

**Comm/Exec Internals:
DECnet Data Structures
Manual**

July 1983

The Comm/Exec Internals: DECnet Data Structures manual provides reference information on the permanent and volatile data structures used by the RSX DECnet product. These data structures include CETAB macros and various control blocks that are set up when DECnet is loaded. Also included in this manual are two appendices dealing with the data link level protocol modules used by DECnet: the DDCMP process (DCP) and the Ethernet Protocol Manager (EPM).

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SOFTWARE VERSION:	COMM/EXEC VERSION 3.0

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Version History

VERSION HISTORY

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manual divided into a manual set
Cross references changed

02-Aug-83
Version 2.00 Final Draft - Completed Manual Set

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PREFACE

MANUAL OBJECTIVES

The goal of this manual is to provide the information necessary for you to understand the internal data structures used by the RSX DECnet product.

MANUAL AUDIENCE

This manual assumes that you are systems level programmer interested in the internals of the RSX DECnet product. You are assumed to be familiar with the PDP-11 family of processors, and be an advanced MACRO-11 programmer who has a firm knowledge of Communications Executive environment.

MANUAL STRUCTURE

This manual is organized in a reference style.

Chapter 1 contains a description of the CETAB macros used by DECnet.

Chapter 2 contains a description of the data structures used by RSX DECnet.

Chapter 3 contains a description of the CEDump switches used to dump the DECnet data structures of a running DECnet system.

Appendix A covers the data structures used by the Ethernet Protocol Manager (EPM) process.

Appendix B covers the data structures that are used in the DDCMP process (DCP).

ASSOCIATED DOCUMENTS

This manual is part of the Comm/Exec Internals manual set describing the internals of the RSX Communications Executive. Although this manual is intended to be a free standing document, references are made to the other manuals in the Comm/Exec Internals manual set.

Familiarity with the Communications Executive from the point of view of a system user can be obtained from the RSX-11 DECnet manual set (Order No. xxxxx). Network Management topics (especially counter and event logging issues) are covered in the DNA Network Management Specification (Order No. xxxxxx). Source listings for the RSX DECnet products are not included but could improve your understanding of the

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RSX DECnet internals. These listings must be obtained directly from the Distributed Systems Group at Tewksbury, Massachusetts.

CHAPTER 1

DECNET CETAB MACROS

There are several CETAB macros that are used to define the data structures needed to support DECnet. They are not present in the configuration file if DECnet is not requested at network generation time.

The macros described in the following sections are only for the DECnet product. For other CETAB macro descriptions see the Guide to Writing a CompaqExec Process manual and the ESI Data Structures manual.

The macro descriptions presented in this chapter are presented in the same order that they are likely to be encountered in the CETAB source file.

DECnet DATA STRUCTURES MANUAL
DECnet CETAB Macros

```
*****  
*           *  
*  ROU$DF  *  
*           *  
*****
```

1.1 ROU\$DF - Define Routing Task Parameters

Format: ROU\$DF nn,maxc,maxh,routa,maxa,rtadj,enadj,
 amxc,amxh,rttia,rtpri

where: nn The maximum node address allowed in the
 network (1.-255.)

 maxc The maximum cost allowed per line (1.-1022.)

 maxh The maximum hops allowed in the network
 (1.-32.)

 routa The routing timer interval in seconds
 (0-65535.)

 maxa Maximum number of areas in network (1.-255.)
 (must be zero if areas are not supported)

 rtadj Number of broadcast router adjacencies
 (1.-255.)

 enadj Number of broadcast endnode adjacencies
 (1-255.)

 amxc Area maximum cost (1.-1022.)

 amxh Area maximum hops (1.-32.)

 rttia Broadcast router timer (1.-255.)

 rtpri Broadcast router priority (1.-255.)

Description: This macro is used to define the routing task
 parameters.

Restrictions: None

Example: ROU\$DF 300.,1022.,15.,30.,0.,5.,255.,0.,0.,10.,0.

This example sets the maximum node address to 300, the maximum cost to 1022, and the maximum hops to 15. The routing timer is set to 30. The network defined does not support areas. The routing task supports up to 5 broadcast router adjacencies and 255 broadcast end-node adjacencies. The broadcast router timer is 10.

```
*****  
*           *  
*   NOD$DF   *  
*           *  
*****
```

1.2 NOD\$DF - Define Local Node Parameters

Format: NOD\$DF <nam>,<id>,<larea>,<laddr[,<harea>,<haddr]>

where:

nam	The name of the local node (must be six characters in length - including blanks).
id	The local node ID (Maximum of 32 characters including blanks).
larea	The local node area number (1.-255.) (must be 1 in single area network)
laddr	The local node address (1.-255.)
harea	The host node area number (1.-255.) (must be 1 in single area network)
haddr	The host node address. If blank the local node address is used. (1.-255.)

Description: This macro is used to define the parameters that characterize the local node.

Restrictions: None

Example: NOD\$DF <ELROND>,<DECNET-11M-PLUS-BL7>,1,,19,,19.

This example sets the node name to ELROND and the node ID to DECNET-11M-PLUS-BL7. The node is in a single area network and has an address of 19. The host node address information is set the same as the local node.

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DECnet CETAB Macros

```
*****  
* *  
* REM$DF *  
* *  
*****
```

1.3 REM\$DF - Define Remote Node Parameters

Format: REM\$DF <name>,area,address

where: name The node name (1-6 alpha-numeric)
area The node area number (must be 1 in single
area network) (1.-255.)
address The node address (1.-255.)

Description: This macro describes the affinity between a node name
and a node number. Each defined remote is appended to
the remote list.

NOTE

- The node name is a 'local phenomenon' and in no
way does the local node's perception of a
remote node's name have to agree with what the
remote node perceives his own name to be. It
is however, recommended that node names agree
for the sake of consistency across the network.

Restrictions: None

Example: REM\$DF <BERGIL>,1,,6.

The example shown defines a remote node name BERGIL and
maps that name to area 1, node 6.

```
*****  
* *  
* SER$DF *  
* *  
*****
```

1.4 SER\$DF - Define Service Parameters

Format: SER\$DF narea,naddr,harea,haddr,scir,sdev,
[pass],[daddr],[dct],[hrdaddr]

where:

- narea The node area address (1.-255.)
- naddr The node address (1.-255.)
- harea The host area address (1.-255.)
- haddr The host address (1.-255.)
- scir The service circuit (System line number)
- sdev The service device (ASCII line name)
- pass The password (1-16 hexadecimal digits)
- daddr The dump address (1-16 hexadecimal digits)
- dct The dump count (1.-255.)
- hrdaddr The hardware address (1-16 hexadecimal digits)

Description: This macro define the parameters needed for down-line load and up-line dump of RSX-11S and Server Base software.

Restrictions: Must be followed by a FIL\$DF macro.

Example: SER\$DF 1.,43.,1.,23.,3,UNA-0,0,,,AA00300003B421

This example declares node 23 in area 1 to be node 43's host node. The service circuit associated with node 43 is circuit 3 (UNA-0). The hardware address of node 43 is AA00300003B421.

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DECnet CETAB Macros

```
*****  
*           *  
*   FIL$DF   *  
*           *  
*****
```

1.5 FIL\$DF - Define File Name Parameters

Format: FIL\$DF [secldr],[terldr],[ldfil],[diasfil][,dumpfil]

where: secldr The secondary loader file name
 terldr The tertiary loader file name
 ldfil The load file name
 diasfil The diagnostics file name
 dumpfil The dump file name

Description: This macro define the various file names needed for servicing the RSX-11S or Server Base software. All filenames are specified as ASCII strings and should conform to legal RSX-11 filename syntax (device:[uic]filename.type). The macro sets up the file names needed as a result of a SER\$DF macro.

Restrictions: Must immediately follow a SER\$DF macro. Although all fields are optional, at least one must be present.

Example: FIL\$DF PLUTO2.SYS,PLUTO3.SYS,RSX11.SYS,,PLUTO.DMP

This example sets up PLUTO2.SYS as the secondary loader file name and PLUTO3.SYS as the tertiary loader file name. The desired load file is RSX11S.SYS. There is no diagnostics file specified. The dump file name is set to PLUTO.DMP.

CHAPTER 2

DECNET VOLATILE DATA STRUCTURES

2.1 INTRODUCTION

This chapter describes the DECnet-RSX Phase IV DEC volatile data base. Its primary purpose is to provide more detailed descriptions of the volatile data structures of the DECnet-RSX products. The first chapter in this manual contains the description of the permanent data base and the other manuals in the Comm/Exec Internals series describe other components of the volatile data base.

The volatile data base structures are initially allocated at network load time based on the permanent data base. These structures may then be modified by the running network software or by use of Network management commands. Any changes, additions or deletions to this data only affect the running system and are not permanent (I.E., they are lost when the network is re-loaded).

These data structures reside in the Communications Executive (Comm/Exec), in system pool (DSR), in the various processes' space, in network pool, and in the user's task.

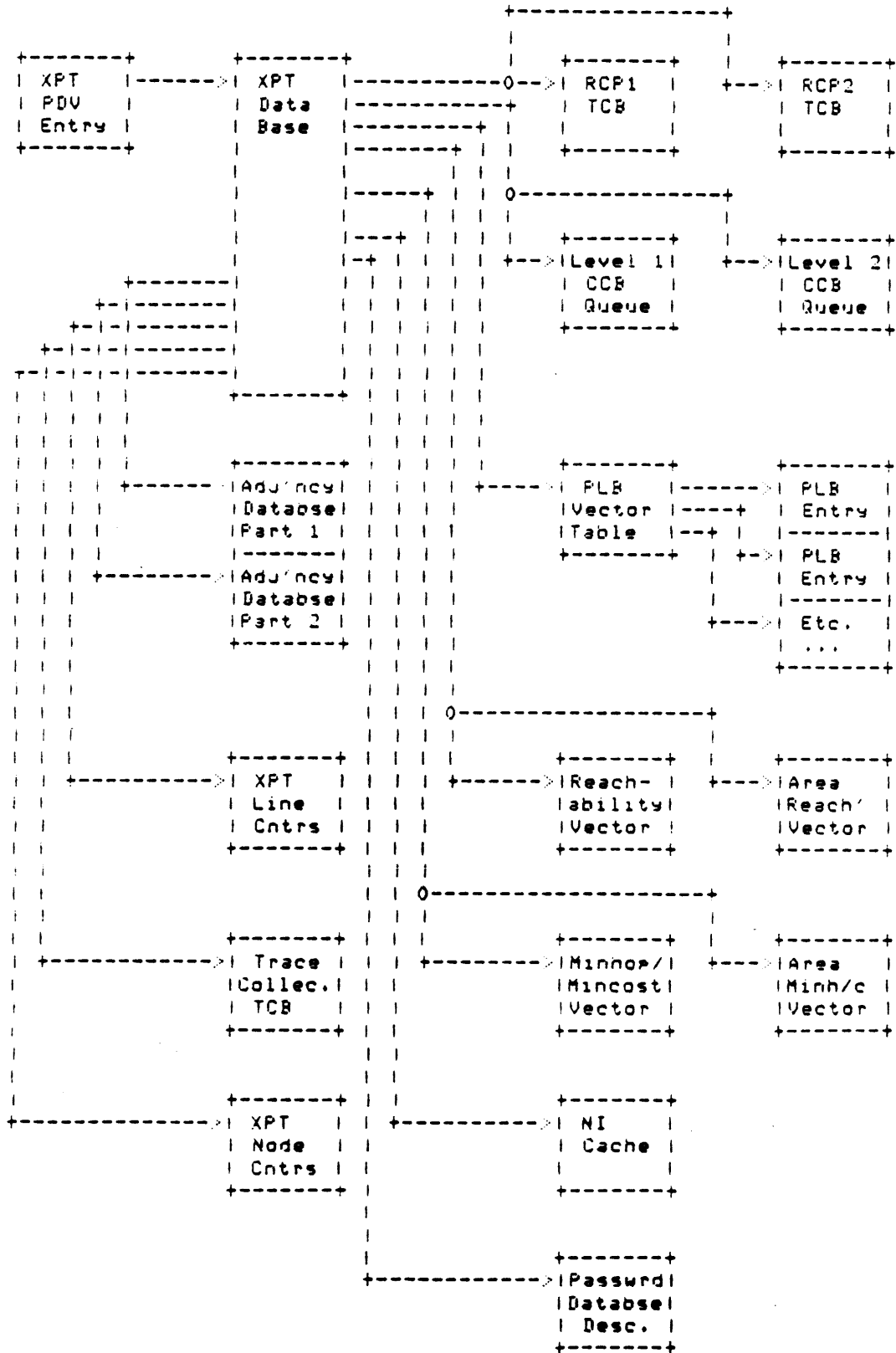
NOTE

It cannot be assumed that a type of data structure will always be allocated from the same place. If there is insufficient memory for the allocation of a data structure in one pool, then another pool will be used to allocate that data structure. Therefore, the data structures in the rest of this document are put under the sections that they would appear if no allocation failures result. If a data structure is normally allocated from Comm/Exec pool, except when there is insufficient memory, then that data structure can be found in the Comm/Exec pool section of this document.

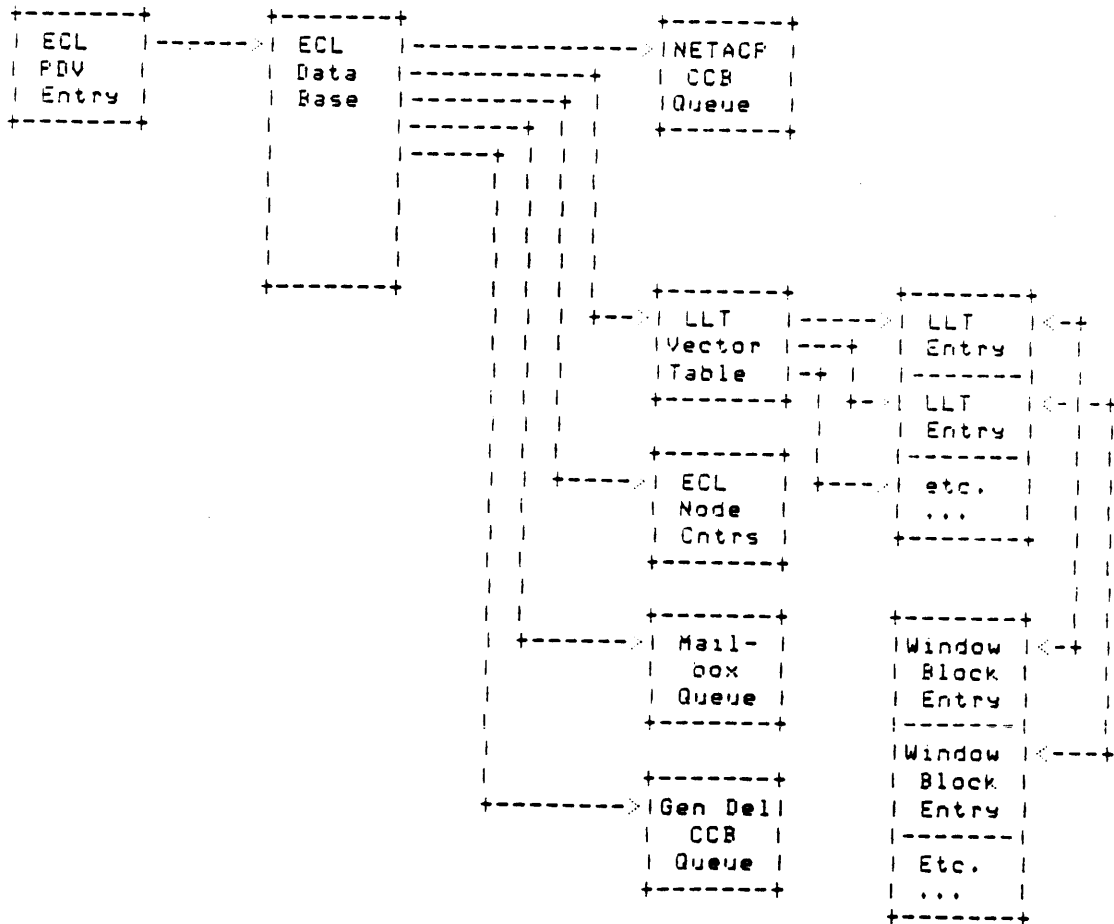
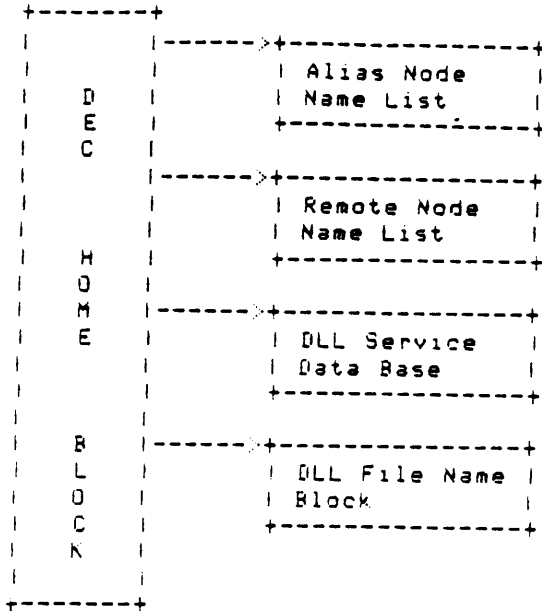
Also, several data structures are allocated from different places depending on the operating system type (M or M-Plus). In this document all data structures of this type will be categorized as DECnet-11M data structures.

The relationship of the major volatile data base components is

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2.2 DATA IN Comm/Exec / RSX POOL

Within the Comm/Exec partition is the Comm/Exec pool. The size of the Comm/Exec pool is determined at Network Generation time. The following data structures are located in either the Comm/Exec pool or the system pool (DSR). Both are mapped in the Executive virtual address space.

NOTE

The Comm/Exec pool is not available for data structures in RSX-11M-PLUS systems with I/D space. The Comm/Exec resides in I space provided by the RSX executive.

2.2.1 DHBDF\$ - DECnet Home Block Format

The DECnet Home Block contains DECnet specific information which is accessed by multiple DECnet processes and/or tasks. The DECnet Home Block is allocated from RSX system pool (DSR) and is pointed to via \$DECPT in the Comm/Exec Common. The DECnet home block can be examined in a running system by using the CEDump /DH switch (See Section 3.1).

Alias Node Name Listhead	D\$ANN
Remote Node Name Listhead	D\$RNN
Pointer to end	
Local Node Name (6 bytes)	D\$LNAM
Local Node Number	D\$LNUM
Ident String Length	D\$LID
Local Node Identification (32 bytes)	
Host Node Address	D\$HOST
Hi-order four bytes of Ethernet Address	D\$HIOR
Number of Routing Channels	D\$NLN
DLL Service Database Address	D\$SER
DLL Database FNB Address	D\$FNB
ECL Segment Size	D\$SEG

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The following Home Block cells are present for routing nodes only:

Number of Broadcast Router Adjacencies	D\$NBRA
Number of Broadcast Endnode Adjacencies	D\$NBEA
Number of Nodes in Network	D\$NNA
Number of Areas in Network	D\$NA
Maximum Cost	D\$MAXC
Maximum Hops	D\$MAXH
Maximum Visitation Count	D\$MAXV
Area Maximum Cost	D\$AMXC
Area Maximum Hops	D\$AMXH
Square Root Limiting Factor	D\$SQRL
Routing Timer (seconds)	D\$RTHR
Broadcast Routing Timer (seconds)	D\$BRTH
Broadcast Router Priority	D\$BRPR

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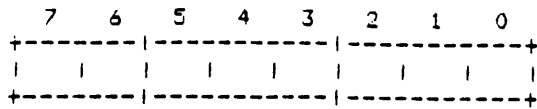
2.2.3 ECDDDB* - ECL Data Base <DSR>

The data shared between the ECL process and the NETACP task is contained in this structure. The pointer to the data is contained in the Process Descriptor LLC data base address cell (Z.DAT) for the ECL process.

	Network ACP CCB Queue	N\$ACQ
	Doubleword Listhead	
N\$FLG	Flag Byte Timer Count	N\$TIM
	Function Code	N\$FNC
	Dummy VCB	N\$VCB
	Source Node Address	N\$SNOD
	(Reserved) Round Trip Delay	N\$DLY
	Source Link Address	N\$SLA
	Destination Link Address	N\$DLA
	Error Code	N\$ERRC
	Mapping of Current LLT	N\$LLTM
	Current LLT Virtual Address	N\$LLT
	Current LLT Physical Address	N\$PLLT
N\$HIGH	Max act los links Cur act los links	N\$ACTL
	Count of CI's Ignored Due to Resources	N\$CIR
	Logical Link Table Length	N\$ULC
	Logical Link Table Address	
	ECL Node Counters	N\$ENC
	Doubleword Listhead	
	ECL Node Counters APR Bias	
	Mailbox Queue Listhead	N\$MBXQ
	General Delivery CCB Queue Listhead	N\$GENQ
N\$GTI	Gen Del In: timer Gen Del Cur timer	N\$GTM

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N\$FLG Flags Byte Definitions

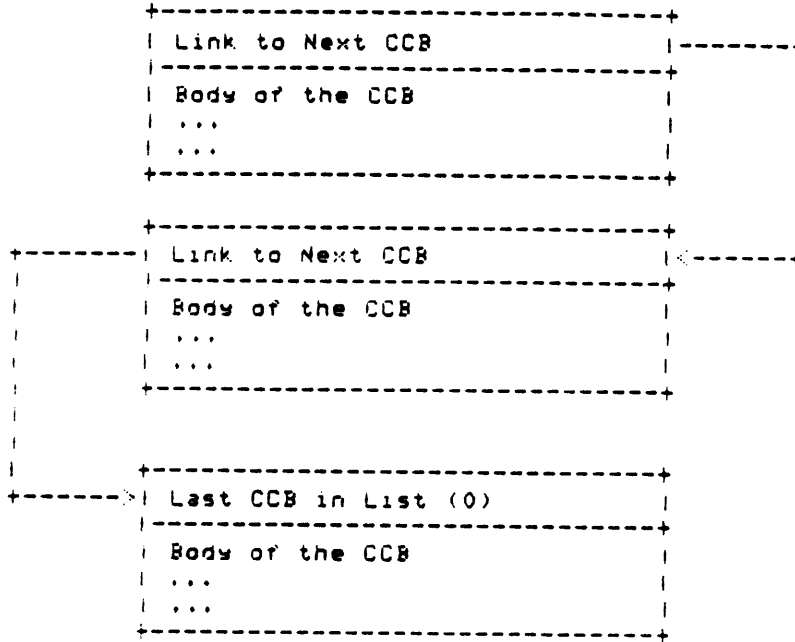


								Reserved
								NF\$RST - Network is in Restricted State
								NF\$SHU - Dismount Via Shut State
								NF\$DMO - Network Being Dismounted
								NF\$SCN - Scan General Delivery Queue
								NF\$MOU - Network is Mounted
								NF\$BLK - I/O Packet De-queueing is Temporarily Blocked
								NF\$TIM - Network ACP Timer Active

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2.2.4 Network ACP CCB Queue <DSR>

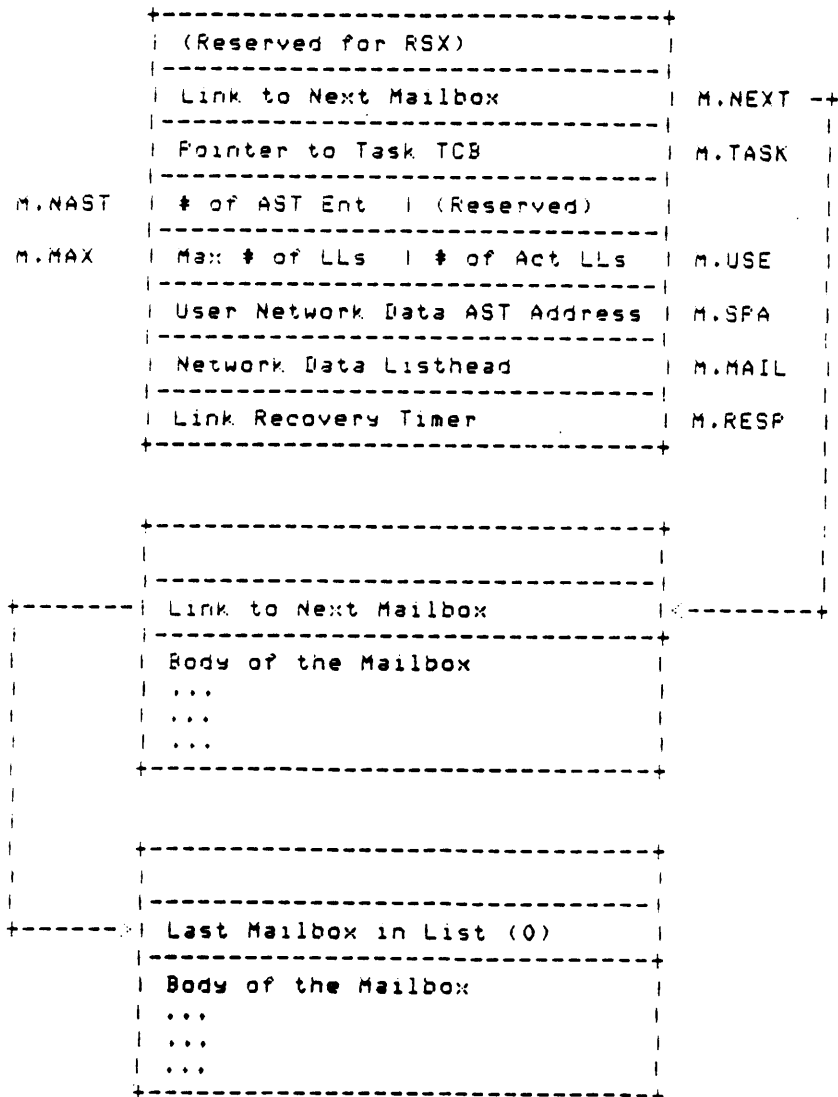
CCBs to be processed by the Network ACP are placed on this queue and the ACP is UNSTOPed to initiate their processing. Both transmit complete and receive complete CCBs may be placed on this queue.



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2.2.5 MBXDF\$ - Mailbox Queue <Comm/Exec Pool>

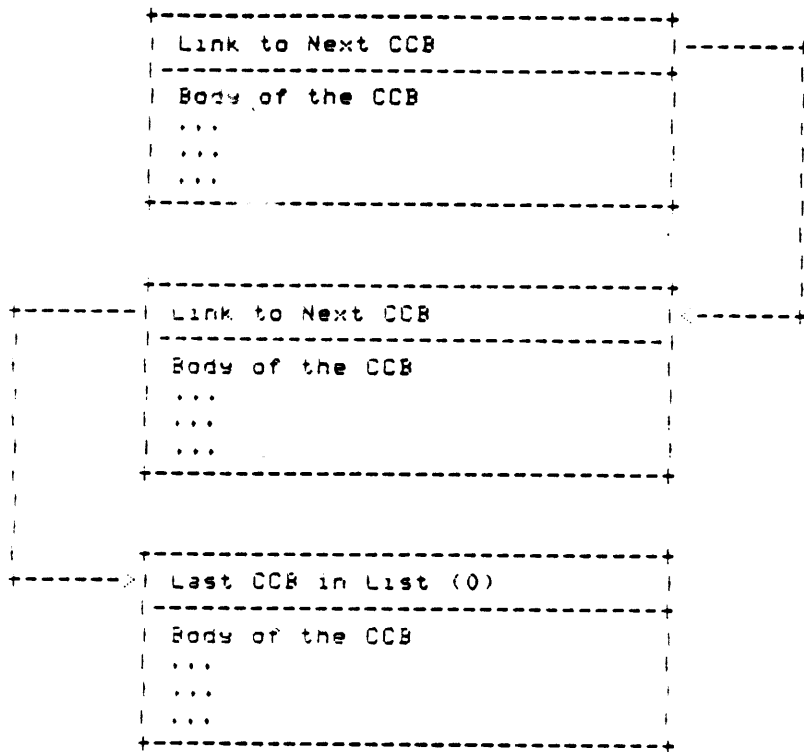
A mailbox is created when a user task indicates that it is an active network user by issuing an OPN\$ function. The mailbox holds common information about the user task for use by the network software. The CEDump /MB switch can be used to dump the mailbox queue of a running system (See Section 3.7).



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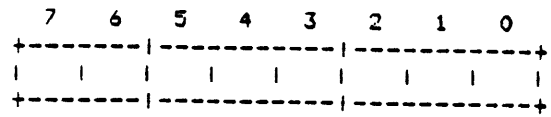
2.2.6 General Delivery CCB Queue

The general delivery queue contains incoming connect and verification requests for tasks which have not yet been requested or tasks which have not been able to issue an OPNS function. The CEDUMP /GE switch can be used to dump the general delivery queue of a running system (See Section 3.2).



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W.KAST Kernel AST Status Flags



- | | | | | | | WK.ACK - Kernel AST for Transmit ACK
- | | | | | | | WK.SND - Kernel AST for Transmit
- | | | | | | | WK.RCV - Kernel AST for Receive
- | | | | | | | WS.DIS - Kernel AST for Disconnect
- | | | | | | | WK.INT - Kernel AST for Interrupt Transmit
- | | | | | | | Reserved
- | | | | | | | Reserved
- | | | | | | | WK.AST - Kernel AST in Progress

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2.2.8 XPDDBS - XPT Database

The data shared between the XPT process and the Routing tasks (RCP1/RCP2) is contained in this structure. The pointer to the data is contained in the Process Descriptor LLC data base address cell (Z.DAT) for the XPT process.

	TCB Address of Level 1 Router	N\$RT1
	Level 1 Routing Message	N\$LV1
	Doubleword Listhead	
	TCB Address of Level 2 Router	N\$RT2
	Level 2 Routing Message	N\$LV2
	Doubleword Listhead	
N\$RTM2	Level 2 Rt. Timer Level 1 Rt. Timer	N\$RTM1
	Physical Link Block Vector Size	N\$PLD
	Physical Link Block Vector Address	
	Reachability Vector Size	N\$ROA1
	Reachability Vector Bias	
	Reachability Vector Address	
	Area Reachability Vector Size	N\$ROA2
	Area Reachability Vector Bias	
	Area Reachability Vector Address	
	Minhop/Mincost Vector Size	N\$MHC1
	Minhop/Mincost Vector Bias	
	Minhop/Mincost Vector Address	
	Area Minhop/Mincost Vector Size	N\$MHC2
	Area Minhop/Mincost Vector Bias	
	Area Minhop/Mincost Vector Address	
	NI Cache Size	N\$CACH
	NI Cache Address	
	Number of Password Database Entries	N\$VER
	Password Database Address	

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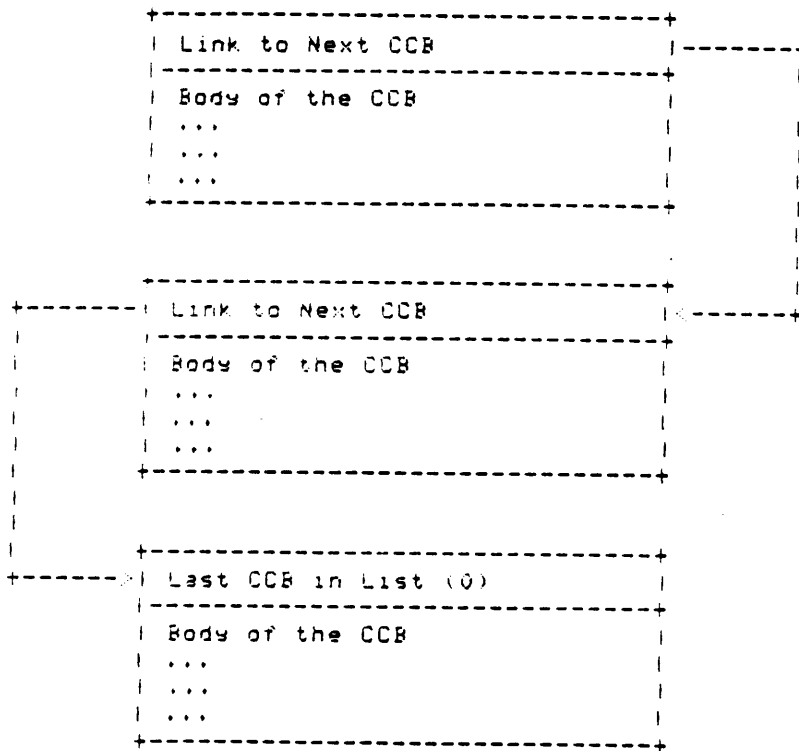
Bias of Adjacency Database Part 1	N\$ADJ1
Bias of Adjacency Database Part 2	N\$ADJ2
Broadcast Router Priority Table Addr.	N\$PRI
Number of Transport Line Cntr Blocks	N\$TLC
Transport Line Counter Bias	--
Transport Line Counters Address	--
Trace Control Word	N\$TRC
Trace Collector TCB Address	N\$TTCB
Trace Control Block Address	N\$TCTL
Transport Node Counter Size	N\$TNC
Transport Node Counters Address	--

The following additional cell is present only on DLM nodes:

\$TCRC Library Pointer	N\$CRC
------------------------	--------

2.2.9 Level 1 Router CCB Queue <DSR>

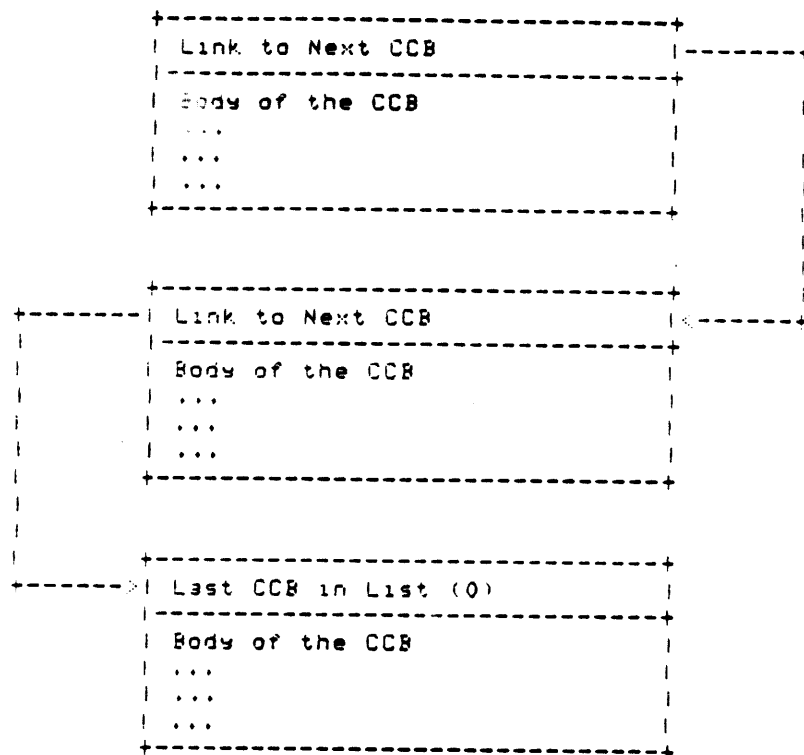
This is linked list of CCBs and associated LDBs containing level 1 routing messages. Buffers are placed on this list by XPT and taken off by RCP1. This list will always be empty for non-routing (end) nodes.



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2.2.10 Level 2 Router CCB Queue <DSR>

This is a linked list of CCBs and associated LDBs containing level 2 routing messages. Buffers are placed on this list by XPT and taken off by RCP2. This list will always be empty for non-routing (end) nodes and non-level 2 routing nodes.



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2.2.11 CACDF\$ - NI Cache <DSR>

The NI Cache is only present for non-routing (end) Ethernet nodes. It contains information about the next hop to set to certain nodes. Entries are made in the cache when a logical link is set up to a node and removed when a time interval has elapsed without any communications with that node. The pointer to the NI Cache is contained in the XPT database.

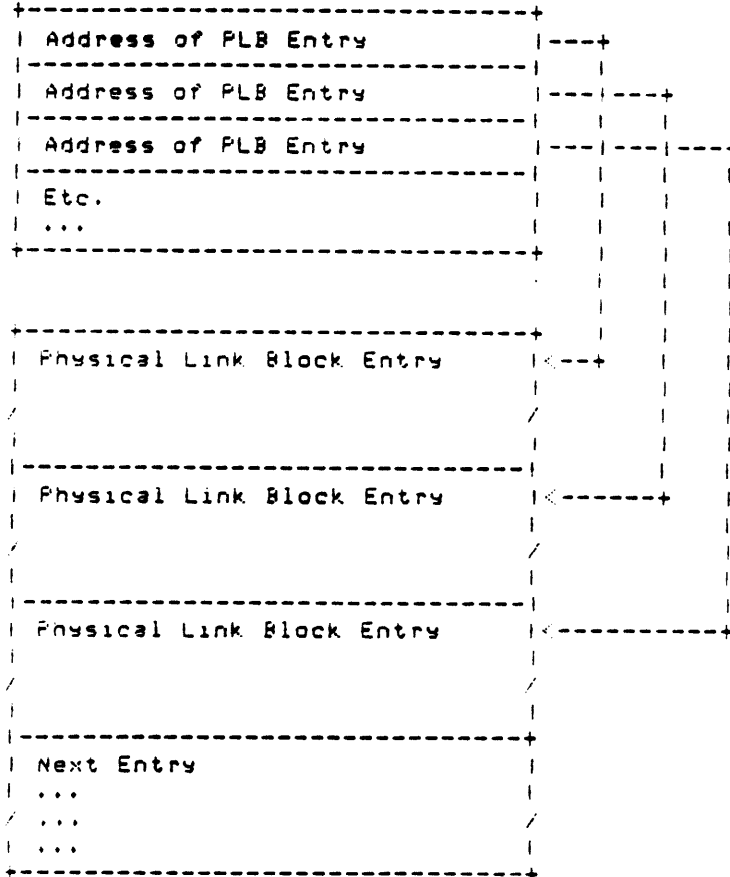
Node ID of Destination	C\$NID
Node ID of Next Hop	C\$NXH
--	--
--	--
Lifetime Timer	C\$TIM
Next Entry	
...	
...	

Note: The Node ID of Destination (C\$NID) is a 16 bit node address and the Node ID of Next Hop (C\$NXH) is a 48 bit node address.

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2.2.12 Physical Link Block Vector Table <DSR>

Each Physical Link Block entry is addressed by the appropriate offset into the PLB Vector Table. The pointer to the PLB Vector Table resides in the XPT database.



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2.2.13 PLBDF\$ - Physical Link Block (PLB) <DSR>

The Physical Link Block is used by XPT to maintain the current status and control/monitor each physical connection to an adjacent node. Pointers to each PLB entry reside in the Physical Link Block Vector Table.

P\$TYP	Adj. Node Type Link State	P\$LST
P\$RTIM	Recovery Timer Recovery Flags	P\$LCD
P\$CNT	# Mss's que'd IXPT channel #	P\$CHN
	Pending Control Function Queue	P\$PFQ
	General Protocol Timer	P\$TIM
	Flags	P\$FLG
	(Reserved) Inp. Packet Lim	P\$IPL
	Max Delay for Rout. Mss Lev 1	P\$RMX1
	Max Delay for Rout. Mss Lev 2	P\$RMX2
P\$STA2	Lvl 2 State Lvl 1 State	P\$STA1
	Transport Block Size	P\$TSIZ
	Count of Adj Nodes of Low TSIZ	P\$TSCT
	Store and Forward Queue	P\$FWD
	Doubleword Listhead	
	Transport Counter Block Address	P\$CTR
	16 Bit Address of Des. Router	P\$DRTR
	Number of Routers on NI	P\$NRNI
	Circuit Routing Priority	P\$RPRI

The following cells are only used for DLM circuits:

	Data Link Mapping Packet Size	P\$PKSZ
	Input Reassembly CCB	P\$ICCB
	Output Segmentation Queue	P\$OCCB
	Holding Area for Init. Seed (4 words)	P\$SEED

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 DECnet Volatile Data Structures

P\$FLG Physical Link Flag Definitions

```
-----
 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0
+-----+-----+-----+-----+
| | | | | | | | | | | | | | | |
+-----+-----+-----+-----+
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | PF$ENB - Link has been Enabled
| | | | | | | | | | | | | | | | PF$EIP - Control Enable in Progress
| | | | | | | | | | | | | | | | PF$STA - Desired Link State (0=Off,1=Up)
| | | | | | | | | | | | | | | | PF$RVR - Verification Message Requested
| | | | | | | | | | | | | | | | PF$RM1 - Level 1 Routing Message Required
| | | | | | | | | | | | | | | | PF$RM2 - Level 2 Routing Message Required
| | | | | | | | | | | | | | | | PF$FM1 - Level 1 Full-Routing Message Required
| | | | | | | | | | | | | | | | PF$FM2 - Level 2 Full Routing Message Required
| | | | | | | | | | | | | | | | Reserved
| | | | | | | | | | | | | | | | Reserved
| | | | | | | | | | | | | | | | Reserved
| | | | | | | | | | | | | | | | PF$FAI - Last Attempt SVC Call Failed
| | | | | | | | | | | | | | | | PF$CLC - Clear Confirmation Required
| | | | | | | | | | | | | | | | PF$BLK - Blocking is Supported on this Circuit
| | | | | | | | | | | | | | | | PF$SVC - Circuit is an SVC
PF$DLM - Data Link Mapping Circuit
```

P\$STA1/2 Routing State Definitions

```
-----
 7 6 5 4 3 2 1 0
+-----+-----+-----+
| | | | | | | | | | | | | | | |
+-----+-----+-----+
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | PR$UP - Circuit is Up
| | | | | | | | | | | | | | | | PR$DWN - Circuit is Down
| | | | | | | | | | | | | | | | PR$MOP - Maintenance Event Received
| | | | | | | | | | | | | | | | PR$LCC - Line Cost Change
| | | | | | | | | | | | | | | | PR$BRU - Broadcast Router Adjacency is Up
| | | | | | | | | | | | | | | | PR$BRD - Broadcast Router Adjacency is Down
| | | | | | | | | | | | | | | | PR$BEU - Broadcast Endnode Adjacency is Up
PR$BED - Broadcast Endnode Adjacency is Down
```


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2.2.14 PLBDF\$ - Password Descriptors Table <DSR>

The password descriptors are used by transport initialization to provide a level of security. Presence of a receive password notifies XPT that node verification must be requested from the adjacent node. The transmit password is transmitted in the transport verification message when verification is requested from the adjacent node.

Validity Flag	U\$FLG
Receive Password	U\$RCV
-- (8 Bytes)	
Transmit Password	U\$XMT
-- (8 Bytes)	
Next Entry if Present	
...	
...	

U\$FLG Password Validity Flag Definitions

1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0
+-----+-----+-----+-----+
+-----+-----+-----+-----+
----- Reserved -----
U\$XMT - Transmit Password is Valid
U\$RCV - Receive Password is Valid

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2.2.15 NSPIF\$ - Connect Initiate Block <DSR>

The Session Control information for outgoing connects is obtained from the user task space to the Connect Initiate Block for use in building the Connect Initiate Message. When a Connect Initiate Message is received, the information is saved in the Connect Pending Block prior to notifying the user task.

	Destination Node Name - (6 Bytes)	N.NODE
	Logical Link Segment Size	N.SEG
N.DOBJ	Dest Obj Type Dest Desc Fmt	N.DFMT
	Destination Descriptor / (9 Words)	
N.SOBJ	Src Obj Type Src Desc Fmt	N.SFMT
	Source Descriptor / (9 Words)	
	Access Requestor ID Length	N.RQDL
	Access requestor ID / (16 Bytes)	N.RQID
	Access Password Length	N.PASL
	Access Password / (8 Bytes)	N.PASS
	Accounting Information Length	N.ACTL
	Accounting Information / (16 Bytes)	N.ACNT
	Optional User Data Length	N.OPDL
	Optional User Data / (16 Bytes)	N.OPTD
	Task Name for Request Logic (RAD50 - 2 Words)	N.NAME
	Max Number of Copies Allowed	N.COPY

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Source Descriptor Formats

Format 0 Descriptor			
N.SOBJ	Src Obj Type	Src Desc Fmt = 0	N.SFMT
	Not Used / (18 bytes) /		

Format 1 Descriptor			
N.SOBJ	Src Obj Type = 0	Src Desc Fmt = 1	N.SFMT
	Source Descriptor Length		N.SDL1
	Source Process Name / (16 bytes) /		N.SDS1

Format 2 Descriptor			
N.SOBJ	Src Obj Type = 0	Src Desc Fmt = 2	N.SFMT
	Source Group Code		N.SGRP
	Source User Code		N.SUSR
	Source Descriptor Length		N.SDL2
	Source Process Name / (12 bytes) /		N.SDS2

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Destination Descriptor Formats

Format 0 Descriptor

N.DOBJ	Dest Obj Type	Dest Desc Fmt	N.DFMT
	= 0	= 0	
	Not Used		
	/ (18 bytes)		/

Format 1 Descriptor

N.DOBJ	Dest Obj Type	Dest Desc Fmt	N.DFMT
	= 0	= 1	
	Destination Descriptor Length		N.DDL1
	Destination Process Name		N.DDS1
	/ (16 bytes)		/

Format 2 Descriptor

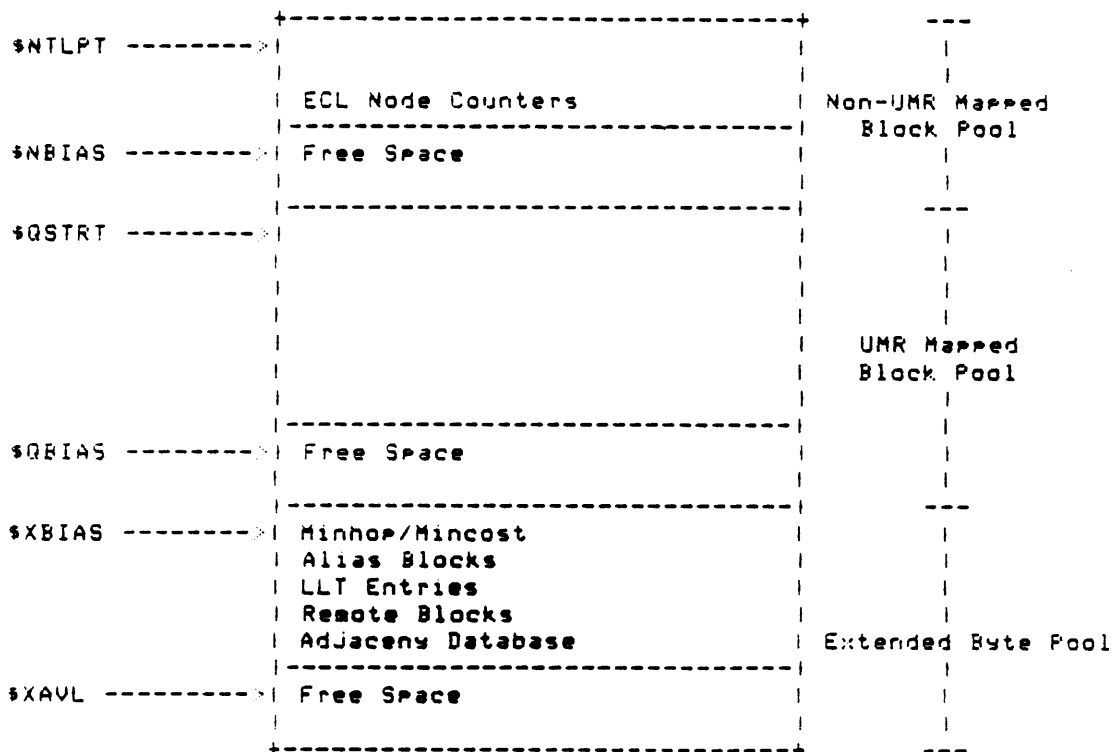
N.DOBJ	Dest Obj Type	Dest Desc Fmt	N.DFMT
	= 0	= 2	
	Destination Group Code		N.DGRP
	Destination User Code		N.DUSR
	Destination Descriptor Length		N.DDL2
	Destination Process Name		N.DDS2
	/ (12 bytes)		/

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DECnet Volatile Data Structures

2.3 DATA IN NETWORK POOL

In addition to the Comm/Exec / RSX Pool, DECnet uses another pool for the location of some of its data structures. The primary reason for an additional pool (not in Exec space) is the limited amount of DSR. Any additions to the Comm/Exec are taken from the system pool (DSR). The additional pool (Network Pool) is not in the network task's virtual address space, and therefore the data structure must be mapped before they can be used.

The general layout for the network buffer pool is as follows:

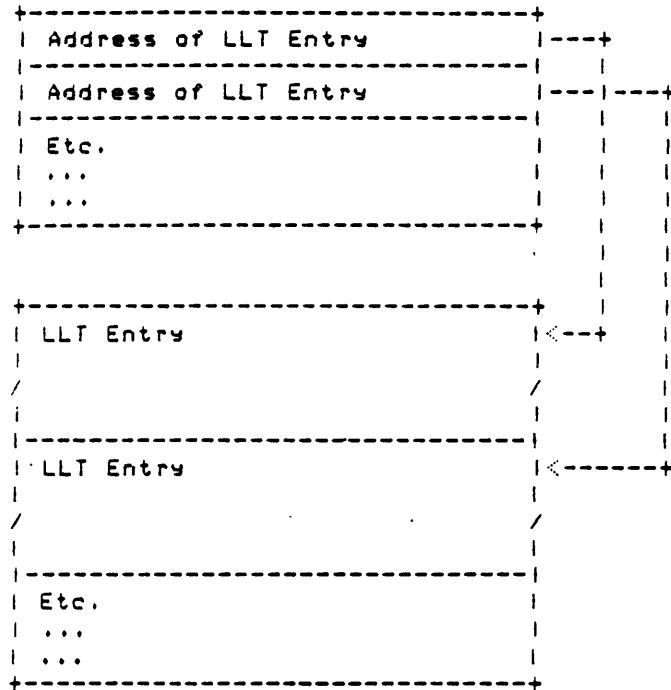


Note: \$NBIAS is 0 if no extended memory

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DECnet Volatile Data Structures

2.3.1 Logical Link Table (LLT)

Each Logical Link Table entry is addressed by the appropriate offset into the LLT table. This offset is referred to as the the LLT index. The pointer to the Logical Link Table resides in the ECL database. Note that the LLT vector table is allocated from DSR.



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2.3.2 LLTDF* - Logical Link Table Entry

Each LLT entry contains the current information for a single logical link. The LLT is used by the ECL process and the NETACP task to service logical links. The LLT entries of a running DECnet system can be dumped using the CEDump /LL switch (See Section 3.5).

L.TYP	Link Type	Link State	L.STA
	Local Logical Link Address		L.LLA
	Remote Logical Link Address		L.RLA
	Remote Node 16 Bit Address		L.REM
L.TIPD	# Data Xmts in Prog	# I/LS Xmts in Prog	L.TIPI
L.VER	Remote NSP Version	Link Flags	L.FLAG
	Next Data Segment Number To Be Assigned		L.NXN
	Next I/LS Segment Number To Be Assigned		L.NIN
	Next Data Segment Number To Be Received		L.RNO
	Highest Ack # From User on Data Chan		L.USA
	Next I/LS Segment Number To Be Received		L.LNO
	Highest I/LS Ack # from User		L.LSA
	Last Data Segment Number Ack'd		L.LDA
	Last Int/LS Segment Number Ack'd		L.LIA
L.CSTA	Net Disc Substa.	User Disc Substate	L.USTA
	Pointer to User's Window Block		L.WIND
L.TIC	Interrupt Count	Transmit Count	L.TC
	Flow Control Request Count (I/LS)		L.LSFI
	Flow Control Request Count (Data)		L.LSFD
	Remote Flow Control Count Estimate		L.RCF
	I/LS Pending ACK Queue		L.ILSQ
L.RTYD	Retry Cell (Data)	Timer Cell (Data)	L.TMRD
L.RTYI	Retry Cell (I/LS)	Timer Cell (I/LS)	L.TMRI
	Message Awaiting Retransmission		L.RTQ
	Long term Timer		L.LTT

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L.LPT	Periodic Timer	Timer (seconds)	L.SEC
	Initial Long Term Timer		L.ILTT
	Message Re-assembly Queue		L.MASQ
L.MAST	Re-ass Queue Tar	Size of Re-ass Que	L.MASZ
	Pointer to ECL Counter Block		L.CTR
	Segment Size for this Link		L.SEGZ
	Disconnect Reason Code		L.DCR
L.OPD	Optional Data	Optional Data Len.	L.OPDL
	(16 bytes)		
	Reserved)		

The following additional fields are only included if System Level Interface (SLI) is present.

L.ULA	User Link Address	Source channel #	L.CHN
L.PDVD	Data Process PDV	Control Process PDV	L.PDVC
	Transmit Message Queue	Doubleword Listhead	L.XMTQ
	Current Transmit CCB Address		L.CXMT
	Interrupt Message Transmit Queue	Doubleword Listhead	L.INTQ
	Current Interrupt CCB Address		L.CINT
	Pending Control CCB Address		L.PCTL
	Pending Accept CCB Address		L.ACC

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DECnet Volatile Data Structures

L.USTA Disconnect Substate for User

US\$DON	= 0	Disconnect Complete
US\$CNF	= 2	Connect Failure
US\$DSC	= 4	User Disconnect Pending
US\$DIS	= 6	Inform user of Disconnect
US\$WDS	= 10	Wait for Disconnect Acknowledge
US\$EAC	= 12	Error Response to Connect Accept

L.CSTA Disconnect Substate for Network

NS\$DON	= 0	Disconnect Complete
NS\$SDI	= 2	Send Disconnect Initiate Message
NS\$WDC	= 4	Wait for Disconnect Confirm Message

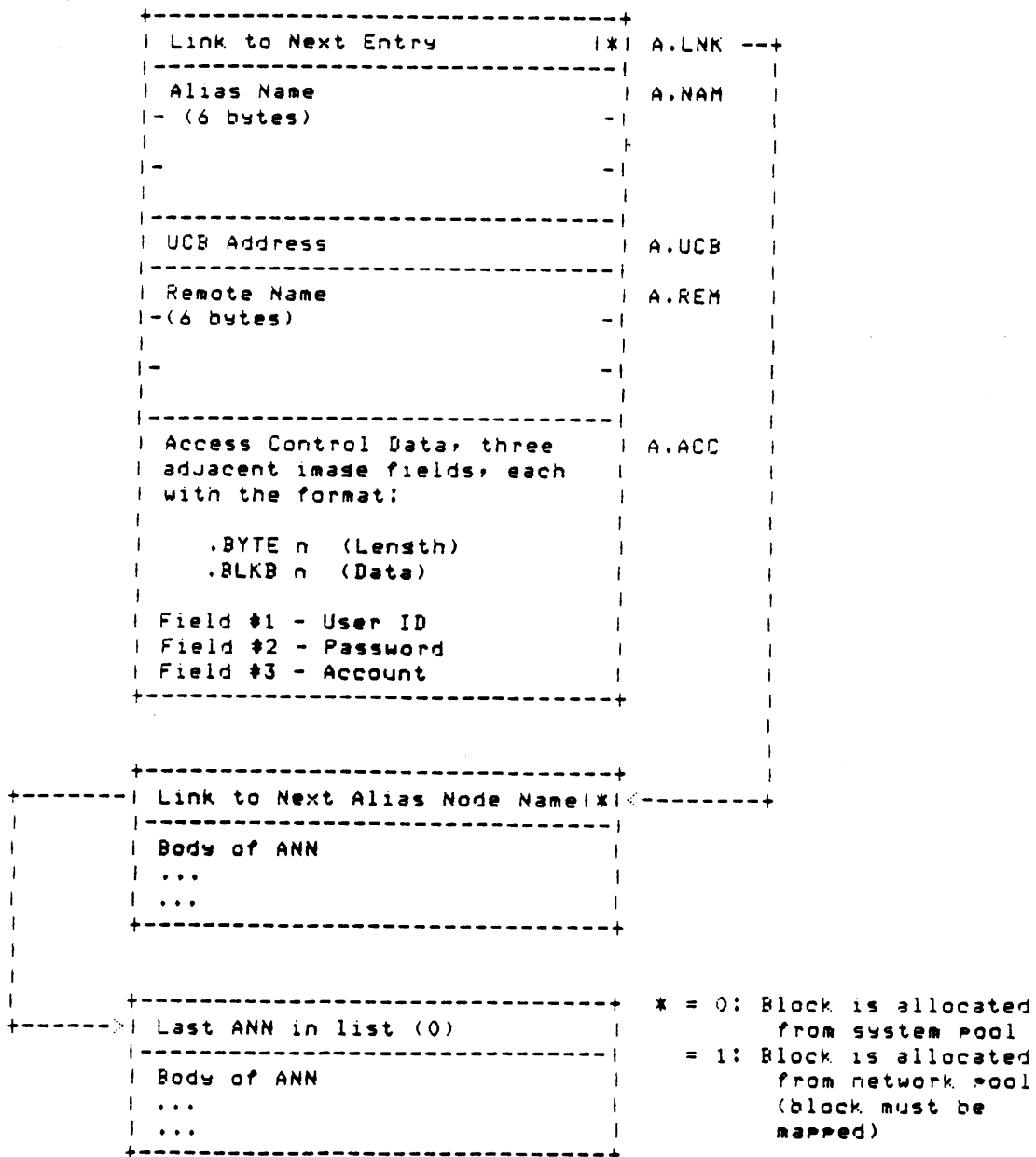
Note that the high bit (Bit 15) of the L.LSFI and L.LSFD flow control request counts are used to flag that a Link Service message is outstanding for the sub-channel. The low order 15 bits (Bits 00-14) are the actual count.

The high bit (Bit 15) of L.USA and L.LSA indicate that an acknowledgement should be sent to the remote network services process.

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2.3.3 ANBDF\$ - Alias Node Name (ANN) List

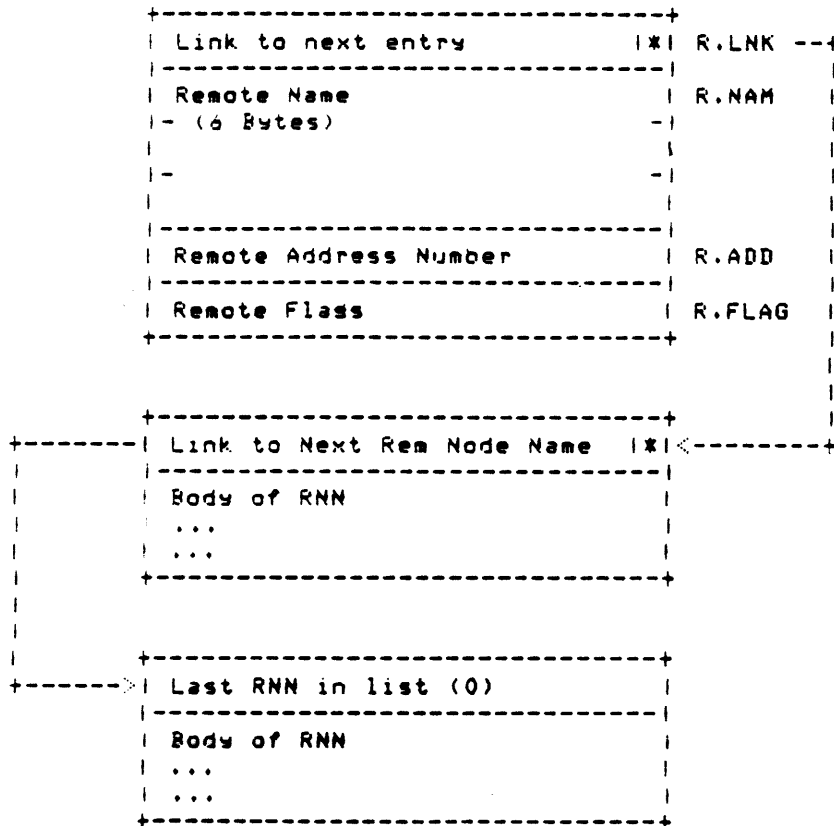
The mapping bias and virtual address of the first Alias Name Block in the Alias list is found in the D\$ANN cell of the DECnet Home Block. The alias blocks may either be allocated from the Comm/Exec / RSX pool or Network Pool. If bit 0 of the alias block pointer is clear then the pointer is the virtual address of the alias block in Comm/Exec / RSX pool. If bit 0 is set then bits 1 through 15 of the pointer are the virtual address of the object block in network pool (\$XAVL contains the bias).



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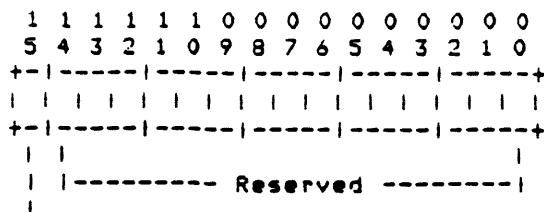
2.3.4 RNBDf\$ - Remote Node Name (RNN) List

The mapping bias and virtual address of the first Remote Name Block in the Remote Name List is found in \$RNNHD of the Comm/Exec. The remote name blocks may either be allocated from the Comm/Exec / RSX pool or Network Pool. If bit 0 of the remote name block pointer is clear then the pointer is the virtual address of the remote name block in Comm/Exec / RSX pool. If bit 0 is set then bits 1 through 15 of the pointer are the virtual address of the object block in network pool (\$XAVL contains the bias).



- * = 0 - Block is allocated from system pool
- = 1 - Block is allocated from network pool (block must be mapped)

R.FLAG Remote Flag Definitions



RF.L00 - Node is a loop node

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2.3.6 ADJDF\$ - Adjacency Database Part 2

The Adjacency database contains information about each adjacent node (point to point neighbors and NI neighbors). Due to the size and attendant mapping problems, the database is split into 2 sections (ADJ1 and ADJ2). Adjacency Database Part 2 can be mapped by the bias contained in NSADJ2 of the XPT database. The Adjacency Database is not present for non-routings (end) nodes.

	+-----+-----+		
	Block Size		A\$TSZ
	+-----+-----+		
A\$TM	Listen Timer Init.Lis.Timer		A\$TMI
	+-----+-----+		
	Entry Number 2		
	--	--	
	+-----+-----+		
	Entry Number n		
	--	--	
	+-----+-----+		

Note: The Listen Timer and Initial Timer Values are kept as multiples of 4 second intervals. This allows for a maximum value of 1020 seconds (4 255.).

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2.3.7 CTRDF# - ECL Node Counters List

These counters are maintained by ECL and read/zeroed by Network Management.

	Link to Next ECL Counter Block	E\$NLNK	->
	Node Address of Node This Block is For	E\$NNOD	
E\$NRTP	Retransmit period Use Counter	E\$NUSE	
	Message start time	E\$STRT	
	Segment # of the Packet Being Timed	E\$NSEG	
	Logical Link Address of Segment	E\$NLLA	
	# of Bytes Received	E\$NBR	
	# of Bytes Sent	E\$NBS	
	# of Messages Received	E\$NMR	
	# of Messages Sent	E\$NMS	
	# of Connects Received	E\$NCR	
	# of Connects Sent	E\$NCS	
E\$NRSV	Reserved Maximum Log. Lnks	E\$NML	
	# of Response Time-outs	E\$NRT	
	# of Ignored Connects	E\$NIC	
	Time This Counter Block Last Zeroed	E\$NTIM	
	Next ECL Block in List		-> More Blocks (terminate with 0 link)
	/ Body of the ECL Counter Block /		

2.3.8 Node MinHop/MinCost Table

The pointer to the minhop/mincost table resides in the XPT database. The contents of the database represent the minimum hops and cost along a path to a target node. This database is not present in non-routing (end) nodes.

```

+-----+
| Entry for Area Router |
+-----+
| Entry for Node 1     |
+-----+
| Entry for Node 2     |
+-----+
|           :           |
|           :           |
+-----+
| Entry for Node n     |
+-----+
  
```

Entry in Hop / Cost Table

```

-----
1 1 1 1 1 1 0 0 0 0 0 0 0 0 0
5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0
+-----+-----+-----+-----+-----+
| | | | | | | | | | | | | | | |
+-----+-----+-----+-----+-----+
| | | | | | | | | | | | | | | |
| | -Hops--| | ----Cost-----|
|
| -Reserved
  
```


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DECnet Volatile Data Structures

2.4 DATA IN PROCESS SPACE

The following data structures are located in process space.

2.4.1 CTRDFs - Transport Node Counters Table

These counters are maintained by XPT and read/zeroed by Network Management.

T\$NVR	Verification	Message Format	T\$NFE
	Reject Counter	Error Counter	
	Node Unreachable Packet		T\$NNUL
	Loss Counter		
T\$NRFL	Node Out of Range	Ased Packet Loss	T\$NAPL
	Packet Loss Count	Counter	
T\$NRUL	Partial Routing	Oversized Packet	T\$NOPL
	Update Loss Count	Loss Counter	

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 DECnet Volatile Data Structures

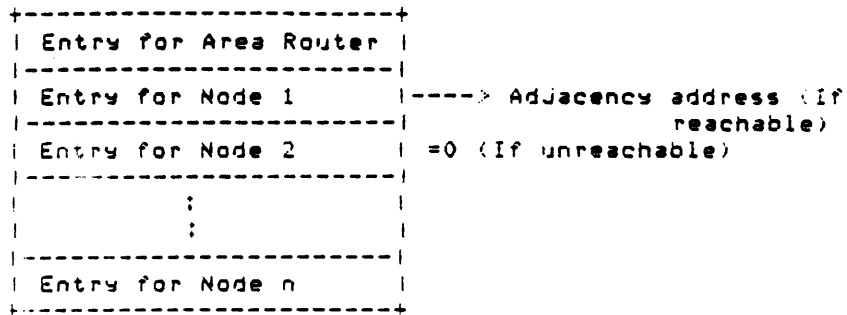
2.4.2 CTRDF\$ - Transport Line Counters Table

These counters are maintained by XPT and read/zeroed by Network Management.

	SLN/STA Identification	T\$LIN
	Output Packets Received Counter	T\$LOPR
	Input Packets Sent Counter	T\$LIPS
T\$LIF	Line Init Fail/Line Down Count	T\$LLD
	Transit Packets Received Counter	T\$LTPR
	Transit Packets Sent Counter	T\$LTPS
	Transit Congestion Loss Count	T\$LTCL
	Time Since Counters Last Zeroed	T\$LTIM
	Initial Hello Timer	T\$T5
	Initial Listener Timer	T\$T6
	Address of SVC descriptor (Bias + Displacement)	T\$SVC
T\$LLDC	Corruption Loss/DLM Flags	T\$FLAG
	Next Line Counter Block ...	

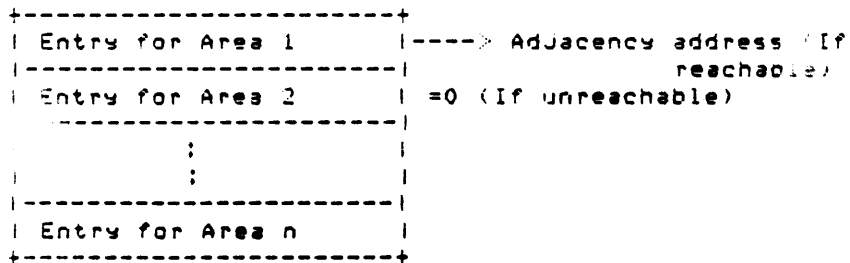
2.4.3 Node Reachability Vector

??? Insert structure explanation here ???



2.4.4 Area Reachability Vector

??? Insert structure explanation here ???



DECNET DATA STRUCTURES MANUAL
 DECnet Volatile Data Structures

2.5 DATA IN USER TASK

The following data structures are used by the user. They are all in user space.

2.5.1 Request Connect Block

	Destination Node Name N.RND	
	- with Trailing Blanks -	
	(6 Bytes)	

N.ROT	Dest Obj Type Desc Fmt Type N.RFM	

	Destination Descriptor	
	/ (18 Bytes) /	

	Requesting User ID Length N.RIDC	

	Requesting User ID N.RID	
	/ (16 Bytes) /	

	Requesting Task Password Lens. N.RPSC	

	Requesting Task Password N.RPS	
	/ (8 Bytes) /	

	Accounting Information Length N.RACC	

	Accounting Information N.RAC	
	/ (16 Bytes) /	

DECNET DATA STRUCTURES MANUAL
 DECnet Volatile Data Structures

Descriptor Field Formats

N.ROT	Dest Obj Type	Desc Fmt Type	N.RFM
		= 0	
	Not Used		
	/ (18 bytes)		/

N.ROT	Dest Obj Type	Desc Fmt Type	N.RFM
	= 0	= 1	
	Destination Process Length		N.RDEC
	Destination Process		N.RDE
	/ (16 bytes)		/

N.ROT	Dest Obj Type	Desc Fmt Type	N.RFM
	= 0	= 2	
	Destination Group Code		N.RGP
	Destination User Code		N.RUS
	Destination Name Length		N.RNMC
	Destination Name		N.RNM
	/ (12 bytes)		/

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 DECnet Volatile Data Structures

2.5.2 CNBDF\$ - Received Connect Block

NO VERIFICATION PERFORMED		
	Temporary Link Address	N.CTL
	Segment Size	N.SEGZ
N.DOT	Dest Obj Type Dest Desc Fmt	N.DFM
	Destination Descriptor / (18 Bytes) /	
	Source Node Name / (6 Bytes) /	N.SND
N.SOT	Src Obj Type Src Desc Fmt	N.SFM
	Source Descriptor / (18 Bytes) /	
	Source Task User ID Length	N.CIDC
	Source Task User ID / (16 Bytes) /	N.CID
	Source Task Password Length	N.CPSC
	Source Task Password / (8 Bytes) /	N.CPS
	Accounting Information Length	N.CACC
	Accounting Information / (16 Bytes) /	N.CAC
	Optional Data Length	N.CDAC
	Optional Data Buffer / (16 Bytes) /	N.CDA

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 DECnet Volatile Data Structures

VERIFICATION PERFORMED		
		N.CTL
		N.SEGZ
N.DOT		N.DFM
	/	
		N.SND
	/	
N.SOT		N.SFM
	/	
		N.CDEV
		N.CUNI
		N.CUIC
		N.CDA

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 DECnet Volatile Data Structures

Destination Descriptor Formats

```

-----
N.DOT | ----- |
      | Dest Obj Type | Dest Desc Fmt | N.DFM
      |              |              |
      |              |              |
      |              |              |
      | Not Used    |              |
      | (18 bytes)  |              |
      |              |              |
      | ----- |
  
```

```

-----
N.DOT | Dest Obj Type | Dest Desc Fmt | N.DFM
      | = 0          | = 1          |
      | ----- |
      | Destination Process Length | N.DDEC
      | ----- |
      | Destination Process      | N.DDE
      | (16 bytes)              |
      | ----- |
  
```

```

-----
N.DOT | Dest Obj Type | Dest Desc Fmt | N.DFM
      | = 0          | = 2          |
      | ----- |
      | Destination Group Code    | N.DGP
      | ----- |
      | Destination User Code    | N.DUS
      | ----- |
      | Destination Name Length  | N.DNMC
      | ----- |
      | Destination Name        | N.DNM
      | (12 bytes)              |
      | ----- |
  
```

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DECnet Volatile Data Structures

Source Descriptor Formats

N.SOT		Src Obj Type		Src Desc Fmt		N.SFM
		= 0		= 0		
		Not Used				
		/ (18 bytes)				

N.SOT		Src Obj Type		Src Desc Fmt		N.SFM
		= 0		= 1		
		Source Process Length				N.SDEC
		Source Process				N.SDE
		/ (16 bytes)				

N.SOT		Src Obj Type		Src Desc Fmt		N.SFM
		= 0		= 2		
		Source Group Code				N.SGP
		Source User Code				N.SUS
		Source Name Length				N.SNMC
		Source Name				N.SNM
		/ (12 bytes)				

CHAPTER 3

DECNET CEDUMP SWITCHES

This chapter describes the switches available to dump the internal data structures of a running DECnet system. For a description of the CEDump utility see the Guide to Writing a CommExec Process Manual. The switches described in this chapter will only function if the DECnet product is installed in the system and loaded. The /AL switch described in the Guide to Writing a CommExec Process Manual will also dump all the DECnet switches if DECnet is present.

DECNET DATA STRUCTURES MANUAL
DECnet CEDump Switches

```
*****  
*           *  
*   /DH   *  
*           *  
*****
```

3.1 The /DH Switch - Dump DECnet Home Block

Format: /DH

Description: This switch will cause CEDUMP to dump the DECnet home block. This block holds many of the constants used by DECnet. For a description of the DECnet home block layout see Section 2.2.1.

Output Example:

Dump of DECnet home block for:

ELROND(4.19) DISTRIBUTED SYSTEMS

```
4.19            Host node address  
000252         Local Ethernet high-order address  
000004  
9.             Number of routing channels  
1022.         Number of broadcast router adjacencies  
12.            Number of broadcast endnode adjacencies  
1022.         Maximum node number  
24.            Maximum cost  
21.            Maximum hops  
0.             Maximum area number  
10.            Maximum visitation count  
64.            Square root limiting factor  
15149.         Routing timer  
16133.         Broadcast routing timer  
0.             Broadcast routing priority  
100427         Features class  
              - Access verification support  
              - Access verification enabled  
              - Event lossing support  
              - Logical link integrity support  
              - Multi-copy task support  
              - System level interface support
```



```
*****  
*           *  
*   /GE   *  
*           *  
*****
```

3.2 The /GE Switch - Dump General Delivery Queue

Format: /GE

Description: This switch will cause CEDUMP to dump the general delivery queue. The general delivery queue is explained in section 2.2.6.

Output Example:

NETACP general delivery queue:

```
CCB @070136   type code: 201 (NT.CON)  
CCB @060124   type code: 201 (NT.CON)
```

DHBDJF

DECNET DATA STRUCTURES MANUAL
DECnet CEDump Switches

```
*****  
*           *  
*   /IO     *  
*           *  
*****
```

3.3 The /IO Switch - Dump I/O Queues

Format: /IO

Description: This switch will cause CEDUMP to dump the QIO I/O
 request queue associated with the NETACP.

Output Example:

NETACP pending I/O queue:

```
I/O request from task-TASKAB /TI=TT14:  
Function code- 123            Device-NS:  
Parameters- 000001 000002 000003 000004 000005 000006 000007 000008  
.  
.  
.  
(repeated for all items on the I/O queue)  
.  
.
```

```
*****  
*           *  
*   /LI   *  
*           *  
*****
```

3.4 The /LI Switch - Dump Active Link Counts

Format: /LI

Description: This switch will cause CEDUMP to dump the logical links information for DECnet. This includes the maximum and current link counts.

Output Example:

Active link counts:

Current-3. Maximum-9.


```
*****  
*           *  
*   /LN   *  
*           *  
*****
```

3.6 The /LN Switch - Dump Physical Link Data Base

Format: /LN

Description: This switch will cause CEDUMP to dump the physical link data base. These blocks, called physical link blocks (PLBs), are described in section 2.2.13.

Output Example:

```
Physical link data base:  
  
Physical Link Block @ 55122  
State - Up  
Adjacent node type-12  
  Adjacent node type flag set:  
    Level 1 router  
    Phase 3 node  
Outstanding control mss-0.   Pending control requests-None  
Recovery timer-0.  
Channel-1.           Number of mss queued-0.  
General protocol timer-13.  
Link flag-5  
  Link flag set:  
    Enabled  
    Up state desired  
Input packet limiter-0.  
Maximum delay for routing mss-145.  
Routing state-0  
  Flag set:  
    None  
Transport block size-576.  
Number of nodes with lowest block size-1.  
Transport counter block address-136460  
Designated router address-0
```

.
(repeated for all PLBs)
.

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```
*****  
*           *  
*   /MB     *  
*           *  
*****
```

3.7 The /MB Switch - Dump Mailbox Queue

Format: /MB

Description: This switch will cause CEDUMP to dump the mailbox queues associated with all active network tasks. The mailbox queue and mailbox structures are described in section 2.2.5.

Output Example:

DECnet Mailbox queue:

```
Mailbox @ 53430 for task-NIC.1 TI=C00  
# of ASTs needed-0.  
# of active logical links-1. Max # of links allowed-1.  
Network data AST virtual address-121250  
# of items on mailbox queue-0.  
Logical link recovery timer-0.
```

```
Mailbox @ 55760 for task-RVTT14 TI=TT14  
# of ASTs needed-0.  
# of active logical links-1. Max # of links allowed-0.  
Network data AST virtual address-121250  
# of items on mailbox queue-0.  
Logical link recovery timer-0.
```

```
.  
  . (repeated for all mailboxes)  
.
```

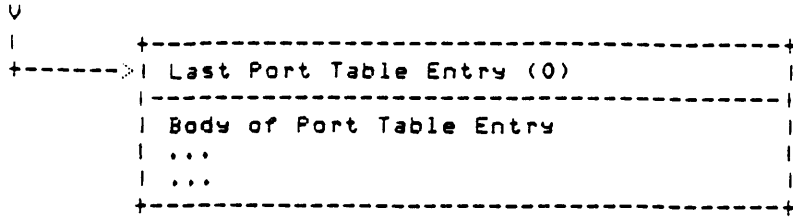

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 EPM Process Data Structures

A.2 EPMDF\$ - EPM LINE TABLE

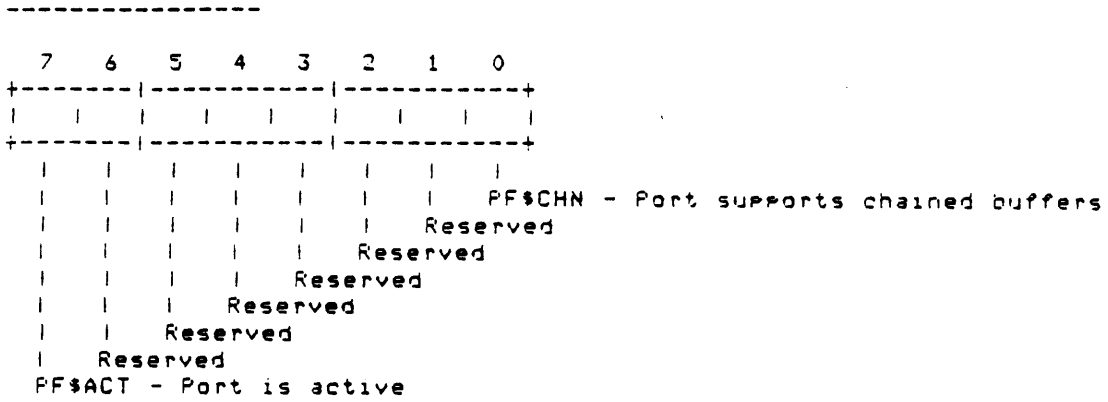
The Ethernet Protocol Manager (EPM) Line Table contains the information for managing broadcast channels (e.g., UNA and QNA). The Line Table contains listheads for each port (port table listhead) and protocol (protocol listhead) which is assigned for the broadcast channel.

C\$RTMR	Initial Timer	Current Timer	C\$TMR
C\$FLG	Controller Flags	System Line Number	C\$LIN
C\$STR	Started Ports - 1	Active Ports - 1	C\$ACT
	Local Workspace		C\$WORK
	Destination Address from Last		C\$DADD
	Received Message		
	(48 Bit Node Address)		
	Source Address from Last Received		C\$SADD
	Message		
	(48 Bit Node Address)		
	Protocol from Last Message		C\$PRO
	Pending Control Function		C\$CTLQ
	Queue Doubleword Listhead		
	Active Control Function		C\$CTLF
	Pending Network Management Function		C\$MANQ
	Queue		
	(Reserved)	DDM PDV Index	C\$DDM
	Line Table Extension for Network		C\$EXT
	Management		
	(4 words)		
	Data Overrun Counter		C\$DAO
	Unrecognized Frame Dest Cntr		C\$UNFD

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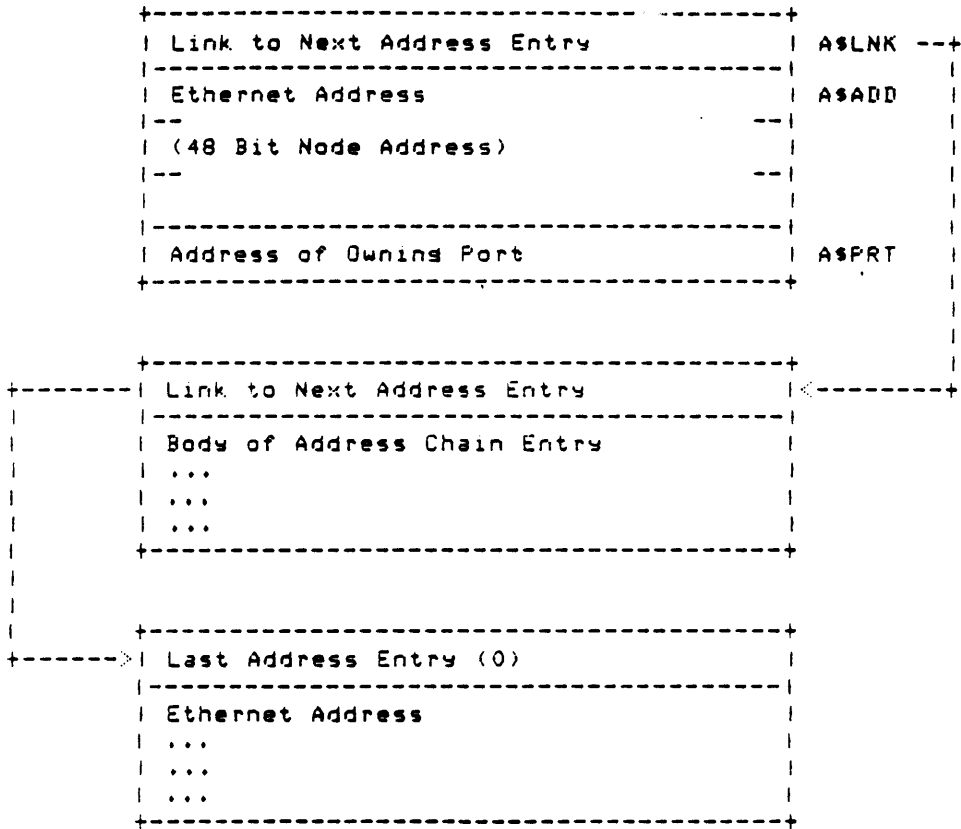


P\$FLG Port Flags



A.5 EPM ETHERNET ADDRESS CHAIN

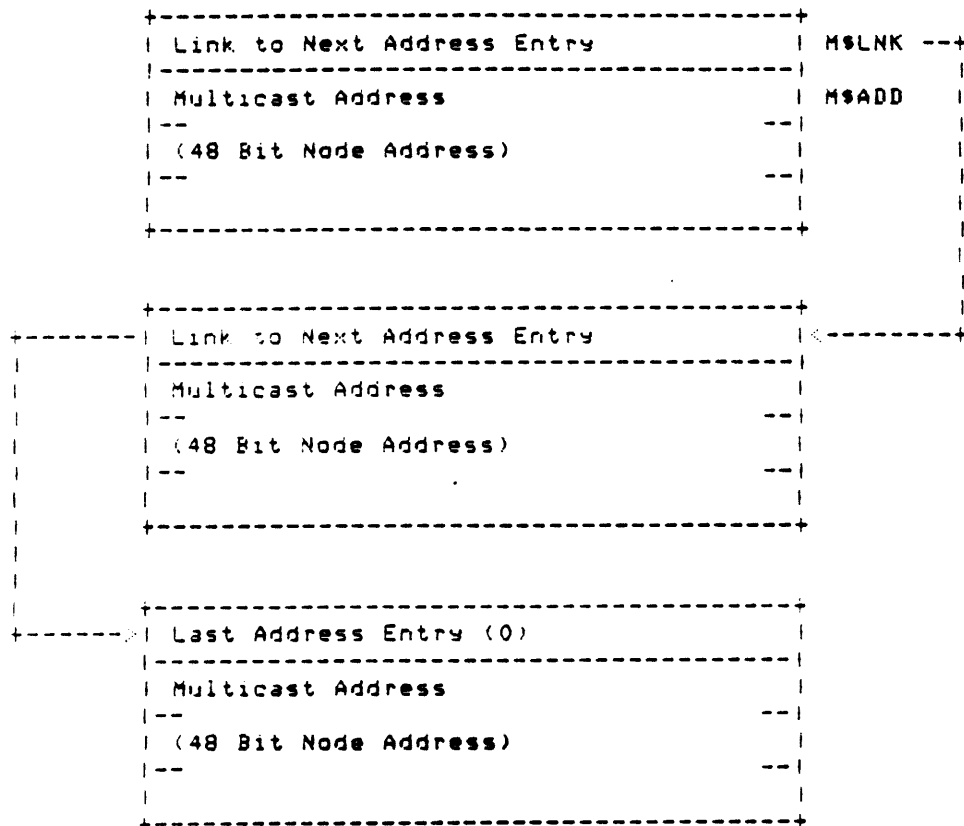
The address chain entry contains the Ethernet address which is enabled for a particular protocol type. The listhead is contained in the EPM Protocol entry.



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EPM Process Data Structures

A.6 EPM MULTICAST ADDRESS CHAIN

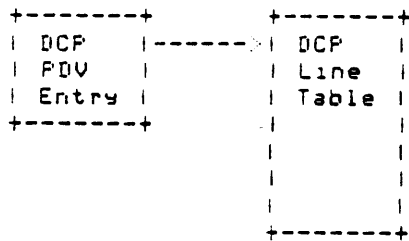
The Multicast Address Chain entry contains the multicast address which is enabled for a broadcast channel portal. The listhead is contained in the EPM Port Table entry (P\$MCST).



APPENDIX B
DCP PROCESS DATA STRUCTURES

B.1 Introduction

This appendix describes the RSX-DECnet V4.0/2.0 DDCMP Process (DCP) data base. Its primary purpose is to provide more detailed descriptions of the DCP data structures.



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 DCP Process Data Structures

8.2 DCPDFS - DCP LINE TABLE

The software DDCMP process (DCP) Line Table contains information for control of system lines which use DCP as the Data Link Control process. Point-to-point lines require only the line table, whereas, multi-point masters require both the line table and tributary station tables.

L.TIMI	Line Tmr Init Line Tmr Cell	L.TIMR
L.ST2	Line Sts Bvt2 Line Status	L.STS
	Tributary Station Queue	L.TBP
	to be Polled	
	Next Trib Statn to Idle Poll	L.NIP
	Idle Pollins	L.PLL
	List	
L.PAIC	* Lft in Ratio Active Pls Lft	L.PAIR
	Queue of Xaits Ready to	L.XSET
	be Given to Driver	
	Queue of Control	L.CNTL
	Requests	
	Library Call to Calculate	L.CRC
	CRC	
	Device Characteristics	L.CHA
	Current Trib Beins Polled	L.CRS
	Last Trib Station Disconnected	L.DISL
	Reason for Disconnection	L.DISR
L.PLD	Pollins Delay System Line #	L.LNUM
L.STRM	Stras Trib Ctrl Trib Init Ct	L.STRC
L.NRSE	Remote Stn Err Buff Unavil Ct	L.BUFU
	Reserved Local Stn Err	L.NLSE
	Control Station Counter Flass	L.SCFW
	Time Since Counters Last Zero	L.TIMC

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 DCP Process Data Structures

B.3 DCP TRIBUTARY STATION TABLE

	Tributary Station Link Addr	S.LNK
	Tributary Station State	S.STE
	Function Pending	S.FNCP
	To be Polled List	S.PLL
S.PLS	Pollins State Pollins Delay	S.PLA
	Pre-Transmit Queue	S.XMT
	Waiting for ACK Queue	S.WFA
S.HTNA	Highest Xmit # Pollins Ctr	S.PLC
S.LMS	Last Xmit Sent # Mssg Outstnd	S.NTD
S.LMRT	Last Mssg Rtn'd Last Xmit ACK'd	S.LMA
S.LGR	Last Good Mss Last Sel Mss	S.LMOS
S.BLKC	# Blks to DDM # Mssg in Rep	S.TNRP
S.STLN	Log Trib Stn # Phys Trb Stn #	S.STPN
S.NKR	NAK Rsn Sent Stn Rec'd Sta	S.RST
S.FTEC	Xmit Thrsh Errs NAK Rsn Rec'd	S.NKLR
S.STEC	Sel Thrsh Errs Rec Thrsh Errs	S.RTEC
S.NKRW	Data Err Outbd Alloc Failures	S.ALF
S.REPS	Locl Rep Tmout Data Err Inbd	S.NKSW
S.NKSB	Locl Buf Errs Rmt Rep Tmouts	S.REPR
S.SELT	Selectn Tmout Rmt Buff Errs	S.NKRB
	Time Since Counters Last Zero	S.TIMC
	Number of Data Messages Received	S.RCVC
	Number of Data Messages Transmitted	S.XMTC

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Selection Interval	S.SELC
Number of Data Bytes Received	S.RCVB
Number of Data Bytes Transmitted	S.XMTB
Data Link Counters Flag Word	S.DLCF

S.DLCF Data Link Counters Flag Word

```

-----
1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0
+-----+-----+-----+-----+
| | | | | | | | | | | | | | | |
+-----+-----+-----+-----+
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | SE.RCH - Headr CRC NAK Rec'd
| | | | | | | | | | | | | | | | SE.RDC - Data CRC NAK Rec'd
| | | | | | | | | | | | | | | | SE.RRR - Rep NAK Rec'd
| | | | | | | | | | | | | | | | SE.SHC - Headr CRC NAK Sent
| | | | | | | | | | | | | | | | SE.SDC - Data NAK Sent
| | | | | | | | | | | | | | | | SE.SRR - Rep NAK Sent
| | | | | | | | | | | | | | | | SE.SBU - Buffer Unavailable NAK Sent
| | | | | | | | | | | | | | | | SE.SBS - Buffer too Small NAK Sent
| | | | | | | | | | | | | | | | SE.RBU - Buffer Unavailable NAK Rec'd
| | | | | | | | | | | | | | | | SE.RBS - Buffer too Small NAK Rec'd
| | | | | SE.NRS - No Reply to Select
| | | | SE.IRS - Incomplete Reply to Select
| | | Reserved
| | Reserved
| Reserved
Reserved
  
```