

Burroughs Corporation



COMPUTER SYSTEMS GROUP
SANTA BARBARA PLANT

2228 3527

B1800/B1700 BNA

PRODUCT SPECIFICATION

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INTRODUCTION

This specification describes the system related aspects of B1000 BNA. It does not contain all the information required to understand and use B1000 BNA. This spec must be used in conjunction with NETWORK SERVICES and HOST SERVICES specs to be able to understand and use B1000 BNA.

BNA will be released with the MARK 10.0 system release. This release of BNA will not support X.25 and the Tasking Protocol. There are no plans to implement the Tasking Protocol on the B1000 systems. X.25, will however, be made available in a future release.

In the 10.0 release, COBOL74 will be the only language that will interface with BNA. BNA interfaces for RPG and FORTRAN77 will be implemented in a future release. There are no plans to provide a BNA interface for COBOL68, FORTRAN66, BASIC, and IBASIC.

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RELATED DOCUMENTATION

The following specs describe different aspects of BNA:

Network Services Manager	(rev E)	#2752 0436
Port and Subport	(rev H)	#2752 0410
Port Level	(rev F.1)	#2752 0451
Router	(rev G)	#2752 0402
Operations Interface	(rev D)	#2752 0485
Station Level	(rev F)	#2752 0444
BDLC Station Group	(rev G)	#2752 0469
X.25 Station Group	(rev D)	#2752 0477
Host Services	(rev B)	#2373 2563
User Interface Overview	(rev B)	#2373 2571
Corporate COEOL74 standard	(rev C)	#1283 0022

The above specs are still not frozen. The revisions indicated are current as of 11/80. Although no significant changes are expected in the specs, some alterations may be made.

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SYSTEM ARCHITECTURE

Fig. 1 illustrates the basic structure of B1000 BNA. ENA consists of several normal state programs that interact with each other and the MCP via queues, port files and MCP communicates.

In the design of ENA an attempt was made to observe the following goals:

1. To the extent that it is possible, changes to the MCP were minimized.
2. An attempt was made to reduce the number of queues in the data transfer path. This required combining several modules into one program, namely NSP. These modules transfer control via procedure calls.
3. In order to keep any one program from getting too large and unwieldy, the PLM and Host Services functions were coded in separate programs.

The Network Services Program (NSP) is an SDL program that performs the Station Group, Router, SLM, Port & Subprt and some PLM functions. ENA does not make use of NDL to handle the line discipline. The entire station group function is coded in the NSP.

The Port Level Manager (PLM) handles the matching functions required to connect a pair of ports. The PLM interfaces with the MCP and the NSP to bring about a connection between a pair of ports. Once this connection has been established, the PLM does not participate in the subsequent data transfer. The PLM is also responsible for execution and control of the Host Services Program (HSP) and the Cooperative-Host Logical I/O Program (HSLIO).

The Host Services Program (HSP) handles the ODT, job transfer, status and the station transfer protocols. One copy of HSP is required for each host with which host services communication is in progress. The HSP uses ports to send or receive data from the NSP.

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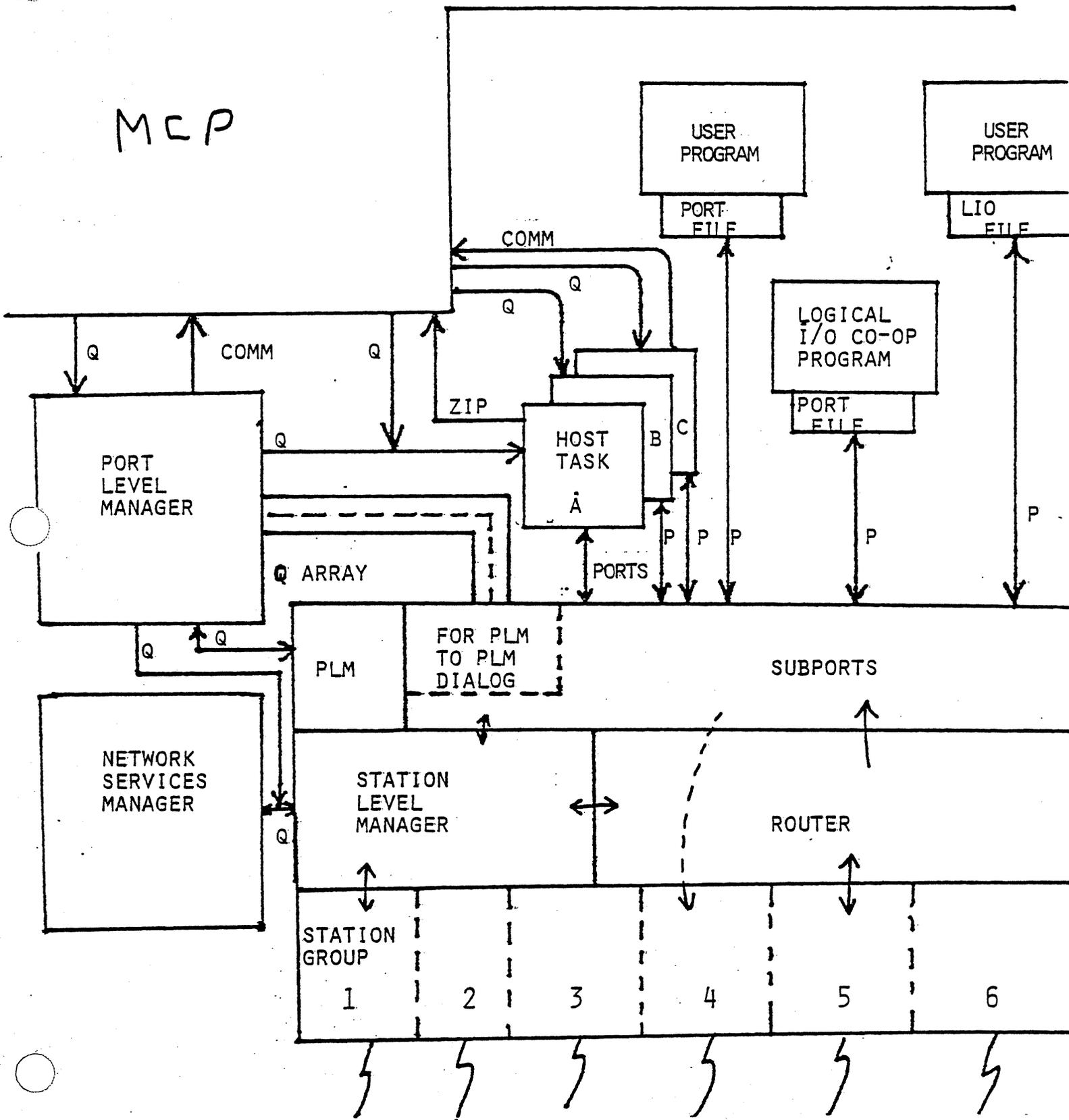
The Network Services Manager (NSM) program performs the Operations Interface Module functions as well as the Network Services Manager functions. This program is responsible for handling network initialization, network shut-down and for syntaxing operator messages before passing them on to the appropriate module.

Using BNA, a user program may access a data file that is located on a remote system. The logical IO procedures in the MCP have been enhanced to translate the open of a data file into an open of a port file. This port file is then matched up with a corresponding port file opened by the Logical IO Co-operating (HSLIO) program. All data transfer requests (e.g. read, write) are sent to HSLIO which does the data transfer with the physical media and then reports the result back to the initiating system. One copy of the HSLIO can handle only one file and consequently multiple files require multiple copies of HSLIO.

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MCP



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HARDWARE REQUIREMENTS

BNA should not be used on a system with less than 512k bytes of memory. The minimum memory requirements of the BNA system (excluding MCP memory requirements) are 250k bytes. The memory requirements will depend on the number of communicating hosts, number of logical IO files opened, number of open ports and the dynamic memory assigned to NSP to store tables and frame containers.

One BDLC adapter will be required for each Two Way Alternate (TWA) connection and two BDLC adapters will be required for each Two Way Simultaneous (TWS) connection. BDLC adapters are qualified on SLC-2 and MLC only. Consequently 1080 systems (i.e. B1905) systems cannot support BNA. In addition, B1700 systems will not be qualified with BNA.

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SYSTEM DEPENDENT FEATURES

The following system dependent commands have been defined. These commands should be looked upon as extensions to the DIM specs. The default values are indicated in parenthesis immediately after the attribute name.

ATTRIBUTE ENTRY COMMANDS:

MAXNODEADDRESS (10)	defines the maximum value of the node address in the network.
MAXNEIGHBORS (4)	defines the maximum number of neighbors that can be connected at any one time.
MAXBOLCSTATIONS (4)	defines maximum number of BOLC lines. This attribute value should be the same as MAX NEIGHBORS if multiple parallel links are not used.
MAXPOTENTIALNEIGHEORS (10)	defines the maximum number of neighbors in the station level manager tables. This attribute will be larger than MAX NEIGHBORS only if validation is to be performed at the station level.
MAXTEXTSIZE (2000)	refers to the maximum size of records associated with ports.
MAXHOSTS (10)	refers to the maximum number of hosts that may communicate with the local host at any one time.
PORTSPERHOST (10)	refers to the maximum number of open ports communicating with any one host.

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MAXSUBPORTS

is calculated by the system but the user may choose to set the value of this attribute lower than the product of MAX HOSTS and PORTS PER HOST.

MAXFRAMECONTAINERS

are calculated based on all of the above parameters. This value can be overridden by explicitly defining MAX FRAME CONTAINERS.

PERCENTFRAMECONTAINERS (20%)

can be used to indicate to the BNA system that fewer frame containers will be actually required to run the system compared to the maximum number calculated.

NSPROGRAM (BNA/NSP)

name of network services program.

HSPROGRAM (BNA/HSP)

name of host services program.

FLMPROGRAM (BNA/PLM)

name of the port level manager.

LIDCOOPPROGRAM (BNA/HSLID)

name of the logical I/O cooperating program.

STATION ATTRIBUTE COMMANDS:

SPEED (9600 bps)

line speed used by the router for line resistance calculation.

EFFICIENCY (95%)

is also used by the router to calculate line resistance.

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HARDWARE

is used to define the location of the BDLC adapters. For two way simultaneous line the syntax is: HARDWARE = (P:C:A, P:C:A). The first Port (P), Channel (C), Adapter (A) refer to the read adapter and the second set refer to the write adapter. For two way alternate lines the syntax is: HARDWARE = (P:C:A).

TRANSITNODEONLY = TRUE/FALSE

if this attribute is true then BNA/NSM will not zip execute the port level manager and consequently no port traffic is allowed. This attribute may be set to false after initialization but the converse is not true.

USERCODESREQUIRED = TRUE/FALSE

If this attribute is true then Host Services and LIO-COOP will require a valid usercode for every input or file-open. If it is false they will not require a usercode although if it is supplied, it must be valid.

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NETWORK SERVICES PROGRAM

The memory layout of the Network Services Program is shown below. The table sizes are determined from the attribute values defined in the system dependent features section of the specification.

The format of Dynamic Memory after initialization will be:

```

***** <== DYNAMIC MEMORY BASE ADDRESS>
*
*   PORT TABLES   *
*
*****
*
*   ROUTER TABLES *
*
*****
*
*   SLM TABLES   *
*
*****
*
*   BDLC TABLES  *
*
*****
*
*   X.25 TABLES  *
*
*****
*
*   FRAME         *
*   CONTAINERS    *
*
***** <== LIMIT ADDRESS
    
```

ENA/NSM computes the dynamic memory requirements of BNA/NSP and then zips "EX BNA/NSP ME <number>."

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PORT LEVEL MANAGER

Port Level Manager Internal Tables

The following tables are maintained in the PLM. All tables are paged arrays.

- Nodes** One entry for each remote node; Linked lists of Free and Active entries are maintained. A linked list of timeout events also threads the active list. Active entries are created when NSP tells PLM that the node has been validated.
- Tasks:** One entry for each HSP or HSLIO job spawned by the PLM; An active entry is created when a job is spawned and removed when the job reaches EOJ. (If a spawned job goes to DS/DP, the PLM DP's the job.)
- Ports:** One entry for each port; An active entry is created when a subport open request is received for an unknown port. It is deleted when the last subport associated with it is closed.
- Subports:** One entry for each subport (including PLM subports); An active entry is created when a subport open request is received from MCP. It is deleted when a subport close request is received from MCP.
- Candidates:** One entry for each candidate for match; An active entry is created when a subport open request is received from MCP, or an offer is received from a remote PLM. It is deleted when the matching process succeeds or fails.
- Stations:** One entry for each local terminal making use of Station Transfer;

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Establishment of PLM Supports:

Condition: NSP receives an Open PLM Support request from local PLM.

Action: NSP sends BEGIN frame to remote Host, NSP sends OPEN_REPLY msg to local PLM.

Condition: NSP receives BEGIN frame from remote Host.

Action: NSP sends a BEGIN msg to local PLM.

Condition: NSP receives OPEN_COMPLETE msg from local PLM for a PLM Support.

Action: NSP sends BEGIN_ACK frame to remote Host. NSP should be prepared to receive data from both ends of the support.

Condition: NSP receives BEGIN_ACK frame from remote Host.

Action: NSP sends BEGIN_ACK msg to local PLM.

Condition: NSP exhausts BEGIN retries before receiving a BEGIN_ACK frame from a remote Host.

Action: NSP sends BEGIN_NAK msg to local PLM.

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Condition: NSP receives data from a remote host in a subport which is opened except for receiving a BEGIN_ACK frame from the remote Host.

Action: It must be assumed that the data beat the BEGIN_ACK frame, or the BEGIN_ACK frame was lost. In either case, we can take this data frame as evidence that the remote host received our BEGIN frame, so we proceed as if the BEGIN_ACK frame has been received.

Condition: PLM receives a BEGIN msg from the NSP for a subport which is already open.

Action: PLM sends OPEN_COMPLETE msg to NSP.

Condition: PLM has: 1) Sent an OPEN_REQUEST,
2) Received an OPEN_REPLY,
3) Received a BEGIN msg.

Action PLM sends an Open Complete msg to the NSP.

Condition PLM has: 1) Sent an Open Complete msg to NSP,
2) Received a BEGIN_ACK msg.

Action PLM can write messages to this subport and expect them to be received by the remote Host.

Condition PLM receives a BEGIN_ACK msg for a Subport through which data has already been received and assumed to be open.

Action Ignore it.

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INITIATING HOST

COOPERATING HOST

PLM

NSP

NSP

PLM

ALLOCATE
 PLM S.P.

----->

OPEN REPLY

<-----

BEGIN

----->

BEGIN

----->

ALLOCATE
 PLM S.P.

<-----

OPEN REPLY

BEGIN

<-----

BEGIN

<-----

OPEN COMPLETE

----->

OPEN COMPLETE

<-----

BEGIN ACK

BEGIN ACK

-----\

\

/

----->

BEGIN ACK

<-----

BEGIN ACK

----->

ESTABLISHMENT OF PLM SUBPORTS

Support Matching Algorithm:

The Candidates for match list is a chronologically ordered linked list with entries for local and remote subports seeking a match. A candidate is added to the list whenever:

- 1) PLM receives a subport OFFER message from a remote PLM or
- 2) PLM receives a subport Open request from MCP (if the open request indicates all subports of a port are to be opened, many entries may be added to the list).

A candidate is added to the end of the list and is compared with all candidates already on the list. Candidates α_1 and α_2 match if, and only if, all of the following boolean expressions are true:

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- Q1.PORTNAME = Q2.PORTNAME
- Q1.YOURNAME = BLANK OR Q1.YOURNAME = Q2.MYNAME
- Q2.YOURNAME = BLANK OR Q2.YOURNAME = Q1.MYNAME
- Q1.YOURHOST = BLANK OR Q1.YOURHOST = Q1.MYHOST
- Q2.YOURHOST = BLANK OR Q2.YOURHOST = Q1.MYHOST
- IF Q1 IS LOCAL-ORIGIN AND Q1.SECURITY = PRIVATE
 THEN Q1.YOUR-USERCODE MUST EQUAL Q2.MY-USERCODE
- IF Q2 IS LOCAL-ORIGIN AND Q2.SECURITY = PRIVATE
 THEN Q2.YOUR-USERCODE MUST EQUAL Q2.MY-USERCODE
- BOTH CANDIDATES CANNOT BE SUPPORTS OF THE SAME PORT
- AT LEAST ONE OF THE CANDIDATES MUST BE LOCAL

To reduce confusion, the following discussion assumes that if one of the candidates is from a remote host, that hosts node address is greater than the local nodes address, which means the local PLM has Matching Responsibility.

If a matching candidate is found and both are local, MCP and NSP are informed, the candidates are removed, and the open is complete.

If a matching candidate is found and one of the candidates is remote, an open complete msg is sent to NSP so it will be ready to receive data through the subport, a MATCH message is sent to the remote PLM. If the remote PLM approves of the match after a security check, it sends back an ACCEPT message. When an ACCEPT message is received by the PLM, an open complete message is sent to MCP, the candidates are removed, and the open is complete.

If no matching candidate is found for a local candidate with open type of AVAILABLE, and an null remote hostname, an open denial is given to MCP and the candidate is removed.

If no matching candidate is found for a local candidate with open type of AVAILABLE, and an specified remote hostname, a JUDGE-QUICKLY offer is sent to the remote PLM.

If no matching candidate is found for a local candidate with open type of WAIT or OFFER (RETURN), and an null remote hostname, it passively waits on the list for another candidate to match it.

If no matching candidate is found for a local candidate with open type of WAIT or RETURN, and a specified remote hostname, an OFFER is sent to the remote PLM.

If no matching candidate is found for a remote candidate with offer type of JUDGE-QUICKLY, a NO-MATCH msg is sent to the remote PLM.

If no matching candidate is found for a remote candidate with offer type of EE-PATIENT, it passively waits on the list for another candidate to match it.

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PLM Station Transfer Support:

When users want to make use of station transfer, they first sign-on to PLM. When the PLM is a station's primary MCS, the following commands may be entered:

BYE:

Causes the user to be logged off PLM.

US <UC>/<PW>:

Allows the user to supply a usercode/password to be used for auto-logout to a remote MCS.

CONNECT TO <HN> [: <PROGRAM-NAME>]

If a HSP has not already been spawned to handle host services dialogs with HN, one is spawned at this time. A Connect message is written to HSP's MCPQ which contains the optional text, and any usercode/password associated with the station. When the PLM approves HSP's remote file open, all stations waiting to connect to that HSP's host are attached to HSP, making the PLM the secondary MCS for that station.

When the PLM is the secondary MCS for a station, any messages which are received by the PLM from that station other than <signal-char>DISCONNECT are sent on to the PLM's parent MCS. If the disconnect command is received, the PLM informs HSP which takes care of detaching the station.

Port Level Manager Files and Their Functions:

- PLMMCPQ:** Queue which carries the following messages from MCP to PLM: ODT commands, subport open requests, subport close requests, Death in Family messages, change subport compression requests.
- HSTQ:** Queue which carries the following messages from PLM to HSP: ODT commands, start cooperating protocol, Death in family.
- HSTOFQ:** Queue which PLM uses to save messages which are to be routed to a HSP which cannot currently be written to.
- PLMCTLQ:** Queue through which PLM gets job control messages from MCP concerning Host Services jobs.

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- PLMZIPQ: Queue through which PLM gets job spawning messages from MCP concerning Host Services jobs.
- ENAREMOTE: MCS messages (needed to support station transfer).
- ENAFCTLQ1: Queue which carries the following messages from PLM to NSF: Initial handshake, allocate subprt request, open complete, subprt close request, change compression.
- ENAFCTLQ2: Queue which carries the following messages from NSP to PLM: Initial handshake, change PLM attributes, attributes, remote node state change msgs, allocate subprt reply.
- BNACTLQ1: Queue family which carries the following messages from the local PLM to remote PLMs: Offer, rescind, match, no-match, accept, refuse, deactivate, dialcg terminate request messages.
- BNACTLQ2: Remote PLMs -> PLM (same as BNACTLQ1).
- BNANSMQ2: Queue which carries Command Responses, and Reports from PLM to NSM.
- ENATRACEQ: Queue which carries trace messages from PLM to ENA Trace program.

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MCP CHANGES FOR BNA

A. CONTROL COMMANDS

1. NET

- This command is used to initiate BNA/NSM (NETWORK SERVICES MANAGER), change its init. file name or use, shut down BNA, or query the phase of BNA.
- EXAMPLES (network initialization)

```
> NET +
  INITIALIZING NETWORK MODE
  BNA/NSM = 1234 BOJ....
```

```
> NET + NWINIT/WESTNET
  (equivalent to
  NET = NWINIT/WESTNET
  NET +)
```

(net change)

```
> NET = NWINIT/BIGNET I *NULL I *DEF
  "BNA/NSM" MODIFIED.
  (**NULL* means do not attempt to use an init.
  file on disk. **DEF* means to change the
  init. file name to "BNA/NWINIT", its
  default value.)
```

(net inquiry)

```
> NET
  NET - (NEXT INIT FILE = *NULL I <file name>
  or
  NET + (PHASE = FAST NODE SHUTDOWN I SLOW NODE SHUTDOWN
  I INITIALIZING I OPERATING,
  INIT FILE = *NULL I <file name >
  NEXT INIT FILE = *NULL I <file name>
```

(net shutdown; valid only if NSM is running)

```
> NET -
  SHUTTING DOWN NETWORK MODE
```

```
> NET - NOW
  SHUTTING DOWN NETWORK MODE
  (This is Fast Shutdown.)
```

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2. NW <input message>
 - valid only if NSM is present.
 - used to input a message to the NSM without the necessity of <job#>AX.
 - no other MCP input may follow NW.

3. HN
 - used to query or change the system's logical hostname.
 - can change only if no jobs are running; other attempts to set hostname will save the specified new hostname and change it at the next CLEAR/START or null mix.
 - EXAMPLES
 - > HN
 - HOSTNAME = "COUERDALENE"
 - > HN POCATELLO
 - HOSTNAME CHANGED FROM "COUERDALENE" TO "POCATELLO"
 - > HN HUNGRYHORSE
 - NEXT NULL MIX OR CLEAR/START WILL USE HOSTNAME = "HUNGRYHORSE"

4. AT <hostname> <input message>
 - valid only if PLM (Port Level Manager) is present; will not execute it.
 - The <input message> is not scanned; it is in the syntax of the cooperating host.
 - If a Host/Services program (HSP) for the specified hostname is running, the message is queued to that HSP. Otherwise it is queued to the PLM. The message header includes hostname, session number, usercode index, "origin_or_device" (zip, EDT, PSR, CRx or CDx, or DSK), and a tag including the zip queue address, LS boolean, and zipping job number. This tag is used in response routing.
 - If the input is from a card device or pseudo reader, more scanning will attempt to find "STREAM <file name>". If this is found, HST treats this as a job transfer request because the value of the origin_or_device field is CDx or CRx.
 - EXAMPLES:
 - > AT HUE WY; PD SOURCE/=
 - > AT MUYELLOW RUN SYSTEM/DUMPALL ("TEACH")
 - > AT PADUCAH STREAM BIG/JOB

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5. START <file name>; HOSTNAME = <hostname>

- used to initiate job transfer of a disk file to any host (the one specified) without the necessity of specifying the hostname in the disk file.
- same message interface to HSP as AT command, with origin_cr_device = DSK.

6. CA COMMAND <PORTNAME>

- displays the candidates for match list. If portname is supplied, only candidates with that portname are displayed.

E. PORT FILES

The following topics are covered in this section.

1. Open
2. Close
3. I/O
4. Wait Events
 Read_ok, Write_ok, and Q_write_occurred are supported for ports and subports.
5. Message Count
 is supported for port files and returns the count of messages in each subfile.

1. Port Open -- done in cooperation with the PLM

- There are three flavors of OPEN. They are: WAIT, AVAILABLE, & RETURN
 - OPEN AVAILABLE without the PLM running, returns "not available"; it does not execute the PLM & causes the user program to be hung.
 - OPEN WAIT is the default, and the program hangs on the open request until the PLM matches the subport open to another subport.
 - OPEN RETURN initiates a subport offer and reinstates the job. When the subport is matched, a subport state-change is caused.
- For multiple subfiles, a key (subport index) must be present to specify which subfiles to open (0 = all).
- The open will allocate temporary disk space for subport attributes when necessary, and this space remains allocated until program EQJ.

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- The job is hung until the PLM tells the MCP to run it again.
- The MCF-PLM interface uses (job number, user program file number, subfile index) to indicate the exact subfile that messages pertain to.

2. Port Close

- Notify PLM of (job, file, subfile).
- Always immediate to user.
- Subfile can be reused, but may use a different mechanical subport.
- Can close all (subfile index = 0) or any one subfile.
- Restore null attributes for subsequent opens.

3. Port I/O

- Seek and position verbs are ignored.
- For multiple subfiles, subfile-index must be specified; it can be 0, meaning "any" for a read (non-selective-read) or "all" for a write (broadcast write to all active subfiles).
- On read, subport-state must be one of {opened, remotely-deactivated, shutdown-in-process, blocked}.
- On write, subport-state must be in {opened, shutdown-in-process, blocked}.
- Read any is round-robin-ed.
- The following exceptions conditions are returned:
 - invalid key (subfile index)
 - key is not present or its value is larger than max-subfiles.
 - status-mask bit or eof reporting.
 - subfile not open
 - I/O attempted to a subfile whose state is not as defined above.
 - status-mask bit or eof reporting.
 - no buffer, no data
 - read with dontwait found no data or write with dontwait found no buffer.
 - incomplete-io reported if requested.

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- Port I/O error
 - queue subsystem had a disk i/o error
 - status-mask bit or exception branch reporting
- logical eof
 - status-mask bit or eof reporting.
- subport-state change
 - status-mask bit or eof (if state = deactivated).
- reinstate values

0	good i/o
1	eof
2	exception
3	incomplete i/o

- status-mask bit usage

bit #	meaning	
-----	-----	
0	exception (any)	ports
1	boundary violation	
2	duplicate key	
3	sequence error	
4	variable length record error	
5	invalid key (or subport index)	ports
6	undefined	
7	parity error	ports
8	undefined	
9	eof (disconnected or closed)	ports
10	short block	
11	undefined	
12	undefined	
13	break on output	
14	undefined	
15	timeout	
16	security violation	
17	no user disk space	
18	subport not open	ports
19	undefined	
20	subport state change	ports
21	undefined	
22	undefined	
23	undefined	

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HOST SERVICES PROGRAM (HSP)

This program implements the following protocols:

- ODT
- JOB TRANSFER
- STATUS CHANGE
- STATION TRANSFER

The ODT protocol allows the user to input "AT <REMOTE HOSTNAME>..." commands from either terminals or the ODT and receive responses (if any). The format is "[<REMOTE HOSTNAME>] <RESPONSE>". For example:

```
AT HOUSTON PC FILE2
[HOUSTON] PD = FILE2
[HOUSTON] ENC PD.
```

Jobs can also be fired up via the ODT protocol, but their status is reported via the Status Change protocol. For example:

```
AT HOUSTON EX DMPALL
[HOUSTON] DMPALL=5 BOJ. PP=9, MP=9 TIME= 12:55:35.2
[HOUSTON] ZDMPALL=5 ENTER SPECS
[HOUSTON] DMPALL=5 ACCEPT.
```

These lines returned by status change protocol.

The JOB XFER protocol is used to:

- 1) Execute a job,
- 2) Transfer the data needed for that job.

The protocol can be accessed by two methods which are shown in the two ensuing examples. On the initiating host, the job transfer protocol sends messages consisting of records until a local "END-OF-JOB" terminator is detected. Then a special message called a job-complete is sent. The cooperating or remote host does the following:

- All control cards previous to data cards are zipped.
- Data cards belonging to a job are placed into a disk file which is named:

```
"RJ" concatenated to four characters of session number
concatenated to four characters of job number (of the
scheduled job) concatenated to "/" concatenated to the
filename specified on the "DATA" card. (e.g.
"RJ00120034"/"CARDS").
```

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- Data cards not associated with a job are placed into a disk file which is named: <usercode>/<filename>.
- Upon reception of "JOB COMPLETE" messages, the scheduled job associated with the "JOB COMPLETE" message is forced out of the schedule.
- When the transferred job does an open on its data file, the MCP "links" the open to the "RJ" file. The program does not know that it is not reading actual cards. Upon closing the "RJ" file, it is removed.

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BNA JOBS
 (CARDS)

<: > AT <HN> STREAM <FN>
 [CONTROL CARDS]

BNA "JOB"

[DATA CARDS]

JOB STREAM

<i> END

<i> TERMINATE <FN>

BNA jobs can consist of:

1. All control cards.
2. Control cards and data cards.
3. Control STMTS
4. Combinations of all of the above.

For example:

?AT HOSTX STREAM MYCARDS	Z CONTROL STMT	
?PD Z; END	Z CONTROL CARDS	- 1
?DF CUBIC; WM; EX DMPALL	Z	- 2
?CO IT SDL	Z	- 3
?DA CARDS	Z DATA CARDS	- 1
DECLARE X CHARACTER (1);	Z	- 2
FILE IN (DEVICE = CARD_READER);	Z	- 3
READ IN (X);	Z	- 4
FINI;	Z	
?DA IN	Z CONTROL CARD	
<DATA>	Z DATA CARD	
?ENC	Z CONTROL CARD	
?TD;END	Z CONTROL STMT	
?TERMINATE MYCARDS		

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BNA JOBS
(DISK)

Disk files may be transmitted using the following command:

START <FILENAME>; HOSTNAME = <HOSTNAME>

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Logical IO

Description of LIO File Open

1. User Pgm opens a file with the hostname attribute set to a foreign host.
2. MCP then does the following:
 - a. Check for PLM presence.
 - b. Build lio-port fib.
 - c. Send lio_port_open message to PLM.
 - d. Hang Pgm waiting port open.
3. At the cooperating host PLM executes LIOCOOP.
4. PLM completes port connection and issues a finish lio_port_open communicate. The Lio portion of MCP sets up port pointers, maxsgtextsize, port state, and reinstates the user Pgm.
5. The MCP again executes the open request and calls BNALIO_OPEN which in turn calls BNA_LIO because a fib is present. This is performed repetitively until the protocol has completed the file open process, at which time the Pgm is allowed to run, hung on ro file, or DS'ed. Protocol open functions are:
 - a. Dialog initiate.
 - b. File open.
 - c. Establish data transfer length.

Data Transfer

1. File access mode by LIOCOOP is always random if KIND-DISK otherwise access is serial. LIOCOOP uses the data transfer block number as the logical record number.
2. I/O communicates are routed to SMCP's procedure R_W_CALLER by not setting FIB_ENHANCED_IO_PERMITTED. R_W_CALLER then calls BNA_LIO to process the communicate.
3. If the logical record the user requested is not in the FIB buffer then the data transfer request for the appropriate block of data is initiated. If the user provides for an INCOMPLETE_IO branch he will be reinstated, otherwise he is forced to wait until a response is received from LIOCOOP. The user is reinstated with a value of GOOD_IO only when data is transferred to/from his program data area from/to the FIB buffer.

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4. File look-ahead is provided for serial input and sequential i/o. Protocol data transfer occurs when the FIB buffer has been filled by logical writes or a record has been requested from a different block.

File Attributes via the Logical I/O Protocol

1. Users may access or change attributes of files residing on foreign host.
2. The file must first be opened with the HOSTNAME set to the desired host.
3. Then the file attribute communicate, as specified in the MCP CONTROL SYNTAX product spec, is used to invoke the SMCP FILE_ATTRIBUTES procedure. This procedure calls BAN_LIO to finish processing the communicate. The user program is forced to wait until the cooperating host responds to the attribute request. BNA_LIO will give the user the attributes he requested and reinstate him.

Dialog Termination

1. Caused by an explicit non-retained file close or program termination. BNA_LIO is called by CLOSE_A_FILE.
2. Updated records in the FIB buffer are sent to the cooperating LIOCCOP.
3. BNAIO_CLOSE sends a LIO_PORT_CLOSE message to the PLM..
4. the LIO_PORT FIB and the FIB buffer are discarded.

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Station Transfer

The following discussion explains the basic implementation of the STATION-TRANSFER Message Protocol for BNA on B1000 systems including any changes or additions to MCS programs in order to support it.

The purpose of the STATION-TRANSFER Message Protocol is to provide a way for a station physically connected to one host to be logically connected to another host. The B1000 system accomplishes this with the involvement of the PLM, a copy of the HSP, the Datacomm Subsystem including the Network Controller and the MCP, and an MCS, either the B1000 SMCS or any user-written MCS if it has been modified appropriately as outlined below.

A local station is first attached by the MCS which currently owns it (this may be SMCS or any user-written MCS) to the PLM which then attaches it to the correct copy of HSP for the requested host. HSP then logically connects the station to the remote host via the BNA network. A copy of HSP at the remote host is then activated and initiates a connect-request to the MCS that accepts "virtual" stations. That MCS replies with approval or denial of the connection and the HSP returns a response to the local host with that approval or denial. Once the logical connection is established, data from the local station is passed by the local Datacomm Subsystem to HSP which passes it via BNA to the remote HSP which then passes it to the remote MCS. Data messages written by the remote MCS to the "virtual" station are passed to the correct remote HSP which passes them via BNA to the local HSP which then writes them to the local station. Control messages from the remote MCS which involve a "virtual" station are handled similarly.

The user must initiate the connection by first attaching the local station to the PLM via whatever mechanism the local MCS uses to effect such station attaches. In the case of SMCS, this mechanism is the "SIGN ON" command. For a station on SMCS, then, the user would first enter:

```
SIGN ON <programid> [<string>]
```

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The <programid> must have been entered in the SMCS/JOES file with the NO-ZIP option set and the program name set to ENA/PLM after the semi-colon that follows the option-list. Refer to the SMCS manual for further details. The optional <string> is any valid input to the PLM.

Once attached to the PLM, the user enters:

CONNECT TO <hostname> [: <programname>]

The optional <programname> is the name of the program to which the user wants the station to be connected. The 81000 STATION-TRANSFER implementation does not support the optional <programname> at the remote host; the connection will be denied if one is sent. The 81000 system always connects the station to the MCS which has previously been determined to be the MCS which will accept "virtual" stations. That determination will be discussed later.

Once the connection is established, all data messages input at the local station will be transmitted to the remote MCS. Any input at the local station which is preceded by the signal character for the local MCS will be sent to that MCS with the exception of the disconnect command which is handled by the PLM as is the connect command above.

When the user wishes to cause the station to be logically disconnected from the remote host, the following command is entered:

<s>DISCONNECT

The <s> preceding the disconnect command is the signal character of the local MCS. The PLM intercepts this command and initiates the disconnect process for the station. The local MCS does not receive the disconnect command but all other inputs that are preceded by the local signal character will be sent to the local MCS.

Once the station is disconnected from the remote host, the user may enter BYE to the PLM which will then detach the station from the PLM leaving it attached to the local MCS as it was before the connection.

The changes to an MCS to support "virtual" stations are only necessary in the local MCS which attaches the station to the PLM and in the remote MCS which accepts the logical connection of the "virtual" station. The following is a list of these changes:

1. When a remote-file open is received that has PROTOCOL set to "99" then approve the open with CURRENT-STATIONS set to "000". This open is from the PLM which will do the open after the user enters NW ENABLESTATIONTRANSFER;

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2. Allow the user at the local station to attach the station to the PLM after the PLM has successfully opened its remote file;
3. When a "virtual-connect-request" control message is read in the MCSs remote file, reply with a "virtual-connect-reply" control message. The format of the "virtual-connect" control messages is:

MESSAGE-TYPE	CHARACTER(2)	
"17"		(MCS reads)
VARIANT	CHARACTER(1)	
"0" = connect-request		(MCS reads)
"1" = connect-reply		(MCS writes)
LSN	CHARACTER(3)	
(ndlmax to 999)		(MCS reads)
APPROVE-DENY	CHARACTER(1)	
"0" = deny		(MCS writes)
"1" = approve		(MCS writes)
DENIAL-REASON	CHARACTER(1)	
(same as open-reply)		(MCS writes)
SIGNAL-CHAR	CHARACTER(1)	
(local signal)		(MCS writes)

4. Any control message written by an MCS that contains the lsn of a "virtual" station must contain ONLY that lsn. For example, an open-reply may contain only one "virtual" lsn and no other lsns at all, "virtual" or local;
5. A remote-file-info reply will not have any information about "virtual" stations that are logically connected to an MCS;
6. In order to determine which MCS is to accept "virtual" station connections and to provide for the local signal function, the MCS must have its remote-file modified to have "PROTOCOL" = 98. This will indicate to the Network Controller that this file is to receive the PLM's open request. It will be necessary to have the Network Controller and the MCS running before the PLM attempts to open its remote-file.

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PORT & SUBPORT LANGUAGE INTERFACE

FPB

1. Hardware type should be set to 60 in port_file FPBs.
2. The field that is currently defined as Q_FAMILY_SIZE_NEW for queue files will also have meaning for port file. It should contain the value that the user should be able to specify as <maxsubfiles> for the port. This value will default to 1 (one) if it is 0 (zero) at port open.
3. The FPB field PORT_KEY should be set if, and only if, the user specifies that the port file has keys (subport indexes).
4. Port and subport attributes are specified in section V.

OPEN

1. The user should be able to specify open_type:

WAIT [default]	not (report_file_missing or reinststate_asap)
RETURN I OFFER	(reinststate_asap (ct_adverb bit 3)
AVAILABLE	(report_file_missing)

Since file_missing and reinststate_asap are mutually exclusive, compilers should not generate opens with both of them set. However, the MCP will check <report_file_missing> before it checks <reinststate_asap>.

File_locked will be reported (if requested) if a port open is attempted to an unreachable host.

2. Specify subport_index: CT_4 = 0 (all) or 1-relative binary index. (ct_adverb bit 4 => CT_4 present.) For subport_index = 0 (open all), all subport attributes are the same.

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3. Full communicate layout:

verb	54	
object	file number	
advert	bit #	
	0	report_file_missing (available)
	1	report_file_locked
	2	report_exceptions
	3	reinstate_asap (return)
	4	subpct_index_specified
	5-11	unused
ct_1	bit length of usercode/password field	
ct_2	base relative address of user/pass field	
ct_3	file number of multi_file tape open	
ct-4	subport index to open (0=all)	

4. Implicit opens will be done whenever an I/O is initiated to a specific subfile that is not open. OPEN all will not do any implicit opens.

CLOSE

- Specify subport_index in CT_2 = 0 (all) or 1_relative binary index. Ct_adverb bit 10 => subport_index present in ct_1.
- Full communicate layout

verb	9	
object	file number	
adverb	bit #	
	0	reel
	1	release
	2	purge
	3	remove
	4	crunch
	5	no rewind
	6	insecure
	7	lock
	8	conditional
	9	rollout
	10	audit switch
	11	ct_1 contains more adverb bits
ct_1	0	unavailable
	1-22	reserved
	23	ct_2 contains subport index

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READ/WRITE

1. Communicate layout is similar to that used for queue and remote file.

verb	1=read, 2=write
object	file number
advert	bit
	0 report eof
	1 report i/o error
	2 report incomplete i/o
	3 status mask length/address present
ct_1	logical record bit length
ct_2	logical record base relative bit address
ct_3	bit length of subport_index field (Expected to be numeric characters.) Subport_index must be between 1 and <max_subport> inclusive. A value of "0" (zero) means "all" subports on a write (broadcast), and means "any" subport on a read.
ct_4	base relative bit address of subport_index field
ct_5	bit length of status mask
ct_6	base relative bit address of status mask

2. Reinstate values

- | | |
|---|--|
| 0 | good i/o |
| 1 | eof (subport disconnected from other end of network:
of network/services terminated) (also in last_lioc_status) |
| 2 | exception (last_lioc_status further defines the exception) |
| 3 | incomplete i/o (not in last_lioc_status) |

3. Status mask bits used in port_file i/o

bit #	meaning	
-----	-----	
0	some exception	
5	invalid key (invalid subport index)	
7	parity error	
9	eof (disconnected) (closed)	
15	timeout	
18	port or subport not open	*new*
20	subport state changed	*new*

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ATTRIBUTE HANDLING

The subport_index for the attributes communicate must be specified in the 24 bit field following the attribute value in the communicate's attribute list.

HOSTNAME is a general file attribute that is also supported by the file attributes communicate. For non-port files, it specifies which logical host in the network that the physical file resides on. For port files, it specifies the default value for the subport attribute "HOSTNAME."

The AVAILABLE attribute is invalid for port files.

The HOSTNAME attribute defaults to a value of 0 (zero). A value of 0 indicates that the user program has not changed the attribute, so the default value of HOSTNAME should be used, which is the value of the MYHOSTNAME attribute (the local system's hostname). A value of "." indicates that a port file with ANY hostname may be matched to this subport. The matching subport may be from any system in the BNA network, including the local system. Thus the value of HOSTNAME = "." means that ANY hostname will suffice (the subport is willing to communicate with a subport from any host in the network).

hostname=	zero	MYHOSTNAME	."	other
-----	----	-----	-----	-----
subports :	local*	local	any	as specified
LIO files:	local	local	local	as specified

When 0 (zero) is specified as the subport_index in a change_attributes communicate and the attribute is one of

COMPRESSION
 HOSTNAME
 YOURNAME
 YOURUSERCODE

The value of that attribute for all subports of the pprt will be set to the specified value.

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ON PORT AND SUBPORT ATTRIBUTES

MCP will allocate temp_disk for max_subports when port open or get/set is done. If max_subports is changed after the temp_disk is allocated, the temp_disk will be forgotten and reallocated for the new number of subports.

Both the PLM and MCP will have copies of some subport attributes. A user program set/get communicate is handled by the MCP only. The MCP copy stays updated via the PLM finish_port_open communicate.

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PORT File Attributes

ATTRIBUTE -----	NUMBER -----	NOTES -----
CENSUS	15	F, S, GET-OPEN
CHANGESUBFILE	1046	F, GET-OPEN
CHANGEEVENT	--	NOT ACCESSIBLE AS AN ATTRIBUTE
COMPRESSION	1037	S, GET, SET
CURRENTRECORD	--	NOT IMPLEMENTED
FILESTATE	97	S, GET
HOSTNAME	96	F, S, GET, SET-CLOSED
INPUTEVENT	--	NOT ACCESSIBLE AS AN ATTRIBUTE
INTNAME	42	F, GET, SET
LASTSUBFILE	1051	F, GET-OPEN
MAXCENSUS	1036	S, GET
MAXRECSIZE	50	F, S, GET, SET-CLOSED
MAXSUBFILES	1034	F, GET, SET-CLOSED-1ST
MYHOSTNAME	1032	F, GET
MYNAME	1031	F, GET, SET-CLOSED
OUTPUTEVENT	--	NOT ACCESSIBLE AS AN ATTRIBUTE
SECURITYGUARD	--	NOT IMPLEMENTED
SECURITYTYPE	67	F, GET, SET-CLOSED
STATE	72	F, GET
SUBFILEERROR	--	NOT IMPLEMENTED
TITLE	80	F, GET, SET-CLOSED
YOURNAME	1039	S, GET, SET-CLOSED
YOURUSERCODE	1040	S, GET, SET-CLOSED

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NOTES:

F THIS IS A FILE ATTRIBUTE.
S THIS IS A SUBFILE ATTRIBUTE.
GET IT IS LEGAL TO GET THIS ANYTIME.
SET IT IS LEGAL TO SET THIS ANYTIME.
GET-OPEN IT IS LEGAL TO GET THIS IF THE FILE IS OPENED.
SET-CLOSED IT IS LEGAL TO SET THIS IF THE FILE IS CLOSED.
SET-CLOSED-1ST .. IT IS LEGAL TO SET THIS IF THE FILE IS CLOSED.
AND IT IS SET BEFORE ANY SUBFILE ATTRIBUTES.

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Special Area for Subport Attributes

This data could occupy a maximum of 255 * 2 disk segments (maximum value for the max_subports attributes). Each subport's attributes will occupy two disk segments, for ease of calculation of the disk address of the attributes (by subport_index).

DECLARE

1 SUBPORT_ATTRS (MAX_SUBPORTS)	CHAR (360)	ATTR.# -----
3 DATA_COMPRESSION	BIT (1)	1037
default: true; ok: false.		
3 YOUR_HOSTNAME_WAS_NULL	BIT (1)	
3 YOUR_NAME_WAS_NULL	BIT (1)	
3 YOUR_USERCODE_WAS_NULL	BIT (1)	
3 FILLER	BIT (4)	
3 ACTUAL_MAX_MSG_TEXT_SIZE	BIT (16)	1038
get only		
3 YOUR_HOSTNAME	CHAR (17)	96
3 YOUR_NAME	CHAR (100)	1039
3 YOUR_USERCODE	CHAR (17)	
3 FILLER	CHAR (233)	
SUBPORT_STATE		1041
get only:		
CLOSED	0	
AWAITINGHOST	1	
OPENPENDING	2	
OPENED	3	
SHUTDOWN_IN_PROGRESS	4	
BLOCKED	5	
DEACTIVATION_PENDING	6	
DEACTIVATED	8	

Z omitted (not supported) subport attributes:

 LOGGING_INFO
 FILE_ERROR

port_file FIE layout

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1	FIB	BIT (FIB_SIZE_COMMON)	
3	FIB.COMMON	BIT (FIB_SIZE_COMMON)	
3	FIB.PORTFILES	BIT (FIB_SIZE_PORT - FIB_SIZE_COMMON)	
5	FILLER	BIT (44)	
5	NEXT_PORT	ADDRESS	
5	BACK_PORT	ADDRESS	
5	MAX_SUBPORTS	BIT (8)	
5	ACTIVE_SUBPORTS	BIT (8)	
5	LASTSUBPORT	BIT (8)	
5	ROUNDCROBIN	BIT (8)	
5	INPUTCOUNT	WORD	
5	OUTPUTCOUNT	WORD	
5	PORT_KEYS	BOOLEAN	
	PORT_CHANGE_EVENT	BOOLEAN	
	EVENT_COUNT	BIT (8)	
	EVENT_SUBP_INDEX	BIT (8)	
5	SUBPORT_ARRAY	BIT (52)	2 (MAX_SUBPORTS)
	7 SUBPORT_CHANGE_EVENT	BOOLEAN	
	7 SUBPORT_STATE	BIT (4)	
	7 SUBPORT_IN_PTR	ADDRESS	
	7 SUBPORT_OUT_PTR	ADDRESS	
	7 SUBFILE_ERROR	BIT (8)	

COMPLEX WAIT AND MESSAGE COUNT

Complex wait and message count will be supported for port files with no changes to the present communicate formats.

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DEBUGGING TOOLS

The ODT command NW AUDIT ON causes BNA modules to begin writing trace information to a queue file. It also causes the execution of the utility program BNA/TRACE, which reads this queue file and records the data in file BNA/AUDIT.FILE. If the device type of BNA/AUDIT.FILE is DISK, the file can be created as a circular wrap-around file with up to 65535 X 180 byte records, as selected by BNA/TRACE program switches 6-9. For example, if these switches equal 21FFF2, a wrap-around file with 8191 records will be created. If they equal 0, a sequential file will be created.

The ODT command NW AUDIT OFF causes BNA modules to close the trace queue file. After all modules have closed the trace file, program BNA/TRACE will go to normal EOJ. At this point, file BNA/AUDIT.FILE can be analyzed by the utility program BNA/AUDIT.

Because this tracing function seriously affects BNA performance, it should only be used when attempting to isolate BNA problems.

DC/AUDIT INTERFACE IN NETWORK SERVICES

The BNA Network Services program BNA/NSP supports the interface to the DC/AUDIT system program which is common to all B1900/B1800 data comm system software including NDL. Usage of this feature is identical to the manner used in a Network Controller, namely:

<job no.>AXIOLG

This ODT message is entered to the BNA/NSP program. Leading and trailing blanks are permitted but imbedded blanks are not. When the message is entered at a time when the BNA/NSP program is not writing to the DC/AUDIT.FILE the file is opened and the following message is displayed:

"IOLG STARTED: <DATE> <TIME>"

If in trying to open the DC/AUDIT.FILE it was found that the file was not available for use, auditing is not started and the following message is displayed:

"FILE "DC/AUDIT.FILE" LOCKED".

If the operator ODT message is entered at a time when the BNA/NSP program is writing to the DC/AUDIT.FILE auditing is stopped, the file closed and the following message displayed:

"AUDIT FILE CLOSED AT <TIME> ON <DATE>."

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USING THE DC/AUDIT PROGRAM TO OUTPUT A BNA/NSP AUDIT

No changes have been made to the DC/AUDIT program to specially format data from a BDLC data comm line. Although the DC/AUDIT program will output the data correctly with the default parameter settings or any of the possible parameters, it is simpler to examine the data if the following (non-default) parameters are used:

"IO.DESC=1 OUTPUT=H"

These will cause the output to be written in hex form and the entire IO descriptor for each operation to be written.

USE OF PROGRAM SWITCHES IN NETWORK SERVICES

The Network Services program, BNA/NSP, uses its program switches for selecting various debugging aids. The specific use of each switch is as follows:

Switch	Value	Meaning
-----	-----	-----

- | | | |
|------|--|--|
| sw 0 | | Traces program flow. Information output to file "FLASHFILE." |
| | bits (bit 0 is MSB; "0" = off, "1" = on) | |
| | 0 1 2 3 | |
| | | |
| | +-----> | BDLC Station Group. |
| | +-----> | Station Level Manager (SLM). |
| | +-----> | Router Level. |
| | +-----> | Port Level. |
| sw 1 | NEQ 0 | Creates a new SIZEFILE and goes to EOJ. (File "SIZEFILE" contains information about structure sizes required by the Network Services Manager (NSM) to calculate the dynamic memory needed by BNA/NSP). |
| sw 2 | NEQ 0 | Causes additional SLM data to be written to file "FLASHFILE". (sw 0 outputs a minimum amount.) |
| sw 3 | NEQ 0 | Has the same effect as <Job No.>AXILOG. |
| sw 4 | | Is not used. |
| sw 5 | NEQ 0 | Generates a trace of all procedures invoked as BNA/NSP executes. |
| sw 6 | = 1 | Forces the SLM to generate a Neighbor Restart condition. Used for testing only. |

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sw 7, 8, 9 Selective Audit for BNA/TRACE (0 = off, 1 = on).

sw 7 B i t s

0 1 2 3

1 1 1 1

1 1 1 +-----> Router Level data and control info.

1 1 +-----> Only Router level control information.

1 +-----> Port Level data and control information.

+-----> Only Port level control information.

sw 8 0 1 2 3

1 1 1 1

1 1 1 +-----> SLM control information.

1 1 +-----> EDLC information.

1 +-----> X.25 level data and control information.

+-----> Only X.25 control information.

sw 9 0 1 2 3

1 1 1 1

1 1 1 +-----> Reserved for future use.

1 1 +-----> Reserved for future use.

1 +-----> For BLACKBOX information.

+-----> For auditing Network Services Outer Loop
 information.

USE OF PROGRAM SWITCHES IN HOST SERVICES PROGRAM

SWITCH

MEANING

SWITCH 0

Equal to 1 causes debug traces; other values are reserved.

SWITCH 1

Equal to 1 causes normal trace to be started from BOJ; this switch is not examined after BOJ.

SWITCH 2

Equal to 1 causes HSP to keep the "saved" and "overflow" files open.

SWITCH 3

Equal to 1 causes HSP to keep the "messages" file open.

SWITCH 4-9

Reserved

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EXCEPTION FROM THE BNA STANDARD

This is a list of differences in our implementation from the specifications or from Mission Viejo. The symbol "M" refers to the fact that implementation is different from that of Mission Viejo and the symbol "S" refers to differences from the specs.

- M S 1. We have a limitation of approximately 400 in our host node table.
 A. The standard assumes no limitations.
- M S 2. We have added a response type of 8 to the SLM greeting message to indicate insufficient resources.
 A. The standard only had seven denial reasons.
- M S 3. We have only 5 correction ports per neighbor.
 A. The standard was recently increased to ten.
- M S 4. The SLM returns a positive response immediately to an ESTABLISH call if the stations are permanent.
 A. The standard states that ALL stations in an ensemble must have been acted upon before returning a response to the NSM.
- M S 5. MYNAME is limited to thirty characters.
 A. The specification requires 100 character strings.
- M S 6. Job transfer from a card deck requires:
 ?AT PADUCHA
 ?STREAM BIG/JOB;
 foreign deck
 ?TERMINATE;
 A. The standard allowed implementors to define their own end card only.
- M 7. Our usercodes are one level. A remote usercode that is the same as a local usercode may access the same files.
 A. The specifications state nothing in this area.
- M S 8. Our logical I/O always sends the common subset of attributes. Our MCP does not know which attributes are set by the user.
 A. The specification says to those attributes set by the user.
- M 9. SEEK is not implemented.
 A. The function of seek is not described in the logical I/O protocol.

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10. B1000 will not support optional program_name on connect at remote host, but will send it from local host.
- M 11. We cannot run ports in an isolated mode without PLM, NSP, NSM.
A. BNA specifications do not require this feature.
- M S 12. We do not have event type attributes. That is, you cannot test such an attribute by doing a GET on it.
A. The USER Interface specification refers to these type of attributes; however this specification has not been distributed for sign off.
- S 13. SBP does not have logging and monitoring.
A. The specifications call for logging and monitoring.
- M S 15. Our max message text size defaults to 2000 characters.
A. The standards assume no maximum.
- M S 16. We have not implemented subport error at the subport level.
A. The specifications call for a subport error attribute.
- M S 17. We have implemented only one level of itinerary.
A. The host services specification defines itinerary as a string of unknown length containing identification of successive hosts thru which this job stream may have been executed.
- S 18. We have not implemented program agents.
A. The specifications call for program agents.
- M S 19. We have a physical record size of 8185 characters.
A. The specifications assume no limit to physical or logical records.
- M S 20. Our naming conventions do not agree to the CSG file standards.
A. The specifications assume CSG standards.
- M S 21. We do not have guard files.
A. The specifications do not explicitly require this feature but there are references to its use.
- M S 22. We have fixed resume ready value for ports.
A. The specification defines a resume ready attribute settable by the user.
- M S 23. Our message queue limits are fixed at BNA initialization time.
A. The specifications allow the user to set these attributes at port open time.

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- M S 24. Our implementation only allows 255 subports to be open at a given time.
 A. The specifications assume no limitation.
- S 25. We have not implemented any part of X.25.
 A. The specifications for X.25 are now available.
- M S 26. We do not allow max segment size to change.
 A. The specifications define a method for two nodes to change max segment size between them.
27. For the first release the only user language that will have a port interface will be COBOL74.
 A. The USER Interface specification defines several others.
28. SYSTEM/COPY, when operating thru BNA, will have several restrictions. ADD, CNTD, COMPARE, the creation of library tapes, NAME/= and our LABELS construct, will not be supported.
 A. The BNA specifications do not cover SYSTEM/COPY.
- M 29. This is a list of our implementation's required size attributes. These attributes are noted to be implementation defined in the DIM specification.

MAX TEXT SIZE
 MAX HOSTS
 MAX BDLC STATIONS
 MAX NEIGHBORS
 HS PROGRAM NAME
 LIO COOP PROGRAM NAME
 NS PROGRAM
 PLM PROGRAM
 TRANSIT NODE ONLY

- A. NSO has requested in the past to be kept abreast of these type of requirements.

- M(?)S 30. For clear call with neighbor or by ensemble, the SLM returns a separate response for each station closed down. The standard states that a single response be returned when closing actions for all affected stations are complete.

31. The following logical I/O features are not implemented:

OPEN EXTEND
 MULTIFILE TAPE
 REWRITE
 LINAGE FOR PRINTERS
 CODESET IN COBOL
 MULTI REEL FILES
 MULTI PACK FILES

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32. We have not implemented OPEN ALL and BROADCAST WRITE DON'T WAIT for port files.
33. For port files and logical I/O files we support BLOCK STRUCTURE = FIXED.
34. MAXSUBFILE attribute must be set before any other attributes are set.
35. The ATTACH message in the Station Transfer Protocol is not supported.
36. The AUTHORIZE command in the DIM spec is not supported. We allow privileged usercodes to change network parameters, all other usercodes may only do inquiry.
37. The "more bit" in the logical I/O protocol is implemented on the co-operating side but not the initiating side.
38. Compression is not supported at the record level. Although the compression attribute for port files may be set at any time, due to the asynchronous design of the system, it may take effect before all previously queued messages are transmitted.

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BNA MESSAGE FILE

The BNA message file is a CANDE compatible data file. It contains all messages or partial phrases used in BNA. Its availability is meant to ease the operation of BNA with a foreign language.

This file is accessed by the Network Services Program and each copy of the Host Services Program. Any output generated that contains a message from this file will start with the number that is the absolute key into this file. Example: 129 END OF INQUIRES.

Since this file is CANDE compatible, an example of the CANDE commands to change the file are given here:

```
GET BNA/MSGs  
P 12900
```

Change the END OF INQUIRIES message.

```
SAVE AS *BNA/MSGs
```

(The asterisk should be used if CANDE is using security.)

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RECORD ZERO RECORD ZERO RECORD ZERO RECORD ZERO
 ADB NS ATTRIBUTE NOT SETTABLE.

ATTRIBUTE UNKNOWN.

ATTRIBUTE NOT SETTABLE NOW.

ADB NS

ATTRIBUTE VALUE IS INVALID.

ATTRIBUTE NOT GETTABLE.

ATTRIBUTE NOT IMPLEMENTED.

ADB NS

ADB NS

ADB NS

BNA PORT LEVEL MANAGER INTERNAL ERROR AT SEQUENCE NUMBER:
 NETWORK SERVICES PROGRAM RELEASE LEVEL NOT COMPATIBLE WITH PLM
 MCP RELEASE LEVEL NOT COMPATIBLE WITH PLM
 PLM RECEIVED FRAME WITH INVALID MSG TYPE FROM HOST:
 PLM RECEIVED UNEXPECTED CONTROL FRAME FROM HOST:
 PLM NODE TABLE EXHAUSTED (NOT FATAL)
 PLM TASK TABLE EXHAUSTED (NOT FATAL)
 PLM PORT TABLE EXHAUSTED (NOT FATAL)
 PLM SUPPORT TABLE EXHAUSTED (NOT FATAL)
 PLM CANDIDATE TABLE EXHAUSTED (NOT FATAL)
 CONNECTION WAS ACCEPTED.
 ADDED AS A STATION.
 ADAPTER MUST BE LESS THAN SIXTEEN.
 ADAPTER MUST BE ZERO.
 ATTRIBUTE TABLE IS TOO SMALL.
 PORT ADDRESS MUST BE 1, 2, 3 OR 4.
 BDLC STATION GROUPS IS GREATER THAN MAXIMUM NODE ADDRESSES.
 BDLC STATION GROUPS IS LESS THAN MAXIMUM NEIGHBORS.
 CHANNEL IS GREATER THAN FOURTEEN.
 CHANNEL MUST BE ZERO.
 CALL CLEARED WITH STATION
 CALL DATA IS NOT ALLOWED, PERMANENT ENSEMBLE IS SPECIFIED.
 CALL WAS ESTABLISHED OR INITIATED BY
 CALL(S) WAITING BY STATION
 CLEARED.
 HAS BEEN CLOSED.
 MANUAL COMMAND SERVICED ON
 CONTINUED.
 IMPROPER ENSEMBLE KIND.
 DELETED AS A HOST.
 DELETED AS A NODE.
 DELETED AS A PROFILE.
 DELETED AS A STATION.
 DELETED AS AN ENSEMBLE.
 DISCARDED.
 THIS ENSEMBLE OR STATION IDENTIFIER ALREADY EXISTS.
 NO SUCH ENSEMBLE.
 AN END OF FILE WAS ENCOUNTERED WHILE READING THE INPUT FILE.
 FILE ALREADY SUSPENDED.
 FILE LOADING IN PROCESS.

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FILE NOT PRESENT.
STOPPED.
GET ATTRIBUTE FAILED. INTERNAL NSM ERROR AND DIE.
HOST OR NODE WAS ALREADY ADDED.
HOST NAME AND NODE ADDRESS DO NOT MATCH.
ADDED AS A HOST.
HOST NAME DOES NOT MATCH THE SYSTEM HOST NAME.
SYSTEM HOST NAME IS NOT SET. BNA WILL NOT RUN.
HOST NAME OR NODE ADDRESS WAS NOT FOUND.
INITQUANTITY WAS SPECIFIED BUT CONNECTION TYPE WAS NOT OUTGOING.
INITQUANTITY MUST BE BETWEEN ZERO AND ENSEMBLE SIZE.
INITQUANTITY MUST BE ZERO OR ONE.
THIS ATTRIBUTE CAUSES INITIALIZE TO FAIL. INTERNAL NSM ERROR AND DIE.
INITIALIZATION DATA ENTRY PHASE COMPLETE.
INVALID PHASE CHANGE. INTERNAL NSM ERROR AND DIE.
LOADING.
LOADING FOR SYNTAX.
MAXIMUM NODE ADDRESSES IS LESS THAN MAXIMUM HOSTS.
MAXIMUM NODE ADDRESSES IS LESS THAN MAXIMUM NEIGHBORS.
MAXIMUM NODE ADDRESSES IS LESS THAN MAXIMUM POTENTIAL NEIGHBORS.
MODIFIED AS A STATION.
MISSING ADAPTER.
IS AN ATTRIBUTE THAT NEEDS TO BE SET BUT WASN'T.
MISSING "BY".
OUTGOING CONNECTION REQUIRES CALL DATA. NONE PRESENT.
MISSING ":".
MISSING ",".
MISSING "HOST".
HOST NAME NOT SPECIFIED.
MISSING "(".
NODE ADDRESS NOT SPECIFIED.
MISSING "ON".
"PERMANENT", "INCOMING" OR "OUTGOING" REQUIRED.
MISSING "+" OR "-".
MISSING QUOTE.
MISSING ")".
MISSING "SYNTAX".
MISSING "STATION".
MORE SYNTAX WAS REQUIRED.
MISSING "WITH".
ADDED AS A NODE.
NODE ADDRESS NOT ALLOWED ON ESTABLISH CALL TO A PERMANENT STATION.
NUMBER WAS REQUIRED.
NODE ADDRESS WAS LESS THAN 1 OR GREATER THAN 65534.
NO FILE BEING LOADED.
THERE WAS NO INITIALIZATION FILE.
NO SUSPENDED FILE.
BNA SYSTEM ERROR. MESSAGE GIVEN TO THE NSM WAS NOT A REPORT.
NOT COMPILED IN.
SPECIFIED NUMBER OF BDLC STATION GROUPS WAS INCREASED.
NOT IMPLEMENTED.
NOT MODIFYABLE.
NOT SETTABLE.
COMMAND OR ATTRIBUTE IGNORED DURING INITIALIZATION.

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NETWORK SERVICES REJECTED COMMAND. NSM INTERNAL ERROR AND DIE.
COMMAND OR ATTRIBUTE ACCEPTED ONLY DURING INITIALIZATION.
PHASE CHANGE NOT OK. NSM INTERNAL ERROR AND DIE.
MAXIMUM POTENTIAL NEIGHBORS IS LESS THAN MAXIMUM NEIGHBORS.
UNKNOWN PROFILE IDENTIFIER.
READIED.
ATTRIBUTE EXCEEDS RANGE LIMITATIONS.
ROUTING INFORMATION REFRESHED.
ROUTER VALIDATE IS ON AND THIS NODE ADDRESS IS UNKNOW.
STATION READIED.
STATION SAVED.
TRANSITNODEONLY WAS SET TRUE BECAUSE MAXIMUM HOSTS WAS ZERO.
SAVED
TAKE A DUMP AND LIST ATRFL.
TOO MANY IDENTIFIERS. NSM INTERNAL ERROR AND DIE.
NO MORE THAN TWO PROFILES MAY BE SPECIFIED.
STATION TABLE IS FULL. MAY NOT ADD UNLESS SOME ARE DELETED.
TRACE STARTED:
TEXT SENT TO
UNKNOWN SYNTAX.
UNKNOWN STATION IDENTIFIER.
ROUTER VALIDATE IS FALSE, COMMAND HAS NO MEANING.
ADDED AS AN ENSEMBLE.
MODIFIED AS AN ENSEMBLE.
FROM
NOT AN EVEN NUMBER OF HEX DIGITS.
NOT ALL HEX CHARACTERS.
MISSING EQUAL SIGN.
UNKNOWN PROFILE IDENTIFIER.
MAXIMUM NODE ADDRESS IS LESS THAN LOCAL IDENTITY.
AN INCOMING ENSEMBLE SHOULD HAVE BEEN SPECIFIED.
UNAVAILABLE
UNAVAILABLE, INVALID
INACTIVE
GREETING
TERMINATING
INTERRUPTED
ACTIVE
MAX SEGMENT SIZE =
SUBPORTS IN USE =
PROTOCOL LEVEL IN USE =
NODE ADDRESS IS GREATER THAN MAXIMUM NODE ADDRESS.
END OF HOST SUMMARIES.
TEST ECHGED FROM
TEST RECEIVED FROM
REACHABLE
UNREACHABLE
NODE SUMMARY DONE.
END ROUTINGS INQUIRY.
NO ROUTINGS AVAILABLE.
NO KNOWN NODE TO SUMMARIZE.
HOP COUNT =
RESISTANCE FACTOR =
END OF PROFILE INQUIRY.

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NO PROFILES PRESENT.

MESSAGE HEADER-LEVEL IS INVALID FOR THIS VERSION OF HOST SERVICES
RECEIVED AN INCORRECT MESSAGE RESPONSE-TYPE
RECEIVED AN INCOMPATIBLE MESSAGE TEXT-SIZE
RECEIVED AN UNEXPECTED MESSAGE-TYPE
RECEIVED A PARTIAL STRUCTURE
RECEIVED AN INVALID STRUCTURE-CODE
AN EXPECTED STRUCTURE WAS NOT FOUND
UNRECOGNIZED FILE-ATTRIBUTE
UNRECOGNIZED FILE-ATTRIBUTE VALUE
UNRECOGNIZED TASK_ATTRIBUTE
UNRECOGNIZED TASK_ATTRIBUTE VALUE
PROTOCOL-VERSIONS ARE INCOMPATIBLE
USERCODE IS INVALID
CHARGECCODE IS INVALID
TAG-LENGTH IS INVALID
REQUEST OR RESPONSE LENGTH IS LESS THAN THE MINIMUM
EXPECTED A COMMA
EXPECTED A LEFT PARENTHESIS
EXPECTED A RIGHT PARENTHESIS
EXPECTED A SEMICOLON
EXPECTED AN EQUAL SIGN
ACCESSCODE IS INVALID
HOST SERVICES WILL NOT CONVERSE IN THIS DIALOG
COOPERATING SIDE OF DIALOG WAS TERMINATED
RECEIVED AN UNKNOWN MESSAGE RESPONSE-TYPE
RECEIVED EXTRA DATA AT THE END OF A MESSAGE
RECEIVED AN INCORRECTLY FORMATTED STRUCTURE
ATTRIBUTE PARAMETER IS INVALID
TAG IS UNRECOGNIZED
PROTOCOL IS NOT SUPPORTED
NO RESOURCES ARE AVAILABLE
A REQUIRED ATTRIBUTE WAS NOT FOUND
AN EXTRANEIOUS ATTRIBUTE WAS FOUND
UNRECOGNIZED STATION-ATTRIBUTE
UNRECOGNIZED STATION-ATTRIBUTE VALUE
RECORDSIZE IS ILLEGAL
RECEIVED A PARTIAL MESSAGE
INVALID OPEN-TYPE
INVALID POSITION SPECIFICATION
INVALID MOTION SPECIFICATION
INVALID LABEL SPECIFICATION
INVALID CLOSE-TYPE
INVALID ASSOCIATION SPECIFICATION
INVALID DISPOSITION SPECIFICATION
INVALID COMBINATION OF CLOSE PARAMETERS
INVALID REQUEST SPECIFICATIONS
IO-LENGTH IS OUT OF RANGE
INVALID FUNCTION SPECIFICATION
INVALID UNITFEATURE CODE
UNITFEATURE VALUE IS OUT OF RANGE
FILE WAS NOT RETAINED ON A RE-OPEN REQUEST
IO-ERROR OCCURED
MAXRECSIZE IS GREATER THAN MAX-REQUESTSIZE

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UNACCEPTABLE DATA-TRANSFER LENGTH
CONNECT DENIED: NO PROCESS AVAILABLE
ATTACH DENIED: NO STATION AVAILABLE
CONNECT/ATTACH DENIED: INCOMPATIBLE MYUSE VALUE
CONNECT DENIED: NO VIRTUAL LSN AVAILABLE
ABORTED FOR HOST-SPECIFIC REASON
RECEIVED AN UNKNOWN ERRORCODE VALUE
RECEIVED AN INVALID ERRORPOINTER VALUE
RECEIVED AN INVALID STRUCTUREPOINTER VALUE
TIMEOUT OCCURED
ABORTED BY THE OPERATOR
A HEADERERROR WAS DETECTED IN A PREVIOUS MESSAGE
THIS STATION IS NOT CONNECTED
CONNECT IS NOT COMPLETE
DISCONNECT IS NOT COMPLETE
THIS STATION IS ALREADY CONNECTED
NO STATION SUB-PORTS AVAILABLE
FILE-MISSING ON PORT OPEN
FILE-LOCKED ON PORT OPEN
CHANGE STATION SUB-PORT NAMES FAILED
END OF CANDIDATE INQUIRY.
PORT-READ OVERFLOW OCCURED
NETWORK SERVICES NOT RUNNING.
ADDED AS A PROFILE.
"ON" OR "OFF" REQUIRED.
"SET" OR "RESET" REQUIRED.
PROFILES MUST BE THE SECOND REQUESTS IN A STATION DECLARATION.
PLM SUBPORT DIALOG ESTABLISHMENT FAILURE
ERROR IN MESSAGE FROM
TABLE IS EMPTY.
NO CANDIDATES EXIST WITH PORTNAME:
SUBPORT-INDEX =
JOB# =
PROGRAM-NAME =
YOUR-HOST =
YOUR-NAME =
YOUR-UC =
MY-HOST =
MY-NAME =
MY-UC =
SEC =
PUBLIC
PRIVATE
MATCHING-STATUS =
NOT-OFFERED
OFFER-OUTSTANDING
MATCH-FOUND
TO-BE-CLOSED
INCOMING-OFFER
PORTNAME =
PLM RECEIVED AN INVALID BEGIN-ACK FRAME FROM HOST:
DISCONNECTED FROM HOST:
CONNECT DENIED TO HOST:
CONNECTED TO HOST:

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LOCAL AND REMOTE SIGNALS ARE THE SAME; LOCAL SHOULD BE CHANGED.
 CONNECT INITIATED TO HOST:
 REQUESTOR INFORMATION NOT IN REQUEST-QUEUE FOR STATION:
 SUB-PORT OPEN FAILED FOR STATION:
 DISCONNECT INITIATED BY REMOTE HOST:
 VALIDATE MUST COME BEFORE ANY HOST OR NODE DECLARATIONS.
 SHUTDOWN CANNOT BE CANCELLED.
 NETWORK SERVICES PROGRAM ERROR AT SEQUENCE:
 PLM/NETWORK SERVICES VERSION MISMATCH; CAN NOW ONLY TRANSIT TRAFFIC.
 RETRIES EXHAUSTED ON PLM CONTROL FRAME DESTINED FOR HOST #
 RETRIES EXHAUSTED ON SUBPORT FRAME DESTINED FOR HOST #
 INVALID PLM CONTROL FRAME RECEIVED FROM HOST #
 FRAME ADDRESSED TO INVALID DESTINATION PORT/SUBPORT RECEIVED FROM HOST #
 FRAME RECEIVED FROM INVALID ORIGINATING PORT/SUBPORT ADDRESS FROM HOST #
 FRAME WITH INVALID PORT TYPE RECEIVED FROM HOST #
 ERROR: HOST ADDRESS IS OUT OF RANGE.
 ERROR: HOST IS ALREADY VALID.
 ERROR: HOST HAS ACTIVE SUBPORTS.
 ERROR: HOST IS ALREADY INVALID.
 ERROR: ATTRIBUTE CANNOT BE SET NOW.
 ERROR: CORRECT SYNTAX IS CONNECT TO HOSTNAME.
 ERROR: REMOTE HOST IS NOT REACHABLE:
 ERROR: NO STATION XFER PORTS AVAILABLE AT THIS TIME.
 UNABLE TO SPAWN HOST SERVICES JOB.
 ERROR: EXPECTED "CONNECT", "US", OR "BYE" BUT GOT:
 CANCEL SHUT DOWN NOT DONE. THERE WAS NONE IN PROGRESS.
 FAST SHUT DOWN NOT DONE. SHUT DOWN HAS PROGRESSED TOO FAR.
 SHUT DOWN MESSAGE IGNORED. SHUT DOWN ALREADY IN PROGRESS.
 REFERENCE NUMBER =
 ROUTING STATUS TO
 CHANGED
 ROUTING TRACE FROM
 TRANSIT COUNT =
 SOURCE =
 DESTINATION =
 MY RESISTANCE FACTOR =
 PATH RESISTANCE FACTOR =
 LINK RESISTANCE FACTOR =
 OPEN CONNECTION PORT DIALOG FAILED.
 OPEN STATION DIALOG FAILED.
 RECEIVED RESOLUTION RESPONSE-TYPE
 CONNECTION PORT DIALOG CLOSED.
 STATION DIALOG CLOSED.
 TEST FRAME RECEIVED.
 TEST FRAME RECEIVED (NO TEXT).
 BDLG STATION GROUP FRAME RECEIVED.
 CALL INCOMING.
 REMOTE BUSY SET/RESET.
 I-FRAME RESPONSE RECEIVED.
 CONNECTION PORT DIALOG OPEN/CLOSED.
 INVALID BDLG ADDRESS RECEIVED.
 NON OCTET BDLG FRAME RECEIVED.
 SHORT BDLG FRAME RECEIVED.
 UNEXPECTED CONNECTION PORT DIALOG CLOSED.

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NON BNA CALLER.
LOCAL LINK RESET.
BDLC FRMR RECEIVED.
RETRIES EXHAUSTED ON OPEN STATION DIALOG.
REMOTE LINK RESET.
BDLC FRMR SENT.
CM OR DISC RECEIVED [OPEN STATION DIALOG].
STATION DIALOG REOPENED.
UNEXPECTED UA OR CM RECEIVED.
RETRY COUNT EXCEEDED.
NO MEMORY.
MEMORY AVAILIABLE.
BDLC MONITOR REPORT.
CONNECTION PORT DIALOG ALREADY OPEN.
CONNECTION PORT DIALOG ALREADY CLOSED.
CONNECTION PORT DIALOG PENDING OPEN.
CONNECTION PORT DIALOG PENDING CLOSE.
STATION DIALOG NOT CLOSED.
CONNECTION PORT DIALOG NOT OPEN.
STATION DIALOG NOT OPEN.
STATION DIALOG ALREADY CLOSED.
STATION DIALOG PENDING OPEN.
STATION DIALOG PENDING CLOSE.
CONNECTION PORT IN INVALID STATE.
DSR RESPONSE TIMER TIMEOUT.
CTS RESPONSE TIMER TIMEOUT.
UNEXPECTED DSR OFF.
UNEXPECTED CTS OFF.
DCD OFF DELAY TIMER TIMEOUT.
DIAL HANDLER IN INVALID STATE.
NO PHONE NUMBER, CALL FAILED.
UNEXPECTED PHI OFF, CALL FAILED.
UNEXPECTED COS ON, CALL FAILED.
ACU RESPONSE TIMER TIMEOUT, CALL FAILED.
ACR ON, CALL FAILED.
DIAL RETRY COUNT EXCEEDED, CALL FAILED.
UNEXPECTED DLO OFF. CALL FAILED.
TEXT TOO LONG.
CONNECTION PORT DIALOG CLOSED.
TEST SENDER NOT RESET.
FRMR RECEIVED.
SABM RETRY COUNT EXCEEDED.
CM RECEIVED.
DISC-1 RECEIVED.
DISC-2 RECEIVED.
DIAL RESPONSE TIMER TIMEOUT.
DISC RETRY COUNT EXCEEDED.
F-RESPONSE TIMER TIMEOUT.
NO NAME/VALUE.
NO NAME.
COMMAND NOT IMPLEMENTED.
INVALID.
CONNECTION PORT DIALOG STATUS BAD.
SLM SENDER NOT RESET.

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NO MEMORY AVAILABLE.
STATION LOG REPORT FROM
DISCONNECTED
FRAME =
BDLC FRAME RECEIVED COUNTER =
FCS FAILURE COUNTER =
BDLC FRAME SENT COUNTER =
I-FRAME SENT COUNTER =
SHUT DOWN OF NETWORK MODE CANCELLED.
SHUT DOWN OF NETWORK MODE STARTED.
FAST SHUT DOWN OF NETWORK MODE STARTED.
MISSING "TD".
SHUT DOWN NOT STARTED. STILL INITIALIZING.
ATTEMPTED MODIFICATION(S) INVALID. (SLM)
UNKNOWN ATTRIBUTE.
CANNOT SET ATTRIBUTE NOW BECAUSE OF STATION STATE OR SLM_PHASE.
ATTRIBUTE CAN NEVER BE SET.
ILLEGAL VALUE FOR ATTRIBUTE.
ATTRIBUTE CANNOT BE SET VIA THIS COMMAND.
VALUES/ATTRIBUTES SPECIFIED IN LIST PRODUCE INVALID RELATIONSHIPS.
REQUIRED ATTRIBUTES ARE MISSING.
STATION INDEX IS INVALID.
STATION TYPE IS INVALID.
STATION(S) IN LIST DO NOT MEET ENSEMBLE COMPATIBILITY CHECKS.
STATION IS ALREADY IN AN ENSEMBLE OF THE SAME TYPE.
NO NEIGHBOR TABLE ENTRY AVAILABLE IN SLM.
NO FREE CONNECTION TYPE ENTRY.
ILLEGAL CONNECTION; STATION ALREADY IN ENSEMBLE OF SAME DIRECTION.
CALL DATA NOT PRESENT.
UNABLE TO OBTAIN A FRAME CONTAINER (SLM).
STATION IS ALREADY ATTACHED.
NO STATION AVAILABLE.
COMMAND OR FEATURE NOT IMPLEMENTED YET.
INVALID ENSEMBLE TYPE.
STATION IS UNAVAILABLE - IN USE.
ADD CONNECTION NOT PREVIOUSLY DONE.
GREETING1 MSG FROM REMOTE STATION FAILED VALIDATION.
GREETING2 MSG FROM REMOTE STATION FAILED VALIDATION.
*** SYSTEM ERROR *** SLM NEIGHBOR TABLE INTEGRITY COMPROMISED.
ILLEGAL SLM PHASE.
TEXT SIZE GREATER THAN NMSS.
*** SYSTEM ERROR *** NEIGHBOR TABLE ENTRY (SLM) NOT FOUND (NNA,STA-ID)=
CLEAR CALL OR SAVE STATION CMD FORCED ABORT OF CALL IN PROCESS (STA-ID).
NEIGHBOR NODE ADDRESS IS UNKNOWN TO SLM.
SORRY, X.25 CAPABILITY NOT YET IMPLEMENTED.
STATION DIALOG/CONN. PORT CLOSED BY STATION GROUP.
SLM GREETINGS INTERCHANGE FAILED BECAUSE GREETING TIMER EXPIRED.
STATION ALREADY CLOSED.
NO FRAME CONTAINERS AVAILABLE TO OPEN STATION DIALOG (SLM).
INCOMING CALL CANCELS OUTGOING CALL PREVIOUSLY INITIATED.
NEIGHBOR NODE ADDRESS REQUIRED TO PLACE CALL ON BDLC SWITCHED ACU STATION.
CALL BEING CLEARED; NO FRAMES FOR GREETINGS DURING NEI RESTART (STA-ID).
NO AVAILABLE NEIGHBOR TABLE ENTRY FOR NEIGHBOR RESTART.
CALL BEING CLEARED; NO FRAMES FOR GREETINGS DURING LINK RESET. STA-ID =

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CAN'T DELETE; STATION IS NOT CLOSED.
ERROR IN MESSAGE FROM
INVALID PRECEDENCE VALUE :
INVALID FRAME TYPE :
TRANSIT COUNT OVERFLOW
INVALID DESTINATION :
INVALID FRAME FORMAT, TYPE =
INCOMPATIBLE LINK CHANGE VERSION :
LINK CHANGE ORIGINATOR NOT MY NEIGHBOR
UNKNOWN LINK CHANGE CAUSE :
INCONSISTANT LINK CHANGE MAXRF =
& MAXHC =
INVALID LINK CHANGE ORIGINATOR
NET CHANGE ORIGINATOR NOT MY NEIGHBOR
INVALID NET CHANGE SUBJECT :
TRACE RESULT DESTINATION UNREACHABLE :
UNKNOWN FRAME FORMAT, TYPE =
INVALID ORIGINATOR OF CONTROL FRAME
ERROR: SPECIFIED NODE NOT A NEIGHBOR
ERROR: SPECIFIED NODE DOES NOT EXIST
FRAME UNDELIVERABLE
UNKNOWN COMMAND
CAN NOT DELETE A NEIGHBOR
CAN ADD OR DELETE INVALID NODE ADDRESS
TOO MANY NEIGHBORS FOR ROUTER TABLE
TOO MANY PHYSICAL LINKS FOR ROUTER TABLE
CAN NOT DETACH NODE NOT NEIGHBOR
CAN NOT DETACH UNKNOWN PHYSICAL LINK
ROUTER ATTRIBUTE CAN NOT BE GOTTEN
ROUTER ATTRIBUTE CODE UNKNOWN
CAN NOT CHANGE LINK RF FOR NODE NOT NEIGHBOR
CAN NOT RESTART FOR NODE NOT NEIGHBOR
DESTINATION OF TEXT UNKNOWN
DESTINATION OF TEXT UNREACHABLE
TEXT IS TOO LONG FOR MAX SEGMENT SIZE
ROUTER ATTRIBUTE CAN NOT BE SET
ROUTER ATTRIBUTE CODE UNKNOWN
ROUTER ATTRIBUTE MAY NOT BE SET DURING PRESENT PHASE
ROUTER ATTRIBUTE MAY NOT BE SET AFTER INITIALIZATION
ROUTER ATTRIBUTE VALUE OUT OF RANGE
TRACE DESTINATION UNREACHABLE
TRACE DESTINATION UNKNOWN
TRACE SOURCE & DESTINATION CAN NOT BE THE SAME
TRACE SOURCE UNKNOWN
TRACE SOURCE UNREACHABLE
DIALOG-ABORT INITIATED
DIALOG-COMPLETE INITIATED
JOBXFERQ QUEUE OVERFLOW, REQUESTED TRANSFER IGNORED.
JOB BEING FLUSHEC.
FRAME DOES NOT CONTAIN USER DATA; FRAME HAS SUBPORT CONTROL INFO, TYPE =
RESTARTING.
'AT' NOT ALLOWED WITHIN ANOTHER 'AT' COMMAND.
NO TEXT FOLLOWING 'AT' COMMAND.
INSUFFICIENT MEMORY FOR ROUTER TO ACCEPT COMMAND; TRY LATER.

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INSUFFICIENT MEMORY FOR ROUTER TO CONTINUE TRACE FROM NODE #
 INSUFFICIENT MEMORY FOR ROUTER TO RESPOND TO REFRESH COMMAND FROM NODE #
 PLM REMOTE FILE OPEN DENIED. STATION TRANSFER DISABLED.

INCORRECT FILEKIND FOR JOB TRANSFER.
 EC REQUIRES A 'BDLCSWITCHEDACU' STATION IF CALldata IS SPECIFIED.
 CAN'T DELETE; STATION IS STILL IN AN ENSEMBLE OR USING A CONNECTION.
 CAN'T DELETE; STATION IS STILL USING A CONNECTION.
 NO STATIONS IN THIS ENSEMBLE OR INVALID ENSEMBLE-ID.
 STATION(S) TO BE DELETED FROM ENSEMBLE NOT MEMBER(S) OF ENSEMBLE.
 CAN'T REMOVE STATION; CONNECTION ACTIVE VIA THIS ENSEMBLE.
 'MODIFY ENSEMBLE' CANNOT BE USED TO DELETE THE LAST STATION IN ENSEMBLE.
 CAN'T DELETE ENSEMBLE BECAUSE CONNECTION(S) VIA IT STILL EXIST.
 CONNECTION ENTRY NOT FOUND.

CALL DATA CANNOT BE SPECIFIED FOR A PERMANENT CONNECTION.

CONNECTION(S) IN USE; CANNOT BE DELETED.

NO CONNECTION ENTRIES WERE FOUND TO DELETE.

ERROR, AUTO COMMAND IS IN PROCESS.

PREVIOUS MANUAL COMMAND STILL BEING PROCESSED. PLEASE AWAIT RESPONSE.

A PHONE NUMBER CAN ONLY BE SPECIFIED FOR A 'BDLCSWITCHEDACU' STATION.

ERROR, MANUAL COMMAND IS OUT OF SEQUENCE.

COMMAND REJECTED; CANNOT USE WHEN STATION IS UNDER MANUAL OPERATION.

ALTHOUGH SHUTDOWN IS UNDER WAY, THIS STATION MUST BE CLEARED MANUALLY.

ROUTER INQUIRED ABOUT STATION TYPE FOR UNKNOWN STA-ID; NSP DUMPED.

NO NEIGHBOR TABLE ENTRIES WITHIN THE STATION LEVEL MANAGER.

NO ACTIVE NEIGHBOR TABLE ENTRIES WITHIN THE STATION LEVEL MANAGER.

NO STATIONS.

NO SUCH STATION.

ROUTER FRAME RECEIVED BY THE SLM.

ESTABLISH CALL ON A 'BDLCSWITCHED' STATION (MANUAL DIAL) REQUIRES <NNA>.

NO CALLS WITH NEIGHBOR EXIST.

ALL STATIONS IN ENSEMBLE ARE CLOSED.

GREETING 0 MSG FROM REMOTE STATION FAILED VALIDATION.

BARN SLM

----- BARN SLM -----

NO ENSEMBLES HAVE BEEN DEFINED.

CONNECTION DELETED WITH

CONNECTION MODIFIED WITH

MISSING DEVICE FOR RESPONSE STEERING.

INVALID DEVICE FOR RESPONSE STEERING.

PLM RECEIVED BAD REFUSE FRAME FROM HOST:

PLM RECEIVED BAD ACCEPT FRAME FROM HOST:

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HOST SERVICES PROGRAM RELEASE LEVEL NOT COMPATIBLE WITH PLM
 NETWORK SERVICES RELEASE LEVEL NOT COMPATIBLE WITH PLM (OVERRIDDEN)
 MCP RELEASE LEVEL NOT COMPATIBLE WITH PLM (OVERRIDDEN)
 HOST SERVICES RELEASE LEVEL NOT COMPATIBLE WITH PLM (OVERRIDDEN)
 PRIMARY MODE CAN ONLY BE SET DURING INITIALIZATION PHASE.
 INVALID TERM ATTRIBUTE.
 ATTRIBUTE CANNOT BE CHANGED WHILE REMOTE TERMINAL IS OPEN.
 INVALID REMOTE STATION.
 ATTEMPTED ACCESS OUTSIDE BOUNDS OF ARRAY:
 REMOTE SIGNAL =
 CONTROL-STRING LENGTH EXCEEDS ZIP-BUFFER SIZE.
 *** CDT PROTOCOL IS CURRENTLY INACTIVE.
 *** STATUS CHANGE PROTOCOL IS CURRENTLY INACTIVE.
 *** INITIATING JOB TRANSFER PROTOCOL IS CURRENTLY INACTIVE.
 *** COOPERATING JOB TRANSFER PROTOCOL IS CURRENTLY INACTIVE.
 *** STATION-ASSIGNMENT REQUEST FAILED.
 *** RECEIVED RECALLED-OUTPUT FOR UNKNOWN RF.
 *** JOB TRANSFER INPUT-FILE IS NOT AVAILABLE.
 *** JOB TRANSFER INPUT-FILE IS LOCKED.
 FAILED TO OPEN PCRT FOR
 CONNECTION WITH
 ATTACHED BY
 BDLC DEDICATED
 BDLC SWITCHED ACU
 BDLC SWITCHED
 REMOTE RESISTANCE FACTOR =
 LOCAL RESISTANCE FACTOR =
 OPERATIONS RESISTANCE FACTOR =
 MAX SEGMENT SIZE IN USE =
 VAN IN USE =
 LINKED ON =
 CLOSED
 PENDING CLOSED
 ATTACHED
 PENDING ATTACHED
 WAITING
 WORKING RESISTANCE FACTOR =
 NEIGHBOR NOT CONNECTED
 WAITING FOR OPERATOR INPUT.
 PASSWORD ALREADY PROCESSED IN THIS COMMAND.
 ILLEGAL PASSWORD.
 NODEPASSWORD(S) CHANGED FOR
 CANNOT CHANGE ATTRIBUTE WHILE NSP IS RUNNING.
 RECEIVED REMOTE-FILE MESSAGE FOR STATION WITH NULL SUPPORT
 RECEIVED REMOTE-FILE ERROR-MESSAGE
 RECEIVED REMOTE-FILE MESSAGE FOR INVALID STATION
 CONNECT OR DISCONNECT IN-PROCESS
 THIS STATION IS NOT AWAITING A VIRTUAL-CONNECT-REPLY
 ALLOCATED VIRTUAL LSN
 DEALLOCATED VIRTUAL LSN
 ALLOCATE-VIRTUAL-LSN FAILED
 DEALLOCATE-VIRTUAL-LSN FAILED
 RECEIVED RECALL-RESPONSE WHEN NOT DONE WITH PREVIOUS RECALL
 ATTRIBUTE-ERROR DETECTED ON INQUIRY-RESPONSE

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CONNECT NOT INITIATED -- HOST SERVICES UNAVAILABLE.
CALL(S) WAITING BY ENSEMBLE
STATION TRANSFER DISABLED.
STATION TRANSFER ENABLED.
UNKNOWN SYNTAX. TEXT SKIPPED UNTIL ";" OR END OF RECORD IS FOUND.
TYPE MUST BE FIRST ELEMENT IN ADD STATION ATTRIBUTE LIST.
TYPE NOT ALLOWED IN PROFILE.
CONNECTION ABORTED
HOST VALIDATION FAILED; INVALID PASSWORD RECEIVED FROM HOST #
LINK RESISTANCE CHANGED WITH
SUPPORT SUFFERED AN UNRECOVERABLE ERROR CONDITION

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