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DECnet-DOS

Release Notes

AA-EF21B-TV



DECnet-DOS

Release Notes

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This document provides information specific to this release of DECnet-DOS.

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Preface

The following release notes include updated information for DECnet–DOS V1.1 and DECnet–Rainbow V1.1. You should use these notes in conjunction with the material presented in the DECnet–DOS documentation set.

Intended Audience

These release notes are intended for users of the Rainbow series of personal computers and for users of the IBM PC, IBM PC/XT, and IBM Personal Computer AT. Some of the information presented in this document is very technical. If you do not understand the material, you should seek assistance from the person who is responsible for configuring your network.

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1

Changes Between V1.0 and V1.1

This chapter describes the software changes made from DECnet-DOS and DECnet-Rainbow Version 1.0 to DECnet-DOS and DECnet-Rainbow Version 1.1.

For DECnet-DOS only, DECnet-DOS V1.1 adds support for IBM Personal Computer ATs, support for PC-DOS V3.1, and Ethernet support.

In Version 1.0, the background network task was installed as an MS-DOS device driver. In Version 1.1, a number of tasks cooperate to provide background network processing. All of these tasks are terminate and stay resident tasks, not device drivers. They include: the interrupt Scheduler (SCH); the Ethernet Data Link Layer (DLL); the LAT protocol handler (LAT); and the DECnet Network Process (DNP). Note that DLL and LAT apply to DECnet-DOS only.

The processes communicate using software interrupts. The interrupts used by each process are listed in an appendix to the *DECnet-DOS Programmer's Reference Manual*.

The following sections describe changes to the DECnet-DOS and DECnet-Rainbow utilities.

1.1 DECnet-DOS and DECnet-Rainbow NFT

- NFT now provides the PRINT and SUBMIT commands which queue remote files at the remote node, and /PRINT and /SUBMIT switches which can be used with the COPY command to copy local files to remote nodes to be queued at the remote node.
- The /FULL switch for the DIRECTORY command now provides a VMS style full directory listing for remote files.

- NFT will now allow you to copy remote files directly to the local printer, for example:

NFT COPY REMOTE::FOO.BAR PRN

or

NFT COPY REMOTE::FOO.BAR PRN:

- NFT can now do block mode file copies. Block mode file copying is an image mode file transfer which moves the data in 512 byte units independent of any record characteristics. The end of file byte position is properly retained. This file copy mode may be necessary to copy files with very long records. To use block mode when copying, specify /BLOCK as the only switch.
- The date and time of creation of copied files is now preserved.

1.2 DECnet-DOS and DECnet-Rainbow SETHOST

- SETHOST now allows you the ability to interrupt a session to perform some local task and then continue the session where you left off. Multiple interrupted sessions are supported (CTERM connections only). Local tasks include any MS-DOS command or sequence of commands, starting or stopping logging of the terminal session, and getting help.
- SETHOST now provides VMS style command line editing.
- SETHOST provides on-line help.
- LAT support is now provided by SETHOST (Ethernet configurations only). When SETHOST attempts to connect to the remote node it first attempts to use LAT protocol. If that fails, SETHOST attempts a CTERM connection. There is no multiple session LAT support.

1.3 DECnet-DOS and DECnet-Rainbow NDU

- NDU can now CREATE virtual disk volumes in 4 different sizes, 1.2, 10, 20, and 32 MB.

1.4 DECnet-DOS and DECnet-Rainbow NTU

- The SET RECORDING command is no longer available. Use the TO file option instead.
- LOOP command syntax has been changed to be more consistent with other DECnet implementations. The LOOP commands are now: LOOP EXECUTOR, LOOP CIRCUIT, LOOP NODE, and LOOP LINE CONTROLLER.

1.5 DECnet-DOS and DECnet-Rainbow TFA

- TFA now has on-line help.
- TFA can now be unloaded after use to make memory available for other tasks. TNT unloads TFA.

1.6 DECnet-DOS and DECnet-Rainbow TTT

- TTT now has on-line help.
- TTT can now be unloaded after use to make memory available for other tasks. TNT unloads TTT.

1.7 DECnet-DOS and DECnet-Rainbow TNTERR

- TNTERRs name has been changed to TNT.
- TNT provides on-line help.
- TNT can unload TTT or TFA from memory.

1.8 DECnet-DOS and DECnet-Rainbow DTR/DTS

- DTR now has on-line help.

1.9 DECnet-DOS and DECnet-Rainbow SPAWNER

- The DECnet Job Spawner is a new utility with DECnet-DOS V1.1. The job spawner runs as a foreground task waiting for incoming connections. When a connection arrives, the spawner looks up the requested object name or number in its database and runs the program which services that type of request. When the program finishes, the spawner again waits for incoming connections. The spawner supports FAL, DTR, and user-written servers.

1.10 DECnet-DOS and DECnet-Rainbow MAIL

- MAIL is a new utility with V1.1. MAIL provides you the ability to transmit messages or files to other non MS-DOS nodes in your network. MAIL does not allow you to receive mail directly at your personal computer node.

1.11 DECnet-DOS and DECnet-Rainbow FAL

- The File Access Listener (FAL) allows other nodes in your network access to files local to your personal computer node. Access is password controlled. FAL can be run with the Job Spawner.

1.12 DECnet–DOS and DECnet–Rainbow DIP

- DECnet–DOS and DECnet–Rainbow can now be completely installed by running the DECnet Installation Procedure (DIP) and answering a few simple questions. Refer to the appropriate installation guide for instructions.

1.13 Revisions to the DECnet–DOS Programmer's Reference Manual

The following tables are revised Versions of Table D–1 and Table D–2, which are in Appendix D (“SUMMARY OF EXTENDED ERROR CODES”) of the *DECnet–DOS Programmer's Reference Manual*.

DECnet–DOS supports extended error support to certain socket operations. When you write a program which uses the *getsockopt* function call, extended error codes can be returned in *opt_status*, a data member of *optdata_dn*. This can occur following an attempted connection request or after disconnecting a logical link.

Table 1–1 lists extended error codes which can be returned following an attempted connection. It lists the error messages found in *derrno.h*, the decimal value for each message, their equivalent error message that *dnet_conn* returns in *errno*, and the error reason.

Table 1–1: Extended Error Messages – Unable to Make a Connection

Decimal	derrno.h	dnet_conn	
Error Code	Mnemonic	In errno	Reason
0	EREJBYOBJ	ECONNREFUSED	Connect failed. Connection rejected by object.
1	EINSSNETRES	ENOSPC	Connect failed. Insufficient network resources.
2	EUNRNODNAM	EADDRNOTAVAIL	Connect failed. Unrecognized node name.
3	EREMNODESHUT	ENETDOWN	Connect failed. Remote node shutting down.
4	EUNROBJ	ESRCH	Connect failed. Unrecognized object.
5	EINVOBJNAM	EINVAL	Connect failed. Invalid object name format.
6	EOJBUSY	ETOOMANYREFS	Connect failed. Object too busy.

(continued on next page)

Table 1-1 (cont.): Extended Error Messages – Unable to Make a Connection

Decimal	derrno.h	dnet_conn	
Error Code	Mnemonic	In errno	Reason
10	EINVDNAM	ENAMETOOLONG	Connect failed. Invalid node name format.
11	ELOCNODESHUT	EHOSTDOWN	Connect failed. Local node shutting down.
32	ENODERESOURCES	ENOSPC	Connect failed. No node resources for new logical link.
33	EUSERESOURCES	ENOSPC	Connect failed. No user resources for new logical link.
34	EACCONREJ	ECONNABORTED	Connect failed. Access control rejected.
36	EBADACCOUNT	ECONNABORTED	Connect failed. Bad account information.
38	ENORESPOBJ	ETIMEDOUT	Connect failed. No response from object.
39	ENODUNREACH	ENETUNREACH	Connect failed. Node unreachable.
43	ECONNTTOOBIG	ECONNABORTED	Connect failed. Connect image data field too long.

Table 1–2 lists extended error codes which can be returned following a disconnection. It lists the error messages found in *derrno.h*, the decimal value for each message, and the error reason.

Table 1–2: Extended Error Messages – Disconnecting a Logical Link

Decimal Error Code	derrno.h Mnemonic	Reason
0	EREJBYOBJ	The remote node end user disconnected a running logical link.
8	EABTBYNMGT	The logical link was disconnected by a third party.
9	EUSERABORT	The remote end user has aborted the link.
38	ENORESPOBJ	The end user or node at the other end of the link has crashed or failed.
39	ENODUNREACH	The connection has been lost due to a local timeout.
41	ENOLINK	The connection has been lost due to a protocol failure, no such link found at remote.
42	ECOMplete	No error. A local end user-initiated disconnect has completed.

1.14 DECnet–DOS and DECnet–Rainbow Programming Interface

- The assembler language interface to the network process in Version 1.0 was software interrupt 2A (hex). In Version 1.1 the interface to the network process is software interrupt 6E (hex). The 2A interface has been retained for compatibility, but may be removed in a future release.
- A new technique for doing I/O which does not block is being provided in Version 1.1, asynchronous I/O. Asynchronous I/O provides a call back mechanism to notify the application program that a request has been completed. Please refer to the *DECnet–DOS Programmer’s Reference Manual* for more information.
- SCBDEF.H

The symbol definition SCBS__SETOSTAT was changed to SCBS__GETOSTAT.

- DN.H

The following definitions for DECnet software components were added:

```

/*
 * Define DECnet modules as TLA (three letter acronym) strings.
 */
#define DNMOD__LAT      "LAT"      /* LAT driver */
#define DNMOD__PDV      "PDV"      /* Port driver */
#define DNMOD__SCH      "SCH"      /* Real-time Scheduler */
#define DNMOD__DLL      "DLL"      /* Data Link Layer */
#define DNMOD__DNP      "DNP"      /* DECnet Network Process */

```

```

/*
 * Define DECnet software module interrupt vectors.
 */
#define DNMODULE__LAT      0x6a      /* LAT driver */
#define DNMODULE__PDV      0x6b      /* Port driver */
#define DNMODULE__SCH      0x6c      /* Real-time Scheduler */
#define DNMODULE__DLL      0x6d      /* Data Link Layer */
#define DNMODULE__DNP      0x6e      /* DECnet Network Process */

```

- DERRNO.H

The following symbol definitions were added (note that these are not supported by DECnet-ULTRIX V1.1):

EUSERABORT	9	- Disconnect: Abort by user
ENODERESOURCES	32	- Connect: No node resources for new logical link
EUSERESOURCES	33	- Connect: No user resources for new logical link
EBADACCOUNT	36	- Connect: Bad account information
ENOLINK	41	- Disconnect: Protocol failure, no such link
ECOMPLETE	42	- Disconnect: No error, disconnect completed
ECONNTOOBIG	43	- Connect: Connect image data field too long

- NERROR.C

Error text for additional DECnet connect errors was added. (see new definitions in DERRNO.H)

The array of character strings, `*dnet__errlist[]`, has changed. The text, "Connect failed, ", which was repeated in every string, has been removed and placed in a single, separate character string, `'connect__error[]'`. If your code indexed directly into this global array of strings, you must account for the "Connect failed, " string in your display code or else use the `connect__error[]` string. If you used the function `'nerror()'`, this change will be transparent to your program.

- DNET__CONN.C

A `'signal()'` function was added for support of non-blocking connects. If a `'signal()'` function is not supported by your C compiler, comment out all references to `'signal'` in this C source file before compilation.

Appendix C of the *DECnet-DOS Programmer's Reference Manual* should include the following entry:

EINTR 4 Interrupted system call.

Automatic outgoing proxy support was added. This was done by issuing a `'bind()'` call to the client socket under the following conditions:

1. No access control information passed in the `'node'` argument to

2. No default access control information found in the local node's node database for the remote node specified in the 'node' argument to 'dnet_conn()'.
 3. A user name has been set up for local node in the local node's database.
- The internal function 'dnet_errconvert()' was modified to reflect changes made in DECnet connect errors (see new definitions in DERRNO.H). This function maps DECnet connect errors to their equivalent 'errno' system error codes so that connect error returns from 'dnet_conn()' will have the correct errno system error code in 'errno' for use by the function 'nerror()'.
 - DNMSDOS.H

localinfo_dn was revised to support the complete path specification for the DECnet database path by adding a new member to the data structure:

1. The complete database path specification is contained in *lcl_decnet_path*.
 2. *lcl_decnet_device* is still supported for backwards compatibility.
 3. See the file for more details on the structure format.
- DNET_PATH.C

dnet_path now supports getting the complete DECnet database path specification. Note that the function's interface has not changed.

- IOCB.H

A new data structure, CIOCB, was added which supports ASYNCHRONOUS NETWORK I/O. This structure is identical to the IOCB structure except for one additional member, 'io_callback'. See the file for more details on the structure's format.

- TIME.H

Three new external definitions were added:

```
int daylight;
long timezone;
char *tzname[2];
```

It is ASSUMED that these are defined by the user's C compiler. If not used, comment them out of header file before compilation(s); otherwise, if not defined, then define them in applications programs.

- **SOCKET.H**

New flag definitions for the CIOCB / IOCB 'io__flags' member were added:

```
#define MSG__ASYNC          0x8      /* perform function asynchronously */
#define MSG__CALLBACK      0x10     /* perform callback */
#define MSG__NEOM          0x20     /* do not perform end of message */
#define MSG__NBOM          0x40     /* do not set beginning of message */
```

New address family definitions were added:

```
#define AF__SES             6
#define AF__MAX             6
```

- **BEGIN.H & FINISH.H**

Segment names were changed in this file.

- **SIZE.H**

SIZE.H is NOT necessary for V1.1 assemblies.

- **DNETDB.H**

The use of the flags byte in the structure, 'dnet__nodeent' has been modified. It is now interpreted as a bit field flags byte. The new flag symbols are:

```
/*
 * dnet__nodeent.dne__delflag - flags
 */
#define DNET__NODE__DEL    0x2      /* deleted entry          */
#define DNET__NODE__CRY    0x4      /* encrypted entry        */
#define DNET__NODE__LAT    0x8      /* LAT preferred host     */
```

A new data structure has been added, 'dnet__accent'. It is the incoming access control information entry. It uses the new database file DECACC.DAT.

- **PRGPRE.H**

The list of header files was modified.

- **ERRNO.H**

New symbol definition for ASYNCHRONOUS NETWORK I/O errors was added: Check CIOCB 'io__status' field for this value.

```
#define NOTHING -2      /* request not complete - asynch i/o */
```

- TYPES.H

More type definitions were added:

```
/*
 * Defines types used in defining values returned by system level
 * calls for file status and time information.
 */
typedef unsigned short ino_t;           /* i-node number (not used on DOS) */
typedef long time_t;                   /* time value */
typedef short dev_t;                   /* device code */
typedef long off_t;                   /* file offset value */
```

- New function dnet__installed():

This is a C library function found in source file DNETINST.C. It performs installation checking of various software components. See file DN.H for component symbol definitions.

- New function dnet__getacc():

This is a C library function found in source file DNETACCE.C. It fetches incoming access control information.

- New function csreg():

This is an assembly function found in source file CSREG.ASM. It returns the current CS (code segment) register value and works with the 2 segment model only.

- New function dnetsets():

This is an assembly function found in source file DNETSES.ASM. It currently returns an incorrect Version number of 0.0 if SESSION is installed.

- New function fbcopy():

This is an assembly function found in source file FBCOPY.ASM. It performs a FAR byte copy. It does not check for source/destination buffer overlap conditions.

- New function decnet():

This is an assembly function found in source file DECNET.ASM. (V1.0 file name was INTIOCTL.ASM.) It provides direct interface to the DECnet Network Process (DNP) via interrupt vector 6EH. V1.0 interrupt interface to DNP was via 2AH – this interface is still supported in V1.1 for backwards compatibility. *decnet()* replaces the V1.0 *ioctl()* function.

- New format for DECNODE.DAT

The format for the file DECNODE.DAT is different in Version 1.1 than it was in Version 1.0. Passwords are now encrypted, so that other users cannot read any of the passwords you have defined.

2

Solving Problems, Restrictions, and Hints

This chapter describes known problems, restrictions, and troubleshooting hints.

2.1 Asynchronous Installation Problems

- When connecting your Rainbow or IBM personal computer to the adjacent node using an Asynchronous DDCMP connection through a null modem cable, remember to switch the send and receive leads properly.
- The use of a terminal switch or a terminal server running LAT for connection of your Rainbow or IBM personal computer to the adjacent node is not supported.
- When using the DECnet Router Server for asynchronous connections, the circuit must be full duplex and must be set to the same line speed as your machine.

For example:

Direct: SET LINE LC-1L SPEED 9600 DUPLEX FULL MODEM NO

Modem: SET LINE LC-1L SPEED 1200 DUPLEX FULL MODEM YES

The circuit cost and hello timer values can be set to any reasonable values. The state should be set to ON.

- When making a direct Asynchronous DDCMP connection to an RSX11 system, note that entire controllers must support either terminals or DDCMP lines, but not both. Insure that your sysgen or system configuration does NOT include the chosen controller and that your DECnet gen DOES include the chosen controller.
- When using Asynchronous DDCMP and connecting directly to a VAX/VMS system, note that VAX/VMS can share the lines on a controller between terminal support and asynchronous DDCMP support.

- When configuring your VAX/VMS adjacent node, use the following commands as a GUIDE for your VMS system manager. These commands establish the chosen terminal lines as dedicated DDCMP lines.

```
$! Load asynch DDCMP device driver. This must be done after
$! every system boot.
$ run sys$system:sysgen
connect noa0/noadapter
exit
$! Tell VMS which lines are to be dedicated to DDCMP
$! This must be done after every system boot
$set term /protocol=ddcmp/speed=9600/notypeahead/perm ttb4:
$set term /protocol=ddcmp/speed=9600/notypeahead/perm ttb5:
$! Use NCP to properly configure the lines and circuits
$! Remember that DEFINE changes the permanent database
$! and SET works immediately.
$ ncp
define line tt-1-4 state on receive buffers 4
define line tt-1-5 state on receive buffers 4
define circuit tt-1-4 state on
define circuit tt-1-5 state on
exit
```

- When configuring your VAX/VMS adjacent node, use the following commands as a GUIDE for your VMS system manager. These commands establish all terminal lines as switchable DDCMP lines (V4.2 and later only).

ON THE VAX

1. The asynchronous DDCMP driver, NODRIVER, must be loaded on the VAX system.

```
SYSGEN> CONNECT NOA0/NOADAPTER
```

2. DYN SWITCH, the image that controls the switching of the line, must be installed as a shareable image on the VAX.

```
INSTALL> CREATE SYS$LIBRARY:DYN SWITCH/SHARE/PROTECT/HEADER/OPEN
```

3. A virtual terminal must be created in order for the physical terminal connection to be broken without actually losing the logical connection between the two systems.

```
SYSGEN> CONNECT VTA0/NOADAPTER/DRIVER=TTDRIVER
```

4. The terminal line must be set for 8 bit characters with no parity and have the attribute DISCONNECT on the VAX.

NOTE

The DISCONNECT attribute enables the virtual terminal to be used. The DISCONNECT attribute must be permanent; it must either be set /PERM after every boot, or the default terminal characteristics must be set properly. If you set the terminal characteristics for your own terminal, you must log out and log back in again for them to take effect. Also note that if modem control is enabled, hangup must also be enabled. You know that this step has been performed properly if your terminal device designator begins with VT.

5. In the node database, the following parameters must be set for the node that will be switching the asynchronous connection:
 - The INBOUND parameter must be set to either ROUTER or ENDNODE.
 - The RECEIVE PASSWORD must be set to match the remote node's EXECUTOR TRANSMIT PASSWORD.

NOTE

The password will be converted to uppercase unless it is defined as a quoted string.

```
NCP>SET NODE node-id INBOUND [router/endnode] RECEIVE PASSWORD password
```

ON THE PERSONAL COMPUTER

1. On a personal computer, the DECnet line must be set OFF, either by default or by command with NCP.
2. The terminal line/terminal emulator must be set for 8 bit characters with no parity.
3. The EXECUTOR TRANSMIT PASSWORD must be set to match the RECEIVE PASSWORD specified for the node definition on the remote system. The password must be entered in uppercase since the password defined on the VAX is converted to uppercase unless it is entered as a quoted string.

NOTE

The EXECUTOR RECEIVE PASSWORD must not be set; when DYN SWITCH is used, DECnet-VAX will not send a password during routing initialization. If the receive password is set, the line will not come up.

4. Both the terminal line and the DDCMP line must be set to the speed of the line to be used; they will not share line characteristics.

5. Connect to the VAX as a normal terminal user using a terminal emulator.
6. When the line is to be switched from a terminal line to a DDCMP line, the following DCL command is entered:

```
$SET TERMINAL /PROTOCOL=DDCMP/SWITCH=DECNET/MANUAL
```

NOTE

/MANUAL is only used when DECnet must be turned on manually. When the switch is initiated, a message appears on the terminal indicating that the switch is taking place on the VAX and the user must exit terminal emulation mode and turn on the DECnet line. If the line is not turned on within approximately 4 minutes, a static asynchronous line will return to terminal mode and a dial-up asynchronous line with hangup will be disconnected.

Terminating a Switched DDCMP Connection

A DDCMP connection created using DYN SWITCH can be terminated from either end of the connection by setting the line or circuit (VAX/uVAX only) OFF. The following are the various scenarios that will occur when the line is disconnected:

1. The personal computer user sets the line OFF or the line drops due to noise, etc.

If the switched line is a hardwired line between the personal computer and the VAX, or a modem is used with /NOHANGUP specified, the circuit on the VAX side will go into an ON/STARTING state for approximately 4 minutes. This enables the personal computer user to set the line back ON and have it operational without having to go through the entire DYN SWITCH procedure again.

2. The system manager on the VAX or uVAX can set either the circuit or the line OFF.

If either the circuit or the line is set OFF on the VAX/uVAX, both the circuit and line information are removed from the volatile database and the asynchronous line is returned to terminal mode.

Miscellaneous Information

1. If a modem is used for a DYN SWITCH connection, the modem signal will not be dropped during the switch.
2. If /NOHANGUP is specified on the terminal line, the modem signal will not drop after the DDCMP circuit is set OFF. The line will return to terminal mode.
3. If DECnet is being turned on manually, a **CTRL/C** or a **CTRL/Y** after the switch message aborts the switch, and the line is returned to terminal mode.

4. For a dynamic connection, the line and circuit will automatically be added to the volatile database on the VAX when the line is switched from terminal mode to DDCMP mode. It does not have to be manually added to the database.
5. An asynchronous terminal connection to a VAX through a switch or a LAT terminal server cannot be switched to a DDCMP line using DYNSWITCH.

2.2 Asynchronous Performance and Tuning

- If you have a poor Asynchronous DDCMP connection (such as a noisy phone line between modems), the following suggestions may help:

Set the line speed lower (NCP SET LINE SPEED *n*).

Set the personal computer's executor retransmit factor higher (NCP SET EXECUTOR RETRANSMIT FACTOR *n*). The default is 6; try 10. This is the number of times that a message is retransmitted before the logical link is declared broken. Setting this parameter higher allows the network more times to retry messages with errors.

Set the personal computer's segment size smaller (NCP SET EXECUTOR SEGMENT BUFFER SIZE *n*). A smaller segment size improves the chances that messages will be sent with no errors. A smaller segment size also means that the loss of one character causes fewer characters to be retransmitted. The VMS minimum is 192. Try 200 first. The minimum of the peers is used. NFT may produce "buffer too small" errors at low values.

Set the Host's EXECUTOR HELLO TIMER longer. This affects how long DECnet will wait for any traffic before declaring the line to be down.

On VMS, SET CIRCUIT MAX TRANSMITS controls the retransmit count before recycling the line. Default is 4, set it to 32.

2.3 Asynchronous Configuration Problems

- When the network process has the line state ON, it assumes that it has complete control of the communications port of the system. It will continue to run DECnet protocols in the background. If you wish to use the communications port for other purposes (such as a terminal emulator), you must first turn the line state OFF with NCP. This will disengage the network process and return the communications port to its previous state.
- The network process uses the communications parameters stored in the DECnet database, NOT the parameters that the port may be programmed with by MS-DOS SETUP commands on the Rainbow (or PC-DOS MODE commands on IBM PCs). Problems will occur if, for example, you do not properly adjust the line speed with NCP to match the remote system.

2.4 Ethernet Performance and Tuning

The Ethernet controllers supported by DECnet-DOS V1.1 use single buffers for message reception. Since the personal computer's CPU is fairly slow compared to the speed of the Ethernet, it is possible for a message to be lost by a personal computer because it is busy getting the last message off of the controller. When this happens, DECnet will detect that a message has been lost (after a short time has passed) and automatically retransmit the lost message. This loss of messages and subsequent recovery can be observed in counters displayed by NCP and NTU, in failures in Ethernet loop circuit commands in NTU, and in short pauses during normal operations. These symptoms do NOT indicate correctable problems. The loss of messages and subsequent recovery is expected.

A number of network management parameters can be changed in an effort to improve performance:

- In very large networks that include many routing nodes and/or many LAT services, each personal computer may have to receive a number of messages which are regularly broadcast by routing nodes and LAT services. These messages are necessary for normal operations. However, received data performance may be improved by preventing the reception of these regular messages. Following are the commands which turn off reception of these messages and the effect of each command. Only after all commands have been typed will the potential performance improvement be realized.

1. LAT /n

The /n switch to LAT prevents LAT from being told the name of each LAT service. If you do not wish to use LAT services, just do not run LAT. If you DO wish to use LAT services, use the /n switch when starting LAT and use the LAT-HOST keyword with the NCP SET NODE command to inform LAT which services should be available. (This restricts your use of LAT services to those with service names of 6 characters or less.) The default is no /n switch, which enables the reception of multicast messages.

2. NCP SET CIRCUIT SERVICE DISABLED [ENABLED]

This command prevents your personal computer from being able to respond to loopback requests or MOP requests at the circuit level. The default is ENABLED, which allows your personal computer to receive multicast messages in order to provide service functions.

3. NCP SET CIRCUIT MULTICAST DISABLED [ENABLED]

This command causes your personal computer to listen for announcements concerning which node on the Ethernet is the router only when the line is started and only every ten minutes for 1 minute after that. The default is ENABLED, which allows your personal computer to receive multicast messages concerning routing.

- If logical links break, try setting the retry counter in your personal computer higher by typing:

```
NCP>SET EXECUTOR RETRANSMIT FACTOR 10
```

- If performance seems bursty, try setting the delays before retransmission lower by typing these commands on your remote (non-MS-DOS) systems:

```
NCP>SET EXECUTOR DELAY FACTOR 32
NCP>SET EXECUTOR DELAY WEIGHT 3
```

- If performance seems bursty, you may also want to try lowering the number of messages that a remote node can send to your personal computer at a time. Type on your personal computer:

```
NCP>SET EXECUTOR RECEIVE PIPE QUOTA 1
```

- If performance seems bursty, you may also want to try raising the number of messages that a remote node can send to your personal computer at a time. Type on your personal computer:

```
NCP>SET EXECUTOR RECEIVE PIPE QUOTA 8
```

2.5 Ethernet Configuration Problems

- During power OFF and perhaps power ON, Ethernet controllers may introduce noise on the Ethernet.
- It may not be possible to format floppies on the IBM PC, the IBM PC/XT, or the IBM PC AT while the Ethernet line is in the ON state. The DMA of bytes to and from the Ethernet controller may interfere with the floppy timing while formatting. If this seems to be happening to you, use the NCP command SET LINE STATE OFF before formatting and then SET LINE STATE ON after formatting.

2.6 General Problems

- Following installation, DECPARM.DAT contains information specific to the line you are using (either Asynchronous or Ethernet). Each time the DECnet Network Process (DNP) is started, it verifies that DECPARM.DAT contains the proper line information. If you wish to switch between use of the Ethernet line and use of the asynchronous line, you should keep two copies of DECPARM.DAT: one for Ethernet (called DECPARM.ETH, for example), and one for asynchronous (called DECPARM.ASY, for example). Insure that AUTOEXEC.BAT does NOT run the DECnet Network Process (DNP). After each boot, you can rename the appropriate DECPARM file to DECPARM.DAT and then run the matching DNP. If you attempt to use the wrong network process for the current permanent database file (DECPARM.DAT), the error message “wrong protocol type found in DECPARM.DAT” will be displayed.

- The network takes control of clock interrupts as soon as the scheduler component runs (SCHPC or SCHRB). The network also takes control of com option interrupts when the line state is ON. Other products which also take control of interrupts may not be compatible with DECnet. In order to run such incompatible software, you must either turn the DECnet line OFF with NCP, or prevent the scheduler component from being run. Note also that use of the DECnet virtual disks and printer may not be possible during execution of incompatible software products.

If you are using an asynchronous DDCMP connection, note that Symphony from Lotus, as shipped, will cause the network circuit to drop and therefore will not allow use of the virtual disk and printer. However, using the INSTALL program that comes with Symphony you can make the changes necessary to force Symphony to ignore the communications port when it runs. Run INSTALL to create a new driver set, or to change an existing driver set. Delete the drivers for modem, protocol, (and for the Rainbow, 7201 asynchronous support). Note that if you modify an existing driver set, you must use the method documented on (or about) page 41 of the Introduction Manual which describes how to use the minus sign to remove an option.

- The network process determines the system type that it is running on by looking at ROM BIOS locations and/or calling the Rainbow software interrupt 18 hex. Due to hardware dependencies, the Rainbow and IBM PC processes are not interchangeable. An error message will be issued and the process will refuse to run on the wrong system.
- The transparent file access capabilities intercept the MS-DOS system call interface through interrupt 21 hex. If you run other programs that intercept interrupt 21, they may interfere with the functioning of the transparent file access operations.
- Be sure to understand that sockets are not bound to programs. Once a socket is created, it will stay alive until it is closed, even if the program that created it exits. A symptom of too many open sockets is running out of buffer space. Use NCP and the command SHOW ACTIVE LINKS to display open sockets, and SET ACTIVE LINK STATE OFF to close open sockets.
- All utilities accept the node specification as either a node name or node address. When node name alone is specified, all utilities will check to see if default access control information has been stored by NCP for that node and use that access control information to make the connection. If the node address is used, checking for default access control information is BYPASSED.

- All features of DECnet-DOS cannot be supported on small memory systems. If you find that the DECnet Installation Procedure (DIP) warns you about having too little memory, if you find that MS-DOS gives you an error message indicating too little memory after running a utility, or if your personal computer hangs after running a utility, try the following:
 - Study the appendix in the Installation Guide which lists each utility, to determine whether it is memory resident and its approximate size.
 - Do not install any unnecessary third party software that is memory resident.
 - Do not install TTT. It is memory resident.
 - Do not install TFA. It is memory resident.
 - Do not install LAT. It is memory resident.
 - Set the FILES parameter in CONFIG.SYS as low as possible. 64 bytes are used for each open file.
 - Set the BUFFERS parameter in CONFIG.SYS as low as possible. 528 bytes are used for each buffer.
 - Use NCP to lower the number of logical links supported.

NCP DEFINE EXEC MAX LINK *n*
 - Use NCP to lower the maximum number of buffers to allocate.

NCP DEFINE EXEC MAX BUFFER *n*

On a 256K personal computer there is enough room to run NCP, NFT, NTU, CTERM based SETHOST, NDU with one virtual device, FAL, DTS, DTR, and MAIL if:

- FILES = 8 in CONFIG.SYS.
- BUFFERS = 2 in CONFIG.SYS.
- EXEC MAX LINKS 2 in NCP.
- EXEC MAX BUFFERS 12–14 in NCP.

Note that if DIP detects insufficient memory, it will automatically adjust memory usage parameters in an attempt to fit all components into memory.

2.6.1 Problems with Rainbow Only

- The Rainbow can suffer from crashes, hangs, memory errors, and other problems if it contains bad memory chips. It may be the case that your Rainbow can have bad memory which is seldom used until DECnet is installed. (The resident parts of DECnet cause more memory to be used.) As a result, it may appear that the DECnet installation is causing these problems when it is in fact the memory. If you are experiencing these problems, have your local field service organization check your Rainbow for bad memory.
- In order to avoid problems with the firmware, all non-interrupt driven network processing is suspended while in SETUP mode. Staying in SETUP mode for long periods of time will most likely cause your network sessions to be lost.

- The network process uses the Rainbow MS-DOS V2.11 Extended Communications BIOS User Defined Interrupt Service table to redirect communications interrupts to it. Use of other programs that use the BIOS function to change or reset the service routine address (see the *Rainbow MS-DOS V2.05 Programmer's Guide* for more information) will effectively terminate DECnet communications if the process is active. For example: running a poly-COM program will modify these addresses. To recover, you must use NCP to set the line state OFF and then back ON again.

2.6.2 Problems with IBM PCs Only

- The SETHOST utility uses interrupt 10H of the IBM BIOS while running to control screen output, and takes over keyboard interrupt 09H to handle keyboard input. Any other programs that you may use to enhance the keyboard or display operation may interfere with the operation of this utility.

2.7 NFT – Network File Transfer

- The algorithm for determining whether a file is ASCII or image when copying from personal computer to remote without switches is as follows: If the first 512 bytes contain a CR/LF, the file must be ASCII. Otherwise, it must be image. Note that some image files may appear to be ASCII using this rule.
- The SET command for paths on remote ULTRIX systems does not work.
- The use of MACY11 and LSA switches for remote DECsystem-10s and DECsystem-20s does not work.
- If a directory command specifies multiple subdirectories and some of them are protected, the error message fails to display the volume and directory names.
- The command DIR REMOTE:: defaults the file specification to *.*. This produces the correct results on all remote systems except ULTRIX. On an ULTRIX system this only lists the files that have a period in their names. To work around this problem, use the command DIR REMOTE::*.
- The SHOW command displays any part of a password string which follows an embedded space. This is not a serious problem since most passwords do not have spaces in them.
- If a wildcarded copy from a remote VAX to the personal computer specifies a wild file specification which matches a directory specification on the VAX, the directory files are copied to the personal computer. These files do not contain any useful information and can be deleted.
- If a wildcarded copy from a remote VAX to the personal computer requests access to a protected directory, NFT displays a message saying that there was a problem with a temporary file. This is the wrong message.

- If a COPY command which copies files from a remote ULTRIX system to a personal computer defaults the output file specification and the ULTRIX file specification contains directories, then the resulting personal computer file will be named incorrectly.
- If the value of MRS is set too large (> 1024) then NFT fails in unpredictable ways.

2.8 Error Messages and Warnings

The following error messages and warnings are not listed in Appendix B (NFT Error Messages) of the *DECnet-DOS User's Guide*.

2.8.1 Error Messages

- Address already in use.
- Address family not supported by protocol family.
- Argument list too long.
- Argument too long.
- Attribute read error.
- Attribute write error.
- Bad address.
- Bad block on device.
- Bad file number.
- Bad terminator or bad value for switch:
- Bad version number.
- Broken pipe.
- Cannot close file.
- Cannot get JFN for file.
- Cannot open local file with DOS reserved names:
- Cannot PRINT list of files.
- Cannot PRINT local file.
- Connection refused.
- Connection reset by peer.
- Connection timed out.
- Destination address required.
- Device not available.
- Device not found.
- Device not ready.
- Device or file full.
- Disk full or other error in closing file.
- Disk full or other error in writing file.
- Disk usage exceeds quota.
- Error in data type.
- Error in file type extension.
- Failure to get transmit buffer.

- F11-ACP could not access file.
- F11-ACP could not create file.
- F11-ACP could not mark file for deletion.
- File activity precludes operation.
- File already open.
- File Exists.
- File extend failure.
- File is currently in an undefined state.
- Filename syntax error.
- File name too long.
- File not found.
- FSZ field invalid.
- Illegal record encountered.
- Insufficient network resources.
- Invalid DAP message type received.
- Invalid DAP message format received.
- Invalid file options.
- Invalid object name format.
- Invalid wildcard context value.
- Logical name error.
- LPT page limit exceeded.
- Message too long.
- Mount device busy.
- Network capacity exceeded.
- Network dropped connection on reset.
- Network operation failed at remote node.
- Network operation not supported.
- Network operation timed out.
- NFAR error, FFIRST with dir in progress.
- NFAR error, file not open.
- NFAR error, FNEXT with no dir in progress.
- NFAR error, illegal access.
- NFAR error, invalid function.
- NFAR error, invalid RATs.
- NFAR error, missing ::.
- NFAR error, missing quote.
- NFAR error, no \\\ or *\\.
- NFAR error, no more room.
- NFAR error, record buffer too small.
- NFAR error, socket not found.
- No buffer space available.
- Node name cannot be longer than 6 characters.
- Node is unreachable.

- No more sockets available.
- No such device.
- Not supported by remote.
- Operation illegal or invalid for file organization.
- Operation in progress.
- Operation not supported on socket.
- Operation would block.
- Parity error on device.
- Path and file names not valid for SET, SHOW, or EXIT commands.
- Permission denied.
- Protocol not available.
- Protocol not supported.
- Remote object is too busy.
- Result too large.
- Socket is already connected.
- Socket is not connected.
- Socket operation on nonsocket.
- Socket type not supported.
- Spool or submit command file error.
- Switches not valid for SET, SHOW, or EXIT commands.
- Task not available.
- Too many open files.
- Unexpected DAP message received.
- Unmatched quotes:
- Unrecognized local file specification, remote to remote operations not supported.
- Unrecognized object.
- Unrecognized remote file specification:
- Unrecognized remote file specification, local to local operations not supported.
- Unsupported DAP flag field received.
- VFC value must be less than 256.

2.8.2 Warnings

- Extra local file names will be ignored.
- Extra remote file names will be ignored.
- Warning: Destination file name list longer than source list.

2.9 SETHOST

2.9.1 CTERM ONLY

- Use of the @ command for batch input is not fully supported by ULTRIX and RSX hosts.
- The VMS command SET TERM/INQ does not work properly when embedded in LOGIN.COM and the @ command is used.
- VMS TDMS applications are not supported under CTERM connections. VMS TDMS applications are supported under LAT connections.
- A protocol-based virtual terminal service can be slower than a direct dumb terminal connection. Some sequences will be faster using CTERM because all character operations for a complete line will be done locally in the Rainbow or IBM PC. Some operations will be slower (such as editing with EDT) because each character typed causes a number of CTERM protocol messages to be exchanged.
- Writing saved session files does not check for disk error.
- While command line editing to VMS, if text is inserted which fills a line, the image on the screen does not wrap to the next line properly. The characters sent to the remote node are correct.
- If backspace characters are output which would back the cursor up before the beginning of the line, text which follows the backspace characters appears on the next line. Text should appear on the same line.
- For asynchronous configurations, characters are sometimes lost when typing ahead.
- The following information applies to IBM PCs only:
 - VT100 emulation on IBM PCs does not fully emulate a VT100. Double height and double width text cannot be displayed, 132 character width mode cannot be selected, not all character attributes are available, and the local printer is not supported.
 - The first ALL-IN-1 screen leaves the cursor in the wrong place. Typing carriage return properly positions the cursor.
 - Not all character attribute escape sequences work properly. Both black and white and color have some problems.
 - After exiting from SETHOST on an IBM PC, some screen attributes are not reset to their state before running SETHOST, such as color and cursor format.

2.9.2 LAT ONLY

- Use of the @ command for batch input is not fully supported by ULTRIX and RSX hosts.
- Use of the @ command for batch input is supported by VMS hosts. However, it will not work properly if the SET TERM/INQ command is embedded in LOGIN.COM and the @ command is used.
- VMS TDMS applications are supported under LAT connections. VMS TDMS applications are not supported under CTERM connections.
- The following information applies to IBM PCs only:
 - VT100 emulation on IBM PCs does not fully emulate a VT100. Double height and double width text cannot be displayed, 132 character width mode cannot be selected, not all character attributes are available, and the local printer is not supported.
 - Not all character attribute escape sequences work properly. Both black and white and color have some problems.
 - After exiting from SETHOST on an IBM PC, some screen attributes are not reset to their state before running SETHOST, such as color and cursor format.
- If backspace characters are output which would back the cursor up before the beginning of the line, text which follows the backspace characters appears on the next line. Text should appear on the same line.
- Connections to RSX-11M-PLUS V3.0 can crash the system. This problem is being solved by patches or future releases of RSX.
- Connections to RSX-11M-PLUS V3.0 can break. This problem is being solved by patches or future releases of RSX.
- Connections to the Ethernet Terminal Server V2.1 (reverse LAT) or earlier may break. This problem is solved by a future release of the terminal server software.
- Connections to ULTRIX V1.2 (or earlier) systems can break. This problem is solved by patches or a future release of the ULTRIX software.
- If the NEW SESSION option is chosen after typing `^ \ (RET)` during a LAT session, SETHOST allows you to create a new session. However, the existing LAT session is aborted. (When a LAT session to a VMS host is aborted, your job remains intact. The next time you log onto the VMS host, you can reconnect to the same job.)
- When using `(CTRL/S)` and `(CTRL/Q)` to pause output, the response may be slow. Pressing the <HOLD SCREEN> key (on the Rainbow) or the <ALT/F1> key (on an IBM PC) is faster, but the response is still not immediate.

- To send **CTRL** to the host system, be sure to repeat the sequence twice. If you only do this once, SETHOST waits for you to press the **RET** key.
- If you use /CTERM/SAVE, you can only get back to using LAT by deleting the file SETHOST.DEF.

2.10 NDU – Network Device Utility

- When the NDU CLOSE command is issued for a remote virtual disk file which resides on a personal computer running FAL, FAL will report the “broken pipe” error message. This is only a warning; no error has occurred.
- If a virtual disk file is created with one NDISK file specification and then an attempt is made to delete the virtual disk file using the command:

DELETE NODE *node* NDISK *file*

with a different file specification which references the same file (using logical names, for example), the delete function will fail. Always delete the virtual disk using the same file specification that it was created with if the delete is done for a connected disk.

2.10.1 NPDRV – Virtual Printer Driver

- If the remote FAL makes an error, the Rainbow or IBM PC may hang. This will very seldom occur.
- On IBM PCs use of the virtual printer by the background print spooler may hang the system.

2.10.2 NDDRV – Virtual Disk Driver

- If the remote FAL makes an error, the Rainbow or IBM PC may hang. This will very seldom occur.

2.11 NCP – Network Control Program

- Setting the state of the line to OFF in an asynchronous configuration will shutdown network processing, but will NOT hang up the phone, even if the circuit’s modem parameter is set to full. If you must hang up the phone under program control, use the NCP command:

NCP>SET LINE STATE HANGUP

- The executor transmit and receive passwords and the remote node access control strings may be quoted or unquoted. Unquoted strings are forced to uppercase.

- Please be aware that some combinations of settings for buffer sizes, buffer counts, and timers may cause performance problems or network failures. Please change network parameters only to solve specific problems. If new problems occur as a result, change back to the default settings.
- If you plan to use the SET KNOWN NODES FROM REMOTE command, be aware that in a large network, the resulting node database can be so large that the search time during connections can be very long. In a large network, consider only defining the nodes you access frequently.
- When entering quoted strings as part of the command line arguments, the quotes are removed. For example:

```
NCP>SET ACCESS USER "bence"
```

With the quotes removed, this results in:

```
NCP>SET ACCESS USER bence
```

The username bence is then forced to uppercase.

2.12 NTU – Network Test Utility

- The LOOP EXECUTOR command requires 3 free sockets for successful execution. If only one (or no) socket is available, a proper error message is returned. If exactly two sockets are available, NTU reports: “time-out waiting for connect”. This does not indicate a failure of the network.
- The LOOP CIRCUIT commands for Ethernet configurations may fail to loop some messages. This does not indicate that there is a problem which needs to be corrected. Personal computers may lose messages at times. DECnet automatically retransmits lost messages, but the circuit loopback architecture does not.
- Access control strings may be quoted or unquoted. Unquoted strings are forced to uppercase.
- LOOP CIRCUIT to the DECnet Router Server V1.0/V1.1 will fail. This does not indicate an error. There is no loop circuit server software in the asynchronous router server product.

2.13 TFA – Transparent File Access

- One can use TFA to type and copy files as follows:

```
TYPE \\f\node\\filespec
COPY local-file \\f\node\\remotefile
TYPE \\f\node\\remotefile >localfile
```

- TFA supports only one open file at a time.

2.14 TTT – Transparent Task-to-Task

- TTT supports up to 4 logical links at one time.

2.15 DTR/DTS

- DTR and DTS are tools used to test the network and measure its performance. The documentation set does not include documentation for DTR or DTS. However, the fourth floppy in the distribution kit contains the file DTS.TXT which describes the use of these tools.
- Interrupt tests to TOPS-20 systems do not work properly.
- DTS on a personal computer reports sequence errors during echo tests, both to VAXes and to other personal computers.

2.16 MAIL

- MAIL.EXE can only SEND mail to remote nodes. It cannot receive mail.
- If one attempts to send a non-ASCII text file as a mail message, MAIL will not produce a useful error message, but instead will behave erratically.

2.17 FAL (File Access Listener)

- FAL does incoming access checking only if the file DECACC.DAT exists in the DECnet database path. Such a file is created the first time the NCP SET ACCESS command is issued. If no such file exists, or if you have not issued the SET ACCESS command, the system's files are available to any and all incoming access requests while FAL is running.

The DECACC.DAT file is deleted if the NCP command CLEAR KNOWN ACCESS is issued. Note that if one clears all entries using the NCP command CLEAR ACCESS USER *user*, the file will still exist, but have no entries. In this case, FAL will do access checking, but allow access to no users.

- Since MS-DOS is a single tasking operating system, FAL must run to the exclusion of all other application programs.
- Some hosts may use as many as 4 logical links to perform a single file access function. If you plan to run FAL, it is suggested that you increase the number of logical links supported. Type:

```
NCP>DEFINE EXECUTOR MAXIMUM LINKS 8
```

- Because MS-DOS path specifications contain the backslash character and directory names and file names have the same syntax, VMS cannot use path specifications without being surrounded with double quotes. In addition, a number of restrictions apply when using quoted file specifications in VMS. To solve all these problems, FAL accepts VMS syntax for file specifications:

```
$ DIR MSDOS::\TEST\*.C           will fail
$ DIR MSDOS::"\TEST\*.C"         will work
$ DIR MSDOS::[TEST]*.C           will work
```

VMS does not understand that \foo is sometimes a file and sometimes a directory. To avoid the problems that this causes, always specify file names or use VMS syntax:

```
$ DIR MSDOS::"\ "                will fail
$ DIR MSDOS::"\ *.*"             will work

$ COPY *.FOO MSDOS::"\DIR"        will fail
$ COPY *.FOO MSDOS::"\DIR\*.*"    will work
$ COPY *.FOO MSDOS::[DIR]*.*      will work
```

VMS does not properly separate the parts of a file specification when it does wildcarding. As a result, wildcard copies of files from a personal computer to VMS using VMS DCL cannot be done using MS-DOS file syntax. Such copies must be done using VMS file syntax:

```
$ COPY MSDOS::"\WORK\*.*" *.*     will fail
$ COPY MSDOS::[WORK]*.*.*          will work
```

- FAL does NOT do file locking. If you will be using FAL for simultaneous access to the same file, insure that all users of the file open the file for reading ONLY. If two users attempt to open the same file for simultaneous write, unpredictable results may occur.
- If FAL is run under the SPAWNER, file access from VMS systems using file lists may fail after the first file. Wildcard file access is supported.
- When the NDU CLOSE command is issued for a remote virtual disk file which resides on a personal computer running FAL, FAL will report the "broken pipe" error message. This is only a warning; no error has occurred.
- Trapping of hard device errors works for all IBM PCs. Hard device errors that occur on a Rainbow will cause FAL to stop. When FAL stops due to a device error, all its sockets are still active. Use the NCP command "SET KNOWN LINKS STATE OFF" to abort FAL's links and sockets before starting FAL again.

2.18 DIP – DECnet–DOS Installation Procedure

1. The following information applies to Rainbows only:
 - The files DNPETHRB.EXE and LAT.EXE are not a part of the DECnet–Rainbow product, but are included on the floppies. Do not copy these files to your Rainbow.
 - If you choose to install DECnet files to floppies (such that loading of NDDRV.SYS and NPDRV.SYS will be from a floppy on system reboot), DIP will insert a dummy — `DEVICE = <x>:<path>DECDIP.SYS` — command line in CONFIG.SYS because MS–DOS will fail on loading the first driver but will succeed on loading subsequent drivers specified.
 - Due to problems with MS–DOS and `(CTRL/C)` interrupt handling, if a user enters a `(CTRL/C)` while in DIP and chooses to “terminate” DIP, any saved answers will not be written to a saved answer file. The only way to produce a saved answer file is by running DIP to completion and saving answers “normally”.
 - Numerous `(CTRL/C)`s may cause unpredictable results.
2. The display of disk usage after copying DECnet files is incorrect when copy path and database paths are specified to be on different devices.
3. If installing DECnet V1.1 and DECnet V1.1 has already been installed at least once, database files do not have to be deleted from the DECnet default database path (for example, *.DAT).
4. If DIP is used to install DECnet, an existing DECPARM.DAT (if found in the specified DECnet database path) will be deleted automatically.

2.19 C Programming Library

- `dnet__conn()`:

This function’s first argument is a node specification string, such as a node name or node address. If the string is a node address, no default access control information will be passed with the connect request. For example, the local node’s remote node database will not be searched to find access control information that may be set up for this remote node address.
- It is necessary to recompile/reassemble the V1.1 library sources and produce a new library against which utilities can be relinked. This will help to ensure that any inconsistencies or incompatibilities that exist from V1.0 will go away.
- The C code in the programming library uses long variable names. Be sure that your compiler can compile such sources.
- Functions required for DECnet network I/O are documented in the *DECnet–DOS Programmer’s Reference Manual*. In addition to these documented functions, many other undocumented ‘support’ functions are included as part of the C programming interface library found on the last kit floppy (DNETLIB.SRC).

3

Modem Control

The information in this chapter is provided for people who want to know how modem control is implemented. The information is intended for people who understand modem operations.

3.1 Using Modem Control

To use modem control for DECnet on your personal computer, you should make sure that cables and connections conform to the EIA RS-232-C and CCITT V.28 and V.24 standards. (Refer to Section 3.3 of this guide for information about the cables and interface leads to use with these standards.)

The following assumptions have been made for this release of DECnet-DOS:

- Connections that were established before turning the line state ON will be maintained.
- Connections that still exist when turning the line state OFF will be maintained (unless the data set is specifically commanded to hangup).

You should also be aware of the following information:

- In the United Kingdom (UK), the R1 relay in modem number 2B is held up for approximately 2 seconds in order to bridge the gaps in the ringing signal. For proper operation in calls that are automatically answered, the 2-second hold up requires that the amount of time from DSR = ON through DTR = OFF and back to DSR = ON be at least 5 seconds. This will avoid a false second call seizure. (Refer to State 7 in Figure 3-1.)

- It is assumed that the terminal has two modes of operation:
 - data leads only (modem control signals ignored)
 - full modem control (modem control signals acknowledged)

The data leads only mode is used for local connections, such as null modem applications. The proper mode signals are simulated internally to allow the use of a single control flow. You can choose between the two modes by using a set-up parameter.

3.2 Modem States

Figure 3-1 shows the different states for the modem. (State 1 and State 2 refer to power ON and internal self test functions, and are omitted from this diagram for purposes of clarity.)

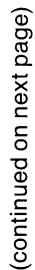


Figure 3-1: Modem States

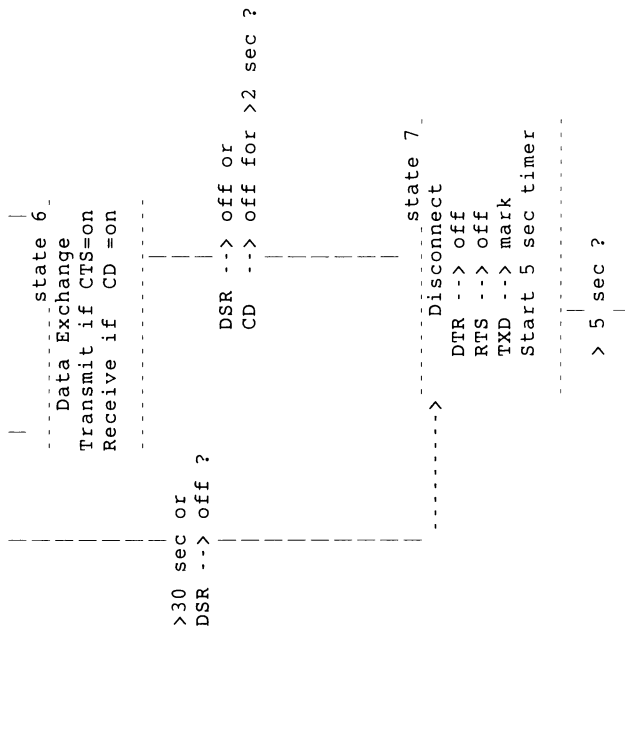


Figure 3-1 (cont.): Modem States

The following sections explain the modem states that are detailed in Figure 3–1.

3.2.1 General

The general states include:

- 1, OFF, or MARK – these relate to the negative voltage at the interface pin.
- 0, ON, or SPACE – these relate to the positive voltage at the interface pin.

3.2.2 State 1

This state is entered at power on.

3.2.3 State 2

This state is entered if the terminal is on-line.

3.2.4 State 3

This state exits unconditionally to State 4 if the data leads only mode is selected. If the full modem control mode is selected, State 5 is entered (as soon as Data State Ready, DSR, has come on). The wait for DSR is untimed. State 3 is the state an on line terminal is normally in before connection has been established.

In State 3, the Data Terminal Ready (DTR) and Request to Send (RTS) signals are turned on. In this state, the modem can switch itself on-line only if DTR is ON. The RTS signal is needed by some modems to prepare the transmit channel.

NOTE

In some cases (such as private wire), it is possible for DSR to be ON before DTR is ON. This is possible if there is a manual connection from the modem to the line.

3.2.5 State 4

In this state, the actual signals from the modem are ignored and forced internally ON (if the data leads only mode is selected). State 6 is then entered.

3.2.6 State 5

This state is entered only after Data Set Ready (DSR) has come ON. This indicates that the modem is on-line. The modem can come on-line either automatically or manually. It will come on-line automatically if there is a call coming in through the automatic answer unit of the modem. It will come on-line manually when you switch from voice to data after you have established an incoming or an outgoing manual call.

Once the modem is on-line, two timers are started. The timers are called T1 and T2. The timers operate as follows:

- T1 protects against a non-data call. This is a PTT requirement in Germany. If no data link has been established within 30 seconds after the modem has gone on-line (State 6), an automatic disconnect is initiated.
- T2 protects against data transfer within the first second after the modem has gone on-line. This avoids garbage due to transient effects in some older modems.

If Clear to Send (CTS) and Carrier Detect (CD) have both come ON, the link is considered established.

3.2.7 State 6

This state is the normal data exchange state of the terminal when the call is established.

3.2.8 State 7

This is the disconnect state. The disconnect is initiated by loss of carrier (CD) for greater than 2 seconds, or by the loss of Data Set Ready (DSR). The terminal waits 5 seconds, then a new connection is anticipated by entering State 3. This sequence provides a proper disconnection for all known modems.

Figure 3-2 illustrates the minimum implementation of the V.24 circuits for full duplex modem control.

INTERNAL DTE SIGNAL NAME (TYPICAL)		ISO 2110 MALE CONNECTOR PIN NUMBER		V.24 CIRCUIT NUMBER
See State 7 in Figure 2-1				
PROT	GND -----TT-->	1	PROTECTIVE GROUND	101
	TxD ----- >----	2	TRANSMITTED DATA	103
	RxD -----< ----	3	RECEIVED DATA	104
	RTS ----- >----	4	REQUEST TO SEND	105
	CTS -----< ----	5	READY FOR SENDING	106
	DSR -----< ----	6	DATA SET READY	107
SIG	GND ----->	7	SIGNAL GROUND	102
	CD -----< ----	8	RECEIVED LINE CARRIER DETECT	109
	DTR ----- >----	20	DATA TERMINAL READY	108/2

Figure 3-2: Minimum Implementation of V.24 Circuits for Full Duplex Modem Control

3.3 Interface Requirements

The following tables specify the interface leads which are required to use DECnet-DOS in asynchronous mode, either with a direct connection or with a modem. (The DECnet software will not monitor the modem leads when direct connection is specified. This allows for the connection to a remote node using a null modem, a modem eliminator, or null modem cable. These are cables and devices which may not provide all the signal leads required for a modem connection.)

Following each table is a list of the part numbers for the DEC EIA RS-232 communication cables which will provide these leads.

Table 3–1: Asynchronous Mode, Direct Connection

Pin No.	Function	CCITT V.24 Circuit No.	EIA RS–232–C Circuit No.
1	Protective Ground	101	AA
2	Transmit Data	103	BA
3	Receive Data	104	BB
7	Signal Ground	102	AB

Communication Cables:

BC22D 6 wire null modem cable (transmit and receive leads crossed within cable, eliminating the need for a separate null modem device.)

BC22E 16 wire modem cable

BC22F 25 wire modem cable

BCC14 16 wire modem cable (with thumb screw connectors)

BCC04 25 wire modem cable (with thumb screw connectors)

Table 3–2: Asynchronous Mode, Modem Connection

Pin No.	Function	CCITT V.24 Circuit No.	EIA RS–232–C Circuit No.
1	Protective Ground	101	AA
2	Transmit Data	103	BA
3	Receive Data	104	BB
4	Request to Send	105	CA
5	Clear to Send	106	CB
6	Data Set Ready	107	CC
7	Signal Ground	102	AB
8	Carrier Detect	109	CF
20	Data Terminal Ready	108/2	CD

Communication Cables:

BC22E 16 wire modem cable

BC22F 25 wire modem cable

BCC14 16 wire modem cable (with thumb screw connectors)

BCC04 25 wire modem cable (with thumb screw connectors)

3.4 Modem Option Selections

To use a modem with the asynchronous port, the modem must be configured to match the line characteristics used by DECnet–DOS. For many modems these will be the standard factory settings. Table 3–3 lists some of the user-selectable options you may find on your modem.

Table 3–3: User-selectable Modem Options

Option	Description	Setting for Use with DECnet–DOS
Character Length	No. of bits used to encode a character.	10 bits – 8 data bits, 1 start bit, and 1 stop bit.
Speed Indicate/Select	Indicate mode: modem indicates modem speed on pin 12 (CCITT V.24 112).	Indicate mode. (Pin 23, CCITT V.24 111, is never asserted and pin 12, CCITT V.24 112, is not monitored by DECnet–DOS.)
Receive Responds to RDL	Allows modem to respond to a remote digital loopback test request.	Enabled (if you want to allow a remote modem test).

Other selectable modem options should be set according to the modem user's guide for the particular modem application you are using. (Other options include a public switched line, a leased line, asynchronous or synchronous mode, etc.).

4

Reporting Problems

If you experience ANY problems using this software, please provide all pertinent information when going for help, including:

1. Physical link description (thick Ethernet, wire, modems, etc.).
2. Adjacent node system and network type and version number.
3. Remote node system and network type and version number.
4. What you were trying to do and what was typed to do it.
5. What appeared on the screen or what happened to make you feel that a problem had occurred.
6. Use the NCP READ LOG, NCP SHOW *xxx* COU, and NCP SHOW *xxx* CHAR commands after any problems and record the displays.

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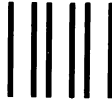
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