET FROM RESET/
022014  emsg16: .asciz  /DELUA,DEUNA WILL NOT READ DESCRIPTOR RINGS/
022067  emsg18: .asciz  /CAN'T GET INITIAL STATUS INFO FROM DELUA,DEUNA/
022146  emsg19: .asciz  /MESSAGE DATA COMPARISON ERROR/
022204  emsg20: .asciz  /TOTAL DATA COMPARE ERRORS/
022236  emsg22: .asciz  /NO RESPONSE FROM NODE./
022265  emsg23: .asciz  /ERROR WHILE ATTEMPTING TO WRITE MODE/
022332  emsg24: .asciz  /TRANSMIT ERROR, ALL FRAMES NOT TRANSMITTED/
```

```
022405  emsg25: .asciz  /ERROR WHILE ATTEMPTING TO WRITE MULTICAST ADDRESS LIST/
022474  emsg26: .asciz  /TRANSMIT LOOP DIRECT FAILED/
022530  emsg30: .asciz  /ERROR WHILE ATTEMPTING PORT FUNCTION/
022575  emsg31: .asciz  /UNABLE TO READ INTERNAL COUNTERS/
022636  emsg33: .asciz  /TIMEOUT ERROR/
022654  emsg34: .asciz  <15><12>/TIMEOUT OCCURED BEFORE LOOPBACK REPLY/
022724  emsg35: .asciz  /%AFAILING NODE ADDRESS: %T%N/
022761  emsg36: .asciz  /%ADATA PATTERN: %T%N/
023006  EMSG37: .ASCIZ  /%AFAILING TARGET NODE ADDRESS: %T%N/
023052  EMSG38: .ASCIZ  /%AFAILING ASSIST NODE ADDRESS: %T%N/
023116  EMSG41: .ASCIZ  <15><12>/TIMEOUT OCCURED - TRANSMIT FAILED/
023162  EMSG42: .ASCIZ  <15><12>/TIMEOUT OCCURED - RECEIVE FAILED/
023225  EMSG43: .ASCIZ  /DELUA,DEUNA RAN OUT OF RECEIVE BUFFERS/
023274  EMSG44: .ASCIZ  /ERROR CONVERTING HEX TEXT TO BINARY/
023340  EMSG45: .ASCIZ  /%N%ATOO MUCH DATA FOR BOUNCE/
023375  EMSG46: .ASCIZ  /%N%ANO ADDRESS FOR LOGICAL NODE NAME/
023442  EMSG47: .ASCIZ  /DELUA,DEUNA WOULD NOT ENTER READY STATE/
023512  EMSG48: .ASCIZ  <15><12>/LOOP DIRECT FAILED/
023537  EMSG49: .ASCIZ  /TRANSMIT FAILED AFTER THREE ATTEMPTS -- ETHERNET EXTREMELY LOADED/
023641  EMSG50: .ASCIZ  /FATAL DEVICE ERROR WHILE ATTEMPTING TRANSMIT/
023716  EMSG51: .ASCIZ  /BAD CLOCK - PROGRAM WILL HANG ON "TIMEOUT"!!/
023773  EMSG52: .ASCIZ  /CAN'T READ DEVICE'S PHYSICAL ADDRESS/
024040  EMSG53: .ASCIZ  /CAN'T READ ROM VERSION NUMBER/
024076  EMSG54: .ASCIZ  /STACK OVERFLOW ERROR - CRASH!/
        .even

        ;--+
        ;       Descriptions of generic fields of system ID messages
        ;--+
024134  simsg1: .asciz  /%N%ACURRENT HARDWARE ADDRESS:          %T/
024206  simsg2: .asciz  /%N%AReceipt number:                    %06/
024261  simsg3: .asciz  /%N%AMaintenance version:               %Z2/
024334  simsg4: .asciz  /%N%AECO:                               %Z2/
024407  simsg5: .asciz  /%N%AUser ECO:                          %Z2/
024462  simsg6: .asciz  /%N%AFunction:                          %02/
024535  simsg7: .asciz  /%N%ADevice:                            /
024605  simsg8: .asciz  /%N%AConsole User Address:              %T/
024657  simsg9: .asciz  /%N%AReservation Timer:                 %06/
024732  smsg10: .asciz  /%N%AConsole Command Size:              %06/
025005  smsg11: .asciz  /%N%AConsole Response Size:             %06/
025060  smsg12: .asciz  /%N%ADEFAULT HARDWARE ADDRESS:          %T/
025132  smsg13: .asciz  /%N%%ASystem Time:                      %06%06%06%06%06/


        ;--+
        ;       Poseidon Specific fields of a system ID message
        ;--+
025221  posds:  .asciz  /%N2%ADiagnostic Status/
025250  posds0: .asciz  /%N%A           WORD 0:                 %06%A(0)/
025330  posds1: .asciz  /%N%A           WORD 1:                 %06%A(0)/
025410  possn:  .asciz  /%N%AServer Number:                     %06%A(0)/
025470  posrvn: .asciz  /%N%ARom Version Number:                /
025540  possvn: .asciz  /%N%ASoftware Version Number:           /
025610  posnam: .asciz  /%N%AServer Name:                       /
025660  posloc: .asciz  /%N%AServer Location:                   /
025730  posstr: .asciz  /%T/
```

```
        .even
025734  PCMSG:: .asciz  /%N%APC OF CALLING ROUTINE = %O6/
        .even
025774  cmperh: .asciz  /%N%ACOMPARE ERRORS IN LOOP MESSAGE%N2/
026042  cmper1: .asciz  /%N%AWord number:%D4%A(D) Expected=%O6%A(O)/
026115  cmper2: .asciz  /%A Recieved=%O6%A(O)/
026142  cmper3: .asciz  /%N%ATotal mismatches in message = %D4/
026210  lgerms: .asciz  /%N%ALength Error -- Bytes Expected: %O6%A Bytes Received: %O6/
026306  summs1: .asciz  /%N%A     NODE       RECEIVES RECEIVES NOT LENGTH COMPARE  BYTES        BYTES/
026426  summs2: .asciz  /%N%A   ADDRESS      COMPLETE   COMPLETE  ERRORS ERRORS COMPARED    TRANSFERRED%N/
026553  summs3: .asciz  /%N%T%S2%Z5%S7%Z5%S5%Z5/
026602  summs5: .asciz  /%S2%Z5%S2%T/
026616  summs6: .asciz  /%S2%T/
        .even
                              .list bin ;;;;;
```

```
                                .SBTTL  GLOBAL ERROR REPORT SECTION

                                ;++
                                ; THE GLOBAL ERROR REPORT SECTION CONTAINS MESSAGE PRINTING AREAS
                                ; USED BY MORE THAN TEST TO OUTPUT ADDITIONAL ERROR INFORMATION.  PRINTB
                                ; (BASIC) AND PRINTX (EXTENDED) CALLS ARE USED TO CALL PRINT SERVICES.
                                ;--


026624                          BGNMSG  ERR1
026624                                  PRINTX  #PCMSG,PCCALL
026650                                  DOCLN
026652                          ENDMSG

026654                          BGNMSG  ERR2
026654  010146                          MOV     R1,-(SP)
026656  013701  001170'                 MOV     P$TYPE,R1
026662  006301                          ASL     R1
026664  062701  001414'                 ADD     #MSGTAB,R1
026670                                  PRINTX  #EMSG35,#STRBUF
026714                                  PRINTX  #EMSG36,(R1)
026736  012601                          MOV     (SP)+,R1
026740                          ENDMSG

026742                          BGNMSG  ERR3
026742                                  PRINTX  #EMSG37,#STRBUF
026766                                  PRINTX  #EMSG38,#STRBU1
027012                          ENDMSG

                                ;*****************************************************************************
                                ;       THESE MESSAGE AREAS ARE USED TO OUTPUT SUPPLEMENTARY INFORMATION
                                ;       AFTER AN ERROR CALL.  THEY ARE INVOKED BY APPENDING THE NAME
                                ;       OF THE AREA TO AN ERROR CALL:  ERRXXX 1,ERRORMESSAGE,AREANAME.
                                ;       THE CORRESPONDING MESSAGE AREA IS SET UP IN THIS SECTION:
                                ;               BGNMSG  AREANAME
                                ;               [CODE]
                                ;               ENDMSG
                                ;
                                ;       THE AREAS IN THIS SECTION ARE FOR MESSAGES USED IN MORE THAN ONE
                                ;       TEST.  USE THE PRINTB (PRINT BASIC) AND PRINTX (PRINT EXTENDED)
                                ;       MACROS.
                                ;*****************************************************************************
```

```
.SBTTL  GLOBAL SUBROUTINES SECTION

;++
; THE GLOBAL SUBROUTINES SECTION CONTAINS THE SUBROUTINES
; THAT ARE USED IN MORE THAN ONE TEST.
;--

;++
; FUNCTIONAL DESCRIPTION:
;    SUBROUTINE TO....

;**********************************************************************************
;       COMPLETE THE "SUBROUTINE TO...." STATEMENT WITH A FUNCTIONAL
;       DESCRIPTION OF THIS SUBROUTINE.
;**********************************************************************************

; INPUTS:

;**********************************************************************************
;       LIST THE INPUT DATA THAT ARE EXPLICITLY PASSED TO THIS SUBROUTINE.
;**********************************************************************************

; IMPLICIT INPUTS:

;**********************************************************************************
;       LIST THE INPUT DATA THAT ARE IMPLICITLY USED BY THIS SUBROUTINE;
;       FOR EXAMPLE, DATA READ FROM COMMON AREAS.
;**********************************************************************************

; OUTPUTS:

;**********************************************************************************
;       LIST THE OUTPUT DATA THAT ARE EXPLICITLY GIVEN BY THIS SUBROUTINE
;**********************************************************************************

; IMPLICIT OUTPUTS:

;**********************************************************************************
;       LIST THE OUTPUT DATA THAT ARE IMPLICITLY GIVEN BY THIS SUBROUTINE;
;       FOR EXAMPLE, DATA STORED IN COMMON AREAS.
;**********************************************************************************

; SUBORDINATE ROUTINES USED:

;**********************************************************************************
;       LIST THE SUBROUTINES CALLED BY THIS SUBROUTINE.
;**********************************************************************************

; FUNCTIONAL SIDE EFFECTS:

;**********************************************************************************
;       DESCRIBE ANY EFFECTS THIS SUBROUTINE MAY HAVE UPON OTHER
;       MODULES OF THE DIAGNOSTIC PROGRAM.  AN EXAMPLE OF THIS IS
;       THE SUBROUTINE INHIBITS ALL INTERRUPTS WITH PRIORITY 7.
;**********************************************************************************

; CALLING SEQUENCE:
```

```

                                ;**********************************************************************
                                ;        GIVE THE EXACT CALLING SEQUENCE USED TO ACCESS THIS SUBROUTINE.
                                ;        FOR EXAMPLE:    MOV COUNT,R1     ;MOVE INPUT TO R1
                                ;                        JSR     PC,ROUTINE       ;GO TO ROUTINE
                                ;                        BCS     ERROR            ;CARRY SET IF ROUTINE HAD ERROR
                                ;**********************************************************************
                                ;--

                                ;**********************************************************************
                                ;      INSERT THE CODE FOR THIS SUBROUTINE.   THE NAME OF THE SUBROUTINF SHOULD
                                ;      BE DEFINED WITH A DOUBLE-COLON (::);  THIS WILL MAKE THE SUBROUTINE GLOBAL.
                                ;**********************************************************************

                                ;**********************************************************************
                                ;      BEGIN EACH SUBROUTINE AT THE TOP OF A NEW PAGE.
                                ;**********************************************************************

                                .SBTTL  CLKSET  Clock Setup Subroutine

                                ;--+
                                ; Functional Description:
                                ;               This subroutine sets up the clock information table following
                                ;               a "CLOCK" call executed in the initialization code.  But since
                                ;               the "CLOCK" call says nothing about an LSI-11's clock, the
                                ;               routine is only used if a line or P-Clock is found.
                                ;
                                ; Inputs - Implicit -
                                ;               R1 - Points to supervisor space where clock info was returned
                                ;               R2 - Points to "CLK" table where clock info will be kept
                                ;
                                ; Outputs - Implicit -
                                ;               "CLKCSR" gets loaded with the clock's CSR address
                                ;               "CLKBR" gets loaded with the clock's interrupt level
                                ;               "CLKVEC" gets loaded with the clock's interrupt vector
                                ;               "CLKHZ" gets loaded with the line freq. (in Hertz)
                                ;
                                ; Calling Procedure: JSR        PC,CLKSET
                                ;
                                ; Side effects - none
                                ;
                                ; Subordinate Routines - none
                                ;
                                ; Register Usage
                                ;               R1 - Points to supervisor space where clock info was returned
                                ;               R2 - Points to "CLK" table where clock info will be kept
                                ;
                                ;--+
027014                          CLKSET::
027014  012122                          mov     (R1)+,(R2)+             ; Load clock's CSR addr. into "CLKCSR"
027016  012112                          mov     (R1)+,(R2)              ; Load clock's intr. level into "CLKBR"
027020  006312                          asl     (R2)                    ; Adjust the intr. level for loading
027022  006312                          asl     (R2)                    ;   into the PSW with a "SETVEC" call
027024  006312                          asl     (R2)
027026  006312                          asl     (R2)
027030  006322                          asl     (R2)+
027032  012122                          mov     (R1)+,(R2)+             ; Load clock's intr. vector into "CLKVEC"
```

```
027034  012122                          mov     (R1)+,(R2)+             ; Load clock's freq. into "CLKHZ'
027036  000207                          rts     PC
```

```

                                        .sbttl  CLKINT  Clock Interrupt Servide Routine

                                        ;- +
                                        ; Functional Description:
                                        ;              This is the clock interrupt service routine which takes care
                                        ;              of keeping the "time-since-start" and counting down any of the
                                        ;              "event" timers.  The timers are used to time completion of
                                        ;              device requests.  The "time-since-start" is used to be logged
                                        ;              with each entry into the event log.
                                        ;
                                        ; Inputs - Implicit -
                                        ;              TIMTCK - The current no. of ticks left to be counted until
                                        ;                       a second has been counted off
                                        ;              CLKHZ -  The no. of ticks in a second, determined by the
                                        ;                       sys. line freq.
                                        ;              TIMMIN & TIMSEC - Current value of "time-since-start" in
                                        ;                       minutes and seconds
                                        ;              TIMER 1,2 and S - Current values of "event timers"
                                        ;
                                        ; Outputs - Implicit -
                                        ;              New value of event timer "1" & "2" decremented by 1 tick
                                        ;              if it was non-zero
                                        ;              New value of event timer "S" decremented by 1 second if it
                                        ;              was non-zero
                                        ;
                                        ; Calling procedure : This routine is entered upon clock interrupt
                                        ;
                                        ; Side effects -
                                        ;              The clock is disabled upon entry and reenabled when leaving
                                        ;
                                        ; Subordinate Routines - none
                                        ;
                                        ; Register Usage - none
                                        ;
                                        ;--+

 027040                                         BGNSRV  CLKINT

 027040  005077  152762                         clr     @CLKCSR                 ; disable the clock from interrupting
 027044  005337  002044'                        dec     TIMTCK                  ; decrement the no. of ticks/sec
 027050  001015                                 bne     1$                      ; go check timers
 027052  013737  002034' 002044'                mov     CLKHZ,TIMTCK            ; reset the no. of ticks/sec.
 027060  005237  002042'                        inc     TIMSEC                  ; inc. no of secs-since-start
 027064  022737  000074  002042'                cmp     #60.,TIMSEC             ; see if we've counted 60 sec.s yet
 027072  001004                                 bne     1$                      ; if not, go check timers
 027074  005237  002040'                        inc     TIMMIN                  ;  else, inc. minutes-since-start
 027100  005037  002042'                        clr     TIMSEC                  ;  and restart second counter

 027104  005737  002046'                1$:     tst     TIMER1                  ; see if TIMER1 timing anything
 027110  001402                                 beq     2$                      ;  if=0, no, check next timer
 027112  005337  002046'                        dec     TIMER1                  ;  else decrement the timer value (by 1 tick)
 027116  005737  002050'                2$:     tst     TIMER2                  ; see if TIMER2 timing anything
 027122  001402                                 beq     3$                      ;  if=0, no, check next timer
 027124  005337  002050'                        dec     TIMER2                  ;  else decrement timer value (by 1 tick)
 027130  005737  002052'                3$:     tst     TIMERS                  ; see if TIMERS timing anything
 027134  001406                                 beq     4$                      ;  if=0, nothing be timed, leave
```

```
027136  023737  002034' 002044'         cmp     CLKHZ,TIMTCK            ; see if a second has been counted off
027144  001002                          bne     4$                      ;  br if no
027146  005337  002052'                 dec     TIMERS                  ;  else, decrement timer value (by 1 sec.)
027152  013777  002036' 152646  4$:     mov     CLKEN,@CLKCSR           ; reenable the clock to interrupt
027160                                  ENDSRV


                                .SBTTL  PREG14  Preserve Registers 1 through 4 across subroutine calls
                                ;- +
                                ; Functional Description:
                                ;               This routine is a relocatable module designed to preserve
                                ;               registers 1 through 4 across subroutine calls.  It saves
                                ;               these registers and then does a JSR to the routine specified
                                ;               in the "CALL".
                                ;
                                ; Inputs - Implicit
                                ;               The address of the routine to "CALL" relative to the "ANCHOR"
                                ;               label is located in the word following the JSR to this routine
                                ;
                                ; Outputs - None
                                ;
                                ; Calling Procedure: This routine is used implicitly by the "CALL" macro.
                                ;               The macro expands to the following:
                                ;
                                ;                       JSR     R4,PREG14
                                ;                       .WORD   [subroutine name]-ANCHOR
                                ;
                                ; Side effects - None
                                ;
                                ; Subordinate Routines -
                                ;               The routine specified in the "CALL" macro is called.
                                ;
                                ; Register Usage -
                                ;               R1 - used to form the absolute address of the call
                                ;               R4 - link register in call to this routine
                                ;               SP - registers 1 through 4 are saved on the stack
                                ;
                                ;--+

027162                          PREG14::
027162  010346                          MOV     R3,-(SP)        ;Push R3, R2, R1
027164  010246                          MOV     R2,-(SP)        ;
027166  010146                          MOV     R1,-(SP)        ;

027170  010437  003124'                 MOV     R4, PCCALL
027174  012401                          MOV     (R4)+,R1        ;Get the relative address of the called
                                                                ;routine.
027176  060701                          ADD     PC,R1           ;Make it an absolute address.

027200  010446                  ANCHOR: MOV     R4,-(SP)        ;Save the return to the calling routine.

027202  022706  001000                  CMP     #1000,SP        ; Don't allow the stack to crush ...
                                                                ; ... floating vector space
027206  103404                          BLO     1$              ;
027210                                  ERRSF   1,EMSG54,ERR1   ; print stack overflow error ... and depart!

027220  004711                  1$:     JSR     PC,(R1)         ;Call the specified routine.
```

```

027222  012604                          MOV     (SP)+,R4        ;Restore the return to the calling routine.

027224  012601                          MOV     (SP)+,R1        ;Restore the registers.
027226  012602                          MOV     (SP)+,R2        ;
027230  012603                          MOV     (SP)+,R3        ;
027232  000204                          RTS     R4              ;Back to the calling routine.


```

```

                                .sbttl  WAIT    Wait For DEUNA/DELUA Interrupt with Timeout

                                ;++
                                ; Functional Description:
                                ;               This routine is called to wait for the Done Interrupt bit (DNI)
                                ;               of PCSR0 to be set signifying the completion of a port command.
                                ;               If the DEUNA/DELUA reports some sort of error, ERRFLG will
                                ;               have been raised in the interrupt service routine.   In this
                                ;               case the error reporting routine will be called.
                                ;
                                ; Inputs - none
                                ;
                                ; Outputs -
                                ;               P1:     success/failure      0=success/-1=failure
                                ;
                                ; Calling Procedure:
                                ;               call    wait
                                ;               p$pop   p1
                                ;
                                ; Side effects - none
                                ;
                                ; Subordinate routines -
                                ;               ERROR - error reporting routine
                                ;
                                ; Register Usage -
                                ;               R2 - used to hold return status
                                ;               R4 - address of word that contains timer value
                                ;--

027234  012703  000012          WAIT::  mov     #10.,R3                 ; move no. of counts to R3
027240  012704  002046'                 mov     #timer1,R4              ;  and timer to be used to R4
027244  005002                          clr     r2                      ;local STATUS parameter
027246  010314                          mov     r3,(r4)                 ;set number of ticks. (global)
027250  005737  003020'         1$:     tst     errflg                  ;check if error occured
027254  001011                          bne     3$                      ; br if yes
027256  005737  003012'                 tst     dniflg                  ;check for dni interrupt
027262  001403                          beq     2$                      ; br if interrupt received
027264  005037  003012'                 clr     dniflg
027270  000410                          br      6$
027272  005714                  2$:     tst     (r4)                    ;has timer expired?
027274  001365                          bne     1$                      ; br if no to wait for interrupt
027276  000403                          br      5$                      ;br to 5$
027300                          3$:     call    ERROR                   ;call error routine
027306  012702  177777          5$:     mov     #-1,r2                  ;indicate failure
027312                          6$:     return  r2                      ;return with success/failure indication

                                .sbttl  ERROR   Handle UNA interrupt errors

                                ;--+
                                ; Functional Description:
                                ;               This subroutine checks the error flags set by
                                ;               UNAISR the interrupt service routine and prints
                                ;               out the approriate error messsages.
                                ;
                                ; Inputs - implicit -
                                ;               error flags should be set by UNAISR routines.
                                ; Outputs - implicit -
                                ;               error messages are printed out to the operator console.
                                ;
                                ; calling sequence:
                                ;               call ERROR
                                ;
                                ; Side effects -
                                ;               1.) error flags that were set in UNAISR are cleared here.
                                ;               2.) errors will be reported at the user's terminal
                                ;               3.) the diagnostic will be exited
                                ;
                                ; Subordinate routines -
                                ;               ERR1 - extended error report
                                ;
                                ;--+

027316  005337  003020'         ERROR:: dec     errflg                  ;decriment error counter to show
                                                                        ;that it has been handled
027322  005737  003004'                 tst     pceflg                  ;see if port command error
027326  001016                          bne     5$                      ; if yes, branch
027330  005737  003002'                 tst     fatflg                  ;see if UNA fatal error
027334  001022                          bne     10$                     ; if yes, branch
027336  005737  003016'                 tst     bcount                  ;see if unexplained interrupt
027342  001026                          bne     15$                     ; if yes, branch
027344  005737  003014'                 tst     rbfcnt                  ; receive buffers unavailable?
027350  001032                          bne     18$                     ; branch if yes
027352                                  errdf   2,emsg04,err1           ;else unknown error
027362  000433                          br      20$                     ; exit

027364  005337  003004'         5$:     dec     pceflg                  ; indicate that it was handled
027370                                  errdf   3,emsg01,err1           ;port command error
027400  000424                          br      20$                     ; exit

027402  005337  003002'         10$:    dec     fatflg                  ; keep up on book keeping
027406                                  errdf   4,emsg02,err1           ;UNA fatal error
027416  000415                          br      20$                     ; exit

027420  005337  003016'         15$:    dec     bcount                  ; book keeping
027424                                  errdf   5,emsg03,err1           ;unexplained interrupt
027434  000406                          br      20$                     ; exit

027436  005337  003014'         18$:    dec     rbfcnt
027442                                  errdf   6,emsg43,err1           ; report it

027452                          20$:    return                          ;return

                                ;--+
                                ; Name - DEVSTART                       Start the DELUA/DEUNA
                                ;
                                ; Functional Description:
                                ;               This routine is called to start up the DELUA/DEUNA.
                                ;               The transmit and receive rings will be reset with their
                                ;               associated pointers reset to the beginnings of their
                                ;               respective rings.  This is done because when given a
                                ;               start port command, the DELUA or DEUNA will reset its
                                ;               pointers to the host rings.
                                ;                       After resetting the rings, a START port command
```

```
                                  ;               will be issued, causing the DELUA/DEUNA to transition to
                                  ;               the running state.
                                  ;
                                  ; Inputs - none
                                  ;
                                  ; Outputs - none
                                  ;
                                  ; Calling Procedure: CALL DEVSTART
                                  ;
                                  ; Side Effects -
                                  ;               1.) transmit and receive rings are reset, and
                                  ;               2.) the DELUA/DEUNA is in the running state
                                  ;
                                  ; Subordinate Routines - none
                                  ;
                                  ; Register Usage -
                                  ;               R1 - pointer to transmit and receive rings
                                  ;               R2 - scratch
                                  ;
                                  ;--+
027454                            DEVSTART:
                                  ;--+
                                  ;       Reset transmit and receive ring pointers
                                  ;--+
027454  013737  002066' 002072'           mov     XRGSRT,XRGCUR           ; point them ...
027462  013737  002066' 002076'           mov     XRGSRT,XRGNXT           ; ... all to the ...
027470  013737  002070' 002074'           mov     RRGSRT,RRGCUR           ; ... beginning of their ...
027476  013737  002070' 002100'           mov     RRGSRT,RRGNXT           ; ... associated rings.

                                  ;--+
                                  ;       Clear the ownership bit of all entries in the transmit ring.  This
                                  ;       will make us the owner of all entries.
                                  ;--+
027504                                    CALL    REMAP   #OTRING         ; enable access to transmit ring
027516  012702  000004                    mov     #NO.NTR,R2              ; R2 is loop control
027522  013701  002072'           10$:    mov     XRGCUR,R1               ; point R1 to transmit ring
027526  042761  100000  000004            bic     #own,4(R1)              ; we own all entries
027534                                    CALL    GETXNX  #XRGCUR         ; point to next entry
027546  005302                            dec     R2                      ; do for all ring entries
027550  001364                            bne     10$                     ;

                                  ;--+
                                  ;       Give ownership cf all receive ring entries to the DELUA/DEUNA by
                                  ;       setting each entry's OWN bit.
                                  ;--+
027552                                    CALL    REMAP   #ORRING         ; enable access to receive ring
027564  012702  000010                    mov     #NO.NRR,R2              ; R2 is loop control
027570  013701  002074'           20$:    mov     RRGCUR,R1               ; point R1 to receive ring
027574  052761  100000  000004            bis     #own,4(R1)              ; DELUA/DEUNA owns all entries
027602                                    CALL    GETRNX  #RRGCUR         ; point to next entry
027614  005302                            dec     R2                      ; do for all ring entries
027616  001364                            bne     20$                     ;

                                  ;--+
                                  ;       Now put the device in the running state by issueing a START port
                                  ;       command.
                                  ;--+
027620                  call    comand #strt            ; put una in running state
027632                  P$POP   r2                      ; check for error
027634  001404          beq     30$                     ; if OK, continue
027636                  errdf   7,emsg07,err1           ; else report error

027646          30$:    CALL    RETMEM                  ; restore memory mapping
027654                  RETURN                          ; leave ...


                ;--+
                ; Name - STOP                           Stop the DELUA/DEUNA
                ;
                ; Functional Description:
                ;               This routine is called to stop the DELUA/DEUNA and
                ;               leave it in the ready state.
                ;
                ; Inputs - none
                ;
                ; Outputs - none
                ;
                ; Calling Procedure: CALL DEVSTOP
                ;
                ; Side Effects -
                ;               1.) The DELUA/DEUNA will be left in the ready state
                ;
                ; Subordinate Routines - none
                ;
                ; Register Usage -
                ;               R1 - return status of STOP port command
                ;
                ;--+
027656          DEVSTOP:
027656                  CALL    COMAND  #STOP           ; Issue the STOP port command
027670                  P$POP   R1                      ; get return status
027672  001404          BEQ     10$                     ; leave if okay
027674                  ERRDF   8,EMSG47,ERR1           ; indicate error ... and exit

027704          10$:    RETURN                          ; return to caller



                .sbttl  UNAINI  Initialize the UNA


                ;--+
                ; Functional Description:
                ;               The purpose of this routine is to initialize and startup
                ;               the DELUA/DEUNA.  The initilization of the DELUA/DEUNA is
                ;               as follows:
                ;
                ;               1.) Issue a GET PCBB port command to tell the device where
                ;                   the port control block is located in host memory.
                ;
                ;               2.) Issue a write ring descriptor port command to tell the
                ;                   device where the receive and transmit rings are located
                ;                   in host memory.
                ;
```

```
                                  ;               The device is then started by issueing a START port command.
                                  ;               Then the devices physical address is read and stored.
                                  ;
                                  ; Inputs - none
                                  ;
                                  ; Outputs - none
                                  ;
                                  ; Calling Procedure: CALL UNAINI
                                  ;
                                  ; Side effects -
                                  ;               PHYADR - contains the device's default physical address
                                  ;
                                  ; Subordinate Routines -
                                  ;               COMAND - subroutine to issue a port command
                                  ;               FUNCT - subroutine to issue an ancillary port command
                                  ;               REMAP - used to modify KPAR4 and KPAR5 so that receive/transmit
                                  ;                       rings can be accessed
                                  ;
                                  ; Register Usage -
                                  ;               R1, R2 - scratch
                                  ;               R3 - contains address of PCSR0
                                  ;               R4 - pointer to memory location to hold devices's physical
                                  ;                    address
                                  ;
                                  ;--+
027706                            UNAINI::
                                  ;--+
                                  ;       Reset the DELUA/DEUNA then enable device interrupts
                                  ;--+
027706  013703  002106'                   mov     PCSR0, R3                       ; move address of PCSR0 to R3
027712  042713  000100                    bic     #inte,(R3)                      ; disable interrupts
027716  012713  000040                    mov     #rset, (R3)                     ; hardware reset una

027722  005002                            clr     r2                              ; loop counter init
027724  011301                    7$:     mov     (R3), r1                        ; read PCSR0
027726  032701  004000                    bit     #DNI, r1                        ; wait for command to finish
027732  001006                            bne     9$                              ; back til DNI =1
027734  005302                            dec     r2                              ; count down delay
027736  001372                            bne     7$                              ; back until timeout
027740                                    errdf   9,EMSG15,ERR1                   ; print " DNI Did not set from"
                                                                                  ;       " a RESET"
027750  012713  004000            9$:     mov     #dni, (R3)                      ; write one to clear DNI
027754  052713  000100                    bis     #inte, (R3)                     ; enable interrupts

                                  ;--+
                                  ;       Tell the device where the port comand block is located in
                                  ;       host memory
                                  ;--+
027760  012763  002150' 000004            mov     #PCBB0,4(r3)                    ; lower 16 bits of adrs
027766  005063  000006                    clr     6(r3)                           ; upper 2

027772                                    call    comand  #getpcb                 ; load address
030004                                    P$POP   r2                              ; get success/failure report
030006  001404                            beq     10$                             ; continue if OK
030010                                    errdf   10,emsg05,err1                  ; else report error

030020                            10$:
```

```
                                        ;--+
                                        ;       Write the rings ...
                                        ;
                                        ;--+
030020                                          call    funct #wdrnge                   ; write descriptor rings
030032                                          P$POP   R2                              ; check for error
030034  001407                                  beq     20$                             ; if OK, continue
030036                                          errdf   11,emsg16,err1                  ; else report error

030046                                          call    devstart                        ; start up the DELUA/DEUNA

                                        ;--+
                                        ;       Read the device's physical address and save it in the variable
                                        ;       PHYADR.
                                        ;--+

030054                                  20$:    call    funct #rdphys                   ; read una physical address
030066                                          P$POP   r2                              ; check for error
030070  001404                                  beq     25$                             ; if OK, continue
030072                                          errdf   12,emsg06,err1                  ; else  report error

030102  012701  002152'                 25$:    mov     #PCBB2, R1                      ; store physical address
030106  012704  002244'                         mov     #PHYADR, R4
030112  012124                                  mov     (R1)+,(R4)+                     ; move first two bytes
030114  012124                                  mov     (R1)+,(R4)+                     ;  and second two
030116  011114                                  mov     (R1),(R4)                       ;  and done

030120                                          CALL    RETMEM                          ; restore memory mapping
030126                                          RETURN


                                        .sbttl  unaisr  una interrupt service routine
                                        ;--+
                                        ; Functional Description:
                                        ;               This is the interrupt service routine for the DELUA/DEUNA.
                                        ;               Each time this routine is entered, the following takes place:
                                        ;
                                        ;               1.) All CSRs are saved for debug
                                        ;
                                        ;               2.) All write-one-to-clear bits are cleared
                                        ;
                                        ;               3.) flags corresponding to all bits, except port command
                                        ;                   field, of PCSR0 are set if the corresponding bits in PCSR0
                                        ;                   are set.
                                        ;
                                        ;               4.) and, If an error has occurred, then ERRFLG is set
                                        ;
                                        ; Inputs - none
                                        ;
                                        ; Outputs - Implicit -
                                        ;               flags are set corresponding to the set bits in PCSR0
                                        ;
                                        ; Calling Procedure: the routine is an interrupt routine, so it is vectored
                                        ;               to on device interrupt
                                        ;
                                        ; Side effects - none
                                        ;
```

```
                                ; Subordinate Routines - none
                                ;
                                ; Register Usage -
                                ;               R1 - address of PCSR0
                                ;               R3 - contents of PCSR0
                                ;
                                ;--+

030130                          BGNSRV  UNAISR

030130  010146                          mov     r1,-(sp)                ;save r1
030132  010246                          mov     r2,-(sp)                ;...
030134  010346                          mov     r3,-(sp)                ;...

030136  005003                          clr     r3                      ;setup write 1 to clr mask
030140  013701  002106'                 mov     pcsr0,r1                ;get pcsr0 address

030144  011103                          mov     (r1),r3                 ;and its contents

030146  012137  002116'                 mov     (R1)+,PCSR0C            ;save pcsr's for debug
030152  012137  002120'                 mov     (R1)+,PCSR1C
030156  012137  002122'                 mov     (R1)+,PCSR2C
030162  011137  002124'                 mov     (R1),PCSR3C
030166  013701  002106'                 mov     PCSR0,R1

030172  000303                          swab    r3                      ;reorient contents of pcsro
030174  110361  000001                  movb    r3,1(r1)                ;write one to clear
                                                                        ; ONLY CLEAR UPPER BYTE
030200  000303                          swab    r3                      ;reorient contents of pcsro


030202  032703  100400                  bit     #seri!fati,r3           ;any fatal status ??
030206  001403                          beq     10$

030210  005237  003002'                 inc     fatflg                  ;set flag
030214  000441                          br      90$                     ;exit

030216  032703  040000          10$:    bit     #pcei,r3                ;port command error interrupt?
030222  001402                          beq     30$                     ;no
030224  005237  003004'                 inc     pceflg                  ;yes, increment flag

030230  032703  010000          30$:    bit     #txi,r3                 ;transmit interrupt ??
030234  001402                          beq     40$                     ;no
030236  005037  003010'                 clr     xflag                   ;yes, set flag

030242  032703  004000          40$:    bit     #dni,r3                 ;command done ??
030246  001402                          beq     45$                     ;no
030250  005237  003012'                 inc     dniflg                  ;yes, count each dni

030254  032703  002000          45$:    bit     #rcbi,r3                ;recieve buffer unavailable?
030260  001405                          beq     50$                     ;no

030262  105737  001274'                 tstb    p$list                  ; are we listening?
030266  001014                          bne     90$                     ; YES, we'll have to ignore this
030270  005237  003014'                 inc     rbfcnt                  ; NO, count them

030274  032703  034000          50$:    bit     #rxi!txi!dni,r3         ;check for non-error interrupt
```

```
030300  001007                          bne     90$                     ;exit if one occured
030302  032703  142000                  bit     #seri!pcei!rcbi,r3      ;check for error interrupt
030306  001002                          bne     80$                     ;if one occured, incr. errflg
030310  005237  003016'                 inc     bcount                  ;else, nonsense interrupt
030314  005237  003020'         80$:    inc     errfl_
030320  012603                  90$:    mov     (sp)+,r                 ;restore registers
030322  012602                          mov     (sp)+,r                 ;restore registers
030324  012601                          mov     (sp)+,r1                ;restore registers

030326                          ENDSRV

                                .sbttl  COMAND  Subr to issue a DELUA/DEUNA port command


                                ;--+
                                ; Functional Description
                                ;               This subroutine issues a DELUA/DEUNA Port Command.  Errors
                                ;               are handled by the subroutine ERROR and reported in
                                ;               P2 if one occured.
                                ;
                                ; Inputs -
                                ;               P1 - The DELUA/DEUNA Port Command mnemonic of the
                                ;                    desired command.
                                ;
                                ; Outputs -
                                ;               P2 - Success report.  Contains 0 for success
                                ;                    -1 if a DELUA/DEUNA error occured. This parameter
                                ;                    is passed directly from the WAIT
                                ;                    routine and is untouched by COMAND.
                                ;
                                ; Calling procedure - Call  COMAND  #<command type>
                                ;
                                ; Side effects - If an error has occured, the routine ERROR will
                                ;                be called.
                                ;
                                ; Subordinate Routines -
                                ;               WAIT - wait for the port command to be completed
                                ;
                                ; Register usage - R1 contains the command type.
                                ;
                                ;--+

030330                          COMAND::
030330                                  P$POP   R1              ;MOVE COMMAND TYPE TO R1
030332  052701  000100                  BIS     #INTE,R1        ;ADD INTERRUPT TO COMMAND
030336  010177  151544                  MOV     R1,@PCSR0       ;MOV COMMAND TO PCSR0
030342                                  CALL    WAIT            ;WAIT FOR DONE INTERRUPT
030350                          10$:    RETURN                  ;RETURN - ERROR INFO STILL ON
                                                                ; PARAMETER STACK FROM WAIT SUB.

                                .sbttl  FUNCT   subr to  perform a DELUA/DEUNA Port Function


                                ;--+
                                ; Functional Description:
                                ;               This subroutine performs a DELUA/DEUNA Ancillary Port command.
                                ;               The function specific PCB is moved into the DELUA/DEUNA PCB.
                                ;
                                ; Inputs -
                                ;               P1 - The DELUA/DEUNA Port Function mnemonic of the
                                ;                    desired function.
                                ; Outputs -
                                ;               P2 - Success report.  Contains 0 for success
                                ;                    -1 if a DELUA/DEUNA error occured.
                                ;                    This parameteris passed directly from the
                                ;                    COMAND sub and is not affected by FUNCT.
                                ;
                                ; Calling procedure - Call  FUNCT #<function type>
                                ;
                                ; Side effects - none
                                ;
                                ; Subordinate routines -
                                ;               COMAND - used to issue a GET COMMAND port command
                                ;
                                ; Register usage -
                                ;               R1 - contains the function type, which is transformed
                                ;                     to the address of the function specific PCB.
                                ;               R2 - contains the address of the DELUA/DEUNA PCB.
                                ;
                                ;--+

030352                          FUNCT:: P$POP    R1                     ; get function type into R1
030354  006301                          asl      R1                     ; multiply by two
030356  062701  002160'                 add      #funtab,R1             ; add function table offset
                                                                        ; R1 now contains address of address
                                                                        ;  of function specific PCB
030362  012702  002150'                 mov      #PCBB0, R2             ; put DELUA/DEUNA PCB into R2
030366  011101                          mov      (R1),R1                ; put address of PCB into R1
030370  012122                          mov      (R1)+,(R2)+            ; mov pcb's
030372  012122                          mov      (R1)+,(R2)+            ; mov pcb's
030374  012122                          mov      (R1)+,(R2)+            ; mov pcb's
030376  012122                          mov      (R1)+,(R2)+            ; mov pcb's
030400                                  call COMAND #getfnt             ; issue get port function command
030412                                  return                          ; success info from COMAND subroutine

                                                                        ; is still on parameter stack
                                .sbttl  XMIT    Transmit DELUA/DEUNA frames

                                ;--+
                                ; Functional Description:
                                ;               This subroutine is used to transmit frames over the DELUA/
                                ;               DEUNA.  It sets up the transmit ring for the buffer to be
                                ;               transmitted, namely the status bits (STP,ENP,OWN) and message
                                ;               length.  Then a POLL DEMAND port command is issued to alert
                                ;               the device that we have something to transmit.
                                ;
                                ; Inputs - Implicit
                                ;               The buffer that is pointed to by the ring entry that is
                                ;               pointed to by XRGCUR has been loaded with the data that will
                                ;               be transferred.  Also, the variable BUFLEN has been set to
                                ;               the number of bytes to transmit.
                                ;
                                ; Outputs -     P1 - Success report =>  0 = success, -1 = failure
                                ;
                                ;       Implicit - 'RETRYS' : nonzero if transmit failed due to
```

```
                                          ;                           traffic.
                                          ;
                                          ; Calling procedure· Call XMIT
                                          ;                    P$POP P1
                                          ;
                                          ; S'de effects - The ring pointer XRGNXT will be updated to point the next
                                          ;                available entry after the transmit operation.
                                          ;
                                          ; Subordinate Routines -
                                          ;               COMAND - issues poll demand
                                          ;               GETXNX - updates transmit ring pointer
                                          ;               REMAP  - used to remap memory so that the t.ansmit ring may
                                          ;                        be accessed
                                          ;               RETMEM - used to return the mapping of memory to its original
                                          ;                        state
                                          ;
                                          ; Register Usage - R1 points to timout timer location
                                          ;                  R2 is used as a pointer if retrys is set
                                          ;                  R3 is used to pass the success/failure message back
                                          ;                  R4 is used as a pointer to ring entries or status info.
                                          ;--+

030414                                    XMIT::
030414                                            CALL    REMAP   #OTRING         ; enable access to transmit memory

030426  005037  003024'                           clr     retrys
030432  013704  002072'                   1$:     mov     xrgcur,R4               ; move ring entry location into R4
030436  032764  100000  000004                    bit     #own,4(R4)              ; make sure we own this
030444  001127                                    bne     40$                     ;  else, bookkeeping error
030446  013714  003126'                           mov     buflen,(R4)             ; move buffer length into first word of
                                                                                  ; next available ring entry
030452  052764  101400  000004                    bis     #own!stp!enp,4(R4)      ; set ownership, start and end of frame bits
030460  012737  000001  003010'   20$:    mov     #1,xflag                ; set transmit flag
030466                                            call    comand #pdmd            ; issue pdmd command
030500                                            P$POP   R3                      ; check for errors
030502  001130                                    bne     50$                     ; if yes, exit
030504  012701  002050'                   22$:    mov     #TIMER2,R1              ; set up to wait for transmit to complete
030510  012711  000100                            mov     #100,(R1)
030514  005737  003010'                   23$:    tst     xflag                   ; see if transmit done bit set
030520  001403                                    beq     24$                     ;  if set, skip wait loop
030522  005711                                    tst     (R1)                    ;  else, see if timeout yet
030524  001373                                    bne     23$                     ;   no, wait
030526  000510                                    br      45$                     ;   yes, exit
030530  032764  100000  000004    24$:    bit     #own,4(R4)              ; see who owns this entry
030536  001072                                    bne     40$                     ; if DELUA/DEUNA still owns this, somethings wrong
030540  032764  040000  000004            bit     #errs,4(R4)             ; see if any errors
030546  001015                                    bne     30$                     ;  if yes, branch and take care of them
030550                                    26$:    CALL    GETXNX  #xrgcur         ; update "transmit ring current" pointer
030562  005003                                    clr     R3                      ;  indicate success
030564  023737  002072' 002076'           cmp     xrgcur,xrgnxt           ; see if current pointer = next pointer
030572  001054                                    bne     40$                     ;  if no, error
030574  005037  003024'                           clr     retrys                  ; let 'retrys' reflect success
030600  000473                                    br      55$                     ; return
030602  032764  016000  000004    30$:    bit     #def!one!more,4(R4)     ; was message still sent?
030610  001357                                    bne     26$                     ;  if yes, go to next one
030612  032764  002000  000006            bit     #rtry,6(R4)             ; else, did DELUA/DEUNA give up after 16 tries
030620  001434                                    beq     32$                     ;  if not, fatal device error, exit
```

```
030622  005237  003024'                 inc     retrys                  ;  if yes, keep count of them
030626  022737  000003  003024'         cmp     #3,retrys               ;  how many tries?
030634  100440                          bmi     43$                     ;  give up after 3 attempts
030636                                  call    getxnx  #xrgcur         ;  update pointers
030650                                  call    getxnx  #xrgnxt         ;
030662  016402  000010                  mov     10(R4),R2               ;  set up to copy data buffer
030666  013704  002072'                 mov     xrgcur,R4               ;  R2 points to old buffer
030672  016403  000010                  mov     10(R4),R3               ;  R3 points to new buffer
030676  013704  003126'                 mov     buflen,R4               ;  R4 counts number of bytes to copy
030702  112223                  31$:    movb    (R2)+,(R3)+             ;  copy data
030704  005304                          dec     R4
030706  001375                          bne     31$                     ;  have we copied all of it
030710  000650                          br      1$                      ;   if yes, try again

030712                          32$:    errdf   13,emsg50,err1          ; else, fatal device error
030722  000420                          br      50$                     ; exit

030724                          40$:    errsf   14,emsg10,err1          ; transmit ring bookkeeping error
030734  000413                          br      50$

030736                          43$:    errhrd  15,emsg49               ; indicate failed due to execessive ...
030746  000406                          br      50$                     ; ... retries and split!!

030750  005237  003022'         45$:    inc     TIMOUT
030754                                  errdf   16,emsg08,err1          ; report error

030764  012703  177777          50$:    mov     #-1,R3                  ; error indicator

030770                          55$:    CALL    RETMEM                  ; remap memory to its original value
030776                                  return  R3                      ; return
                                .sbttl  RECEVE  Receive DELUA/DEUNA ring buffers

                                ;--+
                                ; Functional Description
                                ;               This subroutine handles the reception of incoming frames
                                ;               from the DELUA/DEUNA.  When called, it looks at the status of
                                ;               RRGCUR (current entry in receive ring).  If this entry is owned
                                ;               by the host and there are no errors in the status information,
                                ;               the frame is delivered to the caller of the routine.  Upon
                                ;               seeing a successful routine, the caller will take the contents
                                ;               of the buffer pointed to by the ring entry pointed to by RRGCUR
                                ;               as the received frame.  If there is an error or the entry
                                ;               pointed to by RRGCUR belongs to the device, then an unsuccessful
                                ;               status is returned.
                                ;                       After a valid frame is found, a POLL DEMAND is issued
                                ;               to let the device know that we've got an empty buffer.
                                ;
                                ; Inputs -      none
                                ;
                                ; Outputs -     P1 - The number of frames handled by this call to RECEVE,
                                ;               either 1 or 0.
                                ;
                                ;       Implicit - If P1 = 1 then the received frame is located in the
                                ;               buffer pointed to by the entry pointed to by RRGCUR.
                                ;
                                ; Calling procedure - Call RECEVE
```

```
                                        ;                          P$POP  P1
                                        ;
                                        ; Side effects -
                                        ;                   1.) The pointers RRGCUR and RRGNXT are updated.
                                        ;                   2.) KPAR4 and KPAR5 are left mapping to the receive ring.  This
                                        ;                        is done because this structure is consistently accessed
                                        ;                        immediately after a call to RECEVE
                                        ;
                                        ; Subordinate Routines -
                                        ;                   GETRNX - updates RRGCUR and RRGNXT
                                        ;                   COMAND - used to issue poll demand
                                        ;                   REMAP  - used to remap memory so that the receive ring may
                                        ;                              be accessed.
                                        ;                   RELBUF - used to release unwanted receive buffers
                                        ;
                                        ; Register usage - R1 is used to hold current frame status information
                                        ;                      R2 counts the number of frames handled
                                        ;                      R4 points to the ring descriptor entry
                                        ;
                                        ;--+

031002                                  RECEVE::
031002    005002                                  clr       R2                            ; clear frames handled counter

031004                                  1$:       CALL      REMAP   #ORRING               ; allow access to receive ring
031016    013704    002074'                       mov       rrgcur,R4                     ; move current receive ring pointer to R4
031022    016401    000004                        mov       4(R4),R1                      ; move status of frame to R1
031026    032701    100000                        bit       #own,R1                       ; see who owns this buffer
031032    001070                                  bne       60$                           ;  if una owns it, return

                                        ;--+
                                        ; If the listen command has been issued, then don't do any protocol filtering
                                        ; here
                                        ;--+

031034    105737    001274'                       tstb      p$list                        ; Are we listening?
031040    001031                                  bne       10$                           ; yes, don't protocol filter

031042    016403    000010                        mov       10(R4),R3                     ; move buffer address into R3
031046    016303    000014                        mov       protot(R3),R3                 ; move prototype into R3
031052    020337    003034'                       cmp       R3,prot00                     ; see if it is an acceptable protocall type
031056    001422                                  beq       10$                           ;  if yes, cont.
031060    020337    003036'                       cmp       R3,prot02                     ;  else check other good type
031064    001417                                  beq       10$                           ;   if OK, cont.

031066                                  5$:       CALL      GETRNX  #RRGCUR               ; update current receive pointer
031100                                            CALL      GETRNX  #RRGNXT               ; update next receive pointer
031112                                            CALL      RELBUF  R4                    ; release buffer to DELUA/DEUNA
031122    000434                                  BR        60$                           ; and exit

031124    032701    040000              10$:      bit       #errs,R1                      ; see if any errors
031130    001421                                  beq       20$                           ;  for no errors br to 20$

                                        ;--+
                                        ;         If a CRC error has occurred and we are in promiscuous mode (LISTEN
                                        ;         command is executing) then ignore this error.  Most likely the device's
                                        ;         own system ID will be the cause of the error.  When the device tries
```

```
                                ;       to send (sys. ID) and receive (prom. mode) it gets a CRC error.
                                ;--+

031132  105737  001274'                 tstb    p$list                  ; Are we executing listen command
031136  001403                          beq     15$                     ; No, go log error
031140  032701  004000                  bit     #crc,R1                 ; Is this a CRC error?
031144  001350                          bne     5$                      ; yes, just leave without logging error
                                                                        ; else,
031146  005237  003026'         15$:    inc     rcverr                  ; increment receive error counter
031152                                  printf  #recerr                 ; print error message
031172  000735                          br      5$                      ; update pointers and return
031174  005237  003030'         20$:    inc     rcvbuf                  ; increment good buffers received counter
031200  005202                          inc     R2                      ; keep count of how many buffers received

031202                                  CALL    GETRNX  #RRGCUR         ; update "receive ring current" pointer
031214                          60$:    return  R2                      ; return with number of entrys handled

                                ;--+
                                ; Name - RELBUF                         Release a receive buffer
                                ;
                                ; Functional Description
                                ;               This routine is called to release a receive buffer to the
                                ;               DELUA/DEUNA.  It will set the ownership of a receive ring
                                ;               entry and then issue a poll demand port command to alert
                                ;               the device of an available buffer.
                                ;
                                ; Inputs - Explicit -
                                ;               P1 - pointer to receive ring entry
                                ;
                                ; Outputs - none
                                ;
                                ; Calling Procedure:    CALL RELFBUF P1
                                ;
                                ; Side Effects -
                                ;               1.) The ownership of the ring entry pointed to by P1 goes
                                ;                   to the device.
                                ;               2.) If the poll demand fails then an error is printed and
                                ;                   the diagnostic is exited
                                ;
                                ; Subordinate Routines - noe
                                ;
                                ; Register usage -
                                ;               R1 - pointer to receive ring entry
                                ;
                                ;--+
031220                          RELBUF::
031220                                  P$POP   R1                      ; get pointer to receive ring entry
031222                                  CALL    REMAP   #ORRING         ; allow access to receive ring
031234  052761  100000  000004          BIS     #OWN,4(R1)              ; release the buffer to the device
031242                                  CALL    COMAND  #PDMD           ; issue poll demand port command
031254                                  P$POP   R1                      ; get success indicator
031256  001404                          BEQ     10$                     ; SUCCESS, continue
031260                                  ERRDF   17,EMSG09,ERR1          ; print error message

031270                          10$:    CALL    RETMEM                  ; restore memory mapping
031276                                  RETURN                          ; later ....
```

```

                        ;--+
                        ; Functional Description:
                        ;
                        ;               This routine will convert a string of HEX characters into a
                        ;               right justified binary  stream  (with leading zeros),
                        ;               compatible  with Ethernet conventions.  The source string must
                        ;               be formatted using either  a  word  by  word  hex  description
                        ;               or a byte by byte hex description.  The  returned  string
                        ;               will  be  BYTE  oriented  as required by the Ethernet:
                        ;
                        ;               lo-byte-word0 hi-byte-word0 lo-byte-word1 hi-byte-word1, etc.
                        ;
                        ; Inputs -
                        ;               p1 - address of the source  (HEX)  string to be converted to
                        ;                    a binary  stream.
                        ;               p2 - address of the  desired  destination buffer which will
                        ;                    accept binary data
                        ;               p3 - length (in bytes) of the destination buffer
                        ;
                        ; Outputs -     p4 - zero if successful, -1 if buffer too long or odd number of
                        ;                    hex characters
                        ;
                        ;       Implicit - The  buffer  at  p2  will contain a right justified  binary
                        ;                  stream w/ leading zeros and  corresponding  to  hex string
                        ;                  at R5.
                        ;
                        ; Calling Procedure:    CALL EDPACK p1,p2,p3
                        ;                       P$POP   P4
                        ;
                        ; Side Effects - none
                        ;
                        ; Subordinate Routines -
                        ;               HXFORM - Strip non-HEX characters from input string
                        ;               HEXBIN - HEX to binary conversion
                        ;
                        ;---

031300                  locdst: .blkb   74.             ;max number of characters that may be enterred
031412  000000          source: .word                   ;source address

031414                  EDPACK::
031414                          p$pop   source,r4,r3            ;r4-destination, r3-number of chars rqd
                                                                ;source-src address,  orient-word/byte?
031424  005002                  clr     r2                      ;assume no errors, value returned
031426  006303                  asl     r3                      ;number of characters required w/ "0"s
031430                          call    HXFORM source,#locdst,r3
031450                          p$pop   r1,r2                   ;r1=address of last char
                                                                ;r2=success/fail code (0/-1)
031454  005702                  tst     r2                      ;R1 will point to rightmost character
031456  001010                  bne     9$                      ;right justify buffer
                                                                ;convert hex at locdst to binary
031460  006203                  asr     r3                      ;r3 bytes in output bit stream
031462                          call    HEXBIN #locdst,r4,r3

031500                  9$:     return r2                       ;return with success/failure indication

```

```
                                ;--+
                                ; Functional Description
                                ;               This routine is used to form a string of packed HEX characters.
                                ;               It accepts an input string and the number of characters
                                ;               to be used in the output sting.  Any spaces and dashes are
                                ;               stripped out of the string.  Invalid characters will cause
                                ;               an error to be returned.
                                ;
                                ; Inputs -      P1 - the address of the source string to be formatted.
                                ;               P2 - the address of a buffer to get the formatted string.
                                ;               P3 - the number of HEX characters to look for.
                                ;
                                ; Outputs -     P4 - pointer to the last valid charcter of the output string.
                                ;               P5 - success indicator - 0=success, -1=error.
                                ;
                                ; Calling Procedure - CALL HXFORM P1,P2,P3
                                ;                     P$POP     P4,P5
                                ;
                                ; Side effects - None
                                ;
                                ; Subordinate Routines - None
                                ;
                                ; Register Usage
                                ;               R1 - address of source string
                                ;               R2 - address of destin string
                                ;               R3 - number of HEX characters desired
                                ;               R4 - byte of source string/success indicator
                                ;
                                ;--+
031504                          HXFORM::
031504                                  P$POP   R1,R2,R3                ; Get inputs

031512  112104                  5$:     MOVB    (R1)+,R4                ; get a byte of the source string
031514  120427  000040                  CMPB    R4,#40                  ; Are we looking at a space?
031520  001774                          BEQ     5$                      ; Yes, valid char., get next
031522  120427  000055                  CMPB    R4,#55                  ; Are we looking at a dash?
031526  001771                          BEQ     5$                      ; Yes, valid char., get next

                                ;
                                ; Check to see if we've got a HEX digit.  ASCII range for HEX is 60 <= CHAR < 72
                                ; and 101 <= CHAR < 107
                                ;

031530  120427  000060                  CMPB    R4,#60                  ; Is CHAR < 60?
031534  100417                          BMI     HXERR                   ; CHAR out of range - error
031536  120427  000072                  CMPB    R4,#72                  ; Is 60 <= CHAR < 72?
031542  100407                          BMI     10$                     ; CHAR is good
031544  120427  000101                  CMPB    R4,#101                 ; Is CHAR < 101?
031550  100411                          BMI     HXERR                   ; CHAR out of range - error
031552  120427  000107                  CMPB    R4,#107                 ; Is 101 <= CHAR < 107?
031556  100401                          BMI     10$                     ; CHAR is good
031560  000405                          BR      HXERR                   ; Else - error

031562  110422                  10$:    MOVB    R4,(R2)+                ; put HEX digit in dest. string
031564  005303                          DEC     R3                      ; decrement # of chars. to find
031566  001351                          BNE     5$                      ; non-zero means more to do
031570  005004                          CLR     R4                      ; indicate success in R4
```

```
031572  000402                          BR      HXEXIT                  ; and depart!!

031574  012704  177777          HXERR:  MOV     #-1,R4                  ; indicate error in R4
031600                          HXEXIT: RETURN  R2,R4                   ; return results


                                ;--+
                                ; Functional Description:
                                ;       This procedure will convert a string  of  hex  (ASCII)  characters
                                ;       directly to a binary stream.  The destination binary  stream  will
                                ;       require only half as many bytes as  the  hex  string  because  only
                                ;       one byte is required to represent to hex digits
                                ;
                                ; Inputs -
                                ;               p1 - source string address  (delimitted by a null)
                                ;               p2 - destination  address  for  the  binary  data.
                                ;               p3 - the number of bytes required (half the number of
                                ;                    characters at p1.
                                ;
                                ; Outputs - Implicit -
                                ;               The buffer at p2 will contain  the  binary stream, converted
                                ;               directly from the buffer at p1.
                                ;
                                ; Calling Procedure: CALL       HEXBIN p1,p2,p3
                                ;
                                ; Side Effects - none
                                ;
                                ; Subordinate Routines - none
                                ;
                                ; Register Usage -
                                ;               R1 - source string address
                                ;               R2 - destination string address
                                ;               R3 - holds one byte of binary representation of two characters
                                ;               R4 - pointer to compare string
                                ;
                                ;---
031606  000000                  hn:     .word
031610     060     061     062  cmpstr: .ASCIZ  /0123456789ABCDEF/
031613     063     064     065
031616     066     067     070
031621     071     101     102
031624     103     104     105
031627     106     000
                                        .even

031632                          HEXBIN::
031632                                  p$pop   r1,r2,hn        ;r1=source string address
                                                                ;r2=destination string address
                                                                ;hn=number of bytes required

031642  060237  031606'                 add     r2,hn           ;hn now points to the last_byte_position+1

031646  012704  031610'         1$:     mov     #cmpstr,r4      ;pointer in the compare string
031652  121124                  2$:     cmpb    (r1),(r4)+      ;compare current char with a char in cmpstr
031654  001376                          bne     2$              ;repeat until character found in list
031656  005201                          inc     r1              ;point to the next ASCII byte
031660  162704  031611'                 sub     #cmpstr+1,r4    ;r4 now contains the actual binary value for
                                                                ;the nibble described by the current byte.
```

```
                                                                                ;note: NIBBLE is the HI portion of the BYTE
 031664  006304                                   asl      r4                   ;move nibble to the hi end of the byte
 031666  006304                                   asl      r4
 031670  006304                                   asl      r4
 031672  006304                                   asl      r4
 031674  010403                                   mov      r4,r3                ;save the hi nibble

 031676  012704  031610'                          mov      #cmpstr,r4           ;pointer into compare string
 031702  121124                          3$:      cmpb     (r1),(r4)+           ;compare current char with a char in cmpstr
 031704  001376                                   bne      3$                   ;repeat until match found in cmpstr list
 031706  005201                                   inc      r1                   ;point to the next ASCII byte
 031710  162704  031611'                          sub      #cmpstr+1,r4         ;r4 now contains the actual binary value for
                                                                                ;the nibble described by the current byte.
                                                                                ;note: NIBBLE is the HI portion of the BYTE
 031714  050403                                   bis      r4,r3                ;now the two characters have made a single byte
                                                                                ;now place the complete byte in the destination
 031716  110322                                   movb     r3,(r2)+             ;and point to the next destination byte
 031720  020237  031606'                          cmp      r2,hn                ;if the destination pointer [r2] reaches the
 031724  100750                                   bmi      1$                   ;last character position+1 [hn] then done.
 031726                                           return                        ;return to caller





                                         ;--+
                                         ; Functional Description:
                                         ;        This procedure will convert a binary data stream into a hex string.
                                         ;
                                         ; Inputs -
                                         ;                p1 - binary data buffer address
                                         ;                p2- number of bytes in the buffer
                                         ;                p3- address of output buffer for hex string.  Contains hex
                                         ;                    character pairs seperated by "-"'s (note: this buffer must
                                         ;                    be at least 3*p2 bytes long)
                                         ; Outputs - Implicit
                                         ;                the buffer at p3 will contain the hex string followed by a
                                         ;                NULL character.
                                         ;
                                         ; Calling Procedure: CALL BINHEX P1,P2,P3
                                         ;
                                         ; Subordiate Routines - none
                                         ;
                                         ; Register Usage -
                                         ;                R1 - input buffer address
                                         ;                R2 - output buffer address
                                         ;                R3 - contains one nibble of input string
                                         ;                R4 - contains one byte of input string
                                         ;
                                         ;---
 031730     060      061      062        hexc:    .ASCII  /0123456789ABCDEF/
 031733     063      064      065
 031736     066      067      070
 031741     071      101      102
 031744     103      104      105
 031747     106
 031750  000000                          lst:     .word

```

```
031752                          BINHEX::
031752                                  p$pop   r1,lst,r2       ;R1 has the input buffer address
                                                                ;lst: has the number of bytes in input buffer
                                                                ;R2 has the output buffer address
031762  060137  031750'                 add     r1,lst          ;lst is now address of last source byte + 1
031766  112103                  1$:     movb    (r1)+,r3        ;get the current byte and point to next byte
031770  110304                          movb    r3,r4           ;seperate nibbles and get characters separately
031772  042703  177760                  bic     #177760,r3      ;only right binary nibble remains in r3
031776  006204                          asr     r4              ;shift over for left binary nibble in r4
032000  006204                          asr     r4
032002  006204                          asr     r4
032004  006204                          asr     r4
032006  042704  177760                  bic     #177760,r4      ;only left  binary nibble remains in r4
                                                                ;r4 is the most  significant nibble (first)
                                                                ;r3 is the least significant nibble (second)
032012  116422  031730'                 movb    hexc(r4),(r2)+  ;put the ascii byte into the buffer hi position
032016  116322  031730'                 movb    hexc(r3),(r2)+  ;put the ascii byte into the buffer lo position
032022  112722  000055                  movb    #'-,(R2)+       ;put - between hex pairs
032026  020137  031750'                 cmp     r1,lst          ;result is negative until r1=lst
032032  103755                          blo     1$              ;until r1=lst. (transfer all source bytes)
032034  105042                          clrb    -(r2)           ;terminate output buffer with a null
032036                                  RETURN

                                .sbttl  BLDLD   Build loop direct data buffers for transmit.

                                ;--+
                                ; Functional Description:
                                ;               This subroutine builds loop direct frames for transmission
                                ;               from the DELUA/DEUNA. Source address, Destination address,
                                ;               Prot. type, and loop direct header info are added
                                ;               to the message buffer.  The message buffer is built
                                ;               by a call to BLDBUF.
                                ;
                                ; Inputs -      P1 - The address of the destination address (from node table)
                                ;               implicit - P$SIZE contains the size of the message buffer data
                                ;                          XRGNXT points to the next available ring entry
                                ;                          PHYADR holds the current local DELUA/DEUNA physical address
                                ;
                                ; Outputs - Implicit -
                                ;               The buffer pointed to by the transmit ring entry pointed to
                                ;               by XRGNXT contains a loop direct message to the address pointed
                                ;               to by P1.
                                ;
                                ; Calling procedure - CALL BLDLD P1
                                ;
                                ; Side effects - none
                                ;
                                ; Subordinate Routines -
                                ;               BLDBUF - build a data buffer for transmit
                                ;               GETXNX - update XRGNXT
                                ;               REMAP  - used to remap memory so that the transmit ring may be
                                ;                        accessed
                                ;               RETMEM - used to return the mapping of memory to its original
                                ;                        state
                                ;
                                ; Register usage - R1 holds address of destination address
                                ;                    R2 is a pointer for the loop direct header info
```

```
   3606                                            ;                       R3 holds the frame length
   3607                                            ;                       R4 holds address of next ring entry data buffer
   3608                                            ;
   3609                                            ;--+
   3610
   3611 032040                                     BLDLD::
   3612 032040                                             P$POP   R1                      ; put address of dest. address in R1
   3613 032042                                             CALL    REMAP   #OTRING         ; allow access to transmit ring
   3614 032054  013704  002076'                            mov     xrgnxt,R4               ; move next frame address to R4
   3615 032060  032764  100000  000004                     bit     #own,4(R4)              ; check ownership bit
   3616 032066  001075                                     bne     40$                     ; if don't own, bookkeeping error.
   3617 032070  016404  000010                             mov     10(R4),R4               ; point R4 to data block
   3618 032074  005064  000006                             clr     sourcc(R4)              ; leave blank space for source address
   3619 032100  005064  000010                             clr     sourcc+2(R4)            ;   six bytes worth
   3620 032104  005064  000012                             clr     sourcc+4(R4)
   3621 032110  013764  003034' 000014                     mov     prot00,protot(R4)       ; move protocall type into header
   3622 032116  012702  003260'                            mov     #LOPDIR,R2              ; move loopdirect format header loc. to R2
   3623 032122  012264  000016                             mov     (R2)+,ldskip(R4)        ;  skip count
   3624 032126  011264  000020                             mov     (R2),ldfct1(R4)         ;  function code (forward)
   3625 032132  013764  002244' 000022                     mov     PHYADR,ldadr1(R4)       ;  local node address
   3626 032140  013764  002246' 000024                     mov     PHYADR+2,ldadr1+2(R4)   ;   six bytes
   3627 032146  013764  002250' 000026                     mov     PHYADR+4,ldadr1+4(R4)   ;
   3628 032154  016264  000010  000030                     mov     10(R2),ldfct2(R4)       ;  function code (reply)
   3629 032162  013764  002244' 000032                     mov     PHYADR,ldadr2(r4)       ;  local node address
   3630 032170  013764  002246' 000034                     mov     PHYADR+2,ldadr2+2(R4)   ;   six bytes
   3631 032176  013764  002250' 000036                     mov     PHYADR+4,ldadr2+4(R4)   ;
   3632 032204                                             CALL    MOVEXT  #ONTAB,R1,#OTRING,R4,#3 ; move dest. addr. into frame
   3633 032232                                             CALL    BLDBUF R4,#ldata        ; build data buffer
   3634 032246                                             CALL    GETXNX  #XRGNXT         ; update pointer to next ring entry
   3635 032260  000405                                     br      60$                     ; exit
   3636
   3637 032262                                     40$:    erref   18,emsg10,err1          ; transmit ring bookkeeping error
   3638 032272  000400                                     br      60$                     ; exit
   3639
   3640 032274                                     60$:    CALL    RETMEM                  ; remap memory to original
   3641 032302                                             RETURN
   3642
```

```
                                .sbttl  BLDFAS  Build frame for full assist transmission.

                                ;--+
                                ; Functional Description:
                                ;               This subroutine builds full assist frames for transmiss'on
                                ;               from the DELUA/DEUNA.  A full assist 's a loop through two
                                ;               nodes: the target and assist nodes.  The target node is the
                                ;               node that is being tested and the assist node is the node
                                ;               that is helping with the transmission to and the reception
                                ;               from the target node.  The full assist frame is sent from the
                                ;               NIE node to the assist node, which sends it to the target node,
                                ;               which sends it back to the assist node, which, finally
                                ;               returns it to the NIE node.
                                ;
                                ; Inputs -
                                ;               P1 - pointer to the ethernet address of the target node
                                ;               P2 - pointer to the ethernet address of the assist node
                                ;
                                ;       Implicit -
                                ;               P$SIZE - contains the size of the message buffer data
                                ;               XRGNXT - points to the next available ring entry
                                ;               PHYADR  - holds the current local node address
                                ;
                                ; Outputs - Implicit -
                                ;               A full assist loopback frame has been built in the buffer
                                ;               pointed to by the transmit ring entry pointed to by XRGNXT
                                ;
                                ; Calling Procedure - CALL BLDFAS P1
                                ;
                                ; Side Effects - XRGNXT is updated to point to the next transmit ring entry
                                ;
                                ; Subordinate Routines -
                                ;               BLDBUF - fills frame to be transmitted with data
                                ;               GETXNX - update current transmit ring pointer
                                ;               REMAP  - used to remap memory so that the transmit ring may be
                                ;                        accessed
                                ;               RETMEM - used to return the mapping of memory to its original
                                ;                        state
                                ;
                                ; Register usage - R1 holds address of target node address
                                ;                  R2 holds address of assist node address
                                ;                  R3 holds the frame length
                                ;                  R4 holds address of next ring entry data buffer
                                ;
                                ;--+

032304                          BLDFAS::
032304                                  P$POP   R1,R2                   ; put address of target address into R1
                                                                        ;  and address of assist address into R2

032310                                  CALL    REMAP   #OTRING         ; enable access to transmit memory

032322  013703  002076'                 mov     xrgnxt,R3               ; move next frame address to R3
032326  032763  100000  000004          bit     #own,4(R3)              ; check ownership bit
032334  001144                          bne     40$                     ; if don't own, bookkeeping error.
032336  016304  000010                  mov     10(R3),R4               ; point R4 to buffer

```

```
                                        ;--+
                                        ;       DELUA/DEUNA will add in source address.
                                        ;--+

032342  005064  000006                          clr     sourcc(R4)              ; leave blank space for source address
032346  005064  000010                          clr     sourcc+2(R4)            ;   six bytes worth
032352  005064  000012                          clr     sourcc+4(R4)

                                        ;--+
                                        ;       Add protocol type, skip count, and function code fields to frame
                                        ;--+

032356  013764  003034' 000014                  mov     prot00,protot(R4)       ; move protocall type into header
032364  012764  000000  000016                  mov     #0,faskip(R4)           ;  skip count
032372  012764  000002  000020                  mov     #2,fafct1(R4)           ;  function code (forward)
032400  012764  000002  000030                  mov     #2,fafct2(R4)           ;  function code (forward)
032406  012764  000002  000040                  mov     #2,fafct3(R4)           ;  function code (forward)
032414  012764  000001  000050                  mov     #1,fafct4(R4)           ;  function code (reply)

                                        ;--+
                                        ;       Our physical address is the third forward address.  This completes
                                        ;       the loop.
                                        ;--+

032422  013764  002244' 000042                  mov     phyadr,faadr3(R4)       ;  local node address
032430  013764  002246' 000044                  mov     phyadr+2,faadr3+2(R4)   ;   six bytes
032436  013764  002250' 000046                  mov     phyadr+4,faadr3+4(R4)   ;

                                        ;--+
                                        ;       Our physical address is also the reply address.  This will allow
                                        ;       the DELUA/DEUNA to recognize the reply to the loop message
                                        ;--+

032444  013764  002244' 000052                  mov     phyadr,faadr4(R4)       ;  local node address
032452  013764  002246' 000054                  mov     phyadr+2,faadr4+2(R4)   ;   six bytes
032460  013764  002250' 000056                  mov     phyadr+4,faadr4+4(R4)   ;

                                        ;--+
                                        ;       Now add all portions of the frame that come from the node table.
                                        ;       Namely, destination, target node, and assist node
                                        ; -+

032466                                          CALL    MOVEXT  #ONTAB,R2,#OTRING,R4,#3 ; move in dest. addr.
032514  062704  000022                          ADD     #FAADR1,R4              ; point R4 to first forward addr.
032520                                          CALL    MOVEXT  #ONTAB,R1,#OTRING,R4,#3 ; move in first forward addr.
032546  062704  000010                          ADD     #FAADR2-FAADR1,R4       ; point R4 to second forward addr.
032552                                          CALL    MOVEXT  #ONTAB,R2,#OTRING,R4,#3 ; move in second forward addr.

032600                                          CALL    REMAP   #OTRING         ; allow access to transmit ring
032612  016304  000010                          MOV     10(R3),R4               ; point R4 back to beginning buffer
032616                                          CALL    BLDBUF R4,#FDATA2       ; fill data field
032632                                          CALL    GETXNX  #XRGNXT         ; update pointer to next ring entry
032644  000405                                  br      50$                     ; exit

032646                                  40$:    errsf   19,emsg10,err1          ; transmit ring bookkeeping error
032656  000400                                  br      50$                     ; exit

```

```
032660                        50$:    CALL    RETMEM                  ; remap memory to or ginal
032666                                RETURN
```

```
                                .sbttl  BLDREQ  Build Request ID Frames for transmit.

                                ;--+
                                ; Functional Description:
                                ;               This subroutine builds Request ID frames for transmission
                                ;               from the DELUA/DEUNA.  Source address, destination address,
                                ;               protocall type, sequence number and Request ID
                                ;               header info are built into the buffer.
                                ;
                                ; Inputs - Implicit -
                                ;               The destination address is contained in ADRBUF.
                                ;
                                ; Outputs - Implicit -
                                ;               The buffer pointed to by the transmit ring entry pointed
                                ;               to by XRGNXT contains a request ID message.
                                ;
                                ; Calling Procedure - CALL BLDREQ
                                ;
                                ; Side Effects -
                                ;               XRGNXT - updated to point to next transmit ring entry
                                ;
                                ; Subordinate Routines -
                                ;               GETXNX - updates XRGNXT
                                ;               REMAP  - used to remap memory so that the transmit ring may be
                                ;                        accessed
                                ;               RETMEM - used to return the mapping of memory to its original
                                ;                        state
                                ;
                                ; Register Usage -
                                ;               R2 - is a pointer for Request ID header info.
                                ;               R4 - holds address of next ring entry data buffer.
                                ;
                                ;--+

032670                          BLDREQ::
032670                                  CALL    REMAP   #OTRING         ; allow access to transmit ring
032702  013704  002076'                 mov     XRGNXT,R4               ; move next frame address to R4
032706  032764  100000  000004          bit     #own,4(R4)              ; check ownership bit
032714  001050                          bne     40$                     ; if don't own, bookkeeping error
032716  016404  000010                  mov     10(R4),R4               ; point R4 to data block
032722  012737  000100  003126'         mov     #100,buflen             ; move buffer size to buflen
032730  005064  000006                  clr     sourcc(R4)              ; leave blank space for source addr.
032734  005064  000010                  clr     sourcc+2(R4)            ;  six bytes worth
032740  005064  000012                  clr     sourcc+4(R4)
032744  013764  003036' 000014          mov     prot02,protot(R4)       ; move protocall type into header
032752  012702  003252'                 mov     #REQID,R2               ; move Request ID header loc. to R2
032756  012264  000016                  mov     (R2)+,header(R4)        ;  byte count
032762  012264  000020                  mov     (R2)+,header+2(R4)      ;  function code (request ID)
032766  011264  000022                  mov     (R2),header+4(R4)       ;  reciept no.
032772                                  CALL    MOVEXT  #DNTAB,#ADRBUF,#OTRING,R4,#3    ; set up destination addr. of frame
033022                                  CALL    GETXNX #XRGNXT          ; update pointer to next ring entry
033034  000404                          br      50$                     ; exit
033036                          40$:    errsf   20,emsg10,err1          ; transmit ring bookkeeping error
033046                          50$:    CALL    RETMEM                  ; return memory mapping to its origin
033054                                  RETURN


```

```
                                .sbttl  GET?NX  Get next transmit or recieve ring entry

                                ;--+
                                ; Functional Description
                                ;               This subroutine gets the next transmit or recieve ring
                                ;               entry.  It is entered at seperate points depending on
                                ;               which ring is being used.
                                ;
                                ; Inputs -      P1 - The address of the ring pointer to be updated.
                                ;
                                ; Outputs -     The ring pointer is updated to point to the next available
                                ;                 entry.
                                ;
                                ; Calling procedure - CALL  GETXNX  #P1         ; for transmit updat.s
                                ;                     CALL  GETRNX  #P1         ; for recieve updates
                                ;
                                ; Side effects - None
                                ;
                                ; Subordinate Routines - none
                                ;
                                ; Register Usage - R1 points to the first entry in the ring
                                ;                  R2 points to the last entry in the ring
                                ;                  R3 is the address of the ring pointer to be updated
                                ;
                                ;--+

033056                          GETRNX::
033056  013701  002070'                 mov     rrgsrt,R1               ; move first ring entry to R1
033062  013702  002104'                 mov     rrglst,R2               ; move last ring entry to R2
033066  000404                          br      GETCOM                  ; go to common code
033070                          GETXNX::
033070  013701  002066'                 mov     xrgsrt,R1               ; move first ring entry to R1
033074  013702  002102'                 mov     xrglst,R2               ; move last ring entry to R2
033100                          GETCOM: P$POP   R3                      ; get address of ring pointer in R3
033102  021302                          cmp     (R3),R2                 ; see if pointer points to last ring
033104  001403                          beq     15$                     ;  if yes, branch
033106  062713  000012                  add     #10.,(R3)               ;  else, add entry length to pointer
033112  000401                          br      25$                     ; exit
033114  010113                  15$:    mov     R1,(R3)                 ; point pointer to first entry in ring
033116                          25$:    RETURN



                                .sbttl  BLDBUF  Build Message Buffers

                                ;--+
                                ; Functional Description
                                ;               This routine fills a transmit buffer with data.  It will load
                                ;               bytes into the buffer to pad the data field out to P$SIZE bytes.
                                ;
                                ; Inputs -
                                ;               P1 - address of the beginning of a transmit buffer
                                .               P2 - number of bytes already loaded into data field of
                                ;                    the transmit buffer to be worked on
                                ;
                                ;       Implicit -
                                ;               P$SIZE contains the size the buffer is to be
                                ;               P$TYPE contains the message type
                                ;
                                ; Outputs - Implicit -
                                ;               Buffer starting at location P1 contains a message P$SIZE bytes
                                ;               long using the message type specified by P$TYPE.
                                ;
                                ; Calling proceedure: Call BLDBUF P1,P2
                                ;
                                ; Side effects -
                                ;               XFER - gets loaded with the number of bytes that will be
                                ;                      transferred -- used by summary routine
                                ;               BUFLEN - loaded with the length of the transmit buffer
                                ;               CMPBUF - address of the data field of the transmit buffer to
                                ;                        be used in data compare routine
                                ;
                                ; Subordinate Routines - none
                                ;
                                ; Register usage - R1 - scratch
                                ;                  R2 - (message type X 2), used as offset for pointers
                                ;                  R3 - points to the next byte of the buffer under construction
                                ;                  R4 - points to the last byte of the buffer under construction
                                ;
                                ;--+

033120                          BLDBUF::
033120                                  P$POP   R3,R1                   ; put buffer address into R3
                                                                        ; and number of bytes in buffer in R1
033124                                  CALL    REMAP   #OTRING         ; allow access to transmit ring

                                ;--+
                                ;       set up the boundaries of the data transfer
                                ;--+

033136  062703  000016                  add     #16,R3                  ; point R3 past header info
033142  013704  001172'                 mov     P$SIZE,R4               ; put size into R4
033146  060304                          add     R3,R4                   ; make R4 = last byte of data buffer
033150  010337  003130'                 MOV     R3,CMPBUF               ; store pointer to data field for data
                                                                        ; compare

033154  060103                          add     R1,R3                   ; point R3 past data already in buffer

                                ;--+
                                ;       Set up transfer size and buffer length
                                ;--+
033156  012737  000016  003126'         MOV     #16,BUFLEN              ; buffer length = header ...
033164  063737  001172' 003126'         ADD     P$SIZE,BUFLEN           ; ... + data field
033172  013737  003126' 003120'         MOV     BUFLEN,XFER             ; transfer size for summary

                                ;--+
                                ;       Set up pointer to message to fill with
                                ;--+
033200  013702  001170'                 mov     P$TYPE,R2               ; put message type into R2
033204  006302                          asl     R2                      ; multiply by 2
033206  016201  001450'                 mov     MSGAD(R2),R1            ; point R1 to first byte of stored message

033212  005037  003032'                 clr     COUNT                   ; clear byte counter
033216  005237  003032'         10$:    inc     COUNT                   ; count no. of bytes copied
```

```
033222  112123                                  movb    (R1)+,(R3)+             ; put byte in buffer
033224  026237  001432' 003032'                 cmp     MSGCNT(R2),COUNT        ; are we at end of stored message
033232  001004                                  bne     20$                     ;  if no, check if done
033234  016201  001450'                         mov     MSGAD(R2),R1            ;  else, point R1 to begining
033240  005037  003032'                         clr     COUNT                   ;  and clear counter
033244  020304                          20$:    cmp     R3,R4                   ; is buffer filled?
033246  001363                                  bne     10$                     ;  if no, loop

033250                                          CALL    RETMEM                  ; restore memory mapping
033256                                          RETURN                          ;  else, return

```

```

                                         .sbttl  DATCMP  Compare data buffers

                                         ;--+
                                         ; Functional Description
                                         ;               This subroutine compares two data buffers byte by byte.
                                         ;               If comparison errors occured, location, expected data
                                         ;               and recieved data are printed out for the first five
                                         ;               errors.  The total number of errors is also printed.
                                         ;
                                         ; Inputs -      P1 - The size (in bytes) of the buffer to be compared.
                                         ;               P2 - The address of buffer to compare other buffer against.
                                         ;               P3 - The address of the second buffer.
                                         ;
                                         ; Outputs -     P4 - The number of comparison errors.
                                         ;
                                         ; Calling Procedure - CALL DATCMP P1,P2,P3
                                         ;                     P$POP P4
                                         ;
                                         ; Subordinate Routines - none
                                         ;
                                         ; Side effects - none
                                         ;
                                         ; Register Usage - R1 - number of words to compare
                                         ;                  R2 - pointer to data in transmit buffer
                                         ;                  R3 - pointer to data in receive buffer
                                         ;                  R4 - contains the word offset (words from beginning of data)
                                         ;
                                         ;--+

033260                                   DATCMP::
033260                                           P$POP   R1,R2,R3                ; put compare size in R1
                                                                                 ;  R2 gets transmit data address
                                                                                 ;  R3 gets receive data address
033266  005037  003110'                          CLR     TEMP                    ; init. return value
033272  105737  001303'                          TSTB    P$NCMP                  ; has no compare been selected?
033276  001402                                   BEQ     1$                      ; branch if yes
033300  000137  033562'                          JMP     30$                     ; leave
033304                                   1$:
033304  012704  177777                           MOV     #-1,R4                  ; initialize byte offset
033310  042701  000001                           BIC     #BIT0,R1                ; make even number of word compares

033314  005204                           10$:    inc     R4                      ; increment offset counter
033316                                           CALL    CMPEXT  #OTRING,R2,#ORRING,R3,#1 ; compare a word
033344                                           P$POP   R0                      ; get compare indicator

033346  001462                                   beq     20$                     ;  if same, branch
033350  005237  003110'                          inc     temp                    ; increment error counter
033354  023727  003110' 000001                   cmp     temp,#1                 ; is this the first error?
033362  003010                                   bgt     15$                     ;    NO, skip header
033364                                           PRINTX  #CMPERH                 ;    YES, print a header

033404  022737  000005  003110'  15$:    cmp     #5,temp                 ; if more than 5 errors,
033412  002440                                   blt     20$                     ; don't print message
033414                                           CALL    REMAP   #OTRING         ; allow access to transmit buffer
033426                                           printx  #cmper1,R4,(R2)         ; print expected word
033452                                           CALL    REMAP   #ORRING         ; allow access to receive buffer
```

```
033464                                   PRINTX  #CMPER2,(R3)            ; print received word
033506                                   CALL    RETMEM                  ; restore memory mapping

033514  005722                   20$:    TST     (R2)+                   ; point R2 to next transmitted word
033516  005723                           TST     (R3)+                   ; point R3 to next received word
033520  162701  000002                   SUB     #2,R1                   ; decrement number of words to compare
033524  003273                           bgt     10$                     ;  if not finished, go back for more
033526  022737  000000  003110'          cmp     #0,temp                 ; were there any errors?
033534  001412                           beq     30$                     ;  if no, exit
033536                                   printx  #cmper3,temp
033562                           30$:    RETURN  temp                    ; return with error count on stack


                                 .sbttl  WRITES  Write data onto summary table

                                 ;--+
                                 ; Functional Description:
                                 ;               This subroutine updates the summary table data for
                                 ;               the nodes specified in the call statement.  Either one
                                 ;               or two nodes can updated per call.  After the call,
                                 ;               the summary data counters are cleared.  The summary table
                                 ;               is checked for a matching node address and updates the
                                 ;               counters for that node, or adds the node to the table if it
                                 ;               doesn't exit.  An error is reported if the end of the table
                                 ;               is reached.
                                 ;
                                 ; Inputs -      P1 - The number of nodes to update (1 or 2).
                                 ;               P2 - The address of the first node address.
                                 ;               P3 - The address of the second node address if P1 = 2 or
                                 ;                     blank if P1 = 1.
                                 ;               P4 - page register value for accessing the structure that
                                 ;                    contains the node addresses.
                                 ;
                                 ;       Implicits -
                                 ;               The summary counters: S.NREC, S.REC, S.LEN, S.COMP, S.BYTE,
                                 ;               and S.XFER
                                 ;
                                 ; Outputs -     The summary table is updated.
                                 ;
                                 ; Calling procedure - CALL WRITES P1,P2(,P3)
                                 ;
                                 ; Side effects - The summary counters are cleared.
                                 ;
                                 ; Subordinate Routines -
                                 ;               CMPTWO - routine to compare two strings
                                 ;
                                 ; Register Usage -
                                 ;               R1 points to the current location in the summary table.
                                 ;               R2 points to the node to be updated's address.
                                 ;               R3 is scratch
                                 ;               R4 holds the second node to be updated address.
                                 ;
                                 ;--+

033570                           WRITES::
033570                                   P$POP   temp                    ; see how many nodes to write
033574  023727  003110' 000001           cmp     temp,#1                 ;  if only one, get address
```

```
033602  001002                          bne     5$
033604                                  P$POP   R2
033606  000402                          br 6$
033610                          5$:     P$POP   R2,R4                   ;  if two, get both addresses

033614                          6$:     P$POP   TEMP2                   ; get page register value

033620  012701  100000          10$:    mov     #statbl,R1              ; move statistical table address into R1

033624                          12$:    CALL    REMAP   #OSTAB          ; allow access to summary taLle
033636  020127  126000                  CMP     R1,#STAEND              ; Is the summary table full?
033642  001475                          BEQ     25$                     ; YES, that's all that can be done
033644  005711                          TST     (R1)                    ; Is this spot empty then?
033646  001420                          BEQ     15$                     ; YES, go fill it then

                                ; Else is it equal to the current summary table entry
033650                                  CALL    CMPEXT  #OSTAB,R1,TEMP2,R2,#3
033676                                  P$POP   R3
033700  001416                          beq     20$                     ; if yes, br
033702  062701  000026                  add     #26,R1                  ; else, point R1 to next entry
033706  000746                          br      12$                     ;  and check again

033710                          15$:    CALL    MOVEXT  TEMP2,R2,#OSTAB,R1,#3 ; copy node address into summary table

033736                          20$:    CALL    REMAP   #OSTAB          ; MOVEXT has changed memory mapping
033750  062701  000006                  add     #6,R1                   ; point R1 to data
033754  063721  002770'                 add     s.nrec,(R1)+            ;  update summary data, receives not complete
033760  063721  002766'                 add     s.rec,(R1)+             ;   receives complete
033764  063721  002772'                 add     s.len,(R1)+             ;   length errors
033770  063721  002774'                 add     s.comp,(R1)+            ;   compare errors
033774  063721  002776'                 add     s.byte,(R1)+            ;   bytes compared
034000  103001                          bcc     22$                     ;     if overflow, increment next word
034002  005511                          adc     (R1)
034004  062701  000002          22$:    add     #2,R1                   ;    point R1 to next data
034010  063721  003000'                 add     s.xfer,(R1)+            ;   bytes transfered
034014  103001                          bcc     23$                     ;     if overflow, increment next word
034016  005511                          adc     (R1)
034020  062701  000002          23$:    add     #2,R1                   ;    point R1 to next data
034024  005337  003110'                 dec     temp                    ; decr no of nodes counter
034030  001414                          beq     30$                     ; if no more, exit
034032  010402                          mov     R4,R2                   ; point R2 to next node
034034  000671                          br      10$                     ;  and update summary data
034036                          25$:    printf  #tabful,#summ           ; print table full message
034062  005037  002770'         30$:    clr     s.nrec                  ; clear summary data counters
034066  005037  002766'                 clr     s.rec
034072  005037  002772'                 clr     s.len
034076  005037  002774'                 clr     s.comp
034102  005037  002776'                 clr     s.byte
034106  005037  003000'                 clr     s.xfer
034112                                  CALL    RETMEM                  ; return memory to original mapping
034120                                  return

```

```
                                        .sbttl  BINDEC  Convert a 32 bit binary number to decimal

                                        ; -+
                                        ; Functional Description:
                                        ;               This subroutine converts a 32 bit binary number to
                                        ;               a decimal number represented as an asciz string.
                                        ;
                                        ; Inputs -      P1 - The address of the first word of binary data
                                        ;                    bits 0-15.  The second word, bits 16-31, is
                                        ;                    expected to immediately follow the first word.
                                        ;
                                        ; Outputs -     The ascii string will be located starting at DECSTR
                                        ;
                                        ; Calling Procedure: CALL BINDEC P1
                                        ;
                                        ; Side effects - none
                                        ;
                                        ; Subordinate Routines - none
                                        ;
                                        ; Register Usage - R1 points to bits 0-15 of binary data
                                        ;                  R2 points to bits 16-31 of binary data
                                        ;                  R3 points to the output string
                                        ;                  R4 points to the powers of 10 table
                                        ;
                                        ;--+

034122                                  BINDEC::
034122                                          P$POP   R1                      ; put address of binary word into R1
034124  010546                                  mov     R5,-(SP)
034126  012137  003112'                         mov     (R1)+,temp1             ; put low word in TEMP1
034132  011137  003114'                         mov     (R1),temp2              ; put high word in TEMP2
034136  012703  034324'                         mov     #DECSTR,R3              ; put address of ouput string into R3
034142  012704  034254'                         mov     #TENPWR,R4              ; address of ten power table
034146  012705  034256'                         mov     #TENPWR+2,R5
034152  012737  000012  034242'                 mov     #10.,4$
034160  005037  034340'                 1$:     clr     part                    ; clear partial counter
034164  161437  003112'                 2$:     sub     (R4),temp1              ; subtract 10 power
034170  005637  003114'                         sbc     temp2
034174  161537  003114'                         sub     (R5),temp2
034200  002403                                  blt     3$                      ; branch if 10 power too large
034202  005237  034340'                         inc     part                    ; else add 1 to partial
034206  000766                                  br      2$                      ; loop
034210  062437  003112'                 3$:     add     (R4)+,temp1             ; restore binary words
034214  005537  003114'                         adc     temp2                   ; and point R4 to next table entries
034220  062437  003114'                         add     (R4)+,temp2
034224  022525                                  cmp     (R5)+,(R5)+
034226  052737  000060  034340'                 bis     #'0,part                ; change partial to ascii
034234  113723  034340'                         movb    part,(R3)+              ; and put into output string
034240  005327                                  dec     (PC)+                   ; have we done all 10 digits
034242  000000                          4$:     .word   0
034244  001345                                  bne     1$                      ; if no, branch
034246  105023                                  clrb    (R3)+                   ; if yes, terminate with zero
034250  012605                                  mov     (SP)+,R5
034252                                          return

034254  145000                          TENPWR: 145000                          ; 1.0 E09
```

```
 034256  035632                         35632
 034260  160400                         160400                          ; 1.0 E08
 034262  002765                         2765
 034264  113200                         113200                          ; 1.0 E07
 034266  000230                         230
 034270  041100                         041100                          ; 1.0 E06
 034272  000017                         17
 034274  103240                         103240                          ; 1.0 E05
 034276  000001                         1
 034300  023420                         23420                           ; 1.0 E04
 034302  000000                         0
 034304  001750                         1750                            ; 1.0 E03
 034306  000000                         0
 034310  000144                         144                             ; 1.0 E02
 034312  000000                         0
 034314  000012                         12                              ; 1.0 E01
 034316  000000                         0
 034320  000001                         1                               ; 1.0 E00
 034322  000000                         0

 034324                         DECSTR::.BLKB   12.                     ; 12 bytes for asciz output string
 034340  000000                 PART::  .WORD   0                       ; partial counter

```

```

                                        .SBTTL  COMMAND LINE TRAVERSE ROUTINES

                                        ;++
                                        ;       P$TRV SUBROUTINE
                                        ;
                                        ;PARSE THE COMMAND LINE SUBROUTINE
                                        ;TAKE ACTIONS (VIA ACTION TREE) AS PARSING LINE
                                        ;PARSING DIRECTIONS FROM "CLI PARSING NODES"
                                        ;   REGS USED:
                                        ;
                                        ;       R1,R5=SCRATCH                       P$NUM=NUMERIC CODE FROM DATA
                                        ;       R2=ACTION CODE PARAMETER FROM TREE
                                        ;       R3=PARSE TREE POINTER
                                        ;       R4=INPUT STRING POINTER
                                        ; CALLING SEQUENCE:
                                        ;       JSR     PC,P$TRV
                                        ;--

 034342                                 P$TRV::
 034342  013704  001260'                        MOV     P$BUFA,R4
 034346  013703  001262'                        MOV     P$TREE,R3
 034352  121327  000003                 P$TR5:  CMPB    (R3),#3                 ;SEE IF ONE OF FIRST THREE SPECIAL CODES
 034356  003405                                 BLE     5$                      ;IF YES, DON'T CHECK INPUT STRING
 034360  105714                                 TSTB    (R4)                    ;SEE IF ANY CHARS LEFT IN INPUT STRING
 034362  001441                                 BEQ     P$EXIT                  ;BR IF NO
 034364  121327  000013                         CMPB    (R3),#11.               ;SEE IF SPECIAL CLI CHAR CODE OR ASCII
 034370  003023                                 BGT     20$                     ;BR IF REGULAR ASCII CHAR.
 034372  111301                         5$:     MOVB    (R3),R1                 ;GET SPECIAL CHAR CODE INTO R5
 034374  006301                                 ASL     R1
 034376  016101  034412'                        MOV     10$(R1),R1              ;BUILD TRAVERSE ROUTINE ADDRESS
 034402  062701  034412'                        ADD     #10$,R1
 034406  004711                                 JSR     PC,(R1)                 ;JSR TO SPECIAL CLI TRAVERSE ROUTINE
 034410  000760                                 BR      P$TR5                   ;GO SEE IF MORE OF STRING LEFT


 034412  000114                         10$:    .WORD   TRVERR-10$              ;TRAVERSE TABLE FOR "CLI FUNCTIONS"
 034414  000134                                 .WORD   TRVEXI-10$              ;1
 034416  000152                                 .WORD   TRVBR-10$               ;2
 034420  000162                                 .WORD   TRVBIF-10$              ;3
 034422  000204                                 .WORD   TRVSPA-10$              ;4
 034424  000270                                 .WORD   TRVNUM-10$              ;5
 034426  000612                                 .WORD   TRVALP-10$              ;6

 034430  000000                                 .WORD   0                       ; *** was .WORD TRVALN-10$ ***
 034432  000270                                 .WORD   TRVOCT-10$              ;8
 034434  000256                                 .WORD   TRVDEC-10$              ;9
 034436  000656                                 .WORD   TRVSTR-10$              ;10

                                        ;NOT A SPECIAL CODE

 034440  121314                         20$:    CMPB    (R3),(R4)               ;SEE IF FIRST CHAR OF STRING IS A MATCH
 034442  001403                                 BEQ     22$                     ;BR IF A MATCH
 034444  004737  034510'                        JSR     PC,TRVBRC               ;IF NOT A MATCH, GO TAKE MISS BRANCH
 034450  000740                                 BR      P$TR5                   ; THEN GO BACK PT'G TO MISS NODE
 034452  005204                         22$:    INC     R4                      ;IF A MATCH, INCR. CHAR POINTER
 034454  004737  034470'                        JSR     PC,TRVACT               ; GO DO ACTION DEFINED BY
```

```
034460  062703  000004                  ADD     #4,R3                   ; ACTION CODE IN CLI NODE, THEN
                                                                        ; ADJUST PTR TO NEXT CLI NODE
034464  000732                          BR      P$TR5

034466  000207                  P$EXIT: RTS     PC                      ;RETURN FROM PARSER


                                ;------------------------------------------------------------------  --

                                ;GOTO USER ACTION ROUTINE
034470  116302  000001          TRVACT: MOVB    1(R3),R2                ;GET ACTION CODE FROM CLI NODE
034474  042702  177400                  BIC     #177400;R2              ;CLEAR ANY SIGN EXTENSION
034500  013701  001264'                 MOV     P$ACT,R1                ;GET ADDRESS OF CLI ACTION ROUTINE
034504  004711                          JSR     PC,(R1)                 ;GO DO ACTION DEFINED BY CODE
034506  000207                          RTS     PC                      ;RETURN TO CALLING CODE

                                ;TAKE BRANCH IN TREE
034510  016301  000002          TRVBRC: MOV     2(R3),R1                ;GET BRANCH DISPLACEMENT FROM TREE
034514  060103                          ADD     R1,R3                   ; AND POINT R3 TO THE "MISS" NODE
034516  000207                          RTS     PC                      ; RETURN TO P$TRV

                                ;NO BRANCH TAKEN
034520  062703  000004          TRVNOB: ADD     #4,R3                   ;THINGS OK, UPDATE R3 TO POINT TO NEXT
034524  000207                          RTS     PC                      ; NODE AND RETURN TO P$TRV


                                ;-------------------------------------------------------------------
                                ;ERROR HANDLING
034526  004737  034470'         TRVERR: JSR     PC,TRVACT               ;TAKE ERROR ACTION
034532  112737  177777  001301'         MOVB    #-1,P$GDBD              ;SET ERROR RETURN FLAG
034540  005726                          TST     (SP)+                   ;GET RID OF "JSR PUSH TO TRVERR"
034542  000137  034466'                 JMP     P$EXIT                  ;RETURN DIRECT TO EXIT OF P$TRV ROUTINE

                                ;EXIT ACTION CODE
034546  004737  034470'         TRVEXI: JSR     PC,TRVACT               ;TAKE EXIT ACTION
034552  105037  001301'                 CLRB    P$GDBD                  ;SET GOOD/BAD FLAG TO "SUCCESS (0)"
034556  005726                          TST     (SP)+                   ;GET RID OF "JSR PUSH TO TRVEXI"
034560  000137  034466'                 JMP     P$EXIT                  ;RETURN DIRECT TO EXIT OF P$TRV ROUTINE

                                ;BRANCH ACTION CODE
034564  004737  034470'         TRVBR:  JSR     PC,TRVACT               ;GO TAKE BRANCH ACTION
034570  000137  034510'                 JMP     TRVBRC

                                ;BRANCH-IF ACTION CODE
034574  004737  034470'         TRVBIF: JSR     PC,TRVACT
034600  105737  001301'                 TSTB    P$GDBD                  ;SEE IF P$GDBD SET OR CLEARED BY ACTION
034604  001402                          BEQ     1$                      ;IF CLEAR FALL THRU TO NEXT NODE
034606  000137  034510'                 JMP     TRVBRC                  ;ELSE TAKE THE "MISS" BRANCH
034612  000137  034520'         1$:     JMP     TRVNOB                  ;JUST UPDATE TO NEXT NODE IF THINGS OK

                                ;SPACE ACTION CODE
034616  005001                  TRVSPA: CLR     R1                      ;CLEAR "SPACE OR TAB FOUND" FLAG
034620  121427  000011          1$:     CMPB    (R4),#11                ;SEE IF CHAR. IN CMD LINE= TAB
034624  001003                          BNE     2$                      ;BR IF NO, NOT A TAB
034626  005204                          INC     R4                      ;INC INPUT STRING POINTER
034630  005201                          INC     R1                      ;INDICATE A TAB FOUND
034632  000772                          BR      1$                      ;GO CHECK NEXT CHAR

034634  121427  000040          2$:     CMPB    (R4),#40                ;SEE IF CHAR. IN CMD LINE= SPACE
```

```
034640  001003                            BNE     10$                     ;BR IF NO, NON SPACE OR NON-TAB CHAR.
034642  005204                            INC     R4                      ;INC INPUT STRING POINTER
034644  005201                            INC     R1                      ;INDICATE A SPACE FOUND
034646  000764                            BR      1$                      ;GO CHECK NEXT CHAR
034650  005701                   10$:     TST     R1                      ;SEE IF ANY SPACES OR TABS FOUND
034652  001404                            BEQ     15$                     ;BR IF NO, TAKE NO ACTION
034654  004737  034470'                   JSR     PC,TRVACT               ;GO TAKE ACTION IF ANY FOUND
034660  000137  034520'                   JMP     TRVNOB                  ;JUST GO UPDATE R3 TO NEXT NODE IF OK
034664  000137  034510'          15$:     JMP     TRVBRC                  ;TAKE BRANCH (MISS) IF NONE FOUND


034670  012737  000012  001272'  TRVDEC:  MOV     #10.,P$RADX             ;USE DECIMAL AS RADIX AND ASSUME +
034676  000137  034710'                   JMP     TRVNMA
034702                           TRVOCT:  ;(SAME AS TRVNUM SINCE DEFAULT RADIX IS OCTAL)
034702  012737  000010  001272'  TRVNUM:  MOV     #8.,P$RADX              ;USE OCTAL AS RADIX AND ASSUME +
034710                           TRVNMA:  PUSH    R5
034712  005001                            CLR     R1                      ;CLEAR DIGIT COUNTER
034714  121427  000053                    CMPB    (R4),#'+                ;SEE IF THERE'S A + SIGN THERE
034720  001001                            BNE     10$                     ; BR IF NO
034722  000406                            BR      11$                     ; ELSE P$RADX ALREADY SAYS +, JUST BR
034724  121427  000055           10$:     CMPB    (R4),#'-                ;SEE IF THERE'S A - SIGN THERE
034730  001004                            BNE     1$                      ; BR IF NO
034732  112737  177777  001273'           MOVB    #-1,P$RADX+1            ;SET "MINUS FLAG" (HI BYTE OF P$RADX)
034740  005204                   11$:     INC     R4                      ;BUMP R4 TO POINT TO FIRST CHAR

034742  121427  000060           1$:      CMPB    (R4),#60                ;SEE IF CHAR. LESS THAN A "0"
034746  002434                            BLT     2$                      ;BR IF YES (NOT NUMERIC)
034750  121427  000067                    CMPB    (R4),#67                ;SEE IF CHAR. GREATER THAN A "7"
034754  003426                            BLE     13$                     ; BR IF YES
034756  123727  001272' 000012            CMPB    P$RADX,#10.             ;SEE IF IN DECIMAL MODE
034764  001417                            BEQ     12$                     ; BR IF YES (CAN USE HIGHER LIMIT)
034766  121427  000071                    CMPB    (R4),#71                ;SEE IF DIGIT WAS A 8 OR 9
034772  003022                            BGT     2$                      ;BR IF NON-NUMERIC
034774                                    PRINTF  #CLIBRX                 ;ELSE WAS A 8 OR 9 WHEN IN OCTAL RADIX
035014  112737  177777  001301'           MOVB    #-1,P$GDBD              ;SET ERROR RETURN FLAG
035022  000475                            BR      5$                      ; PRINT ERROR AND TAKE MISS

035024  121427  000071           12$:     CMPB    (R4),#71                ;SEE IF CHAR. GREATER THAN A "9"
035030  003003                            BGT     2$                      ;BR IF YES (NOT NUMERIC)
035032  005204                   13$:     INC     R4                      ;UPDATE CMD LINE PTR TO NEXT CHAR.
035034  005201                            INC     R1                      ;INDICATE A NUMERIC FOUND
035036  000741                            BR      1$                      ;GO LOOK AT NEXT CHAR.

035040  005701                   2$:      TST     R1                      ;SEE IF FOUND ANY NUMERICS
035042  001465                            BEQ     5$                      ;BR IF NO, TAKE "MISS" BRANCH
035044  010405                            MOV     R4,R5                   ;GET POINTER TO START OF NUMERIC STRING
035046  160105                            SUB     R1,R5
035050  005037  001270'                   CLR     P$NUM                   ;CLEAR LOC. WHERE VALUE WILL BE STORED
035054  112502                   3$:      MOVB    (R5)+,R2                ;GET ASCII CHAR AND CONVERT IT TO A #
035056  162702  000060                    SUB     #60,R2
035062  006337  001270'                   ASL     P$NUM                   ;SHIFT CURRENT VALUE TO MAKE ROOM
035066  103440                            BCS     7$                      ;ERROR IF NUMBER TOO BIG
035070  013737  001270' 001266'           MOV     P$NUM,P$CNT             ;SAVE FOR LATER IN CASE DECIMAL RADIX
035076  006337  001270'                   ASL     P$NUM
035102  103432                            BCS     7$                      ;ERROR IF NUMBER TOO BIG
035104  006337  001270'                   ASL     P$NUM
035110  103427                            BCS     7$                      ;ERROR IF NUMBER TOO BIG
```

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 4364 035112  123727  001272' 000012          CMPB    P$RADX,#10.             ;SEE IF DECIMAL RADIX
 4365 035120  001004                          BNE     4$                      ;BR IF NOT EQUAL
 4366 035122  063737  001266' 001270'         ADD     P$CNT,P$NUM
 4367 035130  103417                          BCS     7$                      ;ERROR IF NUMBER TOO BIG
 4368 035132  060237  001270'         4$:     ADD     R2,P$NUM
 4369 035136  103414                          BCS     7$                      ;ERROR IF NUMBER TOO BIG
 4370 035140  005301                          DEC     R1
 4371 035142  001344                          BNE     3$
 4372 035144  105737  001273'                 TSTB    P$RADX+1                ;SEE IF NUM WAS PRECEDED BY A   SIGN
 4373 035150  001402                          BEQ     15$                     ; BR IF NO
 4374 035152  005437  001270'                 NEG     P$NUM                   ; ELSE NEGATE THE NUMBER BEFORE LEAVING
 4375 035156                         15$:     POP     R5                      ;RESTORE R5
 4376 035160  004737  034470'                 JSR     PC,TRVACT               ;SINCE NUMERIC FOUND, GO TAKE ACTION
 4377 035164  000137  034520'                 JMP     TRVNOB                  ;GO POINT R3 TO NEXT NODE
 4378
 4379 035170                         7$:      PRINTF  #CLINBG                 ;PRINT NUMBER TOO BIG ERROR
 4380 035210  112737  177777  001301'         MOVB    #-1,P$GDBD              ;SET ERROR RETURN FLAG
 4381 035216                         5$:      POP     R5                      ;RESTORE R5
 4382 035220  000137  034510'                 JMP     TRVBRC                  ;TAKE "MISS" BRANCH
 4383
 4384
 4385 035224  005001                 TRVALP:  CLR     R1                      ;CLEAR ALPHA FOUND FLAG
 4386 035226  121427  000101         1$:      CMPB    (R4),#101               ;SEE IF CHAR. LESS THAN A "A"
 4387 035232  002406                          BLT     2$                      ;BR IF YES (NOT ALPHA)
 4388 035234  121427  000132                  CMPB    (R4),#132               ;SEE IF CHAR. GREATER THAN A "Z"
 4389 035240  003003                          BGT     2$                      ;BR IF YES (NOT ALPHA)
 4390 035242  005204                          INC     R4                      ;UPDATE CMD LINE PTR TO NEXT CHAR
 4391 035244  005201                          INC     R1                      ;INDICATE AN ALPHA WAS FOUND
 4392 035246  000767                          BR      1$                      ;GO LOOK AT NEXT CHAR.
 4393 035250  005701                 2$:      TST     R1                      ;SEE IF ANY ALPHA'S WERE FOUND
 4394 035252  001404                          BEQ     3$                      ;BR IF NO
 4395 035254  004737  034470'                 JSR     PC,TRVACT               ;IF ANY FOUND TAKE ACTION
 4396 035260  000137  034520'                 JMP     TRVNOB                  ;THEN UPDATE R3 TO NEXT NODE -NO BRANCH
 4397 035264  000137  034510'         3$:      JMP     TRVBRC                  ;NONE FOUND, TAKE MISS BRANCH
 4398
 4399
 4400
 4401 035270                         TRVSTR:  PUSH    R5                      ;SAVE R5
 440_ 035272  010401                          MOV     R4,R1                   ;POINT R1 TO CMD STRING
 4403 035274  010305                          MOV     R3,R5
 4404 035276  062705  000006                  ADD     #6,R5                   ;POUNT R5 TO MATCH STRING FROM CLI NODE
 4405 035302  005037  001266'                 CLR     P$CNT                   ;CLEAR CHAR MATCH COUNT
 4406 035306  105715                 2$:      TSTB    (R5)                    ;SEE IF END OF MATCH STRING YET
 4407 035310  001411                          BEQ     10$                     ;BR IF YES
 4408 035312  105711                          TSTB    (R1)                    ;SEE IF END OF CMD LINE YET
 4409 035314  001407                          BEQ     10$                     ;BR IF YES
 4410 035316  121115                          CMPB    (R1),(R5)               ;SEE IF CHARACTERS MATCH
 4411 035320  001005                          BNE     10$                     ;BR IF NO
 4412 035322  005237  001266'                 INC     P$CNT                   ;MATCH -INCREMENT MATCH COUNT
 4413 035326  005201                          INC     R1                      ;UPDATE STRING POINTERS
 4414 035330  005205                          INC     R5
 4415 035332  000765                          BR      2$                      ;BR TO CONTINUE CHECKING CHARS.
 4416
 4417 035334  005737  001266'         10$:     TST     P$CNT                   ;WHEN DONE SEE IF ANY MATCHES FOUND
 4418 035340  001407                          BEQ     15$                     ;BR IF NO, GO TAKE THE MISS BRANCH
 4419 035342  010104                          MOV     R1,R4                   ;POINT CMD POINTER TO END OF STRING &
 4420 035344                                  POP     R5                      ;RESTORE R5
```

```
4421 035346  004737  034470'           JSR     PC,TRVACT                ;IF A MATCH FOUND, GO DO MATCH ACTION
4422 035352  066303  000004            ADD     4(R3),R3                 ;UPDA1E R3 TO NEXT NODE (NO BRANCH)
4423 035356  000207                    RTS     PC                       ; (NO RETURN THRU TRVNOB SINCE DIFFERENT
4424                                                                    ;  DISPLACEMENT DUE TO MATCH STRING)
4425 035360                   15$:     POP     R5                       ;RESTORE R5
4426 035362  000137  034510'           JMP     TRVBRC                   ; GO TAKE BRANCH
4427                                                                    ; (PARSED OK), -1 IF ILL CMD.....
4428
4429                          ;--+
4430                          ;        TRVADR                           TRAVERSE COMMAND LINE INPUT ADDRESS
4431                          ;
4432                          ;        THIS ROUTINE IS CALLED BY TWO DIFFERENT ACTION ROUTINES.  THE
4433                          ;        NODE ACTION ROUTINE CALLS IT TO PARSE THROUGH THE NODE
4434                          ;        ADDRESS INPUT BY THE OPERATOR.  THE OPRSEL ACTION ROUTINE
4435                          ;        CALLS TRVADR TO PARSE THROUGH THE "OPERATOR SELECTED" MESSAGE
4436                          ;        WHICH HAS BEEN INPUT IN THE COMMAND LINE.  FOR A NODE ADDRESS,
4437                          ;        THE ROUTINE LOOKS FOR A '/' AS A DELIMETER FOR THE ADDRESS,
4438                          ;        AND REPLACES THE / WITH A NULL BYTE FOR USE BY THE ADDRESS
4439                          ;        PACKING ROUTINE.  WHEN CALLED BY THE OPRSEL ROUTINE, A '"'
4440                          ;        IS EXPECTED AS THE DELIMETER FOR THE OPERATOR SELECTED MESSAGE.
4441                          ;        IF A NULL STRING IS ENTERED, AN ERROR MESSAGE IS PRINTED.
4442                          ;
4443                          ;        INPUTS -                 R4 - POINTS TO THE BEGINING OF THE ADDRESS
4444                          ;                                      OR MESSAGE IN THE COMMAND LINE
4445                          ;        OUTPUTS -                SUMMARIZED IN TABLE BELOW
4446                          ;
4447                          ;        COMMAND LINE                     OUTPUTS
4448                          .        INPUT CONDITION !  P$GDBD  ! R4 POINTS TO  !  CFLAG CONTAINS  !  P$MERR
4449                          ;        ----------------+----------+---------------+------    ---- ----+- -----
4450                          ;        ILLEGAL CHAR.   !    -1    ! ILL. CHAR.    !                 !  N/A
4451                          ;        ADR./ASSIST     !    0     ! END OF LINE   !     CASIST      !  N/A
4452                          ;        ADR./TARGET     !          !               !                 !
4453                          ;        ADR./           !    0     ! END OF LINE   !     CTARGT      !  N/A
4454                          ;        ADR.            !          !               !                 !
4455                          ;        ADR./CHAR. JR   !          !               !                 !
4456                          ;        "OPR SEL/CHAR.  !          !               !                 !
4457                          ;          OTHER THAN "A"!   -1     ! /             !     CTARGT      !  N/A
4458                          ;           "T" OR BLANK !          !               !                 !
4459                          ;        ""              !    0     ! CHAR. AFTER " !                 !  -1
4460                          ;        "OPR SEL"       !    0     ! CHAR. AFTER " !     OPRSEL      !   0
4461                          ;
4462                          ;        CALLING PROCEDURE -  JSR  PC,TRVADR
4463                          ;        REGISTER USAGE -     R1 IS USED AS A COUNTER TO REPORT ERROR MESSAGES
4464                          ;                                  IF NULL STRINGS ARE ENTERED.
4465                          ;                             R4 POINTS TO THE NEXT CHAR. IN THE COMMAND LINE
4466                          ;
4467                          ;--+
4468
4469 035366  005001                   TRVADR:  CLR     R1                       ;CLEAR HEX DIGIT FOUND FLAG
4470 035370  121427  000000           1$:      CMPB    (R4),#0                  ;SEE IF NUL CHAR.
4471 035374  001435                            BEQ     20$                      ; IF YES, RETURN
4472 035376  121427  000040                    CMPB    (R4),#40                 ;SEE IF ILLEGAL CHARACTER
4473 035402  002426                            BLT     10$                      ;IF YES; BRANCH TO ERROR ROUTINE
4474 035404  001002                            BNE     4$                       ;branch if not a space
4475 035406  005204                            INC     R4                       ; skip space
4476 035410  000767                            BR      1$                       ; check next character
4477 035412  121427  000042           4$:      CMPB    (R4),#42                 ;SEE IF CHAR. IS A '"'
```

```
035416  001007                          BNE     6$                      ; branch if not
035420  112714  000000                  MOVB    #0,(R4)                 ;ELSE, REPLACE '"' WITH NULL
035424  005204                          INC     R4                      ; point R4 past '"' in input string
035426  012737  000006  002024'         MOV     #OPRSEL,CFLAG           ; set operator selected flag ...
035434  000501                          BR      50$                     ; ... and take off
035436  121427  000057          6$:     CMPB    (R4),#57                ;SEE IF CHAR. IS A "/"
035442  001420                          BEQ     30$                     ;BRANCH IF YES
035444  121427  000132                  CMPB    (R4),#132               ;SEE IF CHAR. GREATER THAN "F"
035450  003003                          BGT     10$                     ; IF YES, ILLEGAL CHAR.
035452  005204                          INC     R4                      ;UPDATE CMD LINE POINTER TO NEXT CHAR.
035454  005201                          INC     R1                      ;INDICATE A VALID CHAR. FOUND
035456  000744                          BR      1$                      ;LOOK AT NEXT CHAR.
035460  112737  177777  001301' 10$:    MOVB    #-1,P$GDBD              ;SET ERROR FLAG
035466  000464                          BR      50$                     ;RETURN
035470  005701                  20$:    TST     R1                      ;SEE IF VALID CHARACTERS FOUND
035472  001772                          BEQ     10$                     ; IF NO, ILLEGAL CHAR.
035474  012737  000000  002024' 25$:    MOV     #CTARGT,CFLAG           ;SET TARGET FLAG
035502  000456                          BR      50$                     ;RETURN
035504  005701                  30$:    TST     R1                      ;SEE IF VALID CHARACTERS FOUND
035506  001764                          BEQ     10$                     ; IF NO, ILLEGAL CHAR.
035510  105737  001305'                 TSTB    P$TEXT                  ; is it text?
035514  001027                          BNE     40$                     ; branch if it is
035516  112714  000000                  MOVB    #0,(R4)                 ; IF YES, REPLACE "/" WITH NULL CHAR.
035522  005204                          INC     R4                      ;UPDATE CMD. LINE POINTER TO NEXT CHAR.
035524  121427  000000                  CMPB    (R4),#0                 ;IS NEXT CHAR. NULL
035530  001761                          BEQ     25$                     ;  IF YES, TAKE DEFAULT OF TARGET
035532  121427  000101                  CMPB    (R4),#'A                ;IS NEXT CHAR. "A"
035536  001412                          BEQ     35$                     ;  IF YES, BR 35$
035540  121427  000124                  CMPB    (R4),#'T                ;IS NEXT CHAR. "T"
035544  001753                          BEQ     25$                     ;  IF YES, SET TARGET FLAG
035546  112737  177777  001301'         MOVB    #-1,P$GDBD              ;  ELSE, SET ERROR FLAG,
035554  005304                          DEC     R4                      ;  READJUST COMMAND LINE POINTER
035556  112714  000057                  MOVB    #'/,(R4)                ;  AND REPLACE / IN CMD LINE TO FIX ERROR
035562  000744                          BR      25$                     ;  SET TARGET FLAG AND RETURN
035564  012737  000001  002024' 35$:    MOV     #CASIST,CFLAG           ;SET ASSIST FLAG
035572  000422                          BR      50$
035574  005701                  40$:    TST     R1                      ;SEE IF ANY CHARACTERS TYPED
035576  001404                          BEQ     45$                     ;IF NO, BRANCH TO 45$
035600  012737  000006  002024'         MOV     #OPRSEL,CFLAG           ;SET OPERATOR SELECTED FLAG
035606  000414                          BR      50$                     ;RETURN
035610                          45$:    PRINTF  #NULSTR                 ;PRINT NULL STRING ERROR MESSAGE
035630  112737  177777  001304'         MOVB    #-1,P$MERR              ;SET OPER. SELECTED MSG. ERROR FLAG
035636  005204                          INC     R4                      ;MOVE CMD. LINE POINTER TO NEXT CHAR.
035640  000207                  50$:    RTS     PC                      ;RETURN

                                ;-----------------------------------------------------------  --- --------

                                .SBTTL  REPORT CODING SECTION


                                ;++
                                ; THE REPORT CODING SECTION CONTAINS THE
                                ; "PRINTS" CALLS THAT GENERATE STATISTICAL REPORTS.
                                ;--

035642                                  BGNRPT

```

```
                                ;*********************************************************************************
                                ;       THIS SECTION, WHICH IS OPTIONAL, CONTAINS THE CODE FOR PRINTING
                                ;       STATISTICAL INFORMATION GATHERED BY THE DIAGNOSTIC.  IT IS
                                ;       EXECUTED BY THE OPERATOR COMMAND "PRINT" OR BY THE MACRO CALL
                                ;       "DORPT".  USE THE PRINTS MACRO TO PRINT THE INFORMATION
                                ;       USE FORMAT STATEMENTS AS IN THE PRINTB/PRINTX MACROS.  IT IS
                                ;       THE PROGRAMMER'S RESPONSIBILTY TO DEVISE AND IMPLEMENT THE
                                ;       FORM AND CONTENT OF THE STATISTICS.
                                ;*********************************************************************************

035642  004737  042674'                 JSR     PC,ACTSUM
035646                                  EXIT    RPT

                                ;*********************************************************************************
                                ;     INSERT LOCAL STORAGE THAT IS USED ONLY
                                ;     DURING THE REPORT SECTION.
                                ;*********************************************************************************

                                ;*********************************************************************************
                                ;     INSERT MESSAGES THAT ARE USED ONLY
                                ;     DURING THE REPORT SECTION.
                                ;*********************************************************************************

                                        .EVEN

035652                                  ENDRPT
```

```
                                        .SBTTL  PROTECTION TABLE

                                        ;++
                                        ; THIS TABLE IS USED BY THE RUNTIME SERVICES
                                        ; TO PROTECT THE LOAD MEDIA.
                                        ;--

035654                                          BGNPROT

035654  177777                                  -1              ;OFFSET INTO P-TABLE FOR CSR ADDRESS
035656  177777                                  -1              ;OFFSET INTO P-TABLE FOR MASSBUS ADDRESS
035660  177777                                  -1              ;OFFSET INTO P-TABLE FOR DRIVE NUMBER

035662                                          ENDPROT

                                        ;*****************************************************************************
                                        ;       INSERT BYTE OFFSET FOR DATA NOTED IN COMMENTS ABOVE.  (OFFSET
                                        ;       REFERS TO THE NUMBER OF BYTES FROM THE BEGINNING OF A PTABLE
                                        ;       ENTRY TO THE ITEM IN QUESTION.)  IF THE PARTICULAR
                                        ;       ITEM DOES NOT APPLY, LEAVE ENTRY AS -1.  WHEN THE RUNTIME
                                        ;       SERVICES EXECUTES A GPHARD, IT USES THESE OFFSETS (IF NOT
                                        ;       SET TO -1) TO GET THE ITEMS AND COMPARE WITH THOSE SAVED
                                        ;       IN THE XXDP+ MONITOR.  IF THE UNIT BEING REQUESTED MATCHES THE
                                        ;       LOAD DEVICE, THE RUNTIME SERVICES RETURN AN INCOMPLETE FLAG ON
                                        ;       THE GPHARD.
                                        ;*****************************************************************************
```

```
                                .SBTTL  INITIALIZE SECTION

                                ;++
                                ; THE INITIALIZE SECTION CONTAINS THE CODING THAT IS PERFORMED
                                ; AT THE BEGINNING OF EACH PASS.
                                ;--

035662                                  BGNINIT

                                ;********************************************************************************
                                ;       THE INITIALIZE CODE IS EXECUTED UNDER FIVE CONDITIONS.  THERE
                                ;       ARE SUPERVISOR EVENT FLAGS THAT ARE USED TO LET THE
                                ;       DIAGNOSTIC KNOW UNDER WHICH CONDITION THE EXECUTION IS TAKING
                                ;       PLACE.  THE EVENT FLAGS ARE READ USING THE "READEF" MACRO.
                                ;       THE CONDITIONS UNDER WHICH THE INIT CODE IS EXECUTED AND THE
                                ;       CORRRESPONDING EVENT FLAGS ARE:
                                ;               START COMMAND           EF.START
                                ;               RESTART COMMAND         EF.RESTART
                                ;               CONTINUE COMMAND        EF.CONTINUE
                                ;               POWERDOWN/POWERUP       EF.PWR
                                ;               NEW PASS                EF.NEW
                                ;       EXAMPLE OF EVENT FLAG USE:
                                ;               READEF  #EF.START
                                ;               BCOMPLETE       STARTCODE
                                ;       DURING THE INIT CODE, USE THE "GPHARD" MACRO TO OBTAIN P-TABLE
                                ;       INFORMATION FOR DEVICE TESTING.  GET ONE UNIT'S INFORMATION IF
                                ;       THIS IS A SEQUENTIAL DIAGNOSTIC.  GET INFORMATION ON ALL
                                ;       UNITS AVAILABLE FOR TESTING IF THIS IS AN EXERCISER.  THE NUMBER
                                ;       OF UNITS AVAILABLE IS IN A HEADER LOCATION: "L$UNIT".
                                ;********************************************************************************
                                ;--+
                                ; Functional Desciption:
                                ;               This routine performs all initialization functions necessary
                                ;               to run the diagnostic.  In sequential order, the functions
                                ;               executed are:
                                ;
                                ;               1.) determine how we got into the INIT code -- START, RESTART,
                                ;                   CONTINUE, or NEW PASS.  The rest of these steps are all
                                ;                   done for a START.  For RESTART and CONTINUE
                                ;
                                ;               2.) set up the two stacks that the program uses -- PARAMETER
                                ;                   and MACHINE stacks
                                ;
                                ;               3.) interrogate DRS for the amount of free memory availble
                                ;                   and save the information
                                ;
                                ;               4.) set up the system clock information
                                ;
                                ;               5.) set DELUA/DEUNA interrupt service routine address and
                                ;                   vector
                                ;
                                ;               6.) set up addresses of CSRs
                                ;
                                ;               7.) Find out what kind of device we are running on.  This
                                ;                   information is contained in PCSR1 <6:4>
                                ;                       --> 000 = DEUNA
                                ;                           001 = DELUA
                                ;
                                ;               8.) Call MEMMAP to format extended memory
                                ;
                                ;               9.) set processor priority to ZERO
                                ;
                                ;               10.) CALL UNAINI to initialize the device we are running on
                                ;
                                ;               11.) print out header information
                                ;
                                ;               12.) setup system clock interrupt service routine address and
                                ;                   vector and enable clock
                                ;
                                ;
                                ; Inputs - none
                                ;
                                ; Outputs - A header message will be printed
                                ;
                                ; Calling Procedure: Invoked by the DRS at either a START, RESTART, or CONTINUE
                                ;
                                ; Side Effects - listed above
                                ;
                                ; Subordinate Routines -
                                ;               UNAINI  - initialize the DELUA/DEUNA
                                ;               FUNCT   - perform an ancillary port command
                                ;               DEVSTOP - stop the DELUA/DEUNA
                                ;
                                ; Register Usage -
                                ;               R2,R3   - scratch
                                ;
                                ;--+

035662                          INIT:
035662  022737  000020  002024'         CMP     #CEXIT,CFLAG            ;SEE IF EXIT COMMAND TYPED
035670  001004                          BNE     INIT1                   ; IF NO, DO INIT CODE
035672  005037  002024'                 CLR     CFLAG                   ; ELSE, CLEAR EXIT FLAG
035676  000137  037276'                 JMP     INICLN                  ; EXIT INIT CODE
035702                          INIT1:  READEF  #EF.START               ;IF HERE BECAUSE OF "START", DO INIT
035710                                  BCOMPLETE      START
035712                                  READEF  #EF.RESTART             ;IF HERE BECAUSE OF "RESTART", DO SOME INIT
035720                                  BNCOMPLETE      5$
035722  000137  037214'                 JMP     RESTRT
035726                          5$:     READEF  #EF.CONTINUE            ;IF HERE BECAUSE OF "CONTINUE", EXIT
035734                                  BNCOMPLETE      10$
035736  000137  037214'                 JMP     RESTRT
035742                          10$:    READEF  #EF.NEW                 ;IF HERE ON NEW PASS, SKIP SOME INIT
035750                                  BNCOMPLETE      15$
035752  000137  037250'                 JMP     NEW
035756  000137  037276'         15$:    JMP     INICLN                  ;IF DON'T KNOW WHY WE'RE HERE, EXIT
035762                          START:  I$STACK #STACK5,SP              ;SET PARAMETER STACK POINTER
035770                                  MEMORY  FRESIZ                  ;GET FREE MEMORY INFO
035776  013737  002134' 002136'         MOV     FRESIZ,FREMEM           ;SIZE OF FREE MEMORY IN FRESIZ
036004  062737  000002  002136'         ADD     #2,FREMEM               ;START OF FREE MEMORY IN FREMEM
036012  012702  002026'                 MOV     #CLKCSR,R2              ;SETUP R2 AS A PRT. TO CLOCK INFO. BLOCK
036016                                  CLOCK   L,R1                    ;GET LINE CLOCK INFO
036026                                  BNCOMPLETE      20$             ;IF NONE, SEE IF P CLOCK PRESENT
036030  004737  027014'                 JSR     PC,CLKSET               ;SET UP CLOCK INFO TABLE AND VECTOR
036034  012737  000100  002036'         MOV     #LCLKEN,CLKEN           ;SET UP THE ENABLE LINE CLOCK DATA
```

```
 4711 036042  000430                          BR      30$
 4712 036044                          20$:    CLOCK   P,R1                    ;GET P CLOCK INFO
 4713 036054                                  BNCOMPLETE      25$             ;IF NO CLOCK, ERROR
 4714 036056  004737  027014'                 JSR     PC,CLKSET               ; ELSE SET UP CLOCK INFO AND VECTOR
 4715 036062  062737  000002  002026'         ADD     #2,CLKCSR               ; POINT CLKCSR TO P-CLK COUNT SET REG.
 4716 036070  012777  001600  143730          MOV     #PCLKCT,@CLKCSR         ;LOAD CLK SET REG. WITH COUNT VALUE
 4717 036076  162737  000002  002026'         SUB     #2,CLKCSR               ;POINT CLKCSR BACK TO P-CLK CSR
 4718 036104  012737  000111  002036'         MOV     #PCLKEN,CLKEN           ;SETUP TO ENABLE P-CLK DATA
 4719 036112  000404                          BR      30$
 4720
 4721 036114                          25$:    ERRDF   21,EMSG51,ERR1          ; THERE AIN'T NO CLOCK - DEATH!!
 4722
 4723 036124                          30$:    GPHARD  #0,R1                   ;GET P-TAB POINTER FOR THIS UNIT
 4724 036134                                  BCOMPLETE       35$             ;THIS ONE IS NOT AVAILABLE
 4725 036136  000137  037276'                 JMP     INICLN
 4726
 4727 036142  012137  002126'         35$:    MOV     (R1)+,UNACSR            ;SAVE CSR
 4728 036146  012137  002130'                 MOV     (R1)+,UNAVEC            ;SAVE VECTOR
 4729 036152  012137  002132'                 MOV     (R1)+,UNAPRI            ;SAVE PRIORITY
 4730 036156                                  SETVEC  UNAVEC,#UNAISR,UNAPRI   ;SETUP DELUA/DEUNA INTERRUPT VECTOR
 4731 036204  013737  002126' 002106'         MOV     UNACSR,PCSR0            ;PCSR0
 4732 036212  013737  002106' 002110'         MOV     PCSR0,PCSR1
 4733 036220  062737  000002  002110'         ADD     #2,PCSR1                ;PCSR1
 4734 036226  013737  002110' 002112'         MOV     PCSR1,PCSR2
 4735 036234  062737  000002  002112'         ADD     #2,PCSR2                ;PCSR2
 4736 036242  013737  002112' 002114'         MOV     PCSR2,PCSR3
 4737 036250  062737  000002  002114'         ADD     #2,PCSR3                ;PCSR3
 4738
 4739 036256  013703  002110'                 MOV     PCSR1,R3                ; get address of PCSR1 in R3
 4740 036262  011302                          MOV     (R3),R2                 ; move value in PCSR1 into R2
 4741 036264  042702  177617                  BIC     #177617,R2              ; isolate device id field of PCSR1
 4742                                                                         ; it is bits 4-6
 4743 036270  010237  000524'                 MOV     R2,DEVICE               ; move value into R2: 0=DEUNA non-0=DELUA
 4744
 4745
 4746 036274                                  CALL    MEMMAP                  ; setup data structures in extended mem.
 4747
 4748 036302  005037  002770'                 CLR     S.NREC                  ; CLEAR SUMMARY DATA COUNTERS
 4749 036306  005037  002766'                 CLR     S.REC
 4750 036312  005037  002772'                 CLR     S.LEN
 4751 036316  005037  002774'                 CLR     S.COMP
 4752 036322  005037  002776'                 CLR     S.BYTE
 4753 036326  005037  003000'                 CLR     S.XFER
 4754
 4755 036332  013737  002034' 002044'         MOV     CLKHZ,TIMTCK            ;LOAD TICKS/SEC
 4756 036340                                  SETVEC  CLKVEC,#CLKINT,CLKBR    ;SETUP CLOCK INTERRUPT VECTOR
 4757 036366  013777  002036' 143432          MOV     CLKEN,@CLKCSR           ;SET ENABLE BITS IN THE CLOCK TO START
 4758 036374                                  SETPRI  #PRI00                  ;SET PRIORITY=0 TO ALLOW FOR INTERRUPTS
 4759 036402                                  CALL    UNAINI                  ;INITIALIZE THE DELUA/DEUNA
 4760
 4761                                 ;--+
 4762                                 ;       Read the devices default physical address.  If successful, print
 4763                                 ;       it out, else, tell user of error and proceed.
 4764                                 ;--+
 4765 036410                                  CALL    FUNCT   #RDDEFA         ;READ DELUA/DEUNA DEFAULT PHYSICAL ADDRESS
 4766 036422                                  P$POP   R2                      ;CHECK FOR ERROR
 4767 036424  001405                          BEQ     40$
```

```
036426                                  ERRSOFT 22,EMSG52               ; INDICATE ERROR
036436  000423                          BR      45$                     ; DON'T TRY TO PRINT
036440                          40$:    CALL    BINHEX #PCBB2,#6,#STRBUF        ;PUT ADDRESS INTO HEX FORMAT
036462                                  PRINTS  #HDMSG1,#STRBUF         ;PRINT ADDRESS

                                ;--+
                                ;       Read ROM firmware version number.  If successful, print it out,
                                ;       else, tell user of error and proceed
                                ;--+
036506                          45$:    CALL    FUNCT  #RDSTA           ;READ STATUS TO GET ROM VERSION
036520                                  P$POP   R2                      ;CHECK FOR ERROR
036522  001405                          BEQ     47$
036524                                  ERRSOFT 23,EMSG53               ; INDICATE ERROR
036534  000415                          BR      50$                     ; DON'T TRY TO PRINT

036536  113702  002152'         47$:    MOVB    PCBB2,R2                ;ONLY WANT LOWEST 6 BITS
036542  142702  000300                  BICB    #300,R2
036546                                  PRINTS  #HDMSG2,R2              ;PRINT ROM VERSION

                                ;--+
                                ;       Now try to print BOOT select options.  The options can be obtained
                                ;       by reading an internal location of the device.  Unfortunately they
                                ;       are neither at the same aodress nor the same bits of the associated
                                ;       word.  Some contortions must be gone through to print the info ...
                                ;       ... oh well ...
                                ;--+
036570                          50$:    PRINTS  #HDMSG3                 ;PRINT MORE HEADER INFO
036610  012703  002626'                 MOV     #UCB20,R3               ;SET UP FUNCTION CONTROL BLOCK
036614  012723  000002                  MOV     #2,(R3)+                ; MOVE 2 BYTES...
036620  012723  003110'                 MOV     #TEMP,(R3)+             ; INTO LOCATION TEMP...
036624  005023                          CLR     (R3)+                   ; HDBB<17:16>
036626  005737  000524'                 TST     DEVICE                  ; What kind of device is this?
036632  001404                          BEQ     55$                     ; If zero then DEUNA
036634  012723  000002                  MOV     #2,(R3)+                ; else, DELUA IDBB<15:0>
036640  012723  000030                  MOV     #30,(R3)+               ; IDBB<23:16>

036644                          55$:    CALL    FUNCT  #DMPMEM          ;DUMP INTERNAL MEMORY
036656                                  P$POP   R2                      ;CHECK FOR ERROR
036660  001405                          BEQ     60$                     ; NO ERROR
036662                                  ERRSOFT 24,EMSG18               ; REPORT ERROR AS SOFT ...
036672  000524                          BR      90$                     ; ... AND SKIP STATUS INFO

036674  013703  003110'         60$:    MOV     TEMP,R3                 ;PUT RESULT INTO R3

                                ;--+
                                ;       For the DELUA, the status bits are 15:13 -- the DEUNA 12:10, so
                                ;       need to shift right if a DELUA
                                ;--+
036700  005737  000524'                 TST     DEVICE                  ; IS DEVICE DEUNA?
036704  001403                          BEQ     62$                     ; YES, NO SHIFT
036706  006203                          ASR     R3                      ; SHIFT STATUS ...
036710  006203                          ASR     R3                      ; ... THREE BITS ...
036712  006203                          ASR     R3                      ; ... TO THE RIGHT.

036714  032703  002000          62$:    BIT     #BIT10,R3               ;DETERMINE STATUS
036720  001430                          BEQ     65$
036722  032703  004000                  BIT     #BIT11,R3
```

```
036726  001441                          BEQ     70$
036730  005737  000524'                 TST     DEVICE                  ; Is this DEUNA?
036734  001411                          BEQ     63$                     ; YES -- special select for DEUNA
036736                                  PRINTS  #HDMSG7                 ; else, remote boot not enabled
036756  000446                          BR      80$                     ;

036760                          63$:    PRINTS  #HDMSG4                 ; BIT10!BIT11 = REMOTE AND POWER UP BOOT ENABLED
037000  000435                          BR      80$

037002  032703  004000          65$:    BIT     #BIT11,R3
037006  001422                          BEQ     75$
037010                                  PRINTS  #HDMSG6                 ; BIT10 = REMOTE BOOT ENABLED
037030  000421                          BR      80$

037032                          70$:    PRINTS  #HDMSG5                 ; BIT11 = REMOTE BOOT ENABLED WITH ROM
037052  000410                          BR      80$

037054                          75$:    PRINTS  #HDMSG7                 ; REMOTE BOOT NOT ENABLED

                                ;--+
                                ;       Now look at self-test status and print it out
                                ;--+
037074  032703  010000          80$:    BIT     #BIT12,R3
037100  001411                          BEQ     85$
037102                                  PRINTS  #HDMSG8                 ; BIT12 = SELF TEST ENABLED
037122  000410                          BR      90$

037124                          85$:    PRINTS  #HDMSG9                 ; SELF TEST DISABLED

037144  012737  000000  001170' 90$:    MOV     #ALPHA,P$TYPE           ;SET MESSAGE DEFAULT VALUES
037152  012737  001000  001172'         MOV     #512.,P$SIZE
037160  012737  000001  001174'         MOV     #1,P$CPYS

037166  023737  002034' 002044'         CMP     CLKHZ,TIMTCK            ; THESE WON'T BE EQUAL IF CLOCK ...
037174  001004                          BNE     95$                     ; ... CLOCK IS WORKING
037176                                  ERRDF   25,EMSG51,ERR1          ; REPORT ERROR AND ABORT

037[illegible]                          95$:    CALL    DEVSTOP                 ; stop the DEUNA/DELUA

037214  105037  001275'         RESTRT: CLRB    P$BLD
037220  105037  001276'                 CLRB    P$HLP
037224  105037  001303'                 CLRB    P$NCMP
037230  105037  001306'                 CLRB    P$BONC
037234  105037  001305'                 CLRB    P$TEXT
037240  005037  002040'                 CLR     TIMMIN                  ;CLEAR TIME SINCE-START-LOCATIONS
037244  005037  002042'                 CLR     TIMSEC

037250  013777  002036' 142550  NEW:    MOV     CLKEN,@CLKCSR           ;SET ENABLE BITS IN THE CLOCK TO START
037256                                  READEF  #EF.START               ; If here because of start, exit
037264                                  BCOMPLETE INIEXI                ;
037266                                  SETPRI  #PRI00                  ; Else, adjust priority level to enable interrupts
037274  000401                          BR      INIEXI                  ;EXIT
037276                          INICLN: DOCLN                           ;ABORT PASS
037300                          INIEXI: EXIT    INIT                    ;EXIT INIT SECTION

                                ;*************************************************************************
                                ;     INSERT LOCAL STORAGE THAT IS USED ONLY
```

```
                                 ;    DURING THE INITIALIZE SECTION.
                                 ;********************************************************************************

                                 ;********************************************************************************
                                 ;    INSERT MESSAGES THAT ARE USED ONLY
                                 ;    DURING THE INITIALIZE SECTION.
                                 ;********************************************************************************

                                        .EVEN

037304                                  ENDINIT
```

```
                                .SBTTL  AUTODROP SECTION

                                ;++
                                ; THIS CODE IS EXECUTED IMMEDIATELY AFTER THE INITIALIZE CODE IF
                                ; THE "ADR" FLAG WAS SET.  THE UNIT(S) UNDER TEST ARE CHECKED TO
                                ; SEE IF THEY WILL RESPOND.  THOSE THAT DON'T ARE IMMEDIATELY
                                ; DROPPED FROM TESTING.
                                ; -

        037306                          BGNAUTO

                                ;*****************************************************************************************
                                ;       INSERT CODE HERE TO CHECK DEVICE(S) TO SEE IF THEY RESPOND.
                                ;       ISSUE A "DODU" FOR THOSE THAT DON'T.
                                ;*****************************************************************************************

        037306                          ENDAUTO
```

```
                                .SBTTL  CLEANUP CODING SECTION

                                ;++
                                ; THE CLEANUP CODING SECTION CONTAINS THE CODING THAT IS PERFORMED
                                ; AFTER THE HARDWARE TESTS HAVE BEEN PERFORMED.
                                ;--

037310                                  BGNCLN

                                ;******************************************************************************
                                ;       INSERT YOUR CLEANUP CODING.  THIS CODING SHOULD
                                ;       RESTORE YOUR TEST-DEVICE TO A NEUTRAL STATE.
                                ;       THIS CODE WILL BE EXECUTED AFTER EACH PASS AND AFTER THE
                                ;       PROGRAM IS INTERRUPTED BY "↑C".
                                ;******************************************************************************

                                ;--+
                                ; Name -                                Clean up code
                                ;
                                ; Functional Desciption:
                                ;               The clean-up code is used to leave the DELUA/DEUNA in a
                                ;               known state.  This will result in the following steps:
                                ;
                                ;               1.) wait one second for all port commands to complete
                                ;
                                ;               2.) Stop the DELUA/DEUNA causing it to transition to the
                                ;                   ready state
                                ;
                                ;               3.) clear the DELUA/DEUNA's multicast address list, and
                                ;
                                ;               4.) if we have got here after the listen command then take
                                ;                   the device out of promiscuous mode
                                ;
                                ; Inputs - none
                                ;
                                ; Outputs - none
                                ;
                                ; Calling Procedure: gets called by the DRS
                                ;
                                ; Side Effects - listed above
                                ;
                                ; Subordinate Routines -
                                ;               DEVSTOP - stop the DELUA/DEUNA
                                ;               FUNCT   - issue an ancillary port command
                                ;
                                ; Register Usage -
                                ;               R2      - function return status
                                ;
                                ;--+

037310                                  SETPRI  #PRI00                  ; Let device and clock interrupt

037316  012737  000062  002046'         MOV     #62,TIMER1              ; Set up for one second loop
037324  005737  002046'         5$:     TST     TIMER1                  ; Have we timed out?
037330  001375                          BNE     5$                      ; No, keep looping
037332  005037  003012'                 CLR     DNIFLG                  ; clear done interrupt flag
```

```
037336                                    CALL    DEVSTOP                 ; stop the DELUA/DEUNA
037344  012737  000000  002326'  10$:     MOV     #0,$WDMC+4              ;CLEAR MULTICAST ADDRESS LIST
037352                                    CALL    FUNCT   #WDMULA         ; WRITE 0 INTO LIST LENGTH
037364  012737  000400  002326'           MOV     #400,$WDMC+4            ; RESET FOR 1 ENTRY
037372                                    P$POP   R2                      ;CHECK FOR ERROR
037374  001404                            BEQ     15$                     ; IF OK CONTINUE
037376                                    ERRDF   26,EMSG25               ; ELSE, REPORT ERROR

037406  105737  001274'          15$:     TSTB    P$LIST                  ; Did we get here after the listen command?
037412  001426                            BEQ     30$                     ; NO!!
037414  105037  001274'                   CLRB    P$LIST                  ; clear listen flag
037420  105037  001253'                   CLRB    SOUFLG                  ; clear source address filter flag
037424  105037  001254'                   CLRB    DESFLG                  ; clear destination address filter flag
037430  105037  001255'                   CLRB    PROFLG                  ; clear protocol type filter flag
037434  012737  000000  002570'           MOV     #0,$WDMO+2              ; set up pcb to clear prom. mode
037442                                    CALL    FUNCT   #WDMODE         ; write mode into device
037454                                    P$POP   R2                      ; check for error
037456  001404                            BEQ     30$                     ; if OK, continue
037460                                    ERRDF   27,EMSG23               ; else, report error

037470  005077  142332           30$:     CLR     @CLKCSR                 ;DISABLE CLOCK
037474                                    SETPRI  #PRI07                  ;SET PROCESSOR PRIORITY BACK TO 7
037502                                    EXIT    CLN

                                 ;*****************************************************************
                                 ;      INSERT LOCAL STORAGE THAT IS USED ONLY
                                 ;      DURING THE CLEANUP SECTION.
                                 ;*****************************************************************

                                 ;*****************************************************************
                                 ;      INSERT MESSAGES THAT ARE USED ONLY
                                 ;      DURING THE CLEANUP SECTION.
                                 ;*****************************************************************

                                          .EVEN

037506                                    ENDCLN
```

```
                        .SBTTL  DROP UNIT SECTION

                        ;++
                        ; THE DROP-UNIT SECTION CONTAINS THE CODING THAT CAUSES A DEVICE
                        ; TO NO LONGER BE TESTED.
                        ;-

037510                          BGNDU

                        ;********************************************************************************
                        ;       INSERT DROP CODE HERE.  THIS CODE WILL BE EXECUTED AFTER
                        ;       A "DROP" COMMAND OR A "DODU" MACRO EXECUTION.  THE PURPOSE
                        ;       OF THIS CODE IS TO DO ANY NECESSARY HOUSEKEEPING AFTER A
                        ;       UNIT HAS BEEN DROPPED.  THIS SECTION IS OPTIONAL.
                        ;********************************************************************************

03/510                          EXIT    DU

                        ;********************************************************************************
                        ;     INSERT LOCAL STORAGE THAT IS USED ONLY
                        ;     DURING THE DROP-UNIT SECTION.
                        ;********************************************************************************

                        ;********************************************************************************
                        ;     INSERT MESSAGES THAT ARE USED ONLY
                        ;     DURING THE DROP-UNIT SECTION.
                        ;********************************************************************************

                                .EVEN

037514                          ENDDU
```

```
                .SBTTL  ADD UNIT SECTION

                ;++
                ; THE ADD-UNIT SECTION CONTAINS ANY CODE THE PROGRAMMER WISHES
                ;  TO BE EXECUTED IN CONJUNCTION WITH THE ADDING OF A UNIT BACK
                ;  TO THE TEST CYCLE.
                ;--

037516                  BGNAU

                ;*******************************************************************************
                ;       INSERT ADD CODE HERE.  THIS CODE WILL BE EXECUTED AFTER
                ;       AN "ADD" COMMAND.  THE PURPOSE OF THIS CODE IS TO DO ANY
                ;       HOUSEKEEPING THAT MAY BE NECESSARY AFTER A UNIT HAS BEEN ADDED.
                ;       THIS SECTION IS OPTIONAL.
                ;*******************************************************************************

037516                  EXIT    AU

                ;*******************************************************************************
                ;     INSERT LOCAL STORAGE THAT IS USED ONLY
                ;     DURING THE ADD-UNIT SECTION.
                ;*******************************************************************************

                ;*******************************************************************************
                ;     INSERT MESSAGES THAT ARE USED ONLY
                ;     DURING THE ADD-UNIT SECTION.
                ;*******************************************************************************

                        .EVEN

037522                  ENDAU


                .SBTTL  TEST 1: NIE
                ;--+
                ; Name - NIE                            Main loop for the NIE
                ;
                ; Functional Desciption:
                ;               This is the one and only "test" in the program.  When
                ;               entered, it will take control over user interactions by
                ;               presenting a completely separate interface than that of
                ;               the DRS.  This interface is detailed in the NCSE functional
                ;               specification for the NIE.
                ;
                ;               The flow of control of the routine is as follows:
                ;
                ;               REPEAT
                ;
                ;                       CLEAR all variables associated with command parse
                ;
                ;                       READ command line typed by user
                ;
                ;                       PARSE the command line
                ;                               (* the parse may result in the execution
                ;                                  of certain action routines *)
                ;
```

```
                                ;                       CASE parse_flags OF
                                ;
                                ;                               P$GDBD : PRINT <error while parsing>
                                ;
                                ;                               P$NNUF : PRINT <not enough input for parse>
                                ;
                                ;                               P$HLP  : EXECUTE HELP routine
                                ;
                                ;                               P$BLD  : EXECUTE BUILD routine
                                ;
                                ;                               P$BONC : EXECUTE BOUNCE routine
                                ;
                                ;                               P$LIST : EXECUTE LISTEN routine
                                ;
                                ;                       END_CASE
                                ;
                                ;               UNTIL (user inputs "EXIT" command)
                                ;
                                ;               NOTE: control will normally return to this routine after
                                ;               appropriate actions have been taken to service the input
                                ;               command.  In some cases control will be grabbed by the DRS,
                                ;               such as if a ↑C is typed, or a device fatal error is encountered
                                ;
                                ; Inputs - none
                                ;
                                ; Outputs - none
                                ;
                                ; Calling Procedure: called by the DRS
                                ;
                                ; Side Effects -
                                ;               1.) depending on what was input by the user, appropriate
                                ;                   routines will be called to service the command.
                                ;
                                ; Subordinate Routines -
                                ;               P$TRV   - parsing routine
                                ;               EXEHLP  - execute the help command
                                ;               EXEBLD  - execute the build command
                                ;               EXEBNC  - execute the bounce command
                                ;               EXELIS  - execute the listen command
                                ;
                                ; Register Usage - None
                                ;
                                ;--+


037524                                  BGNTST

037524  105037  001301'         GETCL:  CLRB    P$GDBD                   ;CLEAR CMD LINE PARSING ERROR FLAG
037530  105037  001300'                 CLRB    P$NNUF                   ;CLEAR NOT-ENOUGH FLAG
037534  105037  001274'                 CLRB    P$LIST                   ;CLEAR LISTEN FLAG
037540  105037  001275'                 CLRB    P$BLD                    ;CLEAR BUILD FLAG
037544  105037  001306'                 CLRB    P$BONC                   ;CLEAR BOUNCE FLAG
037550  105037  001276'                 CLRB    P$HLP                    ;CLEAR HELP FLAG
037554                                  GMANID  CLI$PM,CMDBUF,A,0,1,72.,NO       ;GET CMD LINE FROM OPERATOR
037574  012737  000732' 001260'         MOV     #CMDBUF,P$BUFA           ;SET UP ...
037602  012737  003430' 001262'         MOV     #CLITRE,P$TREE           ;... VARIABLES ...
037610  012737  040012' 001264'         MOV     #CLIACT,P$ACT            ;... FOR PARSE.
```

```

037616  005037  002024'                 CLR     CFLAG                   ;CLEAR QUALIFIER FLAG
037622  004737  034342'                 JSR     PC,P$TRV                ;GO PARSE COMMAND TREE

037626  105737  001301'                 TSTB    P$GDBD                  ;SEE IF PARSED OK, OR AN ERROR
037632  001412                          BEQ     5$
037634                                  PRINTF  #CLIERM                 ;IF NOT PRINT ERROR MESSAGE
037654  000137  037772'                 JMP     50$                     ;

037660  105737  001300'         5$:     TSTB    P$NNUF                  ;SEE IF INCOMPLETE COMMAND TYPED
037664  001412                          BEQ 10$
037666                                  PRINTF  #CLINUF                 ;IF NOT PRINT ERROR MESSAGE
037706  000137  037772'                 JMP     50$

037712  105737  001276'         10$:    TSTB    P$HLP                   ; help command?
037716  001404                          BEQ     15$                     ; branch if not
037720  004737  040250'                 JSR     PC,EXEHLP               ; execute it
037724  000137  037772'                 JMP     50$                     ; get next command

037730  105737  001275'         15$:    TSTB    P$BLD                   ;WAS BUILD COMMAND TYPED?
037734  001403                          BEQ     20$                     ;BRANCH IF NOT
037736  004737  040644'                 JSR     PC,EXEBLD               ;GO EXECUTE BUILD COMMAND
037742  000413                          BR      50$                     ;GO GET NEXT COMMAND

037744  105737  001306'         20$:    TSTB    P$BONC                  ; bounce command?
037750  001403                          BEQ     40$                     ; branch if not
037752  004737  042354'                 JSR     PC,EXEBNC               ; execute bounce
037756  000405                          BR      50$
037760                          40$:
037760  105737  001274'                 TSTB    P$LIST                  ; listen command?
037764  001402                          BEQ     50$                     ; NAY!!
037766  004737  056272'                 JSR     PC,EXELIS               ; execute listen command

037772  022737  000020  002024' 50$:    CMP     #CEXIT,CFLAG            ;WAS EXIT COMMAND TYPED?
040000  001402                          BEQ     70$                     ;YES, LEAVE!!
040002  000137  037524'                 JMP     GETCL                   ;IF NOT GET NEW COMMAND LINE

040006                          70$:    EXIT    TST                     ;  ELSE EXIT

                                .SBTTL  CLI ACTION TABLE AND ROUTINES
                                ;       USER MUST CLEAR/SET P$GDBD IF USE "CLIBIF" IN CONNECTION WITH ACTION
                                ;       R2 WILL HOLD ACTION CODE FROM PARSING (CLI) NODE
040012                          CLIACT:
040012  006302                          ASL     R2              ;MULTIPLY ACTION CODE BY 2
040014  016202  040030'                 MOV     10$(R2),R2      ;OFFSET VALUE
040020  062702  040030'                 ADD     #10$,R2         ;ADD BASE VALUE
040024  004712                          JSR     PC,(R2)         ;GO DO ACTION
040026  000207                          RTS     PC              ;RETURN TO TRVACT

                                                                ;BRIEF DESCRIPTION OF ACTION TAKEN
040030  000152                  10$:    .WORD   ACTNUL-10$      ;0-NULL
040032  000210                          .WORD   ACTHLP-10$      ;1-HELP
040034  000262                          .WORD   ACTNOD-10$      ;2-NODE
040036  000600                          .WORD   ACTBLD-10$      ;3-BUILD
040040  005116                          .WORD   ACTRUN-10$      ;4-RUN SPECIFIED TEST
040042  007322                          .WORD   ACTPAT-10$      ;5-SET 'MESSAGE PATTERN' TEST FLAG
040044  011562                          .WORD   ACTSAV-10$      ;6-SAVE NODE TABLE
```

```
  5226 040046  002644                        .WORD   ACTSUM-10$      ;7-PRINT SUMMARY TABLE
  5227 040050  003224                        .WORD   ACTIDT-10$      ;10-REQUEST ID
  5228 040052  004104                        .WORD   ACTEXT-10$      ;11-EXIT
  5229 040054  000144                        .WORD   ACTNUF-10$      ;12-NOT ENOUGH INFO
  5230 040056  004114                        .WORD   ACTXAD-10$      ;13-EXTRACT NI NODE ADDRESS FROM INPUT LINE
  5231 040060  004212                        .WORD   ACTSR4-10$      ;14-SAVE POINTER TO BEGINING OF ADDRESS STRING
  5232 040062  010756                        .WORD   ACTSND-10$      ;15-SET 'NODE' FLAG FOR SHOW COMMAND
  5233 040064  004220                        .WORD   ACTALP-10$      ;16-SET 'ALPHA' FLAG
  5234 040066  004230                        .WORD   ACTONE-10$      ;17-SET 'ONES' FLAG
  5235 040070  004240                        .WORD   ACTZRO-10$      ;20-SET 'ZEROS' FLAG
  5236 040072  004250                        .WORD   ACT1AL-10$      ;21-SET '1ALT' FLAG
  5237 040074  004260                        .WORD   ACTOAL-10$      ;22-SET '0ALT' FLAG
  5238 040076  004270                        .WORD   ACTCTT-10$      ;23-SET 'CCITT' FLAG
  5239 040100  004300                        .WORD   ACTOPR-10$      ;24-SET 'OPER SEL' FLAG
  5240 040102  004460                        .WORD   ACTTYP-10$      ;25-DETERMINE MESSAGE TYPE
  5241 040104  004466                        .WORD   ACTSZE-10$      ;26-DETERMINE MESSAGE SIZE
  5242 040106  004544                        .WORD   ACTCPY-10$      ;27-DETERMINE MESSAGE COPIES
  5243 040110  004622                        .WORD   ACTNAD-10$      ;30-SET 'NODE/ADDRESS' FLAG
  5244 040112  005004                        .WORD   ACTNAL-10$      ;31-SET 'NODE/ALL' FLAG
  5245 040114  005252                        .WORD   ACTRNA-10$      ;32-SET 'ALL' FLAG FOR RUN COMMAND
  5246 040116  006364                        .WORD   ACTRNL-10$      ;33-SET 'LOOPPAIR' FLAG FOR RUN CMD
  5247 040120  007404                        .WORD   ACTSMS-10$      ;34-SHOW CURRENT MESSAGE PARAMETERS
  5248 040122  007476                        .WORD   ACTCMS-10$      ;35-RESET MESSAGE PARAMETERS TO DEFAULT
  5249 040124  007602                        .WORD   ACTCNT-10$      ;36-SET 'COUNTER' FLAG FOR SHOW COMMAND
  5250 040126  011254                        .WORD   ACTCNL-10$      ;37-CLEAR LOGICAL NODE NAMED FROM TABLE
  5251 040130  011360                        .WORD   ACTFCT-10$      ;40-INITIATE DELUA/DEUNA PORT COMMAND FUNCTION
  5252 040132  000000                        .WORD   0               ;(was ACTUNS-10$) 41-UNSAVE NODE TABLE
  5253 040134  011430                        .WORD   ACTCSU-10$      ;42-CLEAR SUMMARY TABLE
  5254 040136  005720                        .WORD   ACTDIR-10$      ;43-SET 'LOOP DIRECT' FLAG FOR RUN COMMAND
  5255 040140  011514                        .WORD   ACTDFT-10$      ;44-LOOK FOR PASS COUNT DEFAULT
  5256 040142  012240                        .WORD   ACTUSF-10$      ;45-UNSAVE NODE TABLE FROM A FILE
  5257 040144  000154                        .WORD   ACTSQK-10$      ;46-SET QUICK BLD FLAG
  5258 040146  000164                        .WORD   ACTCQK-10$      ;47-CLEAR QUICK BLD FLAG
  5259 040150  000174                        .WORD   ACTCMP-10$      ;50-NO DATA COMPARISON
  5260 040152  000000                        .WORD   0               ;(* was ACTIBB-10$ *) 51 - init bounce buffer pointer
  5261 040154  002012                        .WORD   ACTSBB-10$      ;52 - fill in address in bounce buffer
  5262 040156  001664                        .WORD   ACTBLG-10$      ;53 - calulate address from logical node number
  5263 040160  013062                        .WORD   ACTSOU-10$      ;54 - store input address in source filter
  5264 040162  013120                        .WORD   ACTDES-10$      ;55 - store input address in destination filter
  5265 040164  013172                        .WORD   ACTPRO-10$      ;56 - store protocol type in protocol filter
  5266 040166  013156                        .WORD   ACTLIS-10$      ;57 - set listen flag
  5267 040170  017342                        .WORD   ACTSLI-10$      ;58 - show listen log
  5268 040172  020000                        .WORD   ACTCLI-10$      ;59 - clear listen log
```

```

                                        ;
                                        ;ACTION ROUTINE TO INDICATE THAT NOT ENOUGH COMMAND
                                        ;INFORMATION HAS BEEN ENTERED
                                        ;

 040174  112737  177777  001300'  ACTNUF: MOVB    #-1,P$NNUF              ;SET FLAG TO SAY NEED MORE OF COMMAND

                                        ;
                                        ;ACTION ROUTINE TO DO NOTHING
                                        ;

 040202  000207                   ACTNUL: RTS     PC                      ;RETURN TO PARSER

                                        ;
                                        ;ACTION ROUTINE TO SET QUICK BUILD FLAG
                                        ;

 040204  000240                   ACTSQK: NOP
 040206  105037  001300'                  CLRB    P$NNUF
 040212  000207                           RTS     PC


                                        ;
                                        ; ACTION ROUTINE TO CLEAR QUICK BUILD FLAG
                                        ;

 040214  000240                   ACTCQK: NOP
 040216  105037  001300'                  CLRB    P$NNUF
 040222  000207                           RTS     PC

                                        ;
                                        ; ACTION ROUTINE TO SET NOCOMPARE FLAG
                                        ;
 040224  105037  001300'          ACTCMP: CLRB    P$NNUF
 040230  112737  177777  001303'          MOVB    #-1,P$NCMP
 040236  000207                           RTS     PC
                                        ;
                                        ; action routine to set help flag
                                        ;
 040240  112737  177777  001276'  ACTHLP: MOVB    #-1,P$HLP               ; set help flag
 040246  000207                           RTS     PC                      ; return

                                        ;-->
                                        ; Name - EXEHLP
                                        ;
                                        ; Functional Description:
                                        ;               This routine will print out help to the user
                                        ;
                                        ; Inputs - Implicit
                                        ;               HLPTAB - table of addresses of help messages
                                        ;
                                        ; Outputs -     Prints out help messages at user's terminal
                                        ;
                                        ; Calling Procedure: JSR PC,EXEHLP
                                        ;
                                        ; Side Effects - none
```

```
                                         ;
                                         ; Subordinate Routines - none
                                         ;
                                         ; Register Usage -
                                         ;
                                         ;--+
040250                                   EXEHLP::
040250                                           P$PUSH  R1                              ; save R1
040252  012701  001310'                          MOV     #HLPTAB,R1                      ; point R1 to table of addresses of help
                                                                                         ; messages
040256                                   10$:    PRINTF  (R1)+                           ; print a line of help message
040274  020127  001412'                          CMP     R1,#HLPEND                      ; at end of table?
040300  001366                                   BNE     10$                             ; NO, go print more

040302  105037  001276'                          CLRB    P$HLP                           ; clear the help flag
040306                                           P$POP   R1                              ; restore R1
040310  000207                                   RTS     PC                              ; and take off hose-head


                                         ;
                                         ;ACTION ROUTINE TO READ IN NODE PHY. ADDRESS, STORE IT IN ADRBUF
                                         ;AND ENTER IT INTO THE NODE TABLE
                                         ;

040312  105037  001300'                  ACTNOD: CLRB    P$NNUF                          ;CLEAR NOTNUF FLAG
040316  004737  035366'                          JSR     PC,TRVADR                       ;TRAVERSE ADDRESS, CHECK IF TARGET OR ASSIST
040322  105737  001301'                          TSTB    P$GDBD                          ;CHECK IF RESULTS OK
040326  001137                                   BNE     50$                             ;IF NOT, RETURN WITH -1 IN P$GDBD
040330                                   10$:    CALL    EDPACK CBOADR,#ADRBUF,#6                ;GET ADDRESS INTO BUFFER
040352                                           P$POP   R1                              ;CHECK RESULTS FOR NUMBER OF CHAR.S
040354  001411                                   BEQ     15$                             ;IF OK, BRANCH TO 15$
040356                                           PRINTF  #CADRER                         ;ELSE PRINT ERROR MESSAGE
040376  000513                                   BR      50$                             ;AND RETURN
040400                                   15$:    CALL    CMPTWO #ADRBUF,#ILLADR,#3 ;SEE IF ILLEGAL ADDRESS
040422                                           P$POP   R1
040424  001021                                   BNE     17$                             ;IF YES, PRINT ERROR MESSAGE
040426                                           PRINTF  #ILADMS
040446                                           PRINTF  #ILADM1
040466  000457                                   BR      50$
040470                                   17$:    CALL    BINHEX #ADRBUF,#6,#STRBUF               ;CONVERT BINARY ADDRESS
                                                                                                 ;INTO ASCII STRING
040512  022737  000001  002024'                  CMP     #CASIST,CFLAG                   ;SEE IF TARGET OR ASSIST
040520  001407                                   BEQ     20$
040522  012737  017536' 001066'                  MOV     #ARGTY7,KEYWD2                  ;MOVE 'TARGET' INTO KEYWD2
040530  012737  000000  001200'                  MOV     #CTARGT,NODTY                   ;MOVE TARGET INTO NODE TYPE
040536  000406                                   BR      25$
040540  012737  017527' 001066'  20$:            MOV     #ARGTY6,KEYWD2                  ;MOVE 'ASSIST' INTO KEYWD2
040546  012737  000001  001200'                  MOV     #CASIST,NODTY
040554  012737  100000  001202'  25$:            MOV     #NODTBL,SLOT                    ;POINT SLOT TO START OF NODE TABLE
040562                                           CALL    ENTRND                          ;CALL ROUTINE TO ENTER NODE IN TABLE
040570                                           P$POP   R1                              ;CHECK RESULTS
040572  001015                                   BNE     50$                             ;IF NODE TABLE FULL, RETURN
040574  012737  017434' 001064'                  MOV     #CMDTY7,KEYWD1                  ;ELSE, MOVE "NODE" INTO KEYWD1
040602                                           PRINTS  #MSG2,#STRBUF                   ;INDICATE IF TARGET OR ASSIST
040626  000207                           50$:    RTS     PC



                                         ;
```

```
                                   ;ACTION ROUTINE TO SET THE BUILD COMMAND FLAG
                                   ;

040630  112737  177777  001275'  ACTBLD: MOVB    #-1,P$BLD               ;SET BUILD FLAG
040636  105037  001300'                  CLRB    P$NNUF
040642  000207                           RTS     PC                      ;RETURN

                                   ;--+
                                   ; Name - EXEBLD
                                   ;
                                   ; Functional Description
                                   ;               This routine executes the NIE build function.  The build
                                   ;               function is used to create a node table of those nodes that
                                   ;               are present on the Ethernet that are conforming to the Ethernet
                                   ;               specification.  Nodes that are not adhering to this spec will
                                   ;               not necessary be included in the built node table.
                                   ;                       All correctly functioning Ethernet nodes periodically
                                   ;               transmit a system ID message at approximately ten minute
                                   ;               intervals.  This routine attempts to capture all these IDs
                                   ;               and, thus, build a picture of the network by constructing
                                   ;               a node table.  Note, the node table will not contain any
                                   ;               information on the physical position of the nodes with respect
                                   ;               to each other.
                                   ;                       This routine can run for a maximum of 40 minutes.  There
                                   ;               are three terminating conditions for the routine: 1.) the
                                   ;               operator may hit a control-C at which point control of the
                                   ;               diagnostic will be passed to the DRS, 2.) 40 minutes time
                                   ;               has elapsed since the operator invoked the build command, or 3.)
                                   ;               10 minutes time has elapsed since the routine has received a
                                   ;               new system ID (one which it has not already received and
                                   ;               logged).
                                   ;
                                   ; Inputs - none
                                   ;
                                   ; Outputs - implicit
                                   ;               NODTBL - Node Table
                                   ;                        This structure will contain the current physical
                                   ;                        addresses of all the nodes that the routine has
                                   ;                        received a system ID from.  It can contain a maximum
                                   ;                        of 512 nodes.
                                   ;               DEFTBL - Default hardware address table
                                   ;                        This structure will contain the default hardware
                                   ;                        addresses of all the nodes that the routine has
                                   ;                        received a system ID from.  It also contains the
                                   ;                        type of device attached to each node (e.g. DELUA,
                                   ;                        DEQNA, etc.).  This table can also contain a maximum
                                   ;                        of 512 nodes.
                                   ;
                                   ; Calling Procedure: JSR PC,EXEBLD
                                   ;
                                   ; Side Effects - none
                                   ;
                                   ; Subordinate Routines -
                                   ;               RELBUF - used to release receive ring entries
                                   ;               FINDSL - routine to look for empty locations in node table
                                   ;               RECEVE - routine to receive frames
                                   ;               GETRNX - update receive ring pointers
```

```
                                ;               CMPEXT - compare received addresses with node table entries
                                ;               MOVEXT - move data from received frames to node/default table
                                ;               GETIDA - get address of a particular field of system ID message
                                ;               RETMEM - restore memory mapping to its original state
                                ;
                                ; Register Usage -
                                ;               R1, R2, R3, R4 - multiple uses
                                ;
                                ;--+
040644                          EXEBLD:
040644                          1$:
040644                                  PRINTS  #MSG1                    ; print 'build' command message
040664                                  PRINTS  #MSG11
040704                                  PRINTS  #MSG12

040724                                  P$PUSH  R1,R2,R3,R4              ; save registers

040734                                  CALL    FINDSL                   ; is table already full?
040742                                  P$POP   R2                       ; see what find slot has to say
040744  001402                          BEQ     3$                       ; branch if there is an empty slot
040746  000137  041662'                 JMP     80$                      ; else, leave
040752                          3$:
040752                                  CALL    DEVSTART                 ; start up the DELUA/DEUNA
040760                                  call    funct  #wdmula           ; write multicast address list
040772                                  P$POP   R2                       ; check for error
040774  001404                          beq     10$                      ; if OK, continue
040776                                  errdf   28,emsg25,err1           ; else report error
041006  005037  003110'         10$:    clr     temp                     ; clear 'no. nodes in last min.' counter
041012  005037  003112'                 clr     temp1                    ; clear node type argument (set to target)
041016  005037  003114'                 clr     temp2                    ; set interval counter
041022  012737  000012  003116'         mov     #12,temp3                ; set 'mins. s'nce last new node' counter
041030  012737  100000  001202'         mov     #nodtbl,slot             ; set slot to begining of node table
041036                          19$:
041036  012737  000074  002052'         mov     #60.,timers
041044                          20$:
041044                                  break                            ; allow for control c interruption
041046  005737  002052'                 tst     timers                   ; see if interval is up
041052  001002                          bne     201$                     ; Its's not, keep going
041054  000137  041506'                 jmp     40$                      ;

041060                          201$:   CALL    RECEVE                   ;  else, check for reception of id message
041066                                  P$POP   R2                       ; R2 holds no of messages received
041070  001765                          beq     20$                      ; if none, keep looking
041072  012737  000013  003116'         mov     #13,temp3                ; got one : reset 'mins. since new node'
041100  013703  002100'                 mov     rrgnxt,R3                ;               save receive ring pointer
041104                                  CALL    GETRNX  #RRGNXT          ; update pointer
041116  016304  000010                  MOV     10(R3),R4                ; point R4 to receive buffer

                                ;--+
                                ;       There is a possibility that what was received was a broadcast frame.
                                ;       So, check if it is and if so give it the old heave ho.
                                ;--+

041122  012702  002332'                 mov     #ucb7,R2                 ; point R2 to rem. console mult. address
041126                                  CALL    CMPTWO  R2,R4,#3         ; compare received dest. with
                                                                                  ; console mult. address

```

```
041144                                  P$POP   R1                      ; Get result of compare
041146  001117                          bne     30$                     ; not equal, throw message away (effectively)
041150  062704  000006                  add     #sourcc,R4              ; point R4 to node address
041154  012702  100000                  mov     #nodtbl,R2              ; point R2 to node table
041160                          21$:
041160                                  CALL    CMPEXT  #ONTAB,R2,#ORRING,R4,#3 ; see if node already on table
041206                                  P$POP   R1
041210  001476                          beq     30$                     ; if same, don't add to table
041212                          22$:
041212  062702  000010                  add     #10,R2                  ; point to next table entry
041216  020227  110000                  CMP     R2,#NODEND              ; check to see if end of table
041222  001356                          bne     21$                     ; if no, compare next entry

                                ;--+
                                ;       After all entries in the node table have been checked and a match
                                ;       has not been found, try to add the new node address to the table.
                                ;--+

041224                                  CALL    FINDSL                  ; Look for an empty entry in the table
041232                                  P$POP   R2                      ; get table full indicator
041234  001071                          bne     35$                     ; non-zero return means table full

                                ;--+
                                ;       Add node address and node type to node table
                                ;--+

041236  013702  001202'                 mov     slot,R2                 ; point R2 to slot in node table
041242                                  CALL    MOVEXT  #ORRING,R4,#ONTAB,R2,#3 ; move addr. into node table

                                ;--+
                                ;       Now add address to default node table
                                ;--+

041270  062702  010000                  ADD     #DEFNOD,R2              ; point R2 entry in default addr. table
041274  162704  000006                  sub     #sourcc,R4              ; point R4 back to start of frame
041300                                  call    getide  R4,#7           ; get address of default hardware address
041314                                  p$pop   r1                      ; r1 points to default hardware address
041316                                  CALL    MOVEXT  #ORRING,R1,#ONTAB,R2,#3 ; save default address

                                ;--+
                                ;       Get node type and store it in default node table
                                ;--+
041344                                  call    getide  R4,#144         ; get node type address
041360                                  p$pop   r1                      ; r1 points to node type
041362  111101                          movb    (r1),r1                 ; put node type in r1
041364                                  CALL    REMAP   #ONTAB          ; allow access to node table
041376  110162  000007                  MOVB    R1,7(R2)                ; save node type in default table

041402  005237  003110'                 inc     temp                    ; increment 'nodes in last min.' counter
041406                          30$:    CALL    RELBUF  R3              ; release buffer to DELUA/DEUNA
041416  000612                          br      20$                     ; check for more input

041420                          35$:
041420                                  CALL    RELBUF  R3              ; release buffer to DELUA/DEUNA
041430  012737  000005  002052'         mov     #5, TIMERS              ; allow 5 seconds for cleanup

041436                          36$:
```

```
041436                               CALL    RECEVE                  ; keep fetching frames until they stop
041444                               P$POP   R2
041446  001413                       BEQ     38$                     ; branch if none received
041450  013703  002100'              MOV     RRGNXT,R3               ; point R3 to received entry
041454                               CALL    RELBUF  R3              ; release buffer to DELUA/DEUNA
041464                               CALL    GETRNX  #RRGNXT         ; update ring pointer
041476                       38$:
041476  005737  002052'              TST     TIMERS                  ; is time up?
041502  001355                       BNE     36$                     ; branch if time is not up
041504  000431                       BR      50$                     ; yes, leave
041506                       40$:
041506  005337  003116'              dec     temp3                   ; see if 10 mins since last node
041512  001426                       beq     50$                     ;  if yes, exit
041514  005237  003114'              inc     temp2                   ; see if time is up
041520  023727  003114' 000050       cmp     temp2,#40.
041526  001420                       beq     50$                     ; if yes, exit
041530                               PRINTS  #bldmsg,temp,temp2      ;  else, print "still working" message
041560  005037  003110'              clr     temp
041564  000137  041036'              JMP     19$                     ; do it again
041570                       50$:
041570                               PRINTS  #blddon,temp2           ; print "build complete" message
041614  012737  000000  002326'      mov     #0,$wdmc+4              ; clear multicast address list
041622                               call    funct   #WDMULA         ;  write 0 into list length
041634                               P$POP   R2                      ; check for error
041636  001404                       beq     55$                     ; cont ue if ok
041640                               errdf   29,emsg25,err1          ;  else, report error
041650                       55$:
041650  004737  051006'              jsr     pc,actsnd               ; print node table
041654  012737  000400  002326'      mov     #400,$wdmc+4            ; reset multicast list for 1 entry
041662                       80$:
041662  105037  001275'              CLRB    P$BLD                   ; clear build flag
041666                               CALL    DEVSTOP                 ; stop the DELUA/DEUNA
041674                               CALL    RETMEM                  ; return memory to original mapping
041702                               P$POP   R1,R2,R3,R4             ; restore registers
041712  000207                       RTS     PC
                             ;
                             ; ACTION ROUTINE TO CALCULATE ADDRESS FROM LOGICAL NODE NUMBER
                             ;
041714                       ACTBLG: P$PUSH  R2                      ;SAVE R2
041716                               CALL    REMAP   #ONTAB          ; allow access to node table
041730  013702  001270'              MOV     P$NUM,R2                ;PUT NODE LOGICAL NUMBER INTO R2
041734  006302                       ASL     R2                      ;MULTIPLY BY 8
041736  006302                       ASL     R2                      ;NODE TABLE ADDRESS =
041740  006302                       ASL     R2                      ;  (LOG. NO. X 8) + #NODTBL
041742  062702  100000               ADD     #NODTBL,R2              ;ADD OFFSET

041746  020227  110000               CMP     R2,#NODEND              ; Does R2 point past the end of node table
041752  003002                       BGT     5$                      ; Yes, an incorrect node has been specified
041754  005712                       TST     (R2)                    ; is there an address here?
041756  001014                       BNE     10$                     ; branch if there is

041760                       5$:     PRINTF  #EMSG46                 ; report it
042000  112737  177777  001301'      MOVB    #-1,P$GDBD              ; set error
042006  000410                       BR      20$                     ; leave
042010                       10$:
042010  012237  001070'              MOV     (R2)+,ADRBUF            ; put it in the address buffer
042014  012237  001072'              MOV     (R2)+,ADRBUF+2          ; put it in the address buffer
```

```
042020  011237  001074'                 MOV     (R2),ADRBUF+4           ; put it in the address buffer
042024  105037  001302'                 CLRB    P$AERR                  ; clear address error flag
042030                          20$:
042030                                  P$POP   R2                      ; restore regs
042032                                  CALL    RETMEM                  ; restore memory mapping
042040  000207                          RTS     PC                      ;continue

                                ;--+
                                ; Name   ACTSBB                         Switch for bounce actions routines
                                ;
                                ; Functional Description:
                                ;               This routine is a simple multiplexor between two action
                                ;               routines for the BOUNCE command.  The reason for it is that
                                ;               for the first node specified in the bounce command a different
                                ;               action will take place other than for the rest of the nodes
                                ;               specified in the command.  Namely, the first node specified
                                ;               will be used as the destination of the bounced message, whereas
                                ;               the remaining nodes (if there are any specified) will be
                                ;               used as forward loop request fields.  The routine simply
                                ;               compares XRGNXT to XRGCUR.  If they are equal it calls ACTIBB
                                ;               else it calls ACTFBB.
                                ;
                                ; Inputs - none
                                ;
                                ; Outputs - none
                                ;
                                ; Calling procedure: JSR PC,ACTSBB
                                ;
                                ; Side effects -
                                ;               1.) will invoke one of the two action routines named above
                                ;
                                ; Subordinate Routines -
                                ;               ACTIBB - initialize bounce buffer
                                ;               ACTFBB - fill bounce buffer
                                ;
                                ; Register Usage - none
                                ;
                                ;--+
042042                          ACTSBB::
042042  023737  002076' 002072'        CMP     XRGNXT,XRGCUR                   ; has a buffer been allocated?
042050  001003                          BNE     10$                             ; Yes, call ACTFBB

042052  004737  042066'                 JSR     PC,ACTIBB                       ; Else, call ACTIBB
042056  000402                          BR      20$                             ; ... and exit

042060  004737  042224'         10$:    JSR     PC,ACTFBB                       ; ....
042064  000207                  20$:    RTS     PC                              ; DONE!!


                                ;--+
                                ; Name - ACTIBB                 Initialize the bounce buffer
                                ;
                                ; Functional Description:
                                ;               This action routine is called to initialize a transmit
                                ;               buffer to be used in the BOUNCE command.  Also, it
                                ;               initializes some pointers that the BOUNCE routine must
                                ;               know about.
```

```
                                        ;
                                        ; Inputs - Implicit
                                        ;                       ADRBUF - contains six bytes of destination address
                                        ;
                                        ; Outputs - none
                                        ;
                                        ; Calling Procedure: JSR PC,ACTIBB
                                        ;
                                        ; Side Effects -
                                        ;                       1.) Transmit buffer pointed to by XRGNXT is initialized for
                                        ;                           bounce command
                                        ;                       2.) Variables initialized:
                                        ;                           BNCBUF - pointer to beginning of transmit buffer
                                        ;                           BNCCNT - number of loop information bytes -- set to 2 for
                                        ;                                    skip count
                                        ;
                                        ; Subordinate Routines -
                                        ;                       REMAP   - remap virtual memory
                                        ;                       RETMEM  - restore memory mapping
                                        ;
                                        ; Register Usage -
                                        ;                       R1 - pointer to transmit buffer
                                        ;
                                        ;--+
042066                                  ACTIBB::
042066                                          P$PUSH  R1                      ; Save R1
042070                                          CALL    DEVSTART                ; start up the DELUA/DEUNA
042076                                          CALL    REMAP   #OTRING         ; allow access to transmit ring
042110  013701  002076'                         MOV     XRGNXT,R1               ; point R1 to next entry in ring
042114  016137  000010  002062'                 MOV     10(R1),BNCBUF           ; save pointer to transmit buffer
042122  016101  000010                          MOV     10(R1),R1               ; point R1 to transmit buffer

042126  013711  001070'                         MOV     ADRBUF,(R1)             ; store six ...
042132  013761  001072' 000002                  MOV     ADRBUF+2,2(R1)          ; ... bytes of destination address ...
042140  013761  001074' 000004                  MOV     ADRBUF+4,4(R1)          ; ... in transmit buffer

042146  017761  003034' 000014                  MOV     PROTOO,PROTOT(R1)       ; fill in protocol type

042154  005061  000016                          CLR     16(R1)                  ; skip count equals zero
042160  012737  000002  002064'                 MOV     #2,BNCCNT               ; two bytes of data are in data
                                                                                ; field (skip count)

042166  112737  177777  001306'                 MOVB    #-1,P$BONC              ; indicate that we are to do BOUNCE
042174                                          P$POP   R1                      ; restore R1
042176                                          CALL    GETXNX  #XRGNXT         ; point XRGNXT to next ring entry
042210                                          CALL    RETMEM                  ; restore memory mapping
042216  105037  001300'                         CLRB    P$NNUF                  ; clear not enough flag
042222  000207                                  RTS     PC                      ; all done!!

                                        ;--+
                                        ; Name - ACTFBB                         Fill bounce buffer
                                        ;
                                        ; Functional Description:
                                        ;                       This routine is used to fill in forwarding addresses into
                                        ;                       the loopback portion of a loopback message.
                                        ;
                                        ; Inputs - Implicit -
```

```
                                ;               ADRBUF - contains the address to forward to
                                ;
                                ; Outputs - none
                                ;
                                ; Calling Procedrue: JSR PC,ACTFBB
                                ;
                                ; Side Effects -
                                ;               1.) A forward function is added to the buffer pointed to by
                                ;                   BNCBUF
                                ;               2.) BNCCNT is update to reflect the addition of data to the
                                ;                   buffer
                                ;
                                ; Subordinate Routines -
                                ;               REMAP - remap a portion of virtual memory
                                ;               RETMEM - restore memory mapping
                                ;
                                ; Register Usage -
                                ;               R2 - pointer to transmit buffer
                                ;
                                ;--+
042224                          ACTFBB::
042224                                  P$PUSH  R2                      ; save R2
042226                                  CALL    REMAP   #OTRING         ; allow access to transmit ring
042240  013702  002062'                 MOV     BNCBUF,R2               ; point R2 to transmit buffer
042244  062702  000016                  ADD     #16,R2                  ; point R2 past header info
042250  063702  002064'                 ADD     BNCCNT,R2               ; point R2 past info already in data field

                                ;--+
                                ;       Update count of information contained in this bounce buffer.
                                ;       If the result is greater than the message size then abort attempt
                                ;--+
042254  062737  000010  002064'         ADD     #10,BNCCNT              ; update bounce count
042262  023737  002064' 001172'         CMP     BNCCNT,P$SIZE           ; Is this greater than message size
042270  003414                          BLE     10$                     ; NO!
042272  112737  177777  001301'         MOVB    #-1,P$GDBD              ; indicate bad command to parser
042300                                  PRINTF  #EMSG45                 ; Tell user of problem
042320  000410                          BR      20$                     ; and take off

042322  012722  000002          10$:    MOV     #2, (R2)+               ; set forward function code
042326  013722  001070'                 MOV     ADRBUF, (R2)+           ; set 6 bytes of forwarding address
042332  013722  001072'                 MOV     ADRBUF+2, (R2)+
042336  013722  001074'                 MOV     ADRBUF+4, (R2)+

042342                          20$:    CALL    RETMEM                  ; restore memory mapping
042350                                  P$POP   R2                      ; restore R2
042352  000207                          RTS     PC                      ; return


                                ;--+
                                ; Name - EXEBNC                         Execute bounce command
                                ;
                                ; Functional Description:
                                ;               This routine is called to carry out the Bounce command
                                ;               of the NI Exercisor.  The bounce command is a function supplied
                                ;               to the user so that he/she may choose any path of nodes
                                ;               on the NI to loop a packet through.
                                ;                       To carry out this function a loop request message
;                       is created with each of the nodes specified in the input
;                       command line used as a forwarding field of the message.
;                       To complete the loop the last forwarding field along with
;                       the reply field is set to our own address.  For example, if
;                       the following command were input:
;
;                       NIE > bounce/AA0004000010,N3,N5,N7
;
;                       then this loop request message would result:
;
;                               +-------------------------+
;                               )      DESTINATION        )
;                               )   AA-00-04-00-00-10     )
;                               +-------------------------+
;                               )      SOURCE             )
;                               +-------------------------+
;                               )      PROTOCOL TYPE      )
;                               +-------------------------+
;                               )      FORWARD            )
;                               )        N3               )
;                               +-------------------------+
;                               )      FORWARD            )
;                               )        N5               )
;                               +-------------------------+
;                               )      FORWARD            )
;                               )        N7               )
;                               +-------------------------+
;                               )      FORWARD            )
;                               ) OUR ETHERNET ADDRESS    )
;                               +-------------------------+
;                               )      REPLY              )
;                               ) OUR ETHERNET ADDRESS    )
;                               +-------------------------+
;
;                       After the message is created and transmitted, an attempt is
;                       made to receive the message.  The message will be looped back
;                       to our node if and only if all nodes on the specified path
;                       forward the message properly.  If the message is not received
;                       the user will be notified as such and can then take further
;                       steps to isolate the problem.
;
;                       NOTE: 1.) logical node names can be mixed with ethernet
;                                 addresses, and
;                             2.) the node order specified in the command line
;                                 dictates the path that the message will follow
;
; Inputs - Implicit
;                       The buffer pointed to by BNCBUF has an incomplete loop
;                       request message in it.  It contains all necessary information
;                       except the last forwarding address and the reply address (both
;                       our own)
;
; Outputs - none
;
; Calling Procedure: JSR PC,EXEBNC
;
; Side Effects -
```

```
                                ;               1.) loop request message is completed and transmitted
                                ;               2.) The status of the reception of the message is indicated
                                ;                   to the user
                                ;
                                ; Subordinate Routines -
                                ;               REMAP   - remap virtual memory
                                ;               RETMEM  - restore memory mapping
                                ;               BLDBUF  - fill the transmit buffer with data patterns
                                ;               XMIT    - transmit the loop request message
                                ;               RUNCOM  - Do receive
                                ;
                                ; Register Usage -
                                ;               R2 - pointer to transmit buffer
                                ;
                                ;--+
042354                          EXEBNC: P$PUSH  R2                      ; save r2 and r3
042356                                  CALL    REMAP   #OTRING         ; allow access to transmit ring

                                ;--+
                                ;       Position the pointer to the transmit buffer so that it points to
                                ;       where more loop info should be added.
                                ;--+
042370  013702  002062'                 MOV     BNCBUF,R2               ; let R2 point to transmit buffer
042374  062702  000016                  ADD     #16,R2                  ; point R2 past header info
042400  063702  002064'                 ADD     BNCCNT,R2               ; point R2 past loop data already in
                                                                        ; buffer
                                ;--+
                                ;       Update the count of loop information in the bounce buffer.  If it
                                ;       is greater then the message size (P$SIZE) then abort this command
                                ;--+
042404  062737  000020  002064'         ADD     #20,BNCCNT              ; let bounce count reflect what will
                                                                        ; be added
042412  023737  002064' 001172'         CMP     BNCCNT,P$SIZE           ; TOO MUCH LOOP INFO ???
042420  003414                          BLE     10$                     ; NAY LADDIE!!
042422  112737  177777  001301'         MOVB    #-1,P$GDBD              ; indicate error to parser
042430                                  PRINTF  #EMSG45                 ; report error to user
042450  000465                          BR      50$                     ; and partake of the exit

042452                          10$:

                                ;--+
                                ;       Add last forward address and the reply message to the bounce buffer.
                                ;       They will both be the device's physical address.
                                ;--+
042452  012722  000002                  MOV     #2, (R2)+               ; put our address as forwarding address
042456  013722  002244'                 MOV     PHYADR, (R2)+
042462  013722  002246'                 MOV     PHYADR+2, (R2)+
042466  013722  002250'                 MOV     PHYADR+4, (R2)+
042472  012722  000001                  MOV     #1, (R2)+               ; set reply message
042476  013722  002244'                 MOV     PHYADR, (R2)+           ; put our address in here
042502  013722  002246'                 MOV     PHYADR+2, (R2)+         ; 6 bytes worth
042506  013722  002250'                 MOV     PHYADR+4, (R2)+

042512                                  CALL    BLDBUF  BNCBUF,BNCCNT   ; fill the buffer with data patterns

042530                                  CALL    XMIT                    ; transmit the buffer
042536                                  P$POP   R2                      ; error?
```

```
042540  001404                          BEQ     30$                     ; branch if okay
042542  112737  177777  001301'         MOVB    #-1,P$GDBD              ; set error flag
042550  000425                          BR      50$

042552                          30$:
042552                                  CALL    RUNCOM                  ; execute common receive
042560                                  P$POP   R2                      ; get results
042562  001410                          BEQ     40$                     ; branch if no error
042564  112737  177777  001301'         MOVB    #-1, P$GDBD             ; set error flag
042572                                  ERRSOFT 30,EMSG34
042602  000410                          BR      50$                     ; leave
042604                          40$:
042604                                  PRINTF  #OK                     ; say it arrived a okay
042624                          50$:

                                ;--+
                                ;       A consequence of calling RUNCOM is the updating of certain summary
                                ;       data counters.  This routine does not add to the summary, but
                                ;       must clear the counters, so that they are not misread by future
                                ;       action routines.
                                ;--+
042624  005037  002770'                 CLR     S.NREC                  ; CLEAR SUMMARY DATA COUNTERS
042630  005037  002766'                 CLR     S.REC
042634  005037  002772'                 CLR     S.LEN
042640  005037  002774'                 CLR     S.COMP
042644  005037  002776'                 CLR     S.BYTE
042650  005037  003000'                 CLR     S.XFER

042654                                  CALL    RETMEM                  ; restore memory mapping
042662                                  CALL    DEVSTOP                 ; stop the DELUA/DEUNA
042670                                  P$POP   R2                      ; restore R2
042672  000207                          RTS     PC                      ; bye

                                ;--+
                                ; Name - ACTSUM                         Print summary data
                                ;
                                ; Functional Desciption:
                                ;               This action routine is called to print out the summary
                                ;               data counters kept by the NIE.
                                ;
                                ; Inputs - Implicit -
                                ;               STATBL  - table containing the summary data
                                ;
                                ; Outputs -
                                ;               1.) summary data is printed at the user terminal
                                ;
                                ; Calling Procedure: JSR PC,ACTSUM
                                ;
                                ; Side Effects - none
                                ;
                                ; Subordinate Routines -
                                ;               BINHEX  - convert binary data to HEX character string
                                ;               BINDEC  - convert binary data to decimal character string
                                ;               REMAP   - used to map summary table into page registers
                                ;               RETMEM  - restore memory mapping
                                ;
                                ; Register Usage -
```

```
                                       ;               R1        - pointer to summary table
                                       ;               R2,R3,R4  - summary data
                                       ;
                                       ;--+

042674  105037  001300'                ACTSUM: CLRB    P$NNUF                  ;CLEAR NOTNUF FLAG
042700                                         CALL    REMAP   #OSTAB          ; allow access to summary table
042712                                         P$PUSH  R1,R2,R3,R4
042722  012701  100000                         mov     #statbl,R1              ; move address of table to R1
042726  005711                                 tst     (R1)                    ; see if table empty
042730  001013                                 bne     5$                      ;  if not, cont.
042732                                         printf  #tabemt,#summ           ;  else print 'table empty' message
042756  000526                                 br      30$                     ;  exit

042760                                 5$:     printf  #summs1                 ; print the ...
043000                                         printf  #summs2                 ; ... header info

043020  020127  126000                 10$:    cmp     R1,#STAEND              ; See if at end of table
043024  001503                                 beq     30$                     ;  if yes, exit
043026  005711                                 tst     (R1)                    ; see if rest of table empty
043030  001501                                 beq     30$                     ;  if yes, exit
043032                                         call    binhex  R1,#6,#strbuf   ; print summary data
043052  016102  000006                         mov     6(R1),R2                ;   RX not complete
043056  016103  000010                         mov     10(R1),R3               ;   RX complete
043062  016104  000012                         mov     12(R1),R4               ;   length errors
043066                                         printf  #summs3,#strbuf,R3,R2,R4;    print them out
043120  016102  000014                         mov     14(R1),R2               ;   compare errors
043124  062701  000016                         add     #16,R1                  ;   bytes compared
043130                                         call    bindec  R1              ;    put into ascii string
043140                                         printf  #summs5,R2,#decstr      ;    print them out
043166  062701  000004                         add     #4,R1                   ;   bytes transfered
043172                                         call    bindec  R1              ;    put into ascii string
043202                                         printf  #summs6,#decstr         ;    print
043226  062701  000004                         add     #4,R1                   ; point R1 to next table entry
043232  000672                                 br      10$                     ; do it all again
043234                                 30$:    CALL    RETMEM                  ; restore memory mapping
043242                                         P$POP   R1,R2,R3,R4
043252  000207                                 RTS     PC



                                       ;
                                       ;ACTION ROUTINE TO INITIATE THE REQUEST ID TEST TO THE SPECIFIED NODE
                                       ;


                                       ;--+
                                       ; Functional Description
                                       ;               This subroutine builds and transmits Request ID frames
                                       ;               to the node specified by the operator in the command line.
                                       ;               The system ID info of the specified node is then displayed.
                                       ;               If the node does not respond before 60 seconds have passed
                                       ;               an error is reported to the operator.
                                       ;
                                       ; Inputs -      Implicit - The specified node address is located in ADRBUF.
                                       ;
                                       ; Outputs -     System ID info or error message printed to operator.
                                       ;
                                       ; Calling procedure - JSR PC, ACTIDT
```

```
                                        ;
                                        ; Side effects - XRGNXT pointer is updated by a call to BLDREQ sub.
                                        ;
                                        ; Register Usage - R1 - points to $WDMO for write mode operations.
                                        ;                  R2 - is scratch.
                                        ;                  R3 - points to the received message buffer.
                                        ;                  R4 - scratch
                                        ;
                                        ;--+

043254  105737  001302'                 ACTIDT: TSTB    P$AERR                  ;SEE IF ADDRESS ENTERED WAS VALID
043260  001402                                  BEQ     5$
043262  000137  044026'                         JMP     70$                     ; IF NOT, EXIT ACTION ROUTINE

043266                                  5$:     P$PUSH  R1,R2,R3,R4             ; save registers
043276  105037  001300'                         CLRB    P$NNUF                  ;CLEAR NOTNUF FLAG
043302                                          CALL    CMPTWO #ADRBUF,#ILLADR,#3 ; see if illegal address
043324                                          P$POP   R1
043326  001012                                  bne     10$                     ;  if no, continue
043330                                          PRINTF  #ILADMS                 ;  else print illegal address message
043350  000137  044026'                         jmp     70$

043354                                  10$:    CALL    CMPTWO  #ADRBUF,#PHYADR,#3 ; see if address is own (host node)
043376                                          P$POP   R1                      ;
043400  001563                                  beq     55$
043402  012737  177776  003114'                 mov     #-2,temp2               ; set counter for no. of times tried
043410  012701  002566'                         mov     #$WDMO,R1               ; set up to write mode
043414  012761  010000  000002                  mov     #10000,2(R1)            ;  10000: TPAD =1 (pad transmit buffers)
043422                                          CALL    FUNCT #WDMODE           ; write mode
043434                                          P$POP   R2                      ; check for error
043436  001402                                  beq     15$                     ;  br if error
043440  000137  043772'                         jmp     60$

043444                                  15$:    CALL    DEVSTART                ; start up the DELUA/DEUNA
043452                                          CALL    BLDREQ                  ; build Request ID message frame
043460                                          CALL    XMIT                    ; transmit request
043466                                          P$POP   R2                      ; get results, R2 = success/failure
043470  001402                                  beq     20$                     ;  if OK branch
043472  000137  044002'                         jmp     65$                     ;  else exit routine

043476  005737  003024'                 20$:    tst     retrys                  ; see if failed due to excessive collisions
043502  001412                                  beq     25$                     ;  if no, cont.
043504                                          printf  #rtryer                 ;  yes, print 'excessive collisions' message
043524  000137  043750'                         jmp     55$                     ;  exit

043530  012704  002052'                 25$:    mov     #timers,R4              ; set up for 10 second timout
043534  012714  000012                          mov     #10.,(R4)

043540                                  30$:    break
043542  005714                                  tst     (R4)                    ; see if time has expired
043544  001431                                  beq     35$                     ;  if yes, branch
043546                                          CALL    RECEVE                  ; check for answer
043554                                          P$POP   R2                      ;  R2 holds no. of buffers received
043556  001770                                  beq     30$                     ;  if no buffers recieved, loop

043560  013703  002100'                         mov     RRGNXT,R3               ; get receive ring pointer
043564                                          CALL    GETRNX #RRGNXT          ; update pointer
```

```
043576  016304  000010                   mov     10(R3),R4               ; point R4 to message buffer
043602  026427  000022  051115           cmp     sircpt(R4),#"MR         ; see if message recieved is in reply to one sent
043610  001421                           beq     40$                     ;  if yes, branch to 25$
043612                                   CALL    RELBUF  R3              ; release buffer to DELUA/DEUNA
043622  005237  003114'                  inc     temp2                   ;  increment retry counter
043626  001344                           bne     30$                     ;  if no, look for correct reply message

043630                           35$:    errsoft 31,emsg22               ;  else, report error
043640  005237  002770'                  inc     s.nrec                  ;  update summary data
043644  012704  001070'                  mov     #adrbuf,R4              ;  point R4 to node that did not respond
043650  000137  043720'                  jmp     52$                     ;  and exit

043654  005237  002766'          40$:    inc     s.rec                   ; increment 'received messages' counter
043660  062737  000056  003000'          add     #46.,s.xfer             ; update 'bytes transfered' counter

043666                                   call    prntid  r4              ; Print the system id info

043676                           50$:    CALL    REMAP   #ORRING         ; allow access to receive ring
043710  016304  000010                   MOV     10(R3),R4               ; point R4 to received message again
043714  062704  000006                   ADD     #6,R4                   ; point R4 to source address
043720                           52$:    call    writes  #1,R4,#orring   ; update summary table
043740                                   CALL    RELBUF  R3              ; release buffer to DELUA/DEUNA

043750  005061  000002           55$:    clr     2(R1)                   ; disable transmit padding
043754                                   CALL    FUNCT   #WDMODE
043766                                   P$POP   R2                      ; check for error
043770  001404                           BEQ     65$                     ; ain't none
043772                           60$:    errdf   32,emsg23,err1          ; error -- can't write mode

044002                           65$:    CALL    RETMEM                  ; restore memory mapping
044010                                   CALL    DEVSTOP                 ; stop the DELUA/DEUNA
044016                                   P$POP   R1,R2,R3,R4             ; restore registers

044026  000207                   70$:    RTS     PC



                                 ;
                                 ;ACTION ROUTINE TO CHECK FOR ADDITION PARAMETER CHANGE INPUTS
                                 ;AND PRINT OUT NEW PARAMETER INFO WHEN ALL INPUT ARE PROCESSED
                                 ;

044030  105714                   ACTMSG: TSTB    (R4)                    ;CHECK FOR ADDITIONAL INPUT
044032  001037                           BNE     50$                     ; Branch if none
044034  012737  017424' 001064'  12$:    MOV     #CMDTY6,KEYWD1
044042  013701  001170'                  MOV     P$TYPE,R1               ;GET MESSAGE TYPE ASCII STRING ADDRESS
044046  006301                           ASL     R1                      ;INTO R1
044050  062701  001414'                  ADD     #MSGTAB,R1
044054                                   PRINTF  #MSGPRM                 ;PRINT 'MESSAGE' COMMAND MESSAGE
044074                                   PRINTF  #MSG4,(R1),P$SIZE,P$CPYS        ;PRINT MSG PARAMETERS
044126  105037  001300'                  CLRB    P$NNUF                  ;CLEAR NOTNUF FLAG
044132  000207                   50$:    RTS     PC



                                 ;
                                 ;ACTION ROUTINE TO RETURN CONTROL TO THE SUPERVISOR
                                 ;

```

```
044134  012737  000020  002024' ACTEXT: MOV     #CEXIT,CFLAG            ;SET EXIT FLAG
044142  000207                          RTS     PC



                                ;
                                ;ACTION ROUTINE TO TAKE NI NODE ADDRESS FROM INPUT STRING BUFFER
                                ;AND STORE IT IN THE BUFFER CALLED ADRBUF
                                ;

044144  004737  053322'         ACTXAD: JSR     PC,XSTRIN               ; put node address in CBOBUF
044150                                  CALL    EDPACK #CBOBUF,#ADRBUF,#6       ;PUT NODE ADDRESS INTO ADRBUF
044172                                  P$POP   R0
044174  110037  001302'                 MOVB    R0,P$AERR               ;SET ADDRESS=12 CHAR. GOOD/BAD FLAG
044200  105737  001302'                 TSTB    P$AERR                  ;IF GOOD, RETURN
044204  001415                          BEQ     10$
044206                                  PRINTF  #CADRER                 ;ELSE, PRINT ERROR MESSAGE
044226  105037  001300'                 CLRB    P$NNUF                  ; AND CLEAR 'NOT ENOUGH' FLAG
044232  112737  177777  001301'         MOVB    #-1,P$GDBD              ; set bogus command flag
044240  000207                  10$:    RTS     PC

                                ;
                                ;ACTION ROUTINE TO STORE POINTER TO BEGINING OF OPERATOR INPUT ADDRESS
                                ;IN COMMAND INPUT BUFFER
                                ;

044242  010437  001166'         ACTSR4: MOV     R4,CBOADR               ;SAVE STRING POINTER
044246  000207                  10$:    RTS     PC


                                ;
                                ;ACTION ROUTINE TO SET MESSAGE TYPE = ALPHA FLAG
                                ;

044250  012737  000000  001170' ACTALP: MOV     #ALPHA,P$TYPE           ;SET MESSAGE TYPE
044256  000207                          RTS     PC


                                ;
                                ;ACTION ROUTINE TO SET MESSAGE TYPE = ALL ONES FLAG
                                ;

044260  012737  000001  001170' ACTONE: MOV     #ONES,P$TYPE            ;SET MESSAGE TYPE
044266  000207                          RTS     PC


                                ;
                                ;ACTION ROUTINE TO SET MESSAGE TYPE = ALL ZEROS FLAG
                                ;

044270  012737  000002  001170' ACTZRO: MOV     #ZEROS,P$TYPE           ;SET MESSAGE TYPE
044276  000207                          RTS     PC


                                ;
                                ;ACTION ROUTINE TO SET MESSAGE TYPE = ALTERNATING ONES FLAG
                                ;
```

```

044300  012737  000003  001170' ACT1AL: MOV     #ONEALT,P$TYPE          ;SET MESSAGE TYPE
044306  000207                          RTS     PC


                                ;
                                ;ACTION ROUTINE TO SET MESSAGE TYPE = ALTERNATING ZEROS FLAG
                                ;

044310  012737  000004  001170' ACTOAL: MOV     #ZROALT,P$TYPE          ;SET MESSAGE TYPE
044316  000207                          RTS     PC


                                ;
                                ;ACTION ROUTINE TO SET MESSAGE TYPE = CCITT FLAG
                                ;

044320  012737  000005  001170' ACTCTT: MOV     #CCITT,P$TYPE           ;SET MESSAGE TYPE
044326  000207                          RTS     PC


                                ;
                                ;ACTION ROUTINE TO SET MESSAGE TYPE = OPERATOR SELECTED INPUT
                                ;

044330  105037  001304'         ACTOPR: CLRB    P$MERR                  ;CLEAR MESSAGE ERROR FLAG
044334  112737  177777  001305'         MOVB    #-1,P$TEXT              ; indicate text
044342  004737  035366'                 JSR     PC,TRVADR               ; process string
044346  105037  001305'                 CLRB    P$TEXT                  ; clear text flag
044352  105737  001301'                 TSTB    P$GDBD                  ; good string?
044356  001403                          BEQ     10$                     ; continue if it is
044360  105037  001301'                 CLRB    P$GDBD                  ; clear error flag
044364  000425                          BR      20$                     ; and report error

044366  022737  000006  002024' 10$:    CMP     #OPRSEL,CFLAG           ; was it a user defines text?
044374  001021                          BNE     20$                     ; no, we have an error
044376  012737  000006  001170'         MOV     #OPRSEL,P$TYPE          ; yes, good user string, set type
044404                                  CALL    SELMSG  R4              ; and process it

                                ;--+
                                ;       Make R4 point past string in input command line
                                ;--+
044414                                  P$PUSH  R2                      ; save R2 for now
044416  012702  001722'                 MOV     #OPSLBF,R2              ; point R2 to selected message
044422  122227  000000          15$:    CMPB    (R2)+,#0                ; reached the end of string yet?
044426  001402                          BEQ     18$                     ; YES,
044430  005204                          INC     R4                      ; point past character of message
044432  000773                          BR      15$                     ; continue 'til all the way past

044434                          18$:    P$POP   R2                      ; restore R2
044436  000423                          BR      50$                     ; and branch

044440  022737  000000  002024' 20$:    CMP     #CTARGT,CFLAG           ; see if target flag set
044446  001011                          BNE     30$                     ; branch if it is
044450                                  PRINTF  #UNBOND                 ; print unbounded error message
044470  000406                          BR      50$                     ; and branch

```

```
044472  105737  001304'          30$:    TSTB    P$MERR                  ; see if unbounded string
044476  001003                           BNE     50$                     ; branch if not
044500  112737  177777  001301'          MOVB    #-1,P$GDBD              ; set error in good/bad flag

044506  000207                   50$:    RTS     PC                      ; return


                                 ;
                                 ;ACTION ROUTINE TO CHECK FOR MORE INPUT AFTER MESSAGE TYPE HAS BEEN
                                 ;ALTERED
                                 ;

044510  004737  044030'          ACTTYP: JSR     PC,ACTMSG               ;CHECK FOR ADDITIONAL COMMANDS
044514  000207                           RTS     PC


                                 ;
                                 ;ACTION ROUTINE TO INPUT MESSAGE SIZE PARAMETER, CHECK TO SEE IF
                                 ;IT IS WITHIN LEGAL LIMITS, CHANGE PARAMETER AND THEN RETURN TO
                                 ;SEE IF MORE INPUT EXISTA
                                 ;

044516  023727  001270' 000037   ACTSZE: CMP     P$NUM,#31.              ;CHECK FOR VALID SIZE RANGE
044524  003410                           BLE     10$
044526  022737  002673  001270'          CMP     #1467.,P$NUM
044534  003404                           BLE     10$                     ;IF VALID CONTINUE
044536  013737  001270' 001172'          MOV     P$NUM,P$SIZE            ;SET MESSAGE SIZE
044544  000410                           BR      20$
044546                           10$:    PRINTF  #SIZLMT                 ;PRINT SIZE LIMITS EXCEEDED MESSAGE
044566  004737  044030'          20$:    JSR     PC,ACTMSG               ;CHECK FOR ADDITIONAL COMMANDS
044572  000207                           RTS     PC


                                 ;
                                 ;ACTION ROUTINE TO INPUT COPIES PARAMETER, CHECK TO SEE IF IT IS
                                 ;WITHIN LEGAL LIMITS, CHANGE PARAMETER AND THEN RETURN TO SEE IF
                                 ;MORE INPUT PARAMETERS EXIST
                                 ;

044574  023727  001270' 000000   ACTCPY: CMP     P$NUM,#0                ;CHECK FOR VALID COPIES RANGE
044602  003410                           BLE     10$
044604  022737  000400  001270'          CMP     #256.,P$NUM
044612  003404                           BLE     10$                     ;IF VALID, CONTINUE
044614  013737  001270' 001174'          MOV     P$NUM,P$CPYS            ;SET MESSAGE COPIES
044622  000410                           BR      20$
044624                           10$:    PRINTF  #CPYLMT                 ;PRINT COPY LIMIT EXCEEDED MESSAGE
044644  004737  044030'          20$:    JSR     PC,ACTMSG               ;CHECK FOR ADDITIONAL COMMANDS
044650  000207                           RTS     PC


                                 ;
                                 ;ACTION ROUTINE TO CLEAR NODE SPECIFIED BY PHYSICAL ADDRESS FROM NODE TABLE
                                 ;

044652  105037  001300'          ACTNAD: CLRB    P$NNUF                  ;CLEAR NOTNUF FLAG
044656  105737  001302'                  TSTB    P$AERR                  ;SEE IF ADDRESS ENTERED WAS VALID
044662  001063                           BNE     35$                     ; IF NOT, EXIT ACTION ROUTINE
044664                                   P$PUSH  R2,R3                   ;SAVE R2 AND R3
```

```
044670  012702  001070'              MOV     #ADRBUF,R2              ;MOVE ADDRESS OF ADDRESS INTO R2
044674  012703  100000               MOV     #NODTBL,R3              ;MOVE ADDRESS OF NODE TABLE INTO R3
044700                               CALL    REMAP   #ONTAB          ; allow access to node table

044712                       21$:    CALL    CMPTWO  R2,R3,#3        ;SEE IF ADDRESSES MATCH
044730                               P$POP   R1
044732  001416                       BEQ     25$                     ;IF YES, BR 25$
044734  062703  000010               ADD     #10,R3                  ;ELSE POINT R3 TO NEXT ENTRY
044740  020327  110000               CMP     R3,#NODEND              ;ARE WE AT END OF NODE TABLE?
044744  001362                       BNE     21$                     ;IF NOT, COMPARE NEXT ENTRY
044746                               PRINTF  #NOCMPR                 ;ELSE, PRINT ADDRESS DOESN'T COMPARE MSG.
044766  000414                       BR      30$                     ;RETURN

044770  005023               25$:    CLR     (R3)+                   ;ELSE, CLEAR NODE FROM TABLE
044772  005023                       CLR     (R3)+
044774  005023                       CLR     (R3)+
044776  005013                       CLR     (R3)
045000                               PRINTF  #ADRDEL                 ;PRINT NODE DELETED FROM TABLE MESSAGE

045020                       30$:    CALL    RETMEM                  ; restore memory mapping
045026                               P$POP   R2,R3                   ;RESTORE R2 AND R3
045032  000207               35$:    RTS     PC                      ;RETURN



                             ;
                             ;ACTION ROUTINE TO CLEAR NODE TABLE
                             ;

045034                       A' 'NAL: P$PUSH R2                      ; save R2
045036                               CALL    REMAP   #ONTAB          ;ALLOW ACCESS TO THE NODE TABLE
045050  012702  100000               MOV     #NODTBL,R2              ;MOVE NODE TABLE ADDRESS INTO R2
045054  005022               10$:    CLR     (R2)+                   ;CLEAR WORD IN NODE/DEFAULT TABLE
045056  020227  120000               CMP     R2,#DEFEND              ;ANY MORE?
045062  001374                       BNE     10$                     ;CONTINUE UNTIL DONE
045064                               PRINTF  #TABCLR,#NOD            ;PRINT NODE TABLE CLEARED MESSAGE
045110  105037  001300'              CLRB    P$NNUF                  ;CLEAR NOTNUF FLAG
045114                               P$POP   R2                      ;RESTORE R2
045116                               CALL    RETMEM                  ;RESTORE MEMORY MAPPING
045124  000207                       RTS     PC

                             ;--+
                             ; Functional Description
                             ;               This routine is used to calculate the logical node name
                             ;               of a node.
                             ;
                             ; Inputs -      P1 - pointer to a node in the node table
                             ;
                             ; Outputs -     P2 - Integer representing the logical node name
                             ;
                             ; Calling Procedure - CALL LOGNAM P1
                             ;                     P$POP P2
                             ;
                             ; Side effects - None
                             ;
                             ; Subordinate routines - None
                             ;
                             ; Register Usage - R1 - scratch
```

```
                                        ;
                                        ;--+
     045126                             LOGNM::
     045126                                     P$POP   R1                      ; Get address of node
     045130  162701  100000                     SUB     #NODTBL,R1              ; Make it an offset from base
     045134  006201                             ASR     R1                      ;       DIVIDE
     045136  006201                             ASR     R1                      ;         BY
     045140  006201                             ASR     R1                      ;       EIGHT
     045142                                     RETURN  R1                      ; return the logical value


                                        ;--+
                                        ; Name - ACTRUN                         Run a specified test
                                        ;
                                        ; Functional Desciption:
                                        ;               This routine is called by the parse routine to run
                                        ;               the user specified test.  It looks at the variable
                                        ;               KEYWD1 to determine which test it should call up, then
                                        ;               invokes the appropriate test.  Also, it keeps track
                                        ;               of the pass count and calls the specified test the
                                        ;               appropriate number of times.
                                        ;
                                        ; Inputs - Implicit -
                                        ;               KEYWD1  - contains integer representing a test number
                                        ;               P$PASS  - number of times to invoke test
                                        ;
                                        ; Outputs - none
                                        ;
                                        ; Calling Procedure: JSR PC,ACTRUN
                                        ;
                                        ; Side Effects -
                                        ;               1.) invokes test specified by KEYWD1, P$PASS times
                                        ;
                                        ; Subordinate Routines -
                                        ;               DEVSTART - start up the DELUA/DEUNA
                                        ;               RUNALL  - run the ALLNODE test
                                        ;               RUNLUP  - run the looppair test
                                        ;               RUNDIR  - run the direct loop test
                                        ;               RUNPAT  - run the pattern test
                                        ;               DEVSTOP - stop the DELUA/DEUNA
                                        ;
                                        ; Register Usage - none
                                        ;
                                        ;--+

     045146  105037  001300'            ACTRUN: CLRB    P$NNUF                  ; CLEAR 'NOT ENOUGH' FLAG
     045152  013737  001270' 001176'            MOV     P$NUM,P$PASS
     045160                                     CALL    DEVSTART                ; start up the DELUA/DEUNA
     045166  022737  000032  001064'    5$:     CMP     #CRNALL,KEYWD1          ; SEE IF 'ALL' TEST
     045174  001004                             BNE     10$                     ;  IF NO, CONTINUE
     045176                                     CALL    RUNALL                  ;  IF YES, DO ALLNODE
     045204  000423                             BR      30$
     045206  022737  000033  001064'    10$:    CMP     #CLUPPR,KEYWD1          ; IS IT 'LOOPPAIR' TEST
     045214  001004                             BNE     15$                     ;  IF NO, CONTINUE
     045216                                     CALL    RUNLUP                  ;  IF YES, DO LOOPPAIR
     045224  000413                             BR      30$
     045226  022737  000043  001064'    15$:    CMP     #CDIR,KEYWD1            ; IS IT 'DIRECT' TEST
```

```
045234  001004                           BNE     20$                    ;  IF NO, CONTINUE
045236                                   CALL    RUNDIR                 ;  IF YES, DO DIRECT
045244  000403                           BR      30$
045246                           20$:    CALL    RUNPAT                 ; ELSE, ITS 'PATTERN' TEST
045254  023727  001176' 177777   30$:    CMP     P$PASS,#-1             ; SEE IF PASS SET FOR INDEFINATE
045262  001741                           BEQ     5$                     ;  IF YES, LOOP
045264  005337  001176'                  DEC     P$PASS                 ; HAVE WE DONE ALL PASSES?
045270  001336                           BNE     5$                     ;  IF NO, LOOP
045272                                   CALL    DEVSTOP                ; stop the DELUA/DEUNA
045300  000207                           RTS     PC

                                 ;
                                 ;ACTION ROUTINE TO SET 'RUN ALL' FLAG
                                 ;

045302  012737  000032  001064'  ACTRNA: MOV     #CRNALL,KEYWD1         ; SET FLAG
045310  000207                           RTS     PC

                                 ;--+
                                 ; Name - RUNALL                        run ALLNODE test
                                 ;
                                 ; Functional Desciption:
                                 ;               This routine implements the NIE ALLNODE loop test.
                                 ;                       This is a two part test.  First, the direct loop
                                 ;               test is run.  If all nodes respond to the direct loop
                                 ;               request, then a packet is looped between each pair of nodes
                                 ;               in the node table to establish the connectivity of
                                 ;               the two nodes at the farthest ends of the NI.
                                 ;
                                 ; Inputs - Implicit -
                                 ;               1.) all nodes in the node table
                                 ;
                                 ; Outputs - Implicit -
                                 ;               1.) adds or modifies entries in the summary table
                                 ;
                                 ; Calling Procedure:    CALL RUNALL
                                 ;
                                 ; Side Effects - none
                                 ;
                                 ; Subordinate Routines -
                                 ;               DIRCOM  - run the direct loop test
                                 ;               FULSLT  - find a valid entry in the node table
                                 ;               BLDFAS  - build a full assist message
                                 ;               XMIT    - transmit the loopback packet
                                 ;               REMAP   - allow access to the node table
                                 ;               BINHEX  - convert binary data to HEX character string
                                 ;               LOGNM   - determine logical node name of a node
                                 ;               RUNCOM  - receive the loopback packet
                                 ;               WRITES  - write summary information to summary table
                                 ;
                                 ; Register Usage -
                                 ;               R1      - pointer to target node
                                 ;               R2      - pointer to assist node
                                 ;               R3      - logical node number for target node
                                 ;               R4      - logical node number for assist node
                                 ;
                                 ;--+

045312                             RUNALL: CALL    DIRCOM                  ; run loopdirect test
045320                                     P$POP   R1                      ;  check results
045322  001415                             beq     5$                      ;  if OK, branch
045324  022701  000001                     cmp     #1,R1                   ;   else, was table empty?
045330  001410                             beq     3$                      ;    if yes, don't print abort message
045332                                     prints  #pasabt                 ;  else abort test and print message
045352  000137  045746'            3$:     jmp     32$
045356  012737  100000  001202'    5$:     mov     #nodtbl,slot            ; move node table address to slot
045364                                     CALL    FULSLT                  ; find first entry
045372  013701  001202'                    mov     slot,R1                 ;  and put target address into R1
045376  013737  001174' 003122'    10$:    mov     P$CPYS,cpycnt           ; set up loop for no. of copies
045404  062737  000010  001202'            add     #10,slot                ; update slot
045412                                     CALL    FULSLT                  ; get next assist node from table
045420  013702  001202'                    mov     slot,R2
045424  022737  177777  001202'            cmp     #-1,slot                ;  see if at end of table
045432  001530                             beq     25$                     ;  if yes, br
045434                             15$:    CALL    BLDFAS  R1,slot         ; build full assist message
045450                                     CALL    XMIT                    ; transmit message
045456                                     P$POP   R3                      ;  check results
045460  001346                             BNE     10$                     ; transmit failed -- try next pair

045462                             17$:    CALL    REMAP   #ONTAB          ; allow access to node table
045474                                     call    binhex  R1,#6,#strbuf   ; set up buffers for error print ...
045514                                     call    binhex  r2,#6,#strbul   ; ... if necessary

045534                                     CALL    LOGNM   R1              ; put the logical node name for ...
045544                                     P$POP   R3                      ; ... target into R3
045546                                     CALL    LOGNM   R2              ; put the logical node name for ...
045556                                     P$POP   R4                      ; ... assist into R4

045560                                     printb  #tstms4,#argty7,r3,#argty6,r4   ;   assist node =
045614                                     CALL    RUNCOM                  ; do receive loop
045622                                     P$POP   R4                      ; check results
045624  001405                             beq     21$                     ;  if OK, loop some more

045626                             20$:    errsoft 33,emsg42,ERR3          ;  ... and print failing nodes
045636  000410                             br      101$

045640                             21$:    printb  #okfu
045660  005337  003122'            101$:   dec     cpycnt                  ; decrement 'copies' counter
045664  001263                             bne     15$                     ;  if more to do, loop
045666                                     CALL    WRITES #2,R1,slot,#ontab; else, update summary table
045712  000631                             br      10$
045714  062701  000010             25$:    add     #10,R1                  ; point R1 to next target node
045720  010137  001202'                    mov     R1,slot                 ; update slot
045724                                     CALL    FULSLT                  ; get address from table
045732  013701  001202'                    MOV     SLOT,R1
045736  022737  177777  001202'            cmp     #-1,slot                ; see if end of table
045744  001214                             bne     10$                     ;  if no, continue else, finished
045746                             32$:    RETURN


                                   ;
                                   ;ACTION ROUTINE TO SET 'RUN LOOP DIRECT' FLAG
                                   ;

045750  012737  000043  001064'    ACTDIR: MOV     #CDIR,KEYWD1            ; SET FLAG
```

```
045756  000207                                    RTS     PC

045760                                    RUNDIR: CALL    DIRCOM                  ; call common code
045766                                            P$POP   R1
045770                                    10$:    RETURN

                                          ;--+
                                          ; Name - DIRCOM                         direct loop test common code
                                          ;
                                          ; Functional Desciption:
                                          ;               This routine implements the NIE Direct Loop Test.
                                          ;               In this test a packet is looped directly to all nodes
                                          ;               in the node table
                                          ;
                                          ; Inputs - Implicit
                                          ;               1.) nodes in the node table
                                          ;
                                          ; Outputs - Explicit -
                                          ;               P1 - return status of routine
                                          ;
                                          ;           Implicit
                                          ;               1.) add or modify entries in the summary table
                                          ;
                                          ; Calling Procedure:    CALL DIRCOM
                                          ;                       P$POP   P1
                                          ;
                                          ; Side Effects - none
                                          ;
                                          ; Subordinate Routines -
                                          ;               FULSLT  - find a valid entry in the node table
                                          ;               BLDLD   - build loop direct packet
                                          ;               XMIT    - transmit the loopback packet
                                          ;               REMAP   - allow access to the node table
                                          ;               BINHEX  - convert binary data to HEX character string
                                          ;               LOGNM   - determine logical node name of a node
                                          ;               RUNCOM  - receive the loopback packet
                                          ;               WRITES  - write summary information to summary table
                                          ;
                                          ; Register Usage -
                                          ;               R1      - return status
                                          ;               R2      - return status of transmit
                                          ;               R3      - logical node number
                                          ;               R4      - return status of receive
                                          ;
                                          ;--+
045772  005001                            DIRCOM: clr     R1                      ; clear results register
045774  012737  100000  001202'                   mov     #nodtbl,slot            ; move node table address to slot
046002                                            CALL    FULSLT                  ; see if table empty
046010  022737  177777  001202'                   cmp     #-1,slot
046016  001015                                    bne     9$                      ;  if no continue
046020                                            printf  #tabemt,#nod            ;  else, print "table empty" message
046044  012701  000001                            mov     #1,R1                   ;   put 'table empty' indicator in R1
046050  000554                                    br      32$
046052  012737  100000  001202'   9$:     mov     #nodtbl,slot
046060  013737  001174' 003122'   10$:    mov     P$CPYS,cpycnt           ; set up for no. of copies
046066                                            CALL    FULSLT                  ; get next node in table
046074  022737  177777  001202'                   cmp     #-1,slot                ; see if at end of table
```

```
046102  001537                          beq     32$                     ;  if yes, exit

046104                                  CALL    LOGNM   SLOT            ; Get logical node name pointed to . .
046116                                  P$POP   R3                      ; ... by slot and store in R1
046120                                  CALL    REMAP   #ONTAB          ; allow access to node table
046132                                  CALL    BINHEX  SLOT,#6,#STRBUF ; STRBUF holds address of node that w ll
                                                                        ; be looped directly to

046154                          15$:    printb  #tstms2,#direct,R3      ;  node address
046202  022737  000005  001064'         CMP     #CPATRN,KEYWD1
046210  001016                          BNE     16$
046212  013701  001170'                 MOV     P$TYPE,R1
046216  006301                          ASL     R1
046220  062701  001414'                 ADD     #MSGTAB,R1
046224                                  PRINTB  #MESPA1,(R1)

046246                          16$:    CALL    BLDLD   slot            ; call build loopdirect subroutine
046260                                  CALL    XMIT                    ; transmit loopdirect messages
046266                                  P$POP   R2                      ; get results, R2 = success/failure
046270  001273                          bne     10$                     ; failed to transmit -- try next node

046272                          26$:    CALL    RUNCOM                  ; do recieve loop
046300                                  P$POP   R4                      ; get results
046302  001407                          beq     29$                     ;  if no errors, continue

046304                                  ERRSOFT 34,EMSG48,ERR2
046314  012701  177777                  mov     #-1,R1                  ; put error indicator into R1
046320  000410                          BR      101$

046322                          29$:    PRINTB  #OK                     ; response ok

046342  005337  003122'         101$:   dec     cpycnt                  ; decrement 'copies' counter
046346  001302                          bne     15$                     ;  if more to do, loop
046350                                  CALL    WRITES #1,slot,#ontab   ; else,update summary table

046372  062737  000010  001202' 30$:    add     #10,slot                ; increment to next node table entry
046400  000627                          br      10$

046402                          32$:    CALL    RETMEM                  ; restore memory mapping
046410                                  return  R1



                                ;
                                ;ACTION ROUTINE TO SET 'RUN LOOPPAIR' FLAG
                                ;

046414  012737  000033  001064' ACTRNL: MOV     #CLUPPR,KEYWD1          ; SET FLAG
046422  000207                          RTS     PC

                                ;--+
                                ; Function description
                                ;               This routine implements the looppair function as described
                                ;               by the NIE functional specification.
                                ;
                                ; Inputs - None
                                ;
                                ; Outputs - None
                                ;
                                ; Calling Procedure - CALL RUNLUP
                                ;
                                ; Side effects - The user sees information on the success or failure of each
                                ;                 attempted looping of a frame.
                                ;
                                ; Register Usage -
                                ;                R1 - Pointer into the node table.  This node will be used to
                                ;                     assist in the looping.
                                ;                R2 - Pointer into the node table.  This node will be used as
                                ;                     the target of the looping.
                                ;                R3 - Integer representing the logical node name of the assist
                                ;                     node.
                                ;                R4 - Integer representing the logical node name of the target
                                ;                     node.
                                ;
                                ;--+
046424  012737  100000  001202' RUNLUP: MOV     #NODTBL,SLOT            ; move node table address to slot
046432                                  CALL    FULSLT                  ; see if table empty
046440  022737  177777  001202'         CMP     #-1,SLOT                ;
046446  001014                          BNE     5$                      ;  if no, continue
046450                                  PRINTF  #TABEMT,#NOD            ;  else, print "Table empty" message
046474  000137  047054'                 JMP     50$

046500  012737  100000  001202' 5$:     MOV     #NODTBL,SLOT            ; move node table address to slot
046506                                  CALL    FULSLT                  ; get first node in node table
046514  013737  001202' 003112'         MOV     SLOT,TEMP1              ; save first node to pair with last

046522  013737  001174' 003122' 10$:    MOV     P$CPYS,CPYCNT           ; set up for no. of copies
046530  013701  001202'                 MOV     SLOT,R1                 ; R1 points to assist node
046534  062737  000010  001202'         ADD     #10,SLOT                ; point SLOT to next entry in node table
046542                                  CALL    FULSLT                  ; get next node in table
046550  022737  177777  001202'         CMP     #-1,slot                ; see if at end of table
046556  001003                          BNE     15$                     ;
046560  013702  003112'                 MOV     TEMP1,R2                ; Use first node in node table as target
046564  000402                          BR      20$                     ; This will be the last loop tested

046566  013702  001202'         15$:    MOV     SLOT,R2                 ; R2 Points to target node

046572                          20$:    CALL    BLDFAS  R2,R1           ; build full assist message
046604                                  CALL    XMIT                    ; transmit message
046612                                  P$POP   R4                      ; check results
046614  001077                          BNE     35$                     ; transmit failed -- try next pair

046616                          25$:    CALL    LOGNM   R1              ; get logical node name for assist ...
046626                                  P$POP   R3                      ; ... and put it in R3
046630                                  CALL    LOGNM   R2              ; get logical node name for target ...
046640                                  P$POP   R4                      ; ... and put it in R4
046642                                  PRINTB  #TSTMS4,#ARGTY7,R4,#ARGTY6,R3   ;   assist node =

                                ;
                                ; Set up STRBUF, STRBU1 with addresses of the two nodes involved in this test
                                ;
046676                                  CALL    REMAP   #ONTAB          ; allow access to node table
046710                                  CALL    BINHEX  R2,#6,#STRBUF   ; STRBUF has target node
046730                                  CALL    BINHEX  R1,#6,#STRBU1   ; STRBU1 has assist node

```

```
046750                                  CALL    RUNCOM                  ; do receive loop
046756                                  P$POP   R3                      ; check results
046760  001405                          BEQ     30$                     ;  if no errors, cont

046762                                  ERRSOFT 35,EMSG42,ERR3          ; ... else, print failing nodes
046772  000410                          BR      35$

046774                          30$:    PRINTB  #OKFU

047014  005337  003122'         35$:    DEC     CPYCNT                  ; decrement 'copies' counter
047020  001264                          BNE     20$                     ;  if more to do, loop
047022                                  CALL    WRITES #2,R1,R2,#ONTAB  ; else,update summary table

047044  022737  177777  001202'         CMP     #-1,SLOT                ; Are we through?
047052  001223                          BNE     10$                     ; NAY!

047054                          50$:    CALL    RETMEM                  ; restore memory mapping
047062                                  RETURN

                                ;--+
                                ; Name - RUNCOM                         Common receive code
                                ;
                                ; Functional Desciption:
                                ;               This routine will perform the reception of loopback
                                ;               messages transmitted by any of the loopback tests.
                                ;               It will wait for ten seconds for the reply to the loopback
                                ;               message.  If it successfully receives the message, it
                                ;               performs a data comparison on what was transmitted to what
                                ;               was received.
                                ;                       The success of these operations will be returned
                                ;               to the caller.
                                ;
                                ; Inputs - none
                                ;
                                ; Outputs -     P1 - 0 = successful reception of loop message/ -1 = no success
                                ;
                                ; Calling Procedure:    CALL RUNCOM
                                ;                       P$POP   P1
                                ;
                                ; Side Effects -
                                ;               1.) summary data counters are modified on error
                                ;
                                ; Subordinate Routines -
                                ;               RECEVE  - receive a frame
                                ;               GETRNX  - update receive ring pointer
                                ;               DATCMP  - data compare routine
                                ;               RELBUF  - release a receive buffer to the DELUA/DEUNA
                                ;               RETMEM  - restore memory mapping
                                ;
                                ; Register Usage -
                                ;               R1      - scratch
                                ;               R2      - return status of this routine
                                ;               R3      - pointer to receive ring
                                ;               R4      - holds timer address
                                ;
                                ;--+
047064 005737  003024'          RUNCOM: tst     retrys                  ; see if failed due to excessive collisions
047070 001402                           beq     34$                     ;  if not, then try to receive
047072 000137  047330'                  jmp     50$                     ;  else, take off

047076 012704  002052'          34$:    mov     #timers,R4              ; set up for 10 second timout
047102 012714  000012                   mov     #10.,(R4)
047106 005002                           clr     R2                      ; clear results register
047110                          35$:    break
047112 005714                           tst     (R4)                    ; see if time has expired
047114 001475                           beq     40$                     ;  if yes, branch
047116                                  CALL    RECEVE                  ; check for answer
047124                                  P$POP   R1                      ;  R2 holds no. of buffers received
047126 001770                           beq     35$                     ;  if no buffers recieved, loop
047130 063737  003120' 003000'          add     xfer,s.xfer             ; update bytes transfered sum. counter
047136 005237  002766'                  inc     s.rec                   ; update frames received sum. counter
047142 013703  002100'                  mov     RRGNXT,R3               ; get receive ring pointer
047146                                  CALL    GETRNX #RRGNXT          ; update pointer
047160 016301  000006                   mov     6(R3),R1                ; get frame length from discriptor
047164 042701  170000                   bic     #170000,R1              ;  zero out excess infor
047170 162701  000004                   sub     #4,R1                   ;  subtract crc bytes
047174 020137  003126'                  cmp     R1,buflen               ; check for length error
047200 001416                           beq     37$                     ;  if OK, br
047202 005237  002772'                  inc     s.len                   ;  else, update length errors counter
047206                                  printx  #lgerms,buflen,R1       ;  print length error message
047234 000435                           br      50$                     ;  and exit

047236 016301  000010           37$:    mov     10(R3),R1               ; point R1 to message buffer
047242 062701  000016                   add     #16,R1                  ; point R1 past header info
047246 005011                           clr     (R1)                    ; clear skip count for compare
047250 063737  001172' 002776'          add     P$SIZE,s.byte           ; update bytes compared summary counter
047256                                  CALL    DATCMP P$SIZE,CMPBUF,R1 ; check for data compare errors
047276                                  P$POP   R1                      ;  check results
047300 001413                           beq     50$                     ;   if errors,
047302 060137  002774'                  add     R1,s.comp               ;   update compare errors summary counter
047306 000410                           br      50$

047310 005237  002770'          40$:    inc     s.nrec                  ; update messages not received counter
047314 012737  017233' 001066'          mov     #noresp,keywd2          ; move 'no responce' to error indicator
047322 012702  177777                   mov     #-1,R2                  ; indicate error to R2
047326 000404                           br      60$                     ; skip to exit

047330                          50$:    CALL    RELBUF  R3              ; release buffer to DELUA/DEUNA
047340                          60$:    CALL    RETMEM                  ; restore memory mapping
047346                                  return  R2                      ; return


                                ;
                                ;ACTION ROUTINE TO SET 'RUN PATTERN' FLAG
                                ;

047352 012737  000005  001064'  ACTPAT: MOV     #CPATRN,KEYWD1          ;SET FLAG
047360 000207                           RTS     PC



                                ;--+
                                ; Name - RUNPAT                         run pattern test
```

```
                                        ;
                                        ; Functional Desciption:
                                        ;               This routine implements the NIE pattern test.  It is
                                        ;               identical to the loop direct test with the exception that
                                        ;               it will loop a frame containing each of the defined data
                                        ;               types.
                                        ;
                                        ; Inputs - none
                                        ;
                                        ; Outputs - none
                                        ;
                                        ; Calling Procedure:    CALL RUNPAT
                                        ;
                                        ; Side Effects - none
                                        ;
                                        ; Subordinate Routines -
                                        ;               DIRCOM  - direct loop test for each pattern
                                        ;
                                        ; Register Usage -
                                        ;               R1      - return status of DIRCOM
                                        ;
                                        ;--+
047362                                  RUNPAT: P$PUSH  P$TYPE                  ; save type parameter
047366  005037  001170'                         clr     P$TYPE                  ; set type to first type
047372                                  5$:     CALL    dircom                  ; send messages
047400                                          P$POP   R1                      ; get results to keep stack in order
047402  001403                                  beq     10$                     ; if OK, cont
047404  022701  000001                          cmp     #1,R1                   ;  else, was table empty
047410  001406                                  beq     15$                     ;  if yes, return
047412  005237  001170'                 10$:    inc     P$TYPE                  ; set to next type
047416  022737  000005  001170'                 cmp     #5,P$TYPE               ; see if done all of them
047424  002362                                  bge     5$                      ;  if not, do more
047426                                  15$:    P$POP   P$TYPE                  ; restore message type
047432                                          return


                                        ;
                                        ;ACTION ROUTINE TO SHOW THE CURRENT MESSAGE PARAMETERS
                                        ;

047434  013701  001170'                 ACTSMS: MOV     P$TYPE,R1               ;GET MESSAGE TYPE INTO R1
047440  006301                                  ASL     R1                      ;MULTIPLY BY 2
047442  062701  001414'                         ADD     #MSGTAB,R1              ;ADD MESSAGE TABLE OFFSET
047446                                          PRINTF  #MSGPRM                 ;PRINT MESSAGE PARAMETER MESSAGE
047466                                          PRINTF  #MSG4,(R1),P$SIZE,P$CPYS        ;PRINT PARAMETERS
047520  105037  001300'                         CLRB    P$NNUF
047524  000207                                  RTS     PC



                                        ;
                                        ;ACTION ROUTINE TO CLEAR THE CURRENT MESSAGE PARAMETERS AND
                                        ;RESET THEM TO THE DEFAULT VALUE
                                        ;

047526  012737  000000  001170' ACTCMS: MOV     #ALPHA,P$TYPE           ;RESET TYPE
047534  012737  001000  001172'         MOV     #512.,P$SIZE            ;RESET SIZE
047542  012737  000001  001174'         MOV     #1,P$CPYS               ;RESET COPIES
047550                                  PRINTF  #CLRMSG                 ;PRINT MESSAGE PARAMETERS RESET MESSAGE
```

```
047570                                PRINTF #MSG4,MSGTAB,P$SIZE,P$CPYS   ;PRINT PARAMETERS
047624  105037  001300'               CLRB   P$NNUF                ;CLEAR NOTNUF FLAG
047630  000207                        RTS    PC


                              ;
                              ;ACTION ROUTINE TO SET SHOW COUNTERS FLAG
                              ;

047632                        ACTCNT: CALL   DEVSTART              ; start up the DELUA/DEUNA
047640                                CALL   FUNCT #RDCNTS         ;READ COUNTERS
047652                                P$POP  R1                    ;CHECK RESULT
047654  001402                        BEQ    21$                   ;BRANCH IF ERROR
047656  000137  050762'               JMP    40$
                                                                   ;PRINT COUNTER INFO

047662                        21$:    CALL   BINHEX  #PHYADR,#6,#STRBUF   ;GET ADDRESS INTO ASCII
047704                                PRINTF #CNTR00,#STRBUF
047730                                PRINTF #CNTR01,UCB12+2
047754                                CALL   BINDEC  #UCB12+4
047766                                PRINTF #CNTR02,#DECSTR
050012                                CALL   BINDEC  #UCB12+10
050024                                PRINTF #CNTR03,#DECSTR
050050                                PRINTF #CNTR04,UCB12+14
050074                                PRINTF #CNTR05,UCB12+16
050120                                CALL   BINDEC  #UCB12+20
050132                                PRINTF #CNTR06,#DECSTR
050156                                CALL   BINDEC  #UCB12+24
050170                                PRINTF #CNTR07,#DECSTR
050214                                PRINTF #CNTR08,UCB12+30
050240                                PRINTF #CNTR09,UCB12+32
050264                                CALL   BINDEC  #UCB12+34
050276                                PRINTF #CNTR10,#DECSTR
050322                                CALL   BINDEC  #UCB12+40
050334                                PRINTF #CNTR11,#DECSTR
050360                                CALL   BINDEC  #UCB12+44
050372                                PRINTF #CNTR12,#DECSTR
050416                                CALL   BINDEC  #UCB12+50
050430                                PRINTF #CNTR13,#DECSTR
050454                                CALL   BINDEC  #UCB12+54
050466                                PRINTF #CNTR14,#DECSTR
050512                                CALL   BINDEC  #UCB12+60
050524                                PRINTF #CNTR15,#DECSTR
050550                                CALL   BINDEC  #UCB12+64
050562                                PRINTF #CNTR16,#DECSTR
050606                                PRINTF #CNTR17,UCB12+70
050632                                PRINTF #CNTR18,UCB12+72
050656                                PRINTF #CNTR19,UCB12+74
050702  005737  000524'               TST    DEVICE                ; find out what devie we are talking to
050706  001431                        BEQ    50$                   ; It's a DEUNA -- all done here
050710                                PRINTF #CNTR20,UCB12+100     ; ELSE DELUA -- print babble counter
050734                                PRINTF #CNTR21,UCB12+102     ; ... and port driver error counter
050760  000404                        BR     50$

050762                        40$:    ERRDF  36,EMSG31

050772                        50$:    CALL   DEVSTOP               ; stop the DELUA/DEUNA
```

```
051000  105037  001300'                 CLRB    P$NNUF
051004  000207                          RTS     PC



                                ;
                                ;ACTION ROUTINE TO PRINT OUT THE NODE TABLE
                                ;

051006  105037  001300'         ACTSND: CLRB    P$NNUF
051012  012737  100000  001202'         MOV     #NODTBL,SLOT            ;MOVE NODE TABLE ADDRESS INTO SLOT
051020                                  CALL    FULSLT                  ;SEE IF TABLE EMPTY
051026  022737  177777  001202'         CMP     #-1,SLOT                ;IF YES, DON'T PRINT HEADER
051034  001510                          BEQ     15$
051036                                  PRINTF  #NTBHDR                 ;PRINT NODE TABLE HEADER
051056                          10$:    CALL    FULSLT                  ;FIND LOCATION IN TABLE WITH AN ADDRESS
051064  022737  177777  001202'         CMP     #-1,SLOT                ;CHECK IF AT END OF TABLE
051072  001503                          BEQ     20$                     ;IF YES, RETURN
051074                                  CALL    NTEXTI                  ;SET UP NODE TABLE INFO FOR PRINT
051102                                  PRINTF  #NODADR,#STRBUF         ;PRINT CURRENT NODE ADDRESS
051126                                  PRINTF  #DEFADR,#STRBU1         ;PRINT PHYSICAL ADDRESS
051152                                  PRINTF  #LOGNAM,LOGVAL          ;PRINT LOGICAL NAME
051176                                  PRINTF  #NETADR,AREA,DECNET     ;PRINT DECNET NODE NUMBER
051226                                  PRINTF  TYPADR                  ;PRINT NODE TYPE
051246  062737  000010  001202'         ADD     #8.,SLOT                ;INCR. SLOT TO POINT TO NEXT TABLE ENTRY
051254  000700                          BR      10$                     ;CONTINUE UNTIL ALL ENTRIES PRINTED
051256                          15$:    PRINTF  #TABEMT,#NOD
051302  000207                  20$:    RTS     PC                      ;RETURN




                                ;
                                ;ACTION ROUTINE TO CLEAR A NODE SPECIFIED BY NODE LOGICAL NAME
                                ;FROM THE NODE TABLE
                                ;

051304                          ACTCNL: P$PUSH  R2                      ; save R2
051306                                  CALL    REMAP   #ONTAB          ; allow access to node table
051320  013702  001270'                 MOV     P$NUM,R2                ;PUT NODE LOGICAL NUMBER INTO R2
051324  006302                          ASL     R2                      ;MULTIPLY BY 8
051326  006302                          ASL     R2                      ;NODE TABLE ADDRESS =
051330  006302                          ASL     R2                      ;  (LOG. NO. X 8) + #NODTBL
051332  062702  100000                  ADD     #NODTBL,R2              ;ADD OFFSET
051336  005022                          CLR     (R2)+                   ; clear ...
051340  005022                          CLR     (R2)+                   ; ... 8 byte ...
051342  005022                          CLR     (R2)+                   ; ... entry of ...
051344  005012                          CLR     (R2)                    ; ... node table
051346                                  P$POP   R2                      ; restore R2
051350  105037  001300'                 CLRB    P$NNUF                  ;CLEAR NOTNUF FLAG
051354                                  PRINTF  #LOGDEL,P$NUM           ;PRINT MESSAGE INDICATING DELETION
051400                                  CALL    RETMEM                  ; restore memory mapping
051406  000207                          RTS     PC                      ;RETURN


                                ;
                                ;ACTION ROUTINE TO INITIATE A DELUA/DEUNA PORT COMMAND
                                ;

051410  105037  001300'         ACTFCT: CLRB    P$NNUF                  ;CLEAR NOTNUF FLAG
```

```
051414                                  CALL    DEVSTART        ; start up the DELUA/DEUNA
051422                                  CALL    FUNCT P$NUM     ;CALL FUNCTION ROUTINE WITH FUNCTION CODE
051434                                  P$POP   R1              ;CHECK RESULTS
051436  001404                          BEQ     1$              ; IF OK EXIT
051440                                  ERRDF   37,EMSG30       ; ELSE REPORT ERROR
051450                          1$:     CALL    DEVSTOP         ; STOP THE DELUA/DEUNA
051456  000207                          RTS     PC

                                ;
                                ;ACTION ROUTINE TO CLEAR SUMMARY TABLE
                                ;

051460  105037  001300'         ACTCSU: CLRB    P$NNUF          ;CLEAR 'NOT ENOUGH' COUNTER
051464                                  P$PUSH  R2              ;SAVE R2
051466                                  CALL    REMAP   #OSTAB  ;ALLOW ACCESS TO SUMMARY TABLE
051500  012702  100000                  MOV     #STATBL,R2      ;MOVE SUMMARY TABLE ADDRESS TO R2
051504  005022                  5$:     CLR     (R2)+           ;CLEAR FIRST WORD
051506  020227  126000                  CMP     R2,#STAEND      ;ANY MORE TO CLEAR?
051512  001374                          BNE     5$              ; IF YES, DO IT
051514                                  PRINTF  #TABCLR,#SUMM   ; ELSE, PRINT 'TABLE CLEARED' MESSAGE
051540                                  P$POP   R2              ; AND RESTORE R2
051542  000207                          RTS     PC

                                ;
                                ;ACTION ROUTINE TO CHECK FOR PASS DEFAULT VALUE
                                ;

051544                          ACTDFT:
051544  121427  000040          1$:     CMPB    (R4),#40        ;SEE IF SPACES
051550  001002                          BNE     2$              ; IF NO, CONT.
051552  005204                          INC     R4              ; ELSE, POINT TO NEXT CHAR
051554  000773                          BR      1$              ; AND CHECK AGAIN
051556  121427  000000          2$:     CMPB    (R4),#0         ;SEE IF DEFAULT VALUE
051562  001007                          BNE     10$             ; IF NO, BR
051564  012763  000054  000002          MOV     #54,2(R3)       ; IF YES, POINT R3 TO SKIP CHECK PASS COUNT
051572  012737  000001  001270'         MOV     #1,P$NUM        ;SET DEFAULT TO 1
051600  000403                          BR      15$             ;RETURN
051602  012763  000004  000002  10$:    MOV     #4,2(R3)        ;POINT R3 TO CHECK FOR PASS COUNT
051610  000207                  15$:    RTS     PC

                                ;--+
                                ; Functional description
                                ;               This subroutine is used to save the current node table to
                                ;               the load device medium.  For each entry that is filled in the
                                ;               node table, an entry will be made in a file including: the
                                ;               current address for a node, its default address, its logical
                                ;               name, and the type of device connected to the Ethernet at
                                ;               that node address.  This information is formatted, then
                                ;               sequentially stored on a file resident on the load medium.
                                ;               When an empty slot in the node table is encountered, an
                                ;               appropriate message will be printed to the file.
                                ;
                                ; Inputs - Implicit -
                                ;               The routine NTEXTI extracts information from the node
                                ;               table and leaves it in specific global variables.  These
                                ;               are used by this routine.  For their names and meanings,
                                ;               see the documentation on NTEXTI.
```

```
                                        ;
                                        ; Outputs - file on load medium is created or appended to with the
                                        ;               the information mentioned above
                                        ;
                                        ; Calling procedure - JSR PC,ACTSAV
                                        ;
                                        ; Side effects - node
                                        ;
                                        ; Subordinate routines - FULSLT - Find a full slot
                                        ;                        OUTBLK - output a block of bytes
                                        ;                        FORLOG - format a logical name
                                        ;                        NTEXTI - extract info from node table
                                        ;
                                        ; Register Usage -
                                        ;       R2 -    pointer to node table
                                        ;--+
051612                                  ACTSAV: P$PUSH  R2,R3                   ; Save some registers
051616                                          OPEN    CBOADR,W                ; Open the specified file

051624                                          BNCOMPLETE      30$             ; Leave if the file can't be opened

051626  012737  100000  001202'                 MOV     #NODTBL,SLOT            ; point SLOT to beginning of node table
051634  013702  001202'                 10$:    MOV     SLOT,R2                 ; point R2 to current node table entry
051640                                          CALL    FULSLT                  ; point SLOT  to full entry in node table
051646  022737  177777  001202'                 CMP     #-1,SLOT                ; Are we at the end of the node table
051654  001522                                  BEQ     30$                     ; Yes, done with this command

                                        ;--+
                                        ;       Check to see if the slot is full.  If it isn't then print
                                        ;       "EMPTY SLOT" to the save file
                                        ;--+

051656  020237  001202'                 15$:    CMP     R2,SLOT                 ; Was slot pointed to by R2 full?
051662  001412                                  BEQ     20$                     ; Yes, go output info for this slot
051664                                          CALL    OUTBLK  #EMPSLT,#14     ; No, output empty slot message
051702  062702  000010                          ADD     #8.,R2                  ; point R2 to next slot ...
051706  000763                                  BR      15$                     ; ... and keep trying

                                        ;--+
                                        ;       A full slot has been found.  The following block writes the
                                        ;       info to the save file
                                        ;--+

051710                                  20$:    CALL    NTEXTI                  ; set locations with node entry info
051716                                          CALL    OUTBLK  #STRBUF,#21     ; output current node address for entry
051734                                          CALL    OUTBLK  #SPACES,#4      ; output some spaces
051752                                          CALL    OUTBLK  #STRBU1,#21     ; output default node address for entry
051770                                          CALL    OUTBLK  #SPACES,#4      ; output some spaces
052006                                          CALL    FORLOG                  ; format the logical node name
052014                                          P$POP   R3                      ; get number of characters in ...
052016                                          CALL    OUTBLK  #STRBUF,R3      ; ... logical node name string and ouput
052032                                          CALL    OUTBLK  #SPACES,#4      ; output some spaces

                                        ;--+
                                        ;       TYPADR points to a PRINTF formatted string.  Just add 2 to the address
                                        ;       to point past the formatting info
                                        ;--+
052050  062737  000002  001164'         ADD     #2,TYPADR               ; point TYPADR to device description
052056                                  CALL    OUTBLK  TYPADR,#5       ; output device type for this entry
052074                                  CALL    OUTBLK  #NEWLI2,#2      ; <CR><LF> to file

052112  062737  000010  001202'         ADD     #8.,SLOT                ; point SLOT to next node table entry
052120  000645                          BR      10$                     ; keep processing

052122                          30$:    CLOSE                           ; close up the file
052124                                  P$POP   R2,R3                   ; restore register ...
052130  105037  001300'                 CLRB    P$NNUF                  ; clear not enough flag
052134  000207                          RTS     PC                      ; ... and return

                                ;--+
                                ; Functional Description
                                ;               This routine is designed to take a string of ascii text
                                ;               and store it on the load medium.  The file that is being
                                ;               written is assumed to be already open.
                                ;
                                ; Inputs -      P1 - Address of a character string
                                ;               P2 - Number of characters to be output to the load medium
                                ;
                                ; Outputs - outputs P2 bytes from string P1 to load medium
                                ;
                                ; Calling Procedure - CALL OUTBLK P1,P2
                                ;
                                ; Side effects - None
                                ;
                                ; Subordinate routines - None
                                ;
                                ; Register Usage -
                                ;       R1 -    pointer to character string
                                ;       R2 -    count of bytes to output
                                ;--+
052136                          OUTBLK: P$POP   R1,R2                   ; get input parameters

052142                          10$:    PUTBYT  (R1)                    ; output a byte

052150  005201                          INC     R1                      ; point R1 to next byte
052152  005302                          DEC     R2                      ; decrement number of bytes to output
052154  001372                          BNE     10$                     ; go on if there's more to do

052156                                  RETURN                          ; ALL DONE!!


                                ;--+
                                ; Name - FORLOG
                                ;
                                ; Functional Description
                                ;               This routine is used to convert an integer representing a
                                ;               logical node number (octal) into an ascii character string of
                                ;               the form "N*", where "*" is a character string representing the
                                ;               integer value.   The node table can contain a maximum of
                                ;               2000(0) node entries, thus the length of the character string
                                ;               will not exceed five ("N" + 4 digits).
                                ;
                                ; Inputs - Implicit
                                ;               LOGVAL - word containing the logical node name to be formatted
```

```
                                 ;
                                 ; Outputs - Explicit
                                 ;               P1 - the number of characters in the formatted string
                                 ;
                                 ;          - Implicit
                                 ;               STRBUF  - will contain the formatted output string
                                 ;
                                 ; Calling Procedure - CALL FORLOG
                                 ;                     P$POP P1
                                 ;
                                 ; Side effects - STRBUF is modified
                                 ;
                                 ; Subordinate Routines - None
                                 ;
                                 ; Register Usage -
                                 ;       R1 -    Value to format
                                 ;       R2 -    scratch
                                 ;       R3 -    digit counter
                                 ;       R4 -    scratch
                                 ;--+
052160  112737  000116  001116'  FORLOG: MOVB    #116,STRBUF             ; put an 'N' in STRBUF
052166  013701  001162'                  MOV     LOGVAL,R1               ; get value to format
                                 ;--+
                                 ;       Determine how many digits are needed to represent the logical
                                 ;       node number.  This can be ascertained by comparing the number
                                 ;       to powers of eigth.  For example, if the number is less than
                                 ;       8-squared (100(O)), it can be represented in two digits.
                                 ;--+
052172  012703  000001                   MOV     #1,R3                   ; there will be at least one digit
052176  020127  000010                   CMP     R1,#10                  ; represent # w/ 1 digit?
052202  002411                           BLT     10$                     ; YES

052204  005203                           INC     R3                      ; NO, add one to digit count
052206  020127  000100                   CMP     R1,#100                 ; represent # w/ 2 digits?
052212  002405                           BLT     10$                     ; YES

052214  005203                           INC     R3                      ; NO, add one to digit count
052216  020127  001000                   CMP     R1,#1000                ; represent # w/ 3 digits?
052222  002401                           BLT     10$                     ; YES

052224  005203                           INC     R3                      ; add one to digit count, MAX = 4 digits

                                 ;--+
                                 ;       Convert the logical node number to its ascii equivalent string
                                 ;--+

052226  010302                   10$:    MOV     R3,R2                   ; put digit count in R2

052230  010104                   20$:    MOV     R1,R4                   ; put logical value in R4
052232  042704  177770                   BIC     #177770,R4              ; isolate least significant 3 bits

                                 ;--+
                                 ;       Adding 60(O) to a single digit creates its ascii representation
                                 ;--+

052236  062704  000060                   ADD     #060,R4                 ; create ascii value ...
052242  110462  001116'                  MOVB    R4,STRBUF(R2)           ; ... move it into its string position
```

```
052246  005302                     DEC     R2                      ; decrement digit count
052250  001404                     BEQ     30$                     ; if no more digits, return
052252  006201                     ASR     R1                      ; move next ...
052254  006201                     ASR     R1                      ; ... 3 bits ...
052256  006201                     ASR     R1                      ; ... into position
052260  000763                     BR      20$                     ; and continue formatting

052262  005203             30$:    INC     R3                      ; R3 = digit count + 1 for 'N'
052264                             RETURN  R3                      ; back where we came from!!

                           ;--+
                           ; Name - ACTUSF                 ACTION ROUTINE TO UNSAVE THE NODE TABLE
                           ;
                           ; Functional Description
                           ;               This routine is used to restore the node table from a file
                           ;               located on the load medium.  It assumes that the file will
                           ;               be in the following format:
                           ;
                           ;               CURRENT ADDRESS DEFAULT ADDRESS LOGICAL NAME DEVICE
                           ;
                           ;               The file is sequential read with each valid entry resulting
                           ;               in the addition of a node to the node table.  If a line is
                           ;               of an invalid form or it reads "empty slot", a slot in the
                           ;               node table will be left empty.  This is to preserve the
                           ;               original structure of the node table and also the correspon-
                           ;               dence of logical node names to node addresses.
                           ;
                           ; Inputs - Implicit - Address of a string that names the file is in CBOADR
                           ;        - Explicit - Takes input from a file on the load medium
                           ;
                           ; Outputs - Implicit - The node table is restored from the file
                           ;
                           ; Calling Procedure - JSR PC,ACTUSF
                           ;
                           ; Side effects - The old node table will be wiped out in lieu of the new one
                           ;
                           ; Subordinate Routines
                           ;               RDLIN - read line of an open file
                           ;               NXTDEL - find next delimiter in a string
                           ;               NXTNDL - find next non-delimiter in a string
                           ;               EDPACK - edit data frame
                           ;               ENTRND - enter node into node table
                           ;
                           ; Register Usage
                           ;               R1 -    Scratch
                           ;               R2 -    Node type - target or assist
                           ;               R3 -    Pointer to line of input from file
                           ;               R4 -    pointer to node table
                           ;
                           ;--+
052270                     ACTUSF:
052270                             P$PUSH  R1,R2,R3,R4             ; save registers
052300                             CALL    REMAP   #ONTAB          ; allow access to node table
052312  012704  077770             MOV     #NODTBL-10,R4           ; let R4 point to node table
052316                             OPEN    CBOADR                  ;open file, name=asciz string
052324                             BCOMPLETE       1$              ;return if successful
052326                             PRINTF  #OPNERR,CBOADR          ; else print "open error"
```

```
052352  C00137  053020'                   JMP     30$                     ; ... and leave
052356  062704  000010           1$:      ADD     #10,R4                  , point R4 to next node in table
052362  012703  000526'                   MOV     #FILLIN,R3              ; point R3 to buffer for input line
052366                                    CALL    RDLIN                   ;read a line at a time
052374                                    P$POP   R1                      ; Get success of read in R1
052376  001402                            BEQ     2$                      ; non-zero means EOF
052400  000137  053020'                   JMP     30$

052404  020427  110000           2$:      CMP     R4,#NODEND              ; check if the node table is full
052410  001012                            BNE     3$                      ; NOT this time
052412                                    PRINTF  #NTBLOV                 ; print node table truncated ...
052432  000137  053020'                   JMP     30$                     ; ... and take off

052436                           3$:      CALL    NXTNDL  R3              ; Point R3 to current address
052446                                    P$POP   R3                      ; get updated pointer
052450                                    CALL    EDPACK  R3,#ADRBUF,#6   ; Put address into binary

                                 ;--+
                                 ;        If results of call to EDPACK are unsuccessful, assume "Empty slot".
                                 ;--+
052470                                    P$POP   R1                      ; Get results of call
052472  001403                            BEQ     20$                     ; Success, go add entry
052474  012714  000000                    MOV     #0,(R4)                 ; leave an empty slot in the node table
052500  000726                            BR      1$                      ; ... and move on

                                 ;--+
                                 ;        Store address in node table
                                 ;--+

052502  013714  001070'          20$:     MOV     ADRBUF,(R4)             ; first two bytes
052506  013764  001072' 000002            MOV     ADRBUF+2,2(R4)          ; second two bytes
052514  013764  001074' 000004            MOV     ADRBUF+4,4(R4)          ; last two bytes

052522                           21$:     CALL    NXTDEL  R3              ; point R3 past current address
052532                                    P$POP   R3                      ; get updated pointer
052534                                    CALL    NXTNDL  R3              ; point R3 to default address
052544                                    P$POP   R3                      ; get updated pointer
052546                                    CALL    EDPACK  R3,#ADRBUF,#6   ; get default address in ADRBUF
052566                                    P$POP   R1                      ; ERROR is a don't care - but clean stack

052570  010401                            MOV     R4,R1                   ; point R1 to correspondinr ...
052572  062701  010000                    ADD     #DEFNOD,R1              ; ... default node address

052576  013721  001070'                   MOV     ADRBUF,(R1)+            ; ... and store the default address
052602  013721  001072'                   MOV     ADRBUF+2,(R1)+
052606  013721  001074'                   MOV     ADRBUF+4,(R1)+

052612                                    CALL    NXTDEL  R3              ; point R3 past current address
052622                                    P$POP   R3                      ; get updated pointer
052624                                    CALL    NXTNDL  R3              ; point R3 to logical name
052634                                    P$POP   R3                      ; get updated pointer
052636                                    CALL    NXTDEL  R3              ; and skip by it
052646                                    P$POP   R3                      ; get updated pointer
052650                                    CALL    NXTNDL  R3              ; point R3 to device type (i.e. DEUNA)
052660                                    P$POP   R3                      ; get updated pointer

                                 ;
```

```
                                        ; Now we want to extract the type of device attached to the node.  Since
                                        ; there is just a description of the node in the file, we'll have to figure
                                        ; it out from there.  It is possible to distinguish between types by looking
                                        ; at the third letter of the description (i.e. the 'U' in 'DEUNA').
                                        ;
052662  062703  000002                          ADD     #2,R3                   ; point R3 to third letter of description

052666  121327  000125                          CMPB    (R3),#'U                ; Is this a DEUNA?
052672  001005                                  BNE     22$                     ; NO
052674  112761  000001  000001                  MOVB    #IDTUNA,1(R1)           ; put DEUNA identifier in table
052702  000137  052356'                         JMP     1$                      ; through with line of input

052706  121327  000114          22$:            CMPB    (R3),#'L                ; Is this a DELUA?
052712  001005                                  BNE     23$                     ; NO
052714  112761  000011  000001                  MOVB    #IDTLUA,1(R1)           ; put DELUA identifier in table
052722  000137  052356'                         JMP     1$                      ; through with line of input

052726  121327  000121          23$:            CMPB    (R3),#'Q                ; Is this a DEQNA?
052732  001005                                  BNE     24$                     ; NO
052734  112761  000005  000001                  MOVB    #IDTQNA,1(R1)           ; put DEQNA identifier in table
052742  000137  052356'                         JMP     1$                      ; through with line of input

052746  122327  000103          24$:            CMPB    (R3)+,#'C               ; Is this a DECserver or DECNA
052752  001015                                  BNE     26$                     ; NO
052754  121327  000163                                  CMPB    (R3),#'s        ; IS This a DECserver?
052760  001005                                          BNE     25$             ; NOPE!
052762  112761  000021  000001                          MOVB    #IDTSRV,1(R1)   ; put DECserver identifier in table
052770  000137  052356'                                 JMP     1$              ; through with line of input

052774  112761  000003  000001  25$:                    MOVB    #IDTCNA,1(R1)   ; put DECNA identifier in table
053002  000137  052356'                                 JMP     1$

053006  1. 761  177777  000001  26$:            MOVB    #-1,1(R1)               ; move unknown identifier into table
053014  000137  052356'                         JMP     1$

053020                          30$:            CLOSE                           ; close the open file
053022                                          P$POP   R1,R2,R3                ; restore registers
053030                                          RETURN

053032                          NXTNDL:         P$POP   R1                      ; get pointer to string
053034  121127  000040          5$:             CMPB    (R1),#040               ; Does R1 point to a space?
053040  001002                                  BNE     10$                     ; NO, go look for a tab
053042  005201                                  INC     R1                      ; YES, point past the space
053044  000773                                  BR      5$                      ; keep checking
053046  121127  000011          10$:            CMPB    (R1),#011               ; Does R1 point to a tab?
053052  001002                                  BNE     15$                     ; NO, return
053054  005201                                  INC     R1                      ; YES, point past the tab
053056  000766                                  BR      5$                      ; keep checking

053060                          15$:            RETURN  R1

053064                          NXTDEL:         P$POP   R1                      ; get pointer to string
053066  121127  000040          5$:             CMPB    (R1),#040               ; does R1 point to a space
053072  001405                                  BEQ     15$                     ; YES, return
053074  121127  000011                          CMPB    (R1),#011               ; does R1 point to a tab
053100  001402                                  BEQ     15$                     ; YES, return
053102  005201                                  INC     R1                      ; point to next character
```

```
053104  000770                          BR      5$                              ; keep checking

053106                          15$:    RETURN  R1                              ; return results
053112  013737  001070' 001076' ACTSOU: MOV     ADRBUF,SOUFIL                   ; store 6 bytes of source filter
053120  013737  001072' 001100'         MOV     ADRBUF+2,SOUFIL+2               ;
053126  013737  001074' 001102'         MOV     ADRBUF+4,SOUFIL+4               ;
053134  112737  177777  001253'         MOVB    #-1,SOUFLG                      ; set source filter presence flag
053142  105037  001300'                 CLRB    P$NNUF                          ; clear not enough flag
053146  000207                          RTS     PC

053150  013737  001070' 001104' ACTDES: MOV     ADRBUF,DESFIL                   ; store 6 bytes of destination filter
053156  013737  001072' 001106'         MOV     ADRBUF+2,DESFIL+2               ;
053164  013737  001074' 001110'         MOV     ADRBUF+4,DESFIL+4               ;
053172  112737  177777  001254'         MOVB    #-1,DESFLG                      ; set destination filter presence flag
053200  105037  001300'                 CLRB    P$NNUF                          ; clear not enough flag
053204  000207                          RTS     PC

053206                          ACTLIS::
053206  112737  177777  001274'         MOVB    #-1,P$LIST                      ; set listen command flag
053214  105037  001300'                 CLRB    P$NNUF                          ; clear "not enough" flag
053220  000207                          RTS     PC

053222  004737  053322'         ACTPRO: JSR     PC,XSTRIN                       ; Put protocol type in CBOBUF
053226                                  CALL    EDPACK  #CBOBUF,#PROFIL,#2 ;STORE PROTOCOL FILTER
053250                                  P$POP   R0                              ; get return status
053252  105700                          TSTB    R0                              ; was this a successful call?
053254  001416                          BEQ     5$                              ; yes, take off!
053256                                  PRINTF  #CPROER                         ; else print error
053276  105037  001300'                 CLRB    P$NNUF                          ; clear "not enough" flag
053302  112737  177777  001301'         MOVB    #-1,P$GDBD                      ; set bogus command flag
053310  000403                          BR      10$                             ; exit!
053312  112737  177777  001255' 5$:     MOVB    #-1,PROFLG                      ; set protocol filter presence flag
053320  000207                  10$:    RTS     PC

053322                          XSTRIN: P$PUSH  R1,R2,R3                        ; save these registers
053330  013701  001166'                 MOV     CBOADR,R1                       ; get addrss of string to extract
053334  012702  001042'                 MOV     #CBOBUF,R2                      ; get address of buffer to hold it
053340  121127  000057          10$:    CMPB    (R1),#57                        ; Is this char. a "/"?
053344  001407                          BEQ     20$                             ; Yes!!
053346  121127  000054                  CMPB    (R1),#54                        ; Or a comma?
053352  001404                          BEQ     20$                             ; Yes!!
053354  105711                          TSTB    (R1)                            ; Or is it the end of command line?
053356  001402                          BEQ     20$                             ; Yes!!
053360  112122                          MOVB    (R1)+,(R2)+                     ; buffer the character
053362  000766                          BR      10$                             ; go look at next character in command line
053364  105012                  20$:    CLRB    (R2)                            ; put a null character at end of extracted string
053366  010104                          MOV     R1,R4                           ; point command line pointer past what
                                                                                ; we just grabbed
053370                                  P$POP   R1,R2,R3                        ; restore registers
053376  000207                          RTS     PC                              ; LATER!

                                .SBTTL  READ LINE OF OPENED FILE
                                ;
                                ;
                                ; THIS ROUTINE GETS BYTES FROM AN OPENED FILE UNTIL A CR IS ENCOUNTERED
                                ; "EOF" AND "BAD" FLAGS ARE SET IF END-OF-FILE OR ERRORS ARE ENCOUNTERED
                                ;
                                ; NOTE: ASSUMING A ASCII TEXT FILE IS BEING READ, FOR EXAMPLE.
                                ;       AA-00-03-00-01-AB<CR><LF>
                                ;              "
                                ;       AA-00-03-00-01-AB<CR><LF>
                                ;
                                ;       WHAT YOU SEE READ BYTE-BY-BYTE IS:
                                ;               "A..-AB<CR><LF>A..-AB<CR><LF>..<0><0><0>.....???
                                ;       SO I MADE ASSUMPTION THAT SINCE SEE "0-PADDING" AFTER LAST CHAR TO
                                ;       END-OF-FILEBLOCK, ANY CHARACTER THAT IS NOT "SPACE OR GREATER" OR A
                                ;       <CR> OR <LF> THEN I'LL TAKE THAT AS END-OF-FILE(TEXT), SET EOF-FLAG
                                ;       AND LEAVE.
                                ;
                                ;       INPUTS:
                                ;               FILLIN  BUFFER TO HOLD LINE OF BYTES READ FROM OPENED FILE
                                ;                       (CR NOT INCLUDED, 0-BYTE TERMINATED)
                                ;       OUTPUTS:
                                ;               BAD     IF NON-ZERO, ERROR IN READING A BYTE FROM FILE
                                ;               EOFF    IF NON-ZERO, END OF FILE WAS ENCOUNTERED
                                ;               FILLIN  ASCIZ STRING THAT WAS READ AS CHAR-CR-LF STRING
                                ;                        (CR-LF REMOVED)

053400  012702  000526'         RDLIN:  MOV     #FILLIN,R2              ;POINT R2 TO A LINE BUFFER
053404  005001                          CLR     R1                      ; set success indicator to true
                                ;********************************************************************
                                ; THE FOLLWING TWO LINES ARE EQUIVALENT TO DRS GETBYTE CALL.  THEY HAVE
                                ; ERROR RIGHT NOW -- SHOULD DO A MOVB AND THEY ARE DOING A MOV OF RESULT
                                ;********************************************************************

053406  104426                  1$:     TRAP    C$GETB
053410  110012                          MOVB    R0,(R2)

                                ;********************************************************************
                                ; THIS SHOULD BE A BCOMPLETE.  CALL DOESN'T SEEM TO BE SETTING CARRY
                                ; CORRECTLY -- 5/24/85
                                ;********************************************************************
053412                                  BCOMPLETE       2$              ;BR IF READ-BYTE SUCESSFUL
053414  012701  177777                  MOV     #-1,R1                  ; put EOF in R1
053420  000416                          BR      5$

053422  122712  000000          2$:     CMPB    #0,(R2)                 ;IS this char is a null byte?
053426  001003                          BNE     3$                      ; br if not (look for <CR><LF>)
053430  012701  177777                  MOV     #-1,R1                  ; ... put EOF in R1
053434  000410                          BR      5$                      ; ... and leave!
053436  122712  000015          3$:     CMPB    #15,(R2)                ;IS THE CHARACTER A <CR>
053442  001761                          BEQ     1$                      ; BR IF YES (GO BACK TO GET <LF>)
053444  122712  000012                  CMPB    #12,(R2)                ;IS THE CHARACTER A <LF>
053450  001402                          BEQ     5$                      ; BR IF YES (TERMINATE AND LEAVE)
053452  005202                          INC     R2                      ; IF NO, LEAVE CHAR IN BUFFER
053454  000754                          BR      1$                      ; AND GO GET MORE CHARS

053456  105012                  5$:     CLRB    (R2)
053460                                  RETURN  R1


                                ;--+
                                ; Name - SELMSG                         OPERATOR SELECTED MESSAGE STORAGE
                                ;
                                ; Functional Description
                                ;               This routine will take the operator selected message from the
                                ;               command line input string buffer and put it into a buffer at
                                ;               location OPSLBF.
                                ;
                                ; Inputs -      P1 - ADDRESS OF OPERATOR SELECTED MESSAGE IN
                                ;                                    INPUT STRING
                                ; Outputs - Implicit -
                                ;               The buffer at OPSLBF will contain the ASCII operator selected
                                ;               input string followed by a null character
                                ;
                                ; Side Effects - none
                                ;
                                ; Subordinate Routines - none
                                ;
                                ; Calling Procedure: CALL SELMSG P1
                                ;
                                ; Register Usage -
                                ;               R1 - address of input string
                                ;               R2 - address of output string
                                ;
                                ;--+

053464                          SELMSG: P$POP   R1              ;PUT ADDRESS OF OPR. SEL ASCII STRING INTO R1
053466  012702  001722'                 MOV     #OPSLBF,R2      ;PUT ADDRESS OF OUTPUT BUFFER INTO R2
053472  122711  000045                  CMPB    #45,(R1)        ; IS IT HEX DATA (first char a $)?
053476  001034                          BNE     4$              ; branch if not
053500  005201                          INC     R1              ; point past data type indicator
053502  010103                          MOV     R1, R3          ; point to source string
053504  105713                  1$:     TSTB    (R3)            ; look for end of string
053506  001405                          BEQ     3$              ; branch if end
053510  122713  000057                  CMPB    #57,(R3)        ; is it a "/" delimiter
053514  001402                          BEQ     3$              ; branch if yes
053516  005203                          INC     R3              ; bump pointer
053520  000771                          BR      1$              ; continue counting
053522  160103                  3$:     SUB     R1, R3          ; calculate number of bytes
053524                                  CALL    HXFORM  R1, #OPSLBF, R3 ; convert to hex
053542                                  P$POP   R0,R4           ; get return status
053546  001420                          BEQ     12$             ; branch if success
053550  112737  177777  001301'         MOVB    #-1,P$GDBD      ; set error flag
053556                                  ERRSOFT 38,EMSG44
053566  000412                          BR      13$
053570                          4$:
053570  005003                          CLR     R3              ;CLEAR CHARACTER COUNTER
053572  105711                  5$:     TSTB    (R1)            ;CHECK FOR END OF STRING
053574  001403                          BEQ     10$             ;GO TO 10$ IF END
053576  112122                          MOVB    (R1)+,(R2)+     ;ELSE, MCVE BYTE TO OUTPUT BUFFER
053600  005203                          INC     R3              ;COUNT NUMBER OF CHARACTERS IN INPUT BUFFER
053602  000773                          BR      5$              ;GO DO MORE CHARACTERS
053604  112712  000000          10$:    MOVB    #0,(R2)         ;PUT ZERO AT END OF OUTPUT BUFFER
053610  010337  001446'         12$:    MOV     R3,MSG6C        ;STORE NUMBER OF CHARACTERS FOR USE IN BUF. BUILDING
053614                          13$:    RETURN


                                ;--+
                                ; Name - ENTRND                                 ENTER NODE IN TABLE
                                ;
                                ; Functional Description
                                ;               This routine is used to enter a node in the node table.
                                ;
                                ; Inputs - Implicit -
                                ;               ADRBUF - contains the node address to add to the node table
                                ;
                                ; Outputs - Explicit -
                                ;               P1 - zero if successful, -1 if table is full already
                                ;
                                ; Calling Procedure: CALL ENTRND
                                ;                    P$POP P1
                                ;
                                ; Side Effects - none
                                ;
                                ; Subordinate Routines -
                                ;               FINDSL - used to find empty slot in node table
                                ;               REMAP  - map node table into memory
                                ;               RETMEM - restore memory mapping
                                ;
                                ; Register Usage -
                                ;               R1 - pointer to node table
                                ;               R2 - pointer to node address to be added to the node table
                                ;               R3 - loop control
                                ;
                                ;--+

053616                          ENTRND: CALL FINDSL             ;FIND AVAILABLE SLOT IN TABLE
053624                                  P$POP   R1              ;CHECK IF TABLE FULL
053626  001403                          BEQ     5$              ;IF NOT FULL BR TO 5$
053630                                  P$PUSH  #-1             ;ELSE PUT FULL INDICATION ON STACK
053634  000426                          BR      20$             ;RETURN
053636                          5$:     CALL    REMAP   #ONTAB  ; allow access to node table
053650  012703  000003                  MOV     #3,R3           ;SET INCR. COUNTER TO 6 (BYTES)
053654  013701  001202'                 MOV     SLOT,R1         ;MOV ADDRESS OF AVAILABLE SLOT TO R1
053660  012702  001070'                 MOV     #ADRBUF,R2      ;MOV ADDRESS OF NODE ADDRESS TO R2
053664  012221                  10$:    MOV     (R2)+,(R1)+     ;MOV BYTE OF ADDRESS
053666  005303                          DEC     R3              ;DECR. COUNTER
053670  001375                          BNE     10$             ;CONTINUE UNTIL 6 BYTES TRANSFERED
053672  005201                          INC     R1              ;SET POINTER TO NODE TYPE LOCATION
053674  113711  001200'                 MOVB    NODTY,(R1)      ;MOVE NODE TYPE INTO TABLE
053700                                  CALL    RETMEM          ; restore memory mapping
053706                                  P$PUSH  #0              ;PUT ADDRESS ADDED INDICATION ON STACK
053712                          20$:    RETURN                  ;RETURN

                                ;--+
                                ; Name - FINDSL                         FIND EMPTY SLOT IN NODE TABLE
                                ;
                                ; Functional Description
                                ;               This routine is used to find an empty slot in the node table.
                                ;
                                ; Inputs - none
                                ;
                                ; Outputs - Explicit -
                                ;               P1 - zero if found a slot, -1 if no room in the node table
                                ;
                                ;           Implicit -
                                ;               SLOT - contains address of empty slot in node table
                                ;
                                ; Calling Procedure: CALL FINDSL
                                ;                    P$POP P1
                                ;
                                ; Side Effects - none
                                ;
                                ; Subordinate Routines -
                                ;               REMAP  - map node table into memory
                                ;               RETMEM - restore memory mapping
                                ;
                                ; Register Usage -
                                ;               R2 - pointer into node table
                                ;
                                ;--+
053714                          FINDSL: CALL    REMAP   #ONTAB          ;ALLOW ACCESS TO NODE TABLE
053726  012702  100000                  MOV     #NODTBL,R2              ;MOVE ADDRESS OF NODE TABLE TO R2
053732  022712  000000          10$:    CMP     #0,(R2)                 ;SEE IF SLOT EMPTY
053736  001422                          BEQ     20$                     ;IF YES, BR 20$
053740  062702  000010                  ADD     #8.,R2                  ;ELSE MOVE POINTER TO NEXT ENTRY LOC.
053744  020227  110000                  CMP     R2,#NODEND              ;SEE IF AT END OF NODE TABLE
053750  001370                          BNE     10$                     ;IF NOT, CONTINUE LOOKING
053752                                  PRINTF  #TABFUL,#NOD            ;ELSE, PRINT TABLE FULL MESSAGE
053776                                  P$PUSH  #-1                     ;PUT TABLE FULL INDICATION ON STACK
054002  000404                          BR      30$                     ;RETURN
054004  010237  001202'         20$:    MOV     R2,SLOT                 ;MOVE ADDRESS OF EMPTY LOC. INTO SLOT
054010                                  P$PUSH  #0                      ;PUT LOC. FOUND INDICATION ON STACK
054014                          30$:    CALL    RETMEM                  ;RESTORE MEMORY MAPPING
054022                                  RETURN                          ;RETURN

                                ;--+
                                ; Name - FULSLT                                 FULL SLOT ROUTINE
                                ;
                                ; Functional Description
                                ;               This routine is used to locate an entry in the node table
                                ;               that contains a valid node address.
                                ;
                                ; Inputs - none
                                ;
                                ; Outputs - Implicit
                                ;               SLOT - contains either an address of a node address or
                                ;                      -1 if the end of the node table has been reached
                                ; Calling Procedure: CALL FULSLT
                                ;
                                ; Side Effects - none
                                ;
                                ; Subordinate Routines -
                                ;               REMAP  - map node table into memory
                                ;               RETMEM - restore memory mapping
                                ;
                                ; Register Usage -
                                ;               R1 - pointer into node table
                                ;
                                ;--+

054024                          FULSLT: CALL    REMAP   #ONTAB  ;ALLOW ACCESS TO NODE TABLE
054036  013701  001202'                 MOV     SLOT,R1         ;MOVE SLOT LOCATION TO R1
054042  020127  110000          10$:    CMP     R1,#NODEND      ;SEE IF AT END OF NODE TABLE
054046  001406                          BEQ     15$             ;IF YES, BR 15$
```

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054050  022711  000000                   CMP     #0,(R1)         ;CHECK IF EMPTY
054054  001407                           BEQ     20$             ;IF YES, BR 20$
054056  010137  001202'                  MOV     R1,SLOT         ;ELSE PUT EMPTY LOC. ADDRESS INTO SLOT
054062  000407                           BR      30$             ;RETURN
054064  012737  177777  001202'  15$:    MOV     #-1,SLOT        ;PUT -1 INTO SLOT TO SHOW END OF TABLE
054072  000403                           BR      30$             ;RETURN
054074  062701  000010           20$:    ADD     #8.,R1          ;INCR. POINTER TO NEXT LOCATION
054100  000760                           BR      10$             ;CHECK NEXT LOC.
054102                           30$:    CALL    RETMEM          ;RESTORE MEMORY MAPPING
054110                                   RETURN                  ;RETURN

                                 ;--+
                                 ; Name - CMPTWO                              COMPAIR TWO BUFFERS
                                 ;
                                 ; Functional Description
                                 ;               This routine does a word by word comparison of two buffers
                                 ;               of arbitrary length.  It will report the likeness of the
                                 ;               two buffers.
                                 ;
                                 ; Inputs - Explicit -
                                 ;               P1 - address of first buffer
                                 ;               P2 - address of second buffer
                                 ;               P3 - number of words to compare
                                 ;
                                 ; Outputs - Explicit -
                                 ;               P4 - 0 = buffers contained exact same data; -1 = they differed
                                 ;
                                 ; Calling Procedure: CALL CMPTWO P1,P2,P3
                                 ;                    P$POP P4
                                 ;
                                 ; Side Effects - none
                                 ;
                                 ; Subordinate Routines - none
                                 ;
                                 ; Register usage -
                                 ;               R1 - comparison indicator
                                 ;               R2 - pointer to first buffer
                                 ;               R3 - pointer to second buffer
                                 ;               R4 - number of words to compare
                                 ;
                                 ;--+
054112                           CMPTWO: P$POP   R2,R3,R4        ;PUT ADDRESS OF STRING TO BE COMPARED IN R2 AND R3
054120  022223                   10$:    CMP     (R2)+,(R3)+     ;DO TWO BYTE COMPARE?
054122  001004                           BNE     20$             ; IF NO, EXIT W/ERROR
054124  005304                           DEC     R4              ; DECREMENT NUMBER OF WORDS TO COMPARE
054126  001374                           BNE     10$             ; KEEP GOING IF WE HAVE MORE TO DO
054130  005001                           CLR     R1              ; INDICATE EQUALS!
054132  000402                           BR      30$             ; AND LEAVE
054134  012701  177777           20$:    MOV     #-1,R1          ;PUT NO COMPARISON INDICATOR IN R1
054140                           30$:    RETURN  R1

                                 ;--+
                                 ; Name - NTEXTI                 Extract Node table information
                                 ;
                                 ; Functional Description
                                 ;               This routine will take the information on one node in
                                 ;               the node table and default address table, format it and
```

```
                                  ;               set up a "record" of information on that particular node.
                                  ;               Included in the information will be: current physical address,
                                  ;               default physical address, device type attached to the node,
                                  ;               logical node name, and DECnet address (AREA.NODE_NUMBER).
                                  ;
                                  ; Inputs - Implicit -
                                  ;               SLOT - contains address of node to work on
                                  ;
                                  ; Outputs - Implicit -
                                  ;               STRBUF - contains current physical address of node
                                  ;               STRBU1 - contains default phys'cal address of node
                                  ;               LOGVAL - integer representing logical node number
                                  ;               DECNET - DECnet node number
                                  ;               AREA   - DECnet area number
                                  ;
                                  ; Calling Procedure: CALL NTEXTI
                                  ;
                                  ; Side Effects - none
                                  ;
                                  ; Subordinate Routines -
                                  ;               BINHEX - convert node address into ascii string
                                  ;               GETTYP - set dev ce type attached to node
                                  ;               REMAP  - map node table into memory
                                  ;               RETMEM - restore memory mapping
                                  ;
                                  ; Register Usgae -
                                  ;               R1, R2, R3 - scratch
                                  ;
                                  ;--+
054144                            NTEXTI:
                                  ;--+
                                  ;       Setup the current node address in the buffer STRBUF
                                  ;--+

054144                                    CALL    REMAP   #ONTAB           ;ALLOW ACCESS TO NODE TABLE
054156                                    CALL    BINHEX SLOT,#6,#STRBUF   ;PUT ASCII ADDRESS INTO BUFFER

                                  ;--+
                                  ;       Setup the default hardware address in the buffer STRBU1
                                  ;--+

054200  013703  001202'                   MOV     SLOT,R3                  ;GET POINTER TO NODE TABLE
054204  062703  010000                    ADD     #DEFNOD,R3               ;POINT R3 TO DEFAULT HARDWARE ADDR.
054210                                    CALL    BINHEX  R3,#6,#STRBU1    ;CONVERT BINARY ADDRESS TO ASCII

                                  ;--+
                                  ;       Call GETTYP to setup a string describing the device type in TYPADR
                                  ;--+

054230  062703  000007                    ADD     #7,R3                    ; POINT TO BYTE WITH NODE TYPE
054234                                    CALL    GETTYP  R3               ; GET NODE TYPE!!

                                  ;--+
                                  ;       Setup the logical node number in the variable LOGVAL
                                  ;--+

054244  013702  001202'                   MOV     SLOT,R2                  ;POINT R2 TO NODE TABLE
```

```
054250  162702  100000                  SUB     #NODTBL,R2              ;CALCULATE THE LOGICAL NAME ...
054254  006202                          ASR     R2                      ;
054256  006202                          ASR     R2                      ;... LOG. NAM = (SLOT-#NODTAB)/8
054260  006202                          ASR     R2                      ;
054262  010237  001162'                 MOV     R2,LOGVAL               ;SAVE LOGICAL NAME

                                ;--+
                                ;       Setup the DECnet address in the variables AREA and DECNET
                                ;--+

054266  013701  001202'                 MOV     SLOT,R1                 ;address of node binary > R1
054272  062701  000002                  ADD     #2,R1                   ;point to DECnet indicator
054276  121127  000004                  CMPB    (R1),#04                ;is this a DECnet node?
054302  001405                          BEQ     30$                     ;branch if it is
054304  005037  002054'                 CLR     DECNET                  ;otherwise clear area.number..
054310  005037  002056'                 CLR     AREA
054314  000422                          BR      40$                     ;and exit
054316  062701  000002          30$:    ADD     #2, R1                  ; point to decnet address
054322  011137  002054'                 MOV     (R1),DECNET             ; and buffer it
054326  042737  176000  002054'         BIC     #176000,DECNET          ;clear area number
054334  011137  002056'                 MOV     (R1), AREA
054340  042737  001777  002056'         BIC     #1777,AREA              ;clear node number
054346  012701  000012                  MOV     #10.,R1
054352                          35$:
054352  006037  002056'                 ROR     AREA                    ;shift it into position for print
054356  005301                          DEC     R1
054360  001374                          BNE     35$

054362                          40$:    RETURN                          ;RETURN



                                ;--+
                                ; Functional Description
                                ;               This subroutine prints the information contained in a reply
                                ;               system id message, in English.
                                ;
                                ; Inputs -      P1 - the address of a buffer that contains a reply system
                                ;                    id message.
                                ;
                                ; Outputs -     System id information
                                ;
                                ; Calling procedure - Call PRNTID P1
                                ;
                                ; Side effects - None
                                ;
                                ; Subordinate routines -
                                ;               GETIDA - get address of a particular field in the sys. ID msg.
                                ;               GETTYP - set up the device type
                                ;               REMAP  - map node table into memory
                                ;               RETMEM - restore memory mapping
                                ;
                                ; Register Usage -
                                ;               R1 - used to hold field type identifier for sys. id
                                ;               R2 - scratch
                                ;               R3 - scratch
                                ;
                                ;--+

054364                              PRNTID: p$pop   R1                      ; Get address of system id
054366                                      CALL    REMAP   #ORRING         ; allow access to receive ring
054400  010137  003110'                     mov     R1,temp                 ; save it in TEMP

054404  062701  000006                      add     #sourcc,R1              ; point R1 to source address
054410                                      call    binhex  R1,#6,#strbuf   ; put address in strbuf
054430                                      printf  #simsg1,#strbuf         ; print remote node current address

054454  013701  003110'                     mov     temp,R1                 ; restore address of system id
054460  016137  000016  003112'             mov     siccou(R1),temp1        ; save char. count
054466  162737  000004  003112'             sub     #4,temp1                ; skip code, pad, and receipt number

054474                                      call    getida  temp,#144       ; get address of device type
054512                                      p$pop   R2                      ; save address in R2
054514                                      PRINTF  #SIMSG7                 ; print device field label
054534                                      call    GETTYP  R2              ; get the device type
054544                                      PRINTF  TYPADR                  ; print the device type

054564  062701  000024                      add     #siffid,R1              ; let R1 point to first field identifier
054570  116102  000002              5$:     movb    2(R1),R2                ; get field length in R2
054574  160237  003112'                     sub     R2,temp1                ; sub. field len. from char. count
054600  162737  000003  003112'             sub     #3,temp1                ; sub. id and length fields from char. count

                                    ;--+
                                    ;       To avoid word references on odd-byte boundaries, a field will be
                                    ;       extracted from the system id, then justified on an even byte boundary.
                                    ;       Also, the length field will be extended from a byte to a word with the
                                    ;       upper byte being null.
                                    ;--+
054606  012703  003040'                     mov     #tempbl,R3              ; point R3 to temporary storage
054612  112123                              movb    (R1)+,(R3)+             ; save two bytes for the identifier
054614  112123                              movb    (R1)+,(R3)+             ; save two bytes for the identifier
054616  112123                              movb    (R1)+,(R3)+             ; save the field length
054620  112723  000000                      movb    #0,(R3)+                ; add a null byte to keep alignment

054624  112123                      8$:     movb    (R1)+,(R3)+             ; save a byte of field value
054626  005302                              dec     R2                      ; any more bytes left for value
054630  003375                              bgt     8$                      ; yes, indeed!!
054632  012703  003040'                     mov     #tempbl,R3              ; point R3 back to the beginning of field

054636  022713  000144                      cmp     #144,(R3)               ; was this the device type field?
054642  001002                              bne     10$                     ; no
054644  000137  055434'                     jmp     100$                    ; if so skip it

054650  022713  000000              10$:    cmp     #0,(r3)                 ; This is an illegal field type
054654  001002                              bne     11$                     ; this ain't it!!
054656  000137  055446'                     jmp     101$                    ; on illegal type - exit

054662  022713  000001              11$:    cmp     #1,(R3)                 ; Is this maintenance version field?
054666  001043                              bne     20$                     ; Nay!
054670  116302  000004                      movb    4(R3),R2                ; get version number
054674                                      printf  #simsg3,R2              ; and print it
054716  116302  000005                      movb    5(R3),R2                ; get ECO number
054722                                      printf  #simsg4,R2              ; and print it
054744  116302  000006                      movb    6(R3),r2                ; get user ECO number
054750                                      printf  #simsg5,R2              ; and print it
```

```
054772  000137  055434'                 jmp     100$                            ; done with this field

054776  022713  000002          20$:    cmp     #2,(R3)                         ; is this the function field?
055002  001015                          bne     30$                             ; Nay!
055004  016302  000004                  mov     4(R3),R2                        ; get function code
055010                                  printf  #simsg6,R2                      ; and print it
055032  000137  055434'                 jmp     100$                            ; done with this field

055036  022713  000003          30$:    cmp     #3,(R3)                         ; is this console user field?
055042  001026                          bne     40$                             ; Nay!
055044  010302                          mov     R3,R2                           ; get address of system address
055046  062702  000004                  add     #4,R2                           ;
055052                                  call    binhex  R2,#6,#strbuf           ; put it into STRBUF
055072                                  printf  #simsg8,#strbuf                 ; and print it
055116  000546                          br      100$                            ; done with this field

055120  022713  000004          40$:    cmp     #4,(R3)                         ; Is this reservation timer field?
055124  001014                          bne     50$                             ; Nay!
055126  016302  000004                  mov     4(R3),R2                        ; get reservation timer value
055132                                  printf  #simsg9,R2                      ; and print it
055154  000527                          br      100$                            ; done with this field

055156  022713  000005          50$:    cmp     #5,(R3)                         ; is this console command size?
055162  001014                          bne     60$                             ; nay!
055164  016302  000004                  mov     4(R3),R2                        ; get console command size
055170                                  printf  #smsg10,R2                      ; and print it
055212  000510                          br      100$                            ; done with this field

055214  022713  000006          60$:    cmp     #6,(R3)                         ; is this console response size?
055220  001014                          bne     70$                             ; Nay!
055222  016302  000004                  mov     4(R3),R2                        ; get console response size
055226                                  printf  #smsg11,R2                      ; and print it
055250  000471                          br      100$                            ; done with this field

055252  022713  000007          70$:    cmp     #7,(R3)                         ; is this hardware address field?
055256  001026                          bne     80$                             ; Nay!
055260  010302                          mov     R3,R2                           ; get address
055262  062702  000004                  add     #4,R2                           ; of default hardware address
055266                                  call    binhex  R2,#6,#strbuf           ; convert to readable form
055306                                  printf  #smsg12,#strbuf                 ; and print it
055332  000440                          br      100$                            ; done with this field

055334  022713  000010          80$:    cmp     #10,(R3)                        ; is this system time stamp
055340  001023                          bne     90$                             ; Nay!
055342                                  printf  #smsg13,4(R3),6(R3),10(R3),12(R3),14(R3) ; dump 10 bytes in octal
055406  000412                          br      100$                            ; done with this field

055410  021327  000310          90$:    cmp     (R3),#200.                      ; See if we've got communications
055414  002007                          bge     100$                            ; device specific information
055416  021327  000144                  cmp     (R3),#100.                      ; this will be in the range ...
055422  003404                          ble     100$                            ; ... 101 <= n <= 199

                                ;--+
                                ;       The field that is being looked at is relevant only to POSEIDON
                                ;       communication servers at present.  If further COM devices make use
                                ;       of this field then this section will have to be expanded accordingly
                                ;--+
055424                                  CALL    POSEIDON R3             ; call routine to handle this field

055434  005737  003112'         100$:   tst     templ                   ; are we through w/ this message?
055440  001402                          beq     101$                    ; yes
055442  000137  054570'                 jmp     5$                      ; nope!

055446                          101$:   CALL    RETMEM                  ; restore memory mapping
055454                                  return                          ; good bye

                                ;--+
                                ; Name - POSEIDON                       print POSEIDON specific system ID fields
                                ;
                                ; Functional Description:
                                ;               This routine is used to print out information contained in
                                ;               the communication device specific field of a system ID message,
                                ;               specifically for the DECserver 100 (POSEIDON) communications
                                ;               device.  The values of the TYPE INFO field for these fields will
                                ;               be in the range 101 <= N <= 199 (decimal).
                                ;
                                ; Inputs -      P1 - pointer to block containing a device specific field
                                ;
                                ; Outputs -     none
                                ;
                                ; Calling Procedure:    CALL POSEIDON P1
                                ;
                                ; Side Effects -
                                ;               1.) Prints out the information contained in the field
                                ;
                                ; Subordinate Routines - none
                                ;
                                ; Register Usage -
                                ;               R1 - pointer to block containing a device specific field
                                ;
                                ;--+
055456                          POSEIDON::
055456                                  P$POP   R1                      ; get pointer to system ID field

055460  021127  000145                  CMP     (R1),#101.              ; Is this the Diagnostic Status field?
055464  001036                          BNE     10$                     ; NO, branch.
055466                                  PRINTF  #POSDS                  ; print diagnostic header
055506                                  PRINTF  #POSDS0,4(R1)           ; print word 0 of status
055532                                  PRINTF  #POSDS1,6(R1)           ; print word 1 of status
055556  000137  056016'                 JMP     POSEXIT                 ; all through with field

055562  021127  000150          10$:    CMP     (R1),#104.              ; Is this the Server Number
055566  001014                          BNE     20$                     ; NO, branch.
055570                                  PRINTF  #POSSN,4(R1)            ; print the server number ...
055614  000137  056016'                 JMP     POSEXIT                 ; ... and leave

055620  021127  000146          20$:    CMP     (R1),#102.              ; Is this ROM version number?
055624  001011                          BNE     30$                     ; NO, branch.
055626                                  PRINTF  #POSRVN                 ; Print field identifier message
055646  000443                          BR      60$                     ; ... and go print value

055650  021127  000147          30$:    CMP     (R1),#103.              ; Is this Software Version number?
055654  001011                          BNE     40$                     ; NO, branch.
055656                                  PRINTF  #POSSVN                 ; print field identifier message ...
```

```
055676  000427                          BR      60$                     ; ... and go print value

055700  021127  000151          40$:    CMP     (R1),#105.              ; Is this the Server's name?
055704  001011                          BNE     50$                     ; NO, branch.
055706                                  PRINTF  #POSNAM                 ; print field identifier message ...
055726  000413                          BR      60$                     ; ... and go print value

055730  021127  000152          50$:    CMP     (R1),#106.              ; Is this the Server's Location?
055734  001030                          BNE     POSEXIT                 ; NO, didn't find match ... just exit
055736                                  PRINTF  #POSLOC                 ; print field identifier message

                                ;--+
                                ;       The value for these fields are represented as counted ascii strings.
                                ;       The length of the string is just the INFO LENGTH field of the particular
                                ;       system ID field.  To allow the printing of the string, attach a NULL
                                ;       byte to the end of it
                                ;--+
055756  062701  000004          60$:    ADD     #4,R1                   ; point R1 past TYPE and LENGTH fields
055762  010102                          MOV     R1,R2                   ; make R2 point there
055764  066202  177776                  ADD     -2(R2),R2               ; point R2 past VALUE field
055770  112712  000000                  MOVB    #0,(R2)                 ; stuff a NULL byte at end of string

055774                                  PRINTF  #POSSTR,R1              ; print the string

056016                          POSEXIT:RETURN                          ; hasta la vista, brother!!

                                .sbttl  GETIDA  get the address of a system id field

                                ;--+
                                ; Functional Description
                                ;               This subroutine takes a system id message and a field type
                                ;               identifier and searches for the specific field.  It returns
                                ;               the address of the value for the given field.
                                ;
                                ; Inputs -      P1 - address of a buffer holding a system id message
                                ;               P2 - field type identifier to search for
                                ;
                                ; Outputs -     P3 - address of the value for the given field
                                ;                    If no match is found, zero is returned
                                ;
                                ; Calling procedure - call GETIDA P1,P2
                                ;
                                ; Side effects -
                                ;               1.) This routine leaves the receive ring mapped into KPAR4,5
                                ;
                                ; Register Usage - R1 - points to buffer that holds the system id message
                                ;                  R2 - holds field type identifier to look for
                                ;                  R3 - holds character count of message
                                ;
                                ;--+

056020                          GETIDA:
056020                                  p$pop   R1,R2                   ; get address of string to search for
056024                                  p$push  temp                    ; need a temporary var., so save 'temp'
056030                                  CALL    REMAP   #ORRING         ; allow access to receive ring

056042  016103  000016                  mov     siccou(R1),R3           ; save character count in R3
```

```
056046  162703  000004                    sub     #4,R3                   ; dec. char count to skip code, pad, and
                                                                          ; receipt number
056052  062701  000024                    add     #siffid,R1              ; point R1 to first field ID

056056  012704  003110'           10$:    mov     #temp,R4                ; let R4 point to temporary storage
056062  112124                            movb    (R1)+,(R4)+             ; save a byte of field identifier
056064  112124                            movb    (R1)+,(R4)+             ; save a byte of field identifier
056066  023702  003110'                   cmp     temp,R2                 ; have we found the desired field?
056072  001412                            beq     20$                     ; yes, return it

056074  112104                            movb    (R1)+,R4                ; get byte that has length field

056076  162703  000003                    sub     #3,R3                   ; decrement character count for fields
056102  160403                            sub     R4,R3                   ;
056104  001003                            bne     15$                     ; keep going if more characters
056106  012701  000000                    mov     #0,R1                   ; didn't find it
056112  000404                            br      22$                     ; return error indicator

056114  060401                    15$:    add     R4,R1                   ; let R1 point to next field
056116  000757                            br      10$                     ; continue to look

056120  062701  000001            20$:    add     #1,R1                   ; point R1 to field value
056124                            22$:    p$pop   temp                    ; restore value in 'temp'
056130                                    return  R1                      ; return address

                                  .sbttl  PRTTYP  print the device type


                                  ;--+
                                  ;       PRTTYP                          PRINT DEVICE TYPE
                                  ;
                                  ;       INPUTS                  P1 - ADDRESS OF A BYTE THAT IS NODE TYPE
                                  ;       EXPLICIT OUTPUTS        NONE
                                  ;       IMPLICIT OUTPUTS        THE NODE TYPE WILL BE PRINTED IN PSEUDO-ENGLISH
                                  ;       SUBORDINATE ROUTINES    NONE
                                  ;       CALLING SEQUENCE        CALL PRTTYP P1
                                  ;
                                  ;--+
056134                            GETTYP:
056134                                    P$POP   R2                      ; get address node type
056136  122712  000001                    CMPB    #IDTUNA,(R2)            ; DELUA/DEUNA?
056142  001004                            BNE     50$                     ; branch if not
056144  012737  012746' 001164'           MOV     #UNA,TYPADR             ; save una description
056152  000446                            BR      100$                    ; leave
056154  122712  000005            50$:    CMPB    #IDTQNA,(R2)            ; QNA?
056160  001004                            BNE     60$                     ; branch if not
056162  012737  012756' 001164'           MOV     #QNA,TYPADR             ; save qna description
056170  000437                            BR      100$                    ; leave
056172  122712  000011            60$:    CMPB    #IDTLUA,(R2)            ; LUA?
056176  001004                            BNE     70$                     ; branch if not
056200  012737  012766' 001164'           MOV     #LUA,TYPADR             ; save LUA description
056206  000430                            BR      100$                    ; leave
056210  122712  000003            70$:    CMPB    #IDTCNA,(R2)            ; CNA?
056214  001004                            BNE     80$                     ; branch if not
056216  012737  012776' 001164'           MOV     #CNA,TYPADR             ; save CNA description
056224  000421                            BR      100$                    ; leave
056226  122712  000013            80$:    CMPB    #IDTCSA,(R2)            ; CSA?
056232  001004                            BNE     90$                     ; branch if not
```

```
056234  012737  013006' 001164'            MOV     #SCA,TYPADR                ; save CSA description
056242  000412                             BR      100$                       ; leave
056244  122712  000021             90$:    CMPB    #IDTSRV,(R2)               ; DECserver?
056250  001004                             BNE     95$                        ; branch if not
056252  012737  013016' 001164'            MOV     #SRV,TYPADR                ; save DECserver description
056260  000403                             BR      100$                       ; leave
056262  012737  013032' 001164'    95$:    MOV     #UNKNWN,TYPADR             ; save 'unknown' description
056270                             100$:   RETURN



                                   ;--+
                                   ; Name - EXELIS                          Execute the Listen Command
                                   ;
                                   ; Functional Description
                                   ;               This routine implements the LISTEN command of the NIE.
                                   ;               The purpose of the LISTEN command is to be able to monitor
                                   ;               the activity of nodes on a network.
                                   ;                       Listening on the network consists of receiving
                                   ;               all frames that pass a user specified filter.  The filter
                                   ;               may be on the frame's destination address, source address,
                                   ;               protocol type, or any combination of the three.
                                   ;                       A log will be kept containing information on frames
                                   ;               that pass the filter(s) including: destination address,
                                   ;               source address, protocol type, packet length, and number
                                   ;               of receipts.  If a frame's characteristics match the first
                                   ;               four then the number of receipts counter is incremented.
                                   ;               A maximum of 30 entries will be stored in the log.
                                   ;                       A list of source addresses of frames that pass the
                                   ;               filters will also be kept along with a count of the number
                                   ;               of times that source address has been heard from
                                   ;                       The routine will print information on frames that pass
                                   ;               filters every one millisecond or if there are no frames
                                   ;               outstanding in the receive ring.
                                   ;                       The only way to stop listening is to type a control-C.
                                   ;
                                   ; Inputs - none
                                   ;
                                   ; Outputs - Implicit
                                   ;               LISLOG - log containing frame characteristics
                                   ;               LISNUM - the number of times the LISTEN command has been
                                   ;                        entered since the log has been cleared
                                   ;               LISSEC - total number of seconds of listening
                                   ;               LISMIN - total nubmer of minutes of listerning
                                   ;               LISFSC - seconds to fill log
                                   ;               LISFMN - minutes to fill log
                                   ;               ADRLIS - source address list
                                   ;
                                   ; Calling Procudure: JSR PC,EXELIS
                                   ;
                                   ; Side Effects -
                                   ;               1.) control will pass to the DRS upon control-C
                                   ;
                                   ; Subordinate Routines -
                                   ;               CMPTWO - buffer comparison
                                   ;               RECEVE - receive frames
                                   ;               PRLENT - print a listen event
                                   ;
```

```
                                ; Register Usage -
                                ;               R1 - scratch
                                ;               R2 - pointer to buffer containing frame header
                                ;               R3 - pointer to received frame
                                ;               R4 - pointer to listen log/address list
                                ;
                                ;--+
056272                          EXELIS::

056272                                  CALL    DEVSTART                ; start up the DELUA/DEUNA
056300  012702  002566'                 MOV     #$WDMO,R2               ; get address of PCB for write mode
056304  012762  100000  000002          MOV     #100000,2(R2)           ; set promiscuous mode bit
056312                                  CALL    FUNCT   #WDMODE         ; execute write mode port command
056324                                  P$POP   R2                      ; get error status
056326  001404                          BEQ     5$                      ; no error, continue
056330                                  ERRDF   39,EMSG23,ERR1          ; report error

056340  105737  001234'         5$:     TSTB    LISNUM                  ; Is this the first listen?
056344  001007                          BNE     10$                     ; no, don't initialize
056346  005037  001242'                 CLR     LISMIN                  ; reset minutes since start
056352  005037  001244'                 CLR     LISSEC                  ; reset seconds since start
056356  012737  000001  002052'         MOV     #1,TIMERS               ; set print out for every millisecond

056364  013737  001242' 002040' 10$:    MOV     LISMIN,TIMMIN           ; reset value that clock serv. routine ahngles
056372  013737  001244' 002042'         MOV     LISSEC,TIMSEC           ;
056400                                  PRINTF  #LISHD1                 ; print listen header
056420                                  PRINTF  #NEWLI1                 ; CR-LF
056440  105237  001234'                 INCB    LISNUM                  ; update number of listens

056444                          20$:    BREAK                           ; allow for contol-c interruption
056446                                  CALL    RECEVE                  ; see if any frames have arrived
056454                                  P$POP   R2                      ; R2 positive means yes
056456  001772                          BEQ     20$                     ; didn't get anything, keep looking

056460                          25$:    BREAK                           ; allow for control-c interruption
056462  013737  002040' 001242'         MOV     TIMMIN,LISMIN           ; update total minutes and seconds
056470  013737  002042' 001244'         MOV     TIMSEC,LISSEC           ; since start of listen
056476  013703  002100'                 MOV     RRGNXT,R3               ; get receive ring pointer
056502                                  CALL    GETRNX,#RRGNXT          ; update receive next pointer
056514  016337  000006  001240'         MOV     6(R3),LBYTEC            ; save message buffer length
056522  042737  170000  001240'         BIC     #170000,LBYTEC          ; clear status bits
056530  016302  000010                  MOV     10(R3),R2               ; point R3 to message buffer

                                ;--+
                                ;       Test to see if the received frame passes the user specified filters
                                ;--+

056534  105737  001254'                 TSTB    DESFLG                  ; see if a dest. filter has been specified
056540  001412                          BEQ     40$                     ; no dest. filter
056542                                  CALL    CMPTWO  R2,#DESFIL,#3   ; check against filter
056562                                  P$POP   R1                      ; get equals indicator
056564  001036                          BNE     55$                     ; not equal, don't proceed!

056566  062702  000006          40$:    ADD     #SOURCC,R2              ; point R2 to source address of received frame
056572  105737  001253'                 TSTB    SOUFLG                  ; see if source filter has been specified
056576  001412                          BEQ     50$                     ; no source filter
056600                                  CALL    CMPTWO  R2,#SOUFIL,#3   ; check against filter
```

```
056620                                   P$POP   R1                       ; get equals indicator
056622  001017                           BNE     55$                      ; not equal, don't proceed

056624  062702  000006           50$:    ADD     #6,R2                    ; point R2 to protocol type
056630  105737  001255'                  TSTB    PROFLG                   ; see if p.t. filter has been specified
056634  001420                           BEQ     60$                      ; no p.t. filter
056636                                   CALL    CMPTWO  R2,#PROFIL,#1    ; check against filter
056656                                   P$POP   R1                       ; get equals indicator
056660  001406                           BEQ     60$                      ; passed filter

                                 ;--+
                                 ;       The received frame did not pass all filters, so release it and
                                 ;       continue listening
                                 ;--+
056662                           55$:    CALL    RELBUF  R3               ; release the receive buffer
056672  000137  056444'                  JMP     20$                      ; and keep on listening


056676  005237  001236'          60$:    INC     LPACNM                   ; incremnet number of frames that passed filter

                                 ;--+
                                 ;       Now we've got a frame that has made it through the specified filters.
                                 ;       R3 points to the buffer that contains the frame.  Log information in
                                 ;       listen log and address list.
                                 ;
                                 ;       If all four fields - destination, source, protocol type, and character
                                 ;       count - match an entry in the listen log, update the count for that
                                 ;       entry.  If not and there is room in the log, make a new entry.
                                 ;--+
056702  012704  100000                   MOV     #LISLOG,R4               ; point R4 to listen log
056706  016302  000010                   MOV     10(R3),R2                ; point R2 to receive buffer

                                 ;--+
                                 ;       NOTE: the listen log has been set up such that individual entries have
                                 ;       fields that are in the same relative locations as those in the received
                                 ;       frame.
                                 ;--+

056712  020437  001232'          70$:    CMP     R4,LISNXT                ; have we checked all entries?
056716  001434                           BEQ     85$                      ; yes, try to add a new entry
056720                                   CALL    CMPEXT  #ORRING,R2,#OLLOG,R4,#7 ; see if dest., source, and p.t. match
056746                                   P$POP   R1                       ; get equals indicator
056750  001014                           BNE     80$                      ; not equal, check next entry
056752                                   CALL    REMAP   #OLLOG           ; allow access to listen log
056764  026437  000016  001240'          CMP     LBCOU(R4),LBYTEC         ; see if byte counts match
056772  001003                           BNE     80$                      ; not equal, check next entry
056774  005264  000020                   INC     LISCOU(R4)               ; update count for this entry
057000  000454                           BR      100$                     ; go check address list

057002  062704  000022           80$:    ADD     #LISENT,R4               ; point R4 to next entry in listen log
057006  000741                           BR      70$                      ; and keep checking

057010  105737  001252'          85$:    TSTB    LISFUL                   ; has the log been filled?
057014  001046                           BNE     100$                     ; yes, go check address list

                                 ;--+
                                 ;       To make a new entry, just move dest, source, p.t., and char count into
```

```
                                       ;        listen log and set count to one.
                                       ;--+

057016                                           CALL    MOVEXT  #ORRING,R2,#OLLOG,R4,#7 ; move dest., source., and p.t. into log
057044                                           CALL    REMAP   #OLLOG          ; allow access to listen log
057056  013764  001240' 000016                   MOV     LBYTEC,LBCOU(R4)        ; move byte count into log
057064  012764  000001  000020                   MOV     #1,LISCOU(R4)           ; set count for this entry to one

057072  062737  000022  001232'                  ADD     #LISENT,LISNXT          ; update next entry pointer
057100  023727  001232' 101034                   CMP     LISNXT,#LISEND          ; Is the log full?
057106  001011                                   BNE     100$                    ; No,
057110  112737  177777  001252'                  MOVB    #-1,LISFUL              ; Raise log full flag
057116  013737  002040' 001246'                  MOV     TIMMIN,LOGFMN           ; record the time it took to
057124  013737  002042' 001250'                  MOV     TIMSEC,LOGFSC           ; fill the log

057132  012704  101034                  100$:    MOV     #ADRLIS,R4              ; point R4 to address list
057136  062702  000006                           ADD     #SOURCC,R2              ; point R2 to source address

057142  020437  001256'                 110$:    CMP     R4,ADRNXT               ; have we checked all entries?
057146  001430                                   BEQ     125$                    ;   YES, try to add entry to addr. list

057150                                           CALL    CMPEXT  #ORRING,R2,#OLLOG,R4,#3 ; see if we have an address match
057176                                           P$POP   R1                      ; get equals indicator
057200  001010                                   BNE     120$                    ; if not equal, check next entry
057202                                           CALL    REMAP   #OLLOG          ; allow access to listen log
057214  005264  000006                           INC     ADRCOU(R4)              ; they were equal, so update count for this entry
057220  000434                                   BR      140$                    ; and go on

057222  062704  000010                  120$:    ADD     #ADRENT,R4              ; point R4 to next entry
057226  000745                                   BR      110$                    ; and keep checking

057230  020427  101414                  125$:    CMP     R4,#ADREND              ; Have we filled the address list
057234  001426                                   BEQ     140$                    ; YES, can't add, but continue

                                        ;--+
                                        ;        Add an entry to the address list by moving in the source address of the
                                        ;        received frame and setting the count to one.
                                        ;--+

057236                                           CALL    MOVEXT  #ORRING,R2,#OLLOG,R4,#3 ; store source address
057264                                           CALL    REMAP   #OLLOG          ; allow access to listen log
057276  012764  000001  000006                   MOV     #1,6(R4)                ; set count for this addr. to one
057304  062737  000010  001256'                  ADD     #ADRENT,ADRNXT          ; update next spot pointer

                                        ;--+
                                        ;        With all that has gone on since we first received a good frame, there is
                                        ;        a good chance that we've received more.  So, to keep up, do another
                                        ;        receive.  If nothings there, then print out the information from the
                                        ;        last frame processed.
                                        ;--+

057312                                  140$:    CALL    RECEVE                  ; See if anything's arrived
057320                                           P$POP   R2                      ; R2 is nozero if we received something
057322  001406                                   BEQ     150$                    ; nothing there go print

057324  005737  002052'                 145$:    TST     TIMERS                  ; has time expired?
057330  001012                                   BNE     160$                    ; NO, don't try to print
```

```
057332  012737  000001  002052'          MOV     #1,TIMERS               ; reload timer

057340                          150$:    CALL    PRLENT  10(R3),LBYTEC   ; sho user what we have!

057356                          160$:    CALL    RELBUF  R3              ; release recieve buffer
057366  000137  056444'                  JMP     20$                     ; and keep it going
                                ;--+
                                ;        Can't get out of this routine other than by control-C
                                ;--+


057372                          ACTSLI:  P$PUSH  R2,R3                   ; Save R2
057376                                   CALL    REMAP   #OLLOG          ; allow access to listen log
057410  023727  001232' 100000           CMP     LISNXT,#LISLOG          ; Are there any entries in the log
057416  001021                           BNE     5$                      ; yes, go print there contents
057420                                   PRINTF  #LEMSG                  ; NO, print log empty message
                                ;
                                ; Right here we know that the address list must be empty also, so just print
                                ; "address list empty" message
                                ;
057440                                   PRINTF  #ALEMPT                 ; print empty message
057460  000535                           BR      50$                     ; don't bother going on

057462                          5$:      PRINTF  #LISHD1                 ; print listen log header ...
057502                                   PRINTF  #LISHD2                 ;  ... more header
057522  012702  100000                   MOV     #LISLOG,R2              ; let R2 point to beginning of listen log
057526  020237  001232'         10$:     CMP     R2,LISNXT               ; have we finished printing log?
057532  001424                           BEQ     20$                     ; YES!!
057534  016203  000016                   MOV     LBCOU(R2),R3            ; put message length in R3
057540                                   CALL    PRLENT  R2,R3           ; print entry pointed to by R2
057552                                   PRINTF  #LCOUNT,LISCOU(R2)      ; print the number of times this message
                                                                         ; was received.
057576  062702  000022                   ADD     #LISENT,R2              ; point R2 to next entry
057602  000751                           BR      10$                     ;

057604  105737  001252'         20$:     TSTB    LISFUL                  ; see if listen log was filled
057610  001414                           BEQ     30$                     ; NO, IT WEREN'T
057612                                   PRINTF  #LFMSG,LOGFMN,LOGFSC    ; print log filled message

057642                          30$:     PRINTF  #ALHDR                  ; print address list header
057662  012702  101034                   MOV     #ADRLIS,R2              ; let R2 point to beginning of addr. list

057666  020237  001256'         40$:     CMP     R2,ADRNXT               ; done printing list?
057672  001430                           BEQ     50$                     ; YAA!
057674                                   CALL    BINHEX  R2,#6,#STRBUF   ; convert address pointed to by R2 to HEX
057714  062702  000006                   ADD     #6,R2                   ; point R2 to "#-of-times"
057720                                   PRINTF  #AADDR,#STRBUF,(R2)     ; print this info
057746  062702  000002                   ADD     #2,R2                   ; point R2 to next entry
057752  000745                           BR      40$                     ;

                                ; Now print total listen time and number of listen commands
057754                          50$:     PRINTF  #LTMSG,LISMIN,LISSEC,LISNUM

060010                                   P$POP   R2,R3                   ; restore R2 and R3
060014  105037  001300'                  CLRB    P$NNUF                  ; clear not enough flag
060020                          60$:     CALL    RETMEM                  ; restore memory mapping
060026  000207                           RTS     PC                      ; RETURN
```

```

                                ;
                                ; Action routine to clear the listen data
                                ;
060030  012737  100000  001232' ACTCLI: MOV     #LISLOG,LISNXT          ; clear listen log
060036  012737  101034  001256'         MOV     #ADRLIS,ADRNXT          ; clear address list
060044  005037  001242'                 CLR     LISMIN                  ; reset elapsed time timer
060050  005037  001244'                 CLR     LISSEC                  ;
060054  005037  001246'                 CLR     LOGFMN                  ; reset log filled timer
060060  005037  001250'                 CLR     LOGFSC                  ;
060064  005037  001236'                 CLR     LPACNM                  ; clear number of frames that passed filter
060070  005037  001234'                 CLR     LISNUM                  ; clear number of listen commands
060074  105037  001252'                 CLRB    LISFUL                  ; clear listen log filled flag
060100  105037  001253'                 CLRB    SOUFLG                  ; clear source filter presence
060104  105037  001254'                 CLRB    DESFLG                  ; clear dest. filter presence
060110  105037  001255'                 CLRB    PROFLG                  ; clear p.t. filter presence

060114  105037  001300'                 CLRB    P$NNUF                  ; clear not enough flag
060120  000207                          RTS     PC
                                ;--+
                                ; Name - PRLENT
                                ;
                                ; Functional Description:
                                ;               This routine prints the destination, source, protocol type, and
                                ;               message length of a frame.  The information to be printed may
                                ;               be from the listen log or from an actual received frame.
                                ;
                                ; Inputs -      P1 - A pointer to an entry in the listen log or to a message
                                ;                       buffer.
                                ;               P2 - The length of the entry or message
                                ;
                                ; Outputs - none
                                ;
                                ; Calling procedure - CALL PRLENT P1,P2
                                ;
                                ; Side effects - Information about the frame/listen log entry is printed at
                                ;                the user's terminal.
                                ;
                                ; Subordinate Routines -
                                ;               BINHEX - convert binary to an ASCII HEX string
                                ; Register Usage -
                                ;               R2 - pointer to buffer that contains dest., source, and protocol
                                ;                       type
                                ;               R3 - contains the length of the message
                                ;
                                ;--+
060122                          PRLENT:
060122                                  P$POP   R2,R3                   ; R2 points to an entry in the listen log
060126                                  CALL    BINHEX  R2,#6,#STRBUF   ; convert dest addr. to HEX
060146                                  PRINTF  #DADDR,#STRBUF          ;
060172  062702  000006                  ADD     #SOURCC,R2              ; point R2 to source addr.
060176                                  CALL    BINHEX  R2,#6,#STRBUF   ; convert it to HEX
060216                                  PRINTF  #SADDR,#STRBUF          ;
060242  062702  000006                  ADD     #6,R2                   ; point R2 to protocol type
060246                                  CALL    BINHEX  R2,#2,#STRBUF   ; convert it to HEX
060266                                  PRINTF  #PTYPE,#STRBUF          ;
060312                                  PRINTF  #CHARAC,R3              ; print message length
```

```
060334                        RETURN                              ; return to the dubious caller!

                        ;--+
                        ; Name - MEMMAP
                        ;
                        ; Functional Description
                        ;               All the CPUs that this diagnostic runs on have at
                        ;               least an 18-bit bus providing for at least 128kW of
                        ;               physical memory.  Of this memory, only 32kW are strictly
                        ;               allocated for the diagnostic.  But, there is another 32kW
                        ;               block that is available to the diagnostic by requesting
                        ;               its use from the DRS.  The management of the memory is
                        ;               supposed to be done by the DRS.  With the nature of this
                        ;               diagnostic, speed being of the essence, it has become
                        ;               necessary for me to skirt the DRS and handle the management
                        ;               of this extended memory.
                        ;                       This routine will check with the DRS first to make
                        ;               sure that the extended memory exists.  It then will format
                        ;               the extended memory in the following manner.
                        ;
                        ;                +--------------------------------------+
                        ;                )  FUTURE USE                          ) 377776
                        ;                )                                      ) 360000
                        ;                +--------------------------------------+
                        ;                )  LISTEN LOG AND ADDRESS LIST FOR     ) 357776
                        ;                )  LISTEN COMMAND                      ) 340000
                        ;                +--------------------------------------+
                        ;                )                                      ) 337776
                        ;                )                                      )
                        ;                +  SUMMARY TABLE                       +
                        ;                )                                      )
                        ;                )                                      ) 300000
                        ;                +--------------------------------------+
                        ;                )  DEFAULT ADDRESS TABLE               ) 277776
                        ;                )  NODE TABLE                          ) 260000
                        ;                +--------------------------------------+
                        ;                )  TRANSMIT RING AND TRANSMIT BUFFERS  ) 257776
                        ;                +                                      ) 240000
                        ;                +--------------------------------------+
                        ;                )                                      ) 237776
                        ;                )                                      )
                        ;                +  RECEIVE RING AND RECEIVE BUFFERS    +
                        ;                )                                      )
                        ;                )                                      )
                        ;                +--------------------------------------+ 200000
                        ;
                        ;               To access this memory, KPAR4 and KPAR5 will be remapped
                        ;               to point to two contiguous 4kW pages of extended memory.
                        ;
                        ;               NOTE: The extended memory cannot be used by code that
                        ;               resides at virtual addresses greater than or equal to
                        ;               100000(0).  This is because these addresses would select
                        ;               KPAR4 or KPAR5 which are pointing to extended memory.
                        ;               (which, for obvious reasons, would completely screw everything
                        ;               up).
                        ;
                        ; Inputs - none
                        ;
                        ; Outputs - none
                        ;
                        ; Calling Procedure: CALL MEMMAP
                        ;
                        ; Side Effects -
                        ;               1.) If the call to the DRS returns successfully, then
                        ;                   extended memory will be formatted as above
                        ;
                        ;               2.) If the call to the DRS fails, indicating that there
                        ;                   is no extended memory, then the diagnostic will be
                        ;                   aborted.
                        ;
                        ; Subordinate routines -
                        ;               REMAP  - used to remap memory so that the transmit ring may be
                        ;                        accessed
                        ;               RETMEM - used to return the mapping of memory to its original
                        ;                        state
                        ;
                        ; Register Usage -
                        ;
                        ;
                        ;--+
060336                  MEMMAP::
060336                          MMU     OFF                     ; let diagnostic control MMU


                        ;--+
                        ;       This diagram shows the structure of the transmit and receive rings
                        ;       note RING_BASE+10 is defined by this program.  It is the virtual address
                        ;       of the buffer associated with the particular entry.  In the DELUA/DEUNA
                        ;       documentation it is reserved for the port driver.
                        ;
                        ;       +-----------------------+
                        ;       )  Segment length       )
                        ;       )                       ) RING_BASE+0
                        ;       +-----------------------+
                        ;       )  Segment physical     )
                        ;       )  address              ) RING_BASE+2
                        ;       +-----------------------+
                        ;       )  Status               )
                        ;       )                       ) RING_BASE+4
                        ;       +-----------------------+
                        ;       )  Status & TDR/MLEN    )
                        ;       )                       ) RING_BASE+6
                        ;       +-----------------------+
                        ;       )  Segment virtual      )
                        ;       )  address              ) RING_BASE+10
                        ;       +-----------------------+
                        ;--+

                        ;--+
                        ;       Now build the receive ring.  There will be eight entries in
                        ;       the ring.  The receive buffers follow directly after the receive
                        ;       ring or 120(0) away from the start of this segment of memory.
                        ;--+
060344                          CALL    REMAP   #ORRING         ; enable access to portion of memory
```

```
 8576                                                                   ; that has receive ring and buffers
 8577
 8578
 8579 060356  012701  100120                 MOV     #RBUFV1,R1         ; R1 has virt. addr. of first buffer
 8580 060362  012702  100000                 MOV     #RRING,R2          ; R2 has base address of receive ring
 8581 060366  012703  000120                 MOV     #R11501,R3         ; R3 points to the first receive buffer
 8582 060372  012704  000010                 MOV     #NO.NRR,R4         ; R4 has count of receive ring entries
 8583
 8584 060376  012722  002756         20$:    MOV     #RPKLEN,(R2)+      ; Set up length of segment (1518(D))
 8585 060402  010322                         MOV     R3,(R2)+           ; store address <15:01> of SEGB
 8586 060404  012722  000001                 MOV     #R11716,(R2)+      ; store address <17:16> of SEGB
 8587 060410  005722                         TST     (R2)+              ; leave room for buffer length
 8588 060412  010122                         MOV     R1,(R2)+           ; store virtual addr. of SEGB
 8589 060414  062701  002756                 ADD     #RPKLEN,R1         ; point R1 to next receive buffer
 F590 060420  062703  002756                 ADD     #RPKLEN,R3         ; point R3 to next receive buffer
 8591 060424  005304                         DEC     R4                 ; decrement loop control
 8592 060426  001363                         BNE     20$                ; keep going if more to do
 8593
 8594
 8595                                ;--+
 8596                                ;       Now build transmit ring and buffers.  There will be two entries
 8597                                ;       in the transmit ring.  The transmit buffers follow the transmit
 8598                                ;       ring directly or start at address 20(O)
 8599                                ;--+
 8600
 8601 060430                                 CALL    REMAP   #OTRING    ; enable access to portion of memory
 8602                                                                   ; that has transmit ring and buffers
 8603
 8604 060442  012701  100050                 MOV     #XBUFV1,R1         ; R1 has virt addr. of first buffer
 8605 060446  012702  100000                 MOV     #XRING,R2          ; R2 has base address of transmit ring
 8606 060452  012703  040050                 MOV     #X11501,R3         ; R3 points to the first transmit buffer
 8607 060456  012704  000004                 MOV     #NO.NTR,R4         ; R4 has count of transmit ring entries
 8608
 8609 060462  012722  002756         30$:    MOV     #RPKLEN,(R2)+      ; setup segment length
 8610 060466  010322                         MOV     R3,(R2)+           ; store address <15:01> of SEGB
 8611 060470  012722  000001                 MOV     #X11716,(R2)+      ; store address <17:16> of SEGB
 8612 060474  005722                         TST     (R2)+              ; leave room for buffer length
 8613 060476  010122                         MOV     R1,(R2)+           ; store virt. addr. of SEGB
 8614 060500  062701  002756                 ADD     #RPKLEN,R1         ; point R1 to next transmit buffer
 8615 060504  062703  002756                 ADD     #RPKLEN,R3         ; point R3 to next transmit buffer
 8616 060510  005304                         DEC     R4                 ; decrement loop control
 8617 060512  001363                         BNE     30$                ; non-zero means more to do
 8618
 8619                                ;--+
 8620                                ;       The node table needs to be cleared.
 8621                                ;--+
 8622 060514                                 CALL    REMAP   #ONTAB     ; allow access to node table
 8623 060526  012702  100000                 MOV     #NODTBL,R2         ; let R2 point to the node table
 8624 060532  005022                 40$:    CLR     (R2)+              ; DO clear the node location WHILE
 8625 060534  020227  110000                 CMP     R2,#NODEND         ;     there are more locations to clear
 8626 060540  001374                         BNE     40$                ; ENDDO
 8627
 8628                                ;--+
 8629                                ;       The summary table must be cleared also
 8630                                ;--+
 8631 060542                                 CALL    REMAP   #OSTAB     ; allow access to summary table
 8632 060554  012702  100000                 MOV     #STATBL,R2         ; let R2 point to the summary table
```

```
060560  005022                    50$:   CLR     (R2)+                   ; clear a word of summary table
060562  020227  126000                   CMP     R2,#STAEND              ; Are there more locations to clear?
060566  001374                           BNE     50$                     ; YES, keep going

060570                                   CALL    RETMEM                  ; restore mapping of upper memory

060576                                   RETURN                          ; GOODBYE!

                                  ;--+
                                  ; Name - REMAP
                                  ;
                                  ; Functional Description
                                  ;                This routine is called to remap the upper portion of our
                                  ;                virtual address space to a new portion of physical memory.
                                  ;                The portion being remapped is that which is pointed to by
                                  ;                KPAR4 and KPAR5.
                                  ;                        The new value for KPAR4 is passed to the routine
                                  ;                as a parameter.  KPAR5 will be this parameter plus 200(0).
                                  ;                The memory management unit will be enabled, also.
                                  ;
                                  ; Inputs -
                                  ;                P1 - new value for KPAR4
                                  ;
                                  ; Outputs - none
                                  ;
                                  ; Calling Procedure: CALL REMAP P1
                                  ;
                                  ; Side Effects -
                                  ;                1.) KPAR4 and KPAR5 have been remapped to a new portion of
                                  ;                    physical memory
                                  ;
                                  ;                2.) the CPU's memory management unit has been enabled
                                  ;
                                  ; Subordinate Routines - none
                                  ;
                                  ; Register Usage -
                                  ;                R1 - holds new value for KPARs
                                  ;
                                  ;--+
060600                            REMAP::

                                  ;--+
                                  ;       Create new values for the new KPAR4 and KPAR5, then remap those
                                  ;       registers.
                                  ;--+

060600                                   P$POP   R1                      ; get new value for KPAR4
060602  012737  000000  177572           MOV     #MMUDIS,@#MMCSR0        ; disable memory management
060610  010137  172350                   MOV     R1,@#KPAR4              ; remap KPAR4

060614  062701  000200                   ADD     #200,R1                 ; create new value for KPAR5
060620  010137  172352                   MOV     R1,@#KPAR5              ; remap KPAR5

060624  012737  000001  177572           MOV     #MMUENA,@#MMCSR0        ; enable memory management unit

060632                                   RETURN                          ; that's all folks!

```

```
                                ;--+
                                ; Name - RETMEM
                                ;
                                ; Functional Description
                                ;               This routine is called to restore the mapping of memory to
                                ;               its original state.  The original values of KPAR4 and KPAR5
                                ;               are restored and the memory management unit is disabled.
                                ;
                                ; Inputs - Implicit
                                ;               NKPAR4 - the original value for KPAR4 (1000(0))
                                ;               NKPAR5 - the original value for KPAR5 (1200(0))
                                ;
                                ; Outputs - none
                                ;
                                ; Calling Procedure: CALL RETMEM
                                ;
                                ; Side Effects -
                                ;               1.) KPAR4 and KPAR5 are restored to their original values
                                ;
                                ; Subordinate Routines - none
                                ;
                                ; Register Usage - none
                                ;
                                ;--+
060634                          RETMEM::
060634  012737  000000  177572          MOV     #MMUDIS,@#MMCSR0        ; disable MMU
060642  012737  001000  172350          MOV     #NKPAR4,@#KPAR4         ; restore KPAR4
060650  012737  001200  172352          MOV     #NKPAR5,@#KPAR5         ; restore KPAR5

060656                                  RETURN                          ; LATER!!

                                ; new Routine
                                ;--+
                                ; Name - PARVIR                 SET UP PAR AND VIRTUAL ADDRESSES
                                ;
                                ; Functional Description
                                ;               This routine is used to modify KPAR4 and KPAR5 so that two
                                ;               portions of extended memory can be compared or data can be
                                ;               moved from one portion of extended memory to another.
                                ;
                                ;               There are four inputs to the routine: two pairs, consisting
                                ;               of a base address of a data structure in extended memory
                                ;               and a virtual address within the data structure.  Modifications
                                ;               may be necessary to the base and virtual addresses because
                                ;               some data structures are two pages big.
                                ;
                                ;               The following pseudo-code illustrates the derivation of new base
                                ;               and virtual addresses:
                                ;
                                ;               KPAR4 <-- first base address
                                ;
                                ;               TEST BIT 13 of first virtual address
                                ;
                                ;               If SET THEN
                                ;                       (* want to access the second page of adata structure.
                                ;                          Do this by adding 200(0) to KPAR4 *)
                                ;                       KPAR4 <-- KPAR4 + 200(0)
```

```
                             ;
                             ;                     (* need to clear bit 13 of virtual address so it will
                             ;                       map through KPAR4 *)
                             ;                     CLEAR BIT 13 of first virtual address
                             ;
                             ;             ENDIF
                             ;
                             ;             (* ELSE no change on first pair *)
                             ;
                             ;             KPAR5 <-- second base address
                             ;
                             ;             TEST BIT 13 of second virtual address
                             ;
                             ;             IF SET THEN
                             ;                     (* want to access the second page of a data structure.
                             ;                       Do this by adding 200(0) to KPAR5 *)
                             ;                     KPAR5 <-- KPAR5 + 200(0)
                             ;
                             ;             ELSE
                             ;                     (* KPAR5 was correct, but need to set bit 13 of virtual
                             ;                       address to map through KPAR5 *)
                             ;                     SET BIT 13 of second virtual address
                             ;
                             ;             ENDIF
                             ;
                             ;             After the base and virtual addresses are derived, KPAR4 and
                             ;             KPAR5 are written and MMU is enabled.
                             ;
                             ; Inputs - Implicit - NOTE: because of speed considerations registers
                             ;                        one through four must be set up before routine
                             ;                        is called
                             ;             R1 - first base value
                             ;             R2 - first virtual address
                             ;             R3 - second base value
                             ;             R4 - second virtual address
                             ;
                             ; Outputs - none
                             ;
                             ; Calling Procedure: SET UP R1 - R4
                             ;                  JSR PC,PARVIR
                             ;
                             ; Side Effects -
                             ;             1.) KPAR4 and KPAR5 are remapped
                             ;             2.) the memory management unit is enabled
                             ;             3.) R1 - R4 may be modified
                             ;
                             ; Subordinate Routines - none
                             ;
                             ; Register Usage - as above
                             ;
                             ;--+
060660                       PARVIRT::
060660 012737 000000 177572         MOV     #MMUDIS,@#MMCSR0        ; disable memory management

                             ;--+
                             ;      Test bit 13 of the source virtual address.  If it is set, clear
                             ;      it and point KPAR4 to next page in memory
```

```
                                        ;--+
060666  032702  020000                          BIT     #BIT13,R2               ; Test bit 13 of source virtual addr.
060672  001404                                  BEQ     10$                     ; branch if clear
060674  042702  020000                          BIC     #BIT13,R2               ; clear bit 13 to map through KPAR4
060700  062701  000200                          ADD     #200,R1                 ; point KPAR4 to next page in memory

                                        ;--+
                                        ;       Test bit 13 of the destination virtual address.  If it was set then
                                        ;       point KPAR5 to next page in memory.  If it was clear, then set it
                                        ;       to map through KPAR5 as is.
                                        ;--+

060704  032704  020000                  10$:    BIT     #BIT13,R4               ; Test bit 13 of dest. virtual address
060710  001403                                  BEQ     20$                     ; ... bit was clear
060712  062703  000200                          ADD     #200,R3                 ; point KPAR5 to next page in memory
060716  000402                                  BR      30$                     ; ... and continue

060720  052704  020000                  20$:    BIS     #BIT13,R4               ; set bit 13 to map through KPAR5

060724  010137  172350                  30$:    MOV     R1,@#KPAR4              ; remap KPAR4 ...
060730  010337  172352                          MOV     R3,@#KPAR5              ; ... and KPAR5

060734  012737  000001  177572                  MOV     #MMUENA,@#MMCSR0        ; enable memory management unit

060742  000207                                  RTS     PC


                                        ;--+
                                        ; Name - CMPEXT         COMPARE TWO PORTIONS OF EXTENDED MEMORY
                                        ;
                                        ; Functional Description
                                        ;               This routine is called to compare two portions of extended
                                        ;               memory.  It calls PARVIR to remap the two portions of
                                        ;               memory, then does a word by word comparison of the length
                                        ;               specified in the call to the routine by calling CMPTWO.
                                        ;               It then calls RETMEM to remap memory to its original state.
                                        ;
                                        ; Inputs -
                                        ;               P1 - base address of string one
                                        ;               P2 - virtual address of string one
                                        ;               P3 - base address of string two
                                        ;               P4 - virtual address of string two
                                        ;               P5 - number of words to compare
                                        ;
                                        ; Outputs -
                                        ;               P6 - Comparison indicator -- 0 = compared/-1 = no compare
                                        ;
                                        ; Calling Procedure: CALL CMPEXT P1, P2, P3, P4, P5
                                        ;                    P$POP P6
                                        ;
                                        ; Side Effects - none
                                        ;
                                        ; Subordinate Routines
                                        ;               PARVIR - adjust the base and virtual addresses
                                        ;               CMPTWO - compare the two strings
                                        ;               RETMEM - remap memory to its original state
                                        ;
```

```
                                ; Register Usage -
                                ;               R1 - base address of string one (also return status)
                                ;               R2 - virtual address of string one
                                ;               R3 - base address of string two (also compare number)
                                ;               R4 - virtual address of string two
                                ;
                                ;--+
060744                          CMPEXT::
060744                                  P$POP   R1,R2,R3,R4             ; Set up registers for call to PARVIR

060754  004737  060660'                 JSR     PC,PARVIR               ; adjust base and virtual addresses

060760                                  P$POP   R3                      ; R3 gets number of bytes to compare
060762                                  CALL    CMPTWO  R2,R4,R3        ; do the compare
060776                                  P$POP   R1                      ; R1 gets compare indicator
061000                                  CALL    RETMEM                  ; remap memory to its original state

061006                                  RETURN  R1                      ; chow!!

                                ;--+
                                ; Name - MOVEXT                 MOVE DATA IN EXTENDED MEMORY
                                ;
                                ; Functional Description
                                ;               This routine is used to move data between two portions
                                ;               of extended memory.  It calls PARVIR to adjust the base and
                                ;               virtual addresses it will be referencing.  Then does a word
                                ;               by word transfer between the source and destination.
                                ;               Finally it calls RETMEM to remap memory to its original state.
                                ;
                                ; Inputs -
                                ;               P1 - source base address
                                ;               P2 - source virtual address
                                ;               P3 - destination base address
                                ;               P4 - destination virtual address
                                ;               P5 - number of words to transfer between source and destination
                                ;
                                ; Outputs - none
                                ;
                                ; Side Effects -
                                ;               1.) the data transfer
                                ;
                                ; Subordinate Routines
                                ;               PARVIR  - adjust base and virtual addresses
                                ;               RETMEM - remap memory to its original state.
                                ;
                                ; Register Usage -
                                ;               R1 - source base address (and byte count of transfer)
                                ;               R2 - source virtual address
                                ;               R3 - destination base address
                                ;               R4 - destination virtual address
                                ;
                                ;--+
061012                          MOVEXT::
061012                                  P$POP   R1,R2,R3,R4             ; Setup R1 - R4 for cal' to PARVIR

061022  004737  060660'                 JSR     PC,PARVIR               ; adjust base and virtual addresses

```

```
061026                                  P$POP   R1                    ; get byte count of transfer

061030  012224                  10$:    MOV     (R2)+,(R4)+           ; transfer a single word
061032  005301                          DEC     R1                    ; decrement loop control
061034  001375                          BNE     10$                   ; non-zero means more to do

061036                                  CALL    RETMEM                ; restore memory mapping
061044                                  RETURN                        ; thatsa all!!

                                ;********************************************************************************
                                ;     INSERT LOCAL STORAGE THAT IS USED ONLY
                                ;     DURING THIS TEST.
                                ;********************************************************************************

                                ;********************************************************************************
                                ;     INSERT MESSAGES THAT ARE USED ONLY
                                ;     DURING THIS TEST.
                                ;********************************************************************************

                                        .EVEN

061046                                  ENDTST

                                ;********************************************************************************
                                ;     BEGIN THE REMAINING TESTS ON NEW PAGES.
                                ;********************************************************************************
```

```

                                      .SBTTL  HARDWARE PARAMETER CODING SECTION

                                      ;++
                                      ; THE HARDWARE PARAMETER CODING SECTION CONTAINS MACROS
                                      ; THAT ARE USED BY THE SUPERVISOR TO BUILD P-TABLES.  THE
                                      ; MACROS ARE NOT EXECUTED AS MACHINE INSTRUCTIONS BUT ARE
                                      ; INTERPRETED BY THE SUPERVISOR AS DATA STRUCTURES.  THE
                                      ; MACROS ALLOW THE SUPERVISOR TO ESTABLISH COMMUNICATIONS
                                      ; WITH THE OPERATOR.
                                      ;--

061050                                        BGNHRD

                                      ;***********************************************************************
                                      ;       INSERT HARDWARE PARAMETER INTERPRETIVE CODE HERE.  THIS CODE
                                      ;       IS USED BY THE SUPERVISOR TO INTERROGATE THE OPERATOR FOR
                                      ;       DEVICE INFORMATION TO PUT IN THE P-TABLE.  THIS CODE IS USED
                                      ;       IN CONJUNCTION WITH THE DEFAULT P-TABLE TEMPLATE.  THE MACROS
                                      ;       USED IN THIS SECTION ARE "GPRMD", "GPRMA" AND "GPRML".
                                      ;***********************************************************************

061052                                        GPRMA   ASKCSR,0,0,160000,177776,YES          ; get csr address
061062                                        GPRMA   ASKVEC,2,0,0,776,YES                  ; get vector address
061072                                        GPRMD   ASKPRI,4,0,340,0,7,YES                ; get priority level

061104                                        ENDHRD

                                      ;***********************************************************************
                                      ;     INSERT MESSAGES THAT ARE USED ONLY
                                      ;     DURING THE HARDWARE PARAMETER CODING SECTION.
                                      ;***********************************************************************

061104      127     110     101       ASKCSR: .ASCIZ  /WHAT IS THE PCSRO ADDRESS?/
061107      124     040     111
061112      123     040     124
061115      110     105     040
061120      120     103     123
061123      122     117     040
061126      101     104     104
061131      122     105     123
061134      123     077     000
061137      127     110     101       ASKVEC: .ASCIZ  /WHAT IS THE VECTOR ADDRESS?/
061142      124     040     111
061145      123     040     124
061150      110     105     040
061153      126     105     103
061156      124     117     122
061161      040     101     104
061164      104     122     105
061167      123     123     077
061172      000
061173      127     110     101       ASKPRI: .ASCIZ  /WHAT IS THE PRIORITY LEVEL?/
061176      124     040     111
061201      123     040     124
061204      110     105     040
061207      120     122     111
```

```
       061212     117     122     111
       061215     124     131     040
       061220     114     105     126
       061223     105     114     077
       061226     000
  8989                                          .EVEN
  8990
```

```
                                 .SBTTL  SOFTWARE PARAMETER CODING SECTION

                                 ;++
                                 ; THE SOFTWARE PARAMETER CODING SECTION CONTAINS MACROS
                                 ; THAT ARE USED BY THE SUPERVISOR TO BUILD P-TABLES.  THE
                                 ; MACROS ARE NOT EXECUTED AS MACHINE INSTRUCTIONS BUT ARE
                                 , INTERPRETED BY THE SUPERVISOR AS DATA STRUCTURES.  THE
                                 ; MACROS ALLOW THE SUPERVISOR TO ESTABLISH COMMUNICATIONS
                                 ; WITH THE OPERATOR.
                                 ;--

061230                                   BGNSFT

                                 ;**********************************************************************************
                                 ;       INSERT SOFTWARE PARAMETER INTERPRETIVE CODING HERE.  THIS CODE
                                 ;       IS USED BY THE SUPERVISOR TO INTERROGATE THE OPERATOR FOR
                                 ;       SOFTWARE INFORMATION WHICH WILL BE PLACED IN THE SOFTWARE
                                 ;       TABLE.  THIS SECTION IS OPTIONAL.
                                 ;**********************************************************************************

                                         .EVEN

061232                                   ENDSFT


                                 ;**********************************************************************************
                                 ;     INSERT MESSAGES THAT ARE USED ONLY
                                 ;     DURING THE SOFTWARE PARAMETER CODING SECTION.
                                 ;**********************************************************************************

061232                           $PATCH::
061232                                   .BLKW   10

                                 ;***********************************************************************************
                                 ;       THIS IS A PATCH AREA THAT SHOULD BE INCLUDED IN ALL DIAGNOSTICS.
                                 ;       ADJUST THE SIZE TO FIT YOUR OWN PREFERENCES.
                                 ;***********************************************************************************

061252                                   LASTAD
061256                           L$LAST::
```

```


                         ;****************************************************************************************
                         ;       HARDCODED P-TABLES MAY BE PLACED HERE BY USING THE SETUP MACROS
                         ;       THIS SECTION IS OPTIONAL AND SHOULD BE REMOVED IF IT IS NOT BEING
                         ;       USED.  CHANGE THE POINTER MACRO ARGUMENT TO REFLECT THE REMOVAL.
                         ;
                         ;       THE P-TABLES ARE DELIMITED BY THE "BGNSETUP" AND "ENDSETUP" MACROS.
                         ;       THE "BGNSETUP" MACRO HAS ONE ARGUMENT WHICH IS THE NUMBER OF
                         ;       P-TABLE ENTRIES.   EACH ENTRY IS DELIMITED BY THE "BGNPTAB" AND
                         ;       "ENDPTAB" MACROS.  NEITHER OF THESE MACROS REQUIRE AN ARGUMENT.
                         ;****************************************************************************************

                         ;       BGNSETUP        1
                         ;       BGNPTAB
                         ;       .WORD   0
                         ;       ENDPTAB
                         ;       ENDSETUP

000001                           .END
```

```
Symbol table

AADDR   013723R     ADRENT= 000010 G    BNCCNT  002064R     CLRMSG  014177R     CPYLMT  014256R
ACTALP  044250R     ADRLIS= 101034 G    BNCLOG= 000053      CLRQIK= 000047      CRC   = 004000 G
ACTBLD  040630R     ADRNXT  001256R     BNCPKT  002060R     CLRSTA= 000017 G    CRNALL= 000032
ACTBLG  041714R     ALEMPT  013615R     BOE   = 000400 G    CLUPPR= 000033      CRUN  = 000004
ACTLLI  060030R     ALHDR   013657R     BOOT  = 000005 G    CMDBUF  000732R     CSAVE = 000006
ACTCMP  040224R     ALLNOD  017102R     BOUNCE= 000052      CMDTY1  017370R     CSAVR4= 000014
ACTCMS  047526R     ALPHA = 000000 G    BRDADR  002142R     CMDTY2  017375R     CSHCTR= 000002 G
ACTCNL  051304R     ANCHOR  027200R     BUFL  = 100000 G    CMDTY3  017405R     CSHMSG= 000034
ACTCNT  047632R     AREA    002056RG    BUFLEN  003126RG    CMDTY4  017413R     CSIZE = 000026
ACTCPY  044574R     ARGTY1  017462R     BUILD = 000003      CMDTY5  017420R     CSLIST= 000060
ACTCQK  040214R     ARGTY2  017470R     CADRER  012477R     CMDTY6  017424R     CTARGT= 000000 G
ACTCSU  051460R     ARGTY3  017501R     CALPHA= 000016      CMDTY7  017434R     CTYPE = 000025
ACTCTT  044320R     ARGTY4  017512R     CASIST= 000001 G    CMDTY8  017441R     CUNSAV= 000041
ACTDES  053150R     ARGTY5  017523R     CBOADF  001166R     CMDTY9  017447R     CUNSVF= 000045
ACTDFT  051544R     ARGTY6  017527R     CBOBUF  001042R     CMPBUF  003130RG    CZEROS= 000020
ACTDIR  045750R     ARGTY7  017536R     CCCITT= 000023      CMPERH  025774R     C$AU  = 000052
ACTEXT  044134R     ASKCSR  061104R     CCITT = 000005 G    CMPER1  026042R     C$AUTO= 000061
ACTFBB  042224RG    ASKPRI  061173R     CCLIST= 000061      CMPER2  026115R     C$BRK = 000022
ACTFCT  051410R     ASKVEC  061137R     CCLMSG= 000035      CMPER3  026[illegible]42R     C$BSEG= 000004
ACTHLP  040240R     ASSEMB= 000010      CCLNAD= 000004 G    CMPEXT  0607[illegible]4RG    C$BSUB= 000002
ACTIBB  042066RG    BA    = 000000 G    CCLNAL= 000010 G    CMPSTR  031610R     C$CEFG= 000045
ACTIDT  043254R     BCOUNT  003016RG    CCLSUM= 000042      CMPTWO  054112R     C$CLCK= 000062
ACTLIS  053206RG    BINDEC  034122RG    CCNTR = 000036      CNA     012776R     C$CLEA= 000012
ACTMSG  044030R     BINHEX  031752RG    CCPYS = 000027      CNDADR= 000030      C$CLOS= 000035
ACTNAD  044652R     BIT0  = 000001 G    CDEFLT= 000044      CNDLOG= 000037      C$CLP1= 000006
ACTNAL  045034R     BIT00 = 000001 G    CDIR  = 000043      CNODAL= 000031      C$CVEC= 000036
ACTNOD  040312R     BIT01 = 000002 G    CEXADR= 000013      CNODE = 000015      C$DCLN= 000044
ACTNUF  040174R     BIT02 = 000004 G    CEXIT = 000020 G    CNTR00  017546R     C$DODU= 000051
ACTNUL  040202R     BIT03 = 000010 G    CEXPRO= 000056      CNTR01  017626R     C$DRPT= 000024
ACTONE  044260R     BIT04 = 000020 G    CFLAG   002024R     CNTR02  017675R     C$DU  = 000053
ACTOPR  044330R     BIT05 = 000040 G    CFUNCT= 000040      CNTR03  017730R     C$EDIT= 000003
ACTPAT  047352R     BIT06 = 000100 G    CHARAC  013445R     CNTR04  017775R     C$ERDF= 000055
ACTPRO  0[illegible]3222R     BIT07 = 000200 G    CLIACT  040012R     CNTR05  020052R     C$ERHR= 000056
ACTRNA  045302R     BIT08 = 000400 G    CLIALP= 000006      CNTR06  020121R     C$ERRO= 000060
ACTRNL  046414R     BIT09 = 001000 G    CLIBIF= 000003      CNTR07  020160R     C$ERSF= 000054
ACTRUN  045146R     BIT1  = 000002 G    CLIBR = 000002      CNTR08  020230R     C$ERSO= 000057
ACTSAV  051612R     BIT10 = 002000 G    CLIBRX  011732R     CNTR09  020302R     C$ESCA= 000010
ACTSBB  042042RG    BIT11 = 004000 G    CLIDEC= 000011      CNTR10  020352R     C$ESEG= 000005
ACTSLI  057372R     BIT12 = 010000 G    CLIERM  011623R     CNTR11  020410R     C$ESUB= 000003
ACTSMS  047434R     BIT13 = 020000 G    CLIERR= 000000      CNTR12  020457R     C$ETST= 000001
ACTSND  051006R     BIT14 = 040000 G    CLIEXI= 000001      CNTR13  020524R     C$EXIT= 000032
ACTSOU  053112R     BIT15 = 100000 G    CLINBG  011705R     CNTR14  020571R     C$GETB= 000026
ACTSQK  040204R     BIT2  = 000004 G    CLINUF  011654R     CNTR15  020624R     C$GETW= 000027
ACTSR4  044242R     BIT3  = 000010 G    CLINUM= 000005      CNTR16  020666R     C$GMAN= 000043
ACTSUM  042674R     BIT4  = 000020 G    CLIOCT= 000010      CNTR17  020734R     C$GPHR= 000042
ACTSZE  044516R     BIT5  = 000040 G    CLISPA= 000004      CNTR18  021006R     C$GPLO= 000030
ACTTYP  044510R     BIT6  = 000100 G    CLISTR= 000012      CNTR19  021052R     C$GPRI= 000040
ACTUSF  052270R     BIT7  = 000200 G    CLITRE  003430R     CNTR20  021123R     C$INIT= 000011
ACTXAD  044144R     BIT8  = 000400 G    CLI$PM  011614R     CNTR21  021162R     C$INLP= 000020
ACTZRO  044270R     BIT9  = 001000 G    CLKBR   002030R     COMAND  030330RG    C$MANI= 000050
ACT0AL  044310R     BLDBUF  033120RG    CLKCSR  002026R     COMPAR  017302R     C$MEM = 000031
ACT1AL  044300R     BLDDON  012244R     CLKEN   002036R     CONES = 000017      C$MSG = 000023
ADR   = 000020 G    BLDFAS  032304RG    CLKHZ   002034R     COPRSL= 000024      C$OPEN= 000034
ADRBUF  001070R     BLDLD   032040RG    CLKINT  027040RG    COUNT   003032RG    C$PNTB= 000014
ADRCOU= 000006 G    BLDMSG  012151R     CLKSET  027014RG    CPATRN= 000005      C$PNTF= 000017
ADRDEL  014621R     BLDREQ  032670RG    CLKVEC  002032R     CPROER  012553R     C$PNTS= 000016
ADREND= 101414 G    BNCBUF  002062R     CLRCNT= 000013 G    CPYCNT  003122RG    C$PNTX= 000015
```

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Symbol table

C$QIO = 000377         EA     = 000001 G       ENP    = 000400 G       F$PWR = 000017          HELP2    006033R
C$RDBU= 000007         EDPACK   031414RG       ENTRND   053616R         F$RPT = 000012          HELP20   010020R
C$REFG= 000047         EF.CON= 000036 G        ERRBLK   005730RG        F$SEG = 000003          HELP21   010076R
C$RESE= 000033         EF.NEW= 000035 G        ERRFLG   003020RG        F$SOFT= 000005          HELP22   010161R
C$REVI= 000003         EF.PWR= 000034 G        ERRMSG   005726RG        F$SRV = 000010          HELP23   010262R
C$RFLA= 000021         EF.RES= 000037 G        ERRNBR   005724RG        F$SUB = 000002          HELP24   010362R
C$RPT = 000025         EF.STA= 000040 G        ERROR    027316RG        F$SW  = 000014          HELP25   010473R
C$SEFG= 000046         EMPSLT   013241R        ERRS   = 040000 G       F$TEST= 000001          HELP26   010601R
C$SPRI= 000041         EMSG0    001616RG       ERRTYP   005722RG        GETCL    037524R        HELP27   010673R
C$SVEC= 000037         EMSG01   021215R        ERR1     026624RG        GETCOM   033100R        HELP28   011001R
C$TPRI= 000013         EMSG02   021254R        ERR2     026654RG        GETFNT= 000002 G        HELP29   011105R
C.COLL= 000074 G       EMSG03   021304R        ERR3     026742RG        GETIDA   056020R        HELP3    006126R
C.MREC= 000010 G       EMSG04   021346R        EVL    = 000004 G       GETPCB= 000001 G        HELP30   011207R
C.MXMT= 000040 G       EMSG05   021400R        EXEBLD   040644R         GETRNX   033056RG       HELP31   011326R
C.PREC= 000004 G       EMSG06   021443R        EXEBNC   042354R         GETTYP   056134R        HELP32   011376R
C.PXMD= 000054 G       EMSG07   021503R        EXEHLP   040250RG        GETXNX   033070RG       HELP33   011505R
C.PXMT= 000034 G       EMSG08   021556R        EXELIS   056272RG        G$CNTO= 000200          HELP4    006177R
C.PXM2= 000050 G       EMSG09   021616R        EXIT   = 000011         G$DELM= 000372          HELP5    006250R
C.PXM3= 000044 G       EMSG1    001617RG       E$END  = 002100         G$DISP= 000003          HELP6    006350R
C.RDAT= 000020 G       EMSG10   021646R        E$LOAD= 000035          G$EXCP= 000400          HELP7    006463R
C.RERB= 000014 G       EMSG14   021706R        FAADR1= 000022 G        G$HILI= 000002          HELP8    006574R
C.RERR= 000016 G       EMSG15   021761R        FAADR2= 000032 G        G$LOLI= 000001          HELP9    006664R
C.RLEX= 000032 G       EMSG16   022014R        FAADR3= 000042 G        G$NO  = 000000          HEXBIN   031632RG
C.RLIN= 000030 G       EMSG18   022067R        FAADR4= 000052 G        G$OFFS= 000400          HEXC     031730R
C.RMDB= 000024 G       EMSG19   022146R        FAFCT1= 000020 G        G$OFSI= 000376          HLPEND   001412R
C.SECS= 000002 G       EMSG2    001620RG       FAFCT2= 000030 G        G$PRMA= 000001          HLPTAB   001310R
C.XABB= 000066 G       EMSG20   022204R        FAFCT3= 000040 G        G$PRMD= 000002          HN       031606R
C.XABT= 000070 G       EMSG22   022236R        FAFCT4= 000050 G        G$PRML= 000000          HOE    = 100000 G
C.XDAT= 000060 G       EMSG23   022265R        FASIST   003366RG        G$RADA= 000140          HXERR    031574R
C.XMDB= 000064 G       EMSG24   022332R        FASKIP= 000016 G        G$RADB= 000000          HXEXIT   031600R
COALT = 000022         EMSG25   022405R        FATFLG   003002RG        G$RADD= 000040          HXFORM   031504RG
C1ALT = 000021         EMSG26   022474R        FATI   = 000400 G       G$RADL= 000120          IBE    = 010000 G
DADDR   013424R        EMSG3    001621RG       FDATA1= 000032 G        G$RADO= 000020          ICAB   = 040000 G
DATCMP  033260RG       EMSG30   022530R        FDATA2= 000042 G        G$XFER= 000004          IDENT  = 000010
DECNET  002054RG       EMSG31   022575R        FILLIN   000526R         G$YES = 000010          IDTCNA= 000003 G
DECSTR  034324RG       EMSG33   022636R        FINDSL   053714R         HDMSG1   015710R        IDTCSA= 000013 G
DEF   = 002000 G       EMSG34   022654R        FORLOG   052160R         HDMSG2   015761R        IDTLUA= 000011 G
DEFADR  012700R        EMSG35   022724R        FRAM   = 020000 G       HDMSG3   016034R        IDTQNA= 000005 G
DEFEND= 120000 G       EMSG36   022761R        FREMEM   002136RG        HDMSG4   016070R        IDTSRV= 000021 G
DEFNOD= 010000 G       EMSG37   023006R        FRESIZ   002134RG        HDMSG5   016145R        IDTUNA= 000001 G
DEFTBL= 110000 G       EMSG38   023052R        FULAST   017140R         HDMSG6   016216R        IDU    = 000040 G
DEPADR  002234RG       EMSG4    001622RG       FULSLT   054024R         HDMSG7   016256R        IER    = 020000 G
DESADR= 000055         EMSG41   023116R        FUNCT    030352RG        HDMSG8   016317R        ILADMS   012316R
DESFIL  001104RG       EMSG42   023162R        FUNTAB   002160RG        HDMSG9   016362R        ILADM1   012402R
DESFLG  001254R        EMSG43   023225R        F$AU   = 000015         HEADER= 000016 G        ILLADR   001206R
DESTIN= 000000 G       EMSG44   023274R        F$AUTO= 000020          HELP  = 000001          INIBNC= 000051
DEVICE  000524R        EMSG45   023340R        F$BGN  = 000040         HELP1    005732R        INICLN   037276R
DEVSTA  027454R        EMSG46   023375R        F$CLEA= 000007          HELP10   006753R        INIEXI   037300R
DEVSTO  027656R        EMSG47   023442R        F$DU   = 000016         HELP11   007044R        INIT     035662R
DFPTBL  000204RG       EMSG48   023512R        F$END  = 000041         HELP12   007142R        INIT1    035702R
DIAGMC= 000000         EMSG49   023537R        F$HARD= 000004          HELP13   007247R        INTE   = 000100 G
DIRCOM  045772R        EMSG5    001722RG       F$HW   = 000013         HELP14   007346R        INTR   = 000200 G
DIRECT  017124R        EMSG50   023641R        F$INIT= 000006          HELP15   007440R        ISR    = 000100 G
DMPMEM= 000020 G       EMSG51   023716R        F$JMP  = 000050         HELP16   007453R        IXE    = 004000 G
DMT   = 004000 G       EMSG52   023773R        F$MOD  = 000000         HELP17   007542R        I$AU   = 000041
DMPFLG  003012RG       EMSG53   024040R        F$MSG  = 000011         HELP18   007645R        I$AUTO= 000041
DTBHDR  013152R        EMSG54   024076R        F$PROT= 000021          HELP19   007715R        I$CLN  = 000041
```

```
I$DU   = 000041        LOGFSC   001250R        L$SPC    000056RG       MSG3C    001440R        NOD133   004516R
I$HRD  = 000041        LOGNAM   012706R        L$SPCP   000020RG       MSG4     015643R        NOD134   004520R
I$INIT= 000041         LOGNM    045126RG       L$SPTP   000024RG       MSG4C    001442R        NOD135   004522R
I$MOD  = 000041        LOGVAL   001162R        L$STA    000030RG       MSG5C    001444R        NOD136   004526R
I$MSG  = 000041        LOPDIR   003260RG       L$SW     000214RG       MSG6C    001446R        NOD137   004532R
I$PROT= 000040         LOT    = 000010 G       L$TEST   000114RG       NCHN   = 020000 G      NOD14    003540R
I$PTAB= 000041         LPACNM   001236R        L$TIML   000014RG       NCMPAR= 000050         NOD140   004536R
I$PWR  = 000041        LST      031750R        L$UNIT   000012RG       NETADR   012726R        NOD141   004542R
I$RPT  = 000041        LTMSG    013736R        L10000   000212R        NEW      037250R        NOD142   004546R
I$SEG  = 000041        LUA      012766R        L10001   000214R        NEWLI1   013416R        NOD143   004552R
I$SETU= 000041         LUPAIR   017113R        L10002   026652R        NEWLI2   013421R        NOD144   004556R
I$SFT  = 000041        L$ACP    000110RG       L10003   026740R        NIHLT  = 000006 G      NOD145   004562R
I$SRV  = 000041        L$APT    000036RG       L10004   027012R        NIRCNT   003006RG       NOD146   004566R
I$SUB  = 000041        L$AU     037516RG       L10005   027160R        NIUNI  = 000007 G      NOD147   004572R
I$TST  = 000041        L$AUT    000070RG       L10006   030326R        NKPAR4= 001000 G       NOD15    003554R
J$JMP  = 000167        L$AUTO   037306RG       L10007   035652R        NKPAR5= 001200 G       NOD150   004574R
KEYWD1   001064R       L$CCP    000106RG       L10011   037304R        NOCMPR   014441R        NOD151   004600R
KEYWD2   001066R       L$CLEA   037310RG       L10012   037306R        NOD      014162R        NOD152   004604R
KPAR4  = 172350 G      L$CO     000032RG       L10013   037506R        NODADR   012673R        NOD153   004622R
KPAR5  = 172352 G      L$DEPO   000011RG       L10014   037514R        NODE   = 000002        NOD154   004626R
KPAR6  = 172354 G      L$DESC   000136RG       L10015   037522R        NODEND= 110000 G       NOD155   004632R
LBCOU  = 000016 G      L$DESP   000076RG       L10016   061046R        NODTBL= 100000 G       NOD156   004636R
LBYTEC   001240R       L$DEVP   000060RG       L10017   061104R        NODTY    001200R        NOD157   004642R
LCAR   = 004000 G      L$DISP   000200RG       L10020   061232R        NODTYP   012720R        NOD16    003560R
LCLKEN= 000100 G       L$DLY    000116RG       MEMMAP   060336RG       NOD0     003430R        NOD160   004646R
LCOL   = 010000 G      L$DTP    000040RG       MESPAT   017005R        NOD1     003434R        NOD161   004652R
LCOUNT   013454R       L$DTYP   000034RG       MESPA1   017056R        NOD10    003510R        NOD162   004656R
LDADR1= 000022 G       L$DU     037510RG       MMCSR0= 177572 G       NOD100   004270R        NOD163   004662R
LDADR2= 000032 G       L$DUT    000072RG       MMUDIS= 000000 G       NOD101   004274R        NOD164   004666R
LDATA  = 000022 G      L$DVTY   000122RG       MMUENA= 000001 G       NOD102   004300R        NOD165   004672R
LDFCT1= 000020 G       L$EF     000052RG       MORE   = 010000 G      NOD103   004302R        NOD166   004714R
LDFCT2= 000030 G       L$ENVI   000044RG       MOVEXT   061012RG       NOD104   004306R        NOD167   004720R
LDMEM  = 000021 G      L$ERRT   005722RG       MSGAD    001450RG       NOD105   004322R        NOD17    003572R
LDRESP   011757R       L$ETP    000102RG       MSGCNT   001432RG       NOD106   004326R        NOD170   004724R
LDSKIP= 000016 G       L$EXP1   000046RG       MSGPRM   015213R        NOD107   004332R        NOD171   004730R
LEMSG    013563R       L$EXP4   000064RG       MSGTAB   001414R        NOD11    003514R        NOD172   004734R
LENGTH   017273R       L$EXP5   000066RG       MSGTY0   017322R        NOD110   004336R        NOD173   004740R
LFMSG    013464R       L$HARD   061052RG       MSGTY1   017330R        NOD111   004342R        NOD174   004744R
LGERMS   026210R       L$HIME   000120RG       MSGTY2   017335R        NOD112   004354R        NOD175   004750R
LINHLP   011752R       L$HPCP   000016RG       MSGTY3   017343R        NOD113   004360R        NOD176   004754R
LISBUF   001214R       L$HPTP   000022RG       MSGTY4   017350R        NOD114   004364R        NOD177   004760R
LISCOU= 000020 G       L$HW     000204RG       MSGTY5   017355R        NOD115   004370R        NOD2     003440R
LISEND= 101034 G       L$ICP    000104RG       MSGTY6   017363R        NOD116   004374R        NOD20    003576R
LISENT= 000022 G       L$INIT   035662RG       MSG0C    001432R        NOD117   004400R        NOD200   004764R
LISFUL   001252R       L$LADP   000026RG       MSG00    001466RG       NOD12    003520R        NOD201   005004R
LISHD1   013265R       L$LAST   061256RG       MSG01    001616RG       NOD120   004404R        NOD202   005010R
LISHD2   013371R       L$LOAD   000100RG       MSG02    001617RG       NOD121   004410R        NOD203   005014R
LISLOG= 100000 G       L$LUN    000074RG       MSG03    001620RG       NOD122   004414R        NOD204   005020R
LISMIN   001242R       L$MREV   000050RG       MSG04    001621RG       NOD123   004420R        NOD205   005024R
LISNUM   001234R       L$NAME   000000RG       MSG05    001622RG       NOD124   004424R        NOD206   005030R
LISNXT   001232R       L$PRIO   000042RG       MSG1     015263R        NOD125   004430R        NOD207   005044R
LISSEC   001244R       L$PROT   035654RG       MSG1C    001434R        NOD126   004446R        NOD21    003602R
LISTEN= 000057         L$PRT    000112RG       MSG11    015376R        NOD127   004452R        NOD210   005050R
LOCDST   031300R       L$REPP   000062RG       MSG12    015511R        NOD13    003534R        NOD211   005064R
LOE    = 040000 G      L$REV    000010RG       MSG2     015551R        NOD130   004470R        NOD212   005070R
LOGDEL   014707R       L$RPT    035642RG       MSG2C    001436R        NOD131   004474R        NOD213   005104R
LOGFMN   001246R       L$SOFT   061232RG       MSG3     015602R        NOD132   004512R        NOD214   005110R
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NOD215  005124R        NOD3    003444R        NOD73   004216R        N148$   004646R        N26$    003704R
NOD216  005130R        NOD30   003660R        NOD74   004236R        N149$   004656R        N28$    003730R
NOD217  005144R        NOD300  005622R        NOD75   004242R        N1491$  004652R        N29$    003752R
NOD22   003614R        NOD301  005626R        NOD76   004260R        N150$   004662R        N30$    003774R
NOD220  005150R        NOD302  005630R        NOD77   004264R        N151$   004672R        N300$   005636R
NOD221  005164R        NOD303  005634R        NORESP  017233R        N152$   004730R        N31$    004012R
NOD222  005170R        NOD304  005636R        NOTNUF= 000012         N153$   004740R        N310$   005642R
NOD223  005204R        NOD305  005642R        NO.NRR= 000010 G       N154$   004750R        N315$   005646R
NOD224  005210R        NOD306  005646R        NO.NTR= 000004 G       N1541$  004744R        N32$    004036R
NOD225  005224R        NOD307  005652R        NTBHDR  013042R        N155$   004754R        N320$   005652R
NOD226  005230R        NOD31   003662R        NTBLOV  014775R        N156$   004764R        N330$   005656R
NOD227  005234R        NOD310  005656R        NTEXTI  054144R        N157$   005014R        N331$   005666R
NOD23   003620R        NOD311  005662R        NULL  = 000000         N16$    003514R        N332$   005672R
NOD230  005240R        NOD312  005666R        NULSTR  012625R        N160$   005020R        N335$   005676R
NOD231  005254R        NOD313  005672R        NXTDEL  053064R        N161$   005024R        N340$   005706R
NOD232  005260R        NOD314  005676R        NXTNDL  053032R        N162$   005070R        N350$   005712R
NOD233  005264R        NOD315  005702R        N10$    003434R        N163$   005110R        N50$    004060R
NOD234  005270R        NOD316  005706R        N100$   004150R        N164$   005130R        N70$    004064R
NOD235  005274R        NOD317  005712R        N101$   004154R        N165$   005150R        N72$    004070R
NOD236  005300R        NOD32   003664R        N102$   004174R        N166$   005170R        N74$    004100R
NOD237  005316R        NOD320  005716R        N104$   004216R        N167$   005210R        N76$    004120R
NOD24   003636R        NOD33   003700R        N106$   004242R        N168$   005234R        N78$    004124R
NOD240  005322R        NOD34   003704R        N108$   004264R        N17$    003540R        N80$    004126R
NOD241  005326R        NOD35   003724R        N11$    003444R        N170$   005240R        N81$    004132R
NOD242  005332R        NOD36   003730R        N110$   004270R        N1701$  005260R        N82$    004136R
NOD243  005336R        NOD37   003746R        N112$   004274R        N1702$  005270R        N90$    004142R
NOD244  005342R        NOD4    003450R        N1122$  004332R        N175$   005300R        N95$    004146R
NOD245  005362R        NOD40   003752R        N1123$  004370R        N1751$  005322R        OFLO  = 010000 G
NOD246  005366R        NOD41   003770R        N1124$  004336R        N1752$  005332R        OK      016602R
NOD247  005402R        NOD42   003774R        N12$    003450R        N176$   005342R        OKFU    016742R
NOD25   003640R        NOD43   004010R        N120$   004302R        N177$   005366R        OKRE    016625R
NOD250  005406R        NOD44   004012R        N121$   004306R        N1771$  005406R        OKTR    016673R
NOD251  005412R        NOD45   004032R        N122$   004326R        N1772$  005416R        OLLOG = 003400 G
NOD252  005416R        NOD46   004036R        N123$   004360R        N1773$  005422R        ONE   = 004000 G
NOD253  005422R        NOD47   004054R        N124$   004400R        N178$   005426R        ONEALT= 000003 G
NOD254  005426R        NOD5    003464R        N126$   004404R        N18$    003560R        ONES  = 000001 G
NOD255  005432R        NOD50   004060R        N127$   004410R        N180$   005432R        ONTAB = 002600 G
NOD256  005436R        NOD51   004062R        N128$   004414R        N181$   005436R        OPNERR  011560R
NOD257  005456R        NOD52   004064R        N129$   004424R        N182$   005462R        OPRSEL= 000006 G
NOD26   003652R        NOD53   004070R        N13$    003470R        N183$   005500R        OPSLBF  001722R
NOD260  005462R        NOD54   004074R        N130$   004430R        N184$   005522R        ORRING= 002000 G
NOD261  005474R        NOD55   004100R        N132$   004452R        N185$   005540R        OSTAB = 003000 G
NOD262  005500R        NOD56   004114R        N134$   004474R        N186$   005544R        OTRING= 002400 G
NOD263  005516R        NOD57   004120R        N135$   004520R        N1861$  005550R        OUTBLK  052136R
NOD264  005522R        NOD6    003470R        N136$   004516R        N1862$  005560R        OWN   = 100000 G
NOD265  005540R        NOD60   004124R        N14$    003474R        N1863$  005600R        O$APTS= 000000
NOD266  005544R        NOD61   004126R        N140$   004522R        N1864$  005610R        O$AU  = 000000
NOD267  005550R        NOD62   004132R        N141$   004526R        N190$   005614R        O$BGNR= 000001
NOD27   003656R        NOD63   004136R        N1412$  004542R        N20$    003576R        O$BGNS= 000000
NOD270  005554R        NOD64   004142R        N142$   004552R        N200$   005616R        O$DU  = 000000
NOD271  005560R        NOD65   004146R        N1421$  004556R        N201$   005622R        O$ERRT= 000000
NOD272  005574R        NOD66   004150R        N143$   004572R        N210$   005630R        O$GNSW= 000000
NOD273  005600R        NOD67   004154R        N1431$  004562R        N22$    003620R        O$POIN= 000001
NOD274  005604R        NOD7    003474R        N145$   004574R        N23$    003640R        O$SETU= 000000
NOD275  005610R        NOD70   004170R        N146$   004600R        N231$   003656R        PART    034340RG
NOD276  005614R        NOD71   004174R        N1461$  004604R        N24$    003660R        PARVIR  060660RG
NOD277  005616R        NOD72   004212R        N147$   004636R        N25$    003664R        PASABT  016426R
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PATCH   003132RG      P$AEPR  001302R       RRGSRT  002070RG      STRT   = 000004 G     TSTMS2  016471R
PATTRN  017213R       P$BLD   001275R       RRING  = 100000 G     SUMM    014167R       TSTMS3  016517R
PCBB0   002150RG      P$BONC  001306R       RSET   = 000040 G     SUMMRY= 000007        TSTMS4  016532R
PCBB2   002152RG      P$BUFA  001260R       RSTT   = 000015 G     SUMMS1  026306R       TXI    = 010000 G
PCBB4   002154RG      P$CNT   001266R       RTRY   = 002000 G     SUMMS2  026426R       TYPADR  001164R
PCBB6   002156RG      P$CPYS  001174R       RTRYER  012067R       SUMMS3  026553R       T$ARGC= 000002
PCCALL  003124RG      P$EXIT  034466R       RUN    = 000003 G     SUMMS5  026602R       T$CODE= 002032
PCEFLG  003004RG      P$GDBD  001301R       RUNALL  045312R       SUMMS6  026616R       T$ERRN= 000047
PCEI   = 040000 G     P$HEX   001277R       RUNCOM  047064R       SVCGBL= 000000        T$EXCP= 000000
PCLKCT= 001600 G      P$HLP   001276R       RUNDIR  045760R       SVCINS= 177777        T$FLAG= 000040
PCLKEN= 000111 G      P$LIST  001274R       RUNLUP  046424R       SVCSUB= 177777        T$GMAN= 000000
PCMSG   025734RG      P$MERR  001304R       RUNPAT  047362R       SVCTAG= 177777        T$HILI= 000007
PCSR0   002106RG      P$NCMP  001303R       RXI    = 020000 G     SVCTST= 177777        T$LAST= 000001
PCSR0C  002116RG      P$NNUF  001300R       R11501= 000120 G      S$LSYM= 010000        T$LOLI= 000000
PCSR1   002110RG      P$NUM   001270R       R11716= 000001 G      S.BYTE  002776RG      T$LSYM= 010000
PCSR1C  002120RG      P$PASS  001176R       SADDR   013431R       S.COMP  002774RG      T$LTNO= 000001
PCSR2   002112RG      P$RADX  001272R       SAVED   015172R       S.LEN   002772RG      T$NEST= 177777
PCSR2C  002122RG      P$SIZE  001172R       SCA     013006R       S.NREC  002770RG      T$NSO  = 000005
PCSR3   002114RG      P$TEXT  001305R       SELMSG  053464R       S.REC   002766RG      T$PTNU= 000000
PCSR3C  002124RG      P$TREE  001262R       SERI   = 100000 G     S.XFER  003000RG      T$SAVL= 177777
PCTO   = 000200 G     P$TRV   034342RG      SETQIK= 000046        TABCLR  015066R       T$SEGL= 177777
PDMD   = 000010 G     P$TR5   034352R       SFPTBL  000214RG      TABEMT  014113R       T$SUBN= 000000
PFNOP  = 000000 G     P$TYPE  001170R       SICCOU= 000016 G      TABFUL  014041R       T$TAGL= 177777
PHYADR  002244RG      QNA     012756R       SIFFID= 000024 G      TASIST  003302RG      T$TAGN= 010021
PNOP   = 000003 G     RASIST  003334RG      SIMSG1  024134R       TEMP    003110RG      T$TEMP= 000005
PNT    = 001000 G     RBFCNT  003014RG      SIMSG2  024206R       TEMPBL  003040RG      T$TEST= 000001
POSDS   025221R       RBUFV1= 100120 G      SIMSG3  024261R       TEMP1   003112RG      T$TSTM= 177777
POSDS0  025250R       RCBI   = 002000 G     SIMSG4  024334R       TEMP2   003114RG      T$TSTS= 000001
POSDS1  025330R       RCVBUF  003030RG      SIMSG5  024407R       TEMP3   003116RG      T$$AU  = 010015
POSEID  055456RG      RCVERR  003026RG      SIMSG6  024462R       TENPWR  034254R       T$$AUT= 010012
POSEXI  056016R       RDCNTS= 000012 G      SIMSG7  024535R       TIMERS  002052R       T$$CLE= 010013
POSLOC  025660R       RDDEFA= 000002 G      SIMSG8  024605R       TIMER1  002046R       T$$DU  = 010014
POSNAM  025610R       RDLIN   053400R       SIMSG9  024657R       TIMER2  002050R       T$$HAR= 010017
POSRVN  025470R       RDMODE= 000014 G      SIRCPT= 000022 G      TIMMIN  002040R       T$$HW  = 010000
POSSN   025410R       RDMULA= 000006 G      SIZLMT  014342R       TIMOUT  003022RG      T$$INI= 010011
POSSTR  025730R       RDPHYA= 000004 G      SLOT    001202RG      TIMSEC  002042R       T$$MSG= 010004
POSSVN  025540R       RDRNGS= 000010 G      SLOT1   001204RG      TIMTCK  002044R       T$$PRO= 010010
PREG14  027162RG      RDSTA  = 000016 G     SMSG10  024732R       TKPAR6= 002400 G      T$$RPT= 010007
PRI    = 002000 G     RDSYS  = 000022 G     SMSG11  025005R       TMRF   = 000012 G     T$$SOF= 010020
PRIMLD= 000001 G      READY  = 000002 G     SMSG12  025060R       TMRO   = 000011 G     T$$SRV= 010006
PRI00  = 000000 G     RECAST  017174R       SMSG13  025132R       TRAST   017154R       T$$SW  = 010001
PRI01  = 000040 G     RECERR  012014R       SOUADR= 000054        TRVACT  034470R       T$$TES= 010016
PRI02  = 000100 G     RECEVE  031002RG      SOUFIL  001076RG      TRVADR  035366R       T1      037524RG
PRI03  = 000140 G     RELBUF  031220RG      SOUFLG  001253R       TRVALP  035224R       UAM    = 000200 G
PRI04  = 000200 G     REMAP   060600RG      SOURCC= 000006 G      TRVBIF  034574R       UBTO   = 040000 G
PRI05  = 000240 G     REQID   003252RG      SOURCE  031412R       TRVBR   034564R       UCB10   002372RG
PRI06  = 000300 G     RESET  = 000000 G     SPACES  013256R       TRVBRC  034510R       UCB11   002416RG
PRI07  = 000340 G     RESTOR  015201R       SRV     013016R       TRVDEC  034670R       UCB12   002442RG
PRLENT  060122R       RESTRT  037214R       STACK5  000214R       TRVERR  034526R       UCB13   002442RG
PRNTID  054364R       RETMEM  060634RG      STAEND= 126000 G      TRVEXI  034546R       UCB20   002626RG
PROFIL  001112RG      RETRY   017247R       START   035762R       TRVNMA  034710R       UCB21   002626RG
PROFLG  001255R       RETRYS  003024RG      STATBL= 100000 G      TRVNOB  034520R       UCB22   002670R
PROTOT= 000014 G      RMTC   = 000010 G     STATUS  002600RG      TRVNUM  034702R       UCB23   002670R
PROTO0  003034RG      RPKLEN= 002756 G      STOP   = 000017 G     TRVOCT  034702R       UCB6    002272RG
PROTO2  003036RG      RRGCUR  002074RG      STP    = 001000 G     TRVSPA  034616R       UCB7    002332RG
PTYPE   013437R       RRGLST  002104RG      STRBUF  001116R       TRVSTR  035270R       UDBB    002756PG
P$ACT   001264R       RRGNXT  002100RG      STRBU1  001140R       TSTMS1  016451R       UNA     012746R
```

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Symbol table

UNACSR  002126RG       WDMODE= 000015 G       XRGCUR  002072RG       X11716= 000001 G       $RDMC   002262RG
UNAINI  027706RG       WDMULA= 000007 G       XRGLST  002102RG       ZEROS = 000002 G       $RDMO   002556RG
UNAISR  030130RG       WDPHYA= 000005 G       XRGNXT  002076RG       ZROALT= 000004 G       $RDPH   002242RG
UNAPRI  002132RG       WDRNGS= 000011 G       XRGSRT  002066RG       $CLRC   002546RG       $RDRN   002362RG
UNAVEC  002130RG       WDSYS = 000023 G       XRING = 100000 G       $CLRS   002606RG       $RDST   002576RG
UNBOND  014533R        WRITES  033570RG       XSTRIN  053322R        $DMEM   002616RG       $RDSY   002650RG
UNIHLT= 000005 G       XBUFV1= 100050 G       X$    = 000321         $LMEM   002640RG       $WDMC   002322RG
UNIT    002140RG       XFER    003120RG       X$ALWA= 000000         $PATCH  061232RG       $WDMO   002566RG
UNKNWN  013032R        XFLAG   003010RG       X$FALS= 000040         $PNOP   002230RG       $WDPH   002252RG
UNSMSG  015133R        XMIT    030414RG       X$OFFS= 000400         $RDCN   002432RG       $WDRN   002406RG
USCI  = 000400 G       XPKLEN= 001756 G       X$TRUE= 000020         $RDDE   002232RG       $WTSY   002660RG
WAIT    027234RG       XPWR  = 100000 G       X11501= 040050 G

. ABS.  000000    000   (RW,I,GBL,ABS,OVR)
        061256    001   (RW,I,LCL,REL,CON)
Errors detected:  0

*** Assembler statistics


Work  file  reads: 344
Work  file writes: 336
Size of work file: 30278 Words  ( 119 Pages)
Size of core pool: 19402 Words  ( 74 Pages)
Operating  system: RSX-11M/PLUS (Under VAX/VMS)

Elapsed time: 00:12:59.40
ZUACC,ZUACC/CR/-SP=SUPR11/ML,ZUACC
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