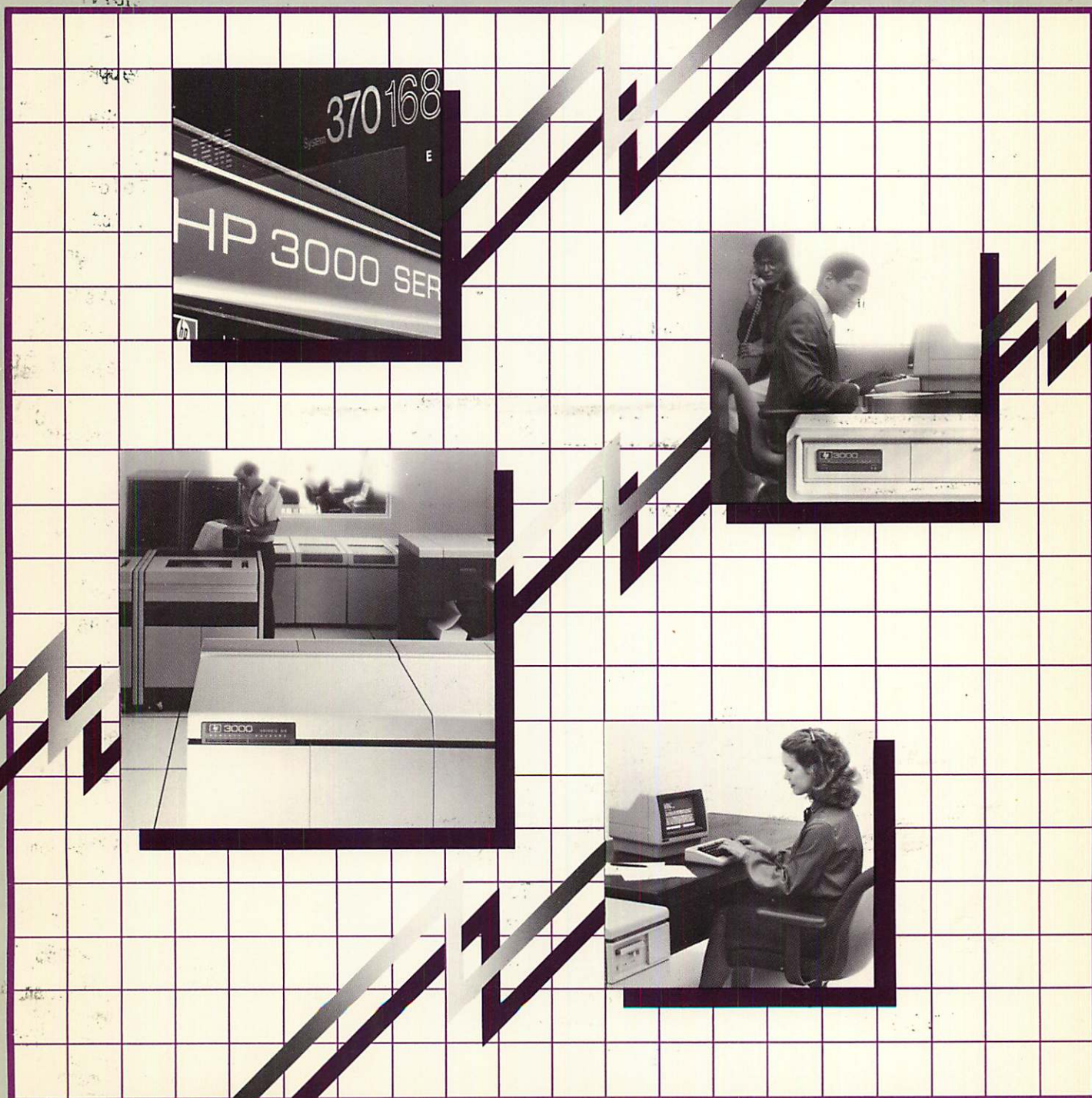


## DSN/DS HP3000 to HP3000 Network Administrator Manual



**HP Distributed Systems Network**

**DSN/DS  
HP 3000 to HP 3000  
Network Administrator Manual**



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# LIST OF EFFECTIVE PAGES

The List of Effective Pages gives the date of the most recent version of each page of the manual. Within the manual, changes since the most recent edition are indicated by printing the date of the update on the bottom of the page, and by marking the changes with a vertical bar in the margin. If an update is incorporated when an edition is reprinted, these bars are removed but the dates are retained. No information is incorporated into a reprinting unless it appears as a prior update. To verify that your manual contains the most current information, check that the date printed at the bottom of the page matches the date listed below for that page.

Effective Pages	Date
all.....	April 1984



# PREFACE

The Hewlett-Packard Distributed Systems Network (HP-DSN) is a set of hardware and software data communications products. One of these data communications products is DSN/Distributed Systems (DSN/DS) which is an integrated software package that provides the capability of communication between HP computer systems.

This manual explains advanced topics, such as system configuration, and using TRACE for debugging. For basic use of HP DSN/DS, see the *HP DSN/DS HP 3000 to HP 3000 User/Programmer Reference Manual (32189-90001)*.

Users of this manual should be familiar with the basic operating principles of the HP 3000 computer system using the MPE operating system, and should also be familiar with the subjects covered in the following manuals:

For MPE-IV (Versions not earlier than C.B1.A2):

- *HP 3000 Computer Systems, MPE Commands Reference Manual (30000-90009).*
- *HP 3000 Computer Systems, MPE Intrinsic Reference Manual (30000-90010).*
- *HP 3000 Computer Systems, System Manager/System Supervisor Reference Manual (30000-90014).*
- *HP 3000 Computer Systems, Console Operator's Guide (32002-90004).*

For MPE-V/E (Versions not earlier than G.00.00):

- *HP 3000 Computer Systems, MPE V Commands Reference Manual (32033-90006)*
- *HP 3000 Computer Systems, MPE V Intrinsic Reference Manual (32033-90007)*
- *HP 3000 Computer Systems, MPE V System Operation and Resource Management Reference Manual (32033-90005)*



# PREFACE (continued)

For both:

- *Data Communications Handbook (30000-90105)*

For those users who also become involved in the selection and/or connection of the various network components, reference should be made to the appropriate component manuals, including the following:

- *HP 30010A Intelligent Network Processor (INP) Installation and Service Manual (30010-90001).*
- *HP 30020A Intelligent Network Processor (INP) Installation and Service Manual (30020-90001).*
- *HP 30020B Intelligent Network Processor (INP) Installation and Service Manual (30020-90005).*
- *HP 30010A/30020A/B Intelligent Network Processor (INP) Diagnostic Procedures Manual (30010-90002).*
- *HP 30055A Synchronous Single-Line Controller (SSLC) Installation and Service Manual (30055-90001).*
- *Hardwired Serial Interface (HSI) Installation and Service Manual (30360-90001).*

For those programmers who use other subsystems in conjunction with DS/3000, the following manuals should be referenced:

- *IMAGE/3000 Reference Manual (32215-90003)*
- *BASIC/3000 Interpreter Manual (30000-90026)*
- *COBOL/II Reference Manual (32233-90001)*
- *KSAM/3000 Reference Manual (30000-90079)*

## NOTE

Within the text of this manual, cross-references are made to these manuals by title. To obtain the part number of the referenced manual, refer to these lists of manuals in the Preface.

## PREFACE (continued)

In this release, DSN/DS and DSN/X.25 are two distinct HP products. If you are using X.25 by itself, whether with a Packet Assembler-Disassembler or an HP 2334A Cluster Controller, you should refer to the *DSN/X.25 for the HP 3000 Reference Manual (32191-90001)*. If you are using DSN/DS for computer-to-computer communications, either with or without X.25, you should use this manual with the *HP DSN/DS HP 3000 to HP 3000 User/Programmer Manual (32189-90001)* for DS information. Refer to the X.25 manual for PAD and HP 2334A information and examples.



# CONVENTIONS USED IN THIS MANUAL

## NOTATION

## DESCRIPTION

nonitalics

Words in syntax statements which are not in italics must be entered exactly as shown. Punctuation characters other than brackets, braces and ellipses must also be entered exactly as shown. For example:

EXIT;

*italics*

Words in syntax statements which are in italics denote a parameter which must be replaced by a user-supplied variable. For example:

CLOSE *filename*

[ ]

An element inside brackets in a syntax statement is optional. Several elements stacked inside brackets means the user may select any one or none of these elements. For example:

$\left[ \begin{array}{l} A \\ B \end{array} \right]$  User *may* select A or B or neither.

{ }

When several elements are stacked within braces in a syntax statement, the user must select one of those elements. For example:

$\left\{ \begin{array}{l} A \\ B \\ C \end{array} \right\}$  User *must* select A or B or C.

...

A horizontal ellipsis in a syntax statement indicates that a previous element may be repeated. For example:

[, *itemname*]...;

In addition, vertical and horizontal ellipses may be used in examples to indicate that portions of the example have been omitted.

■

A shaded delimiter preceding a parameter in a syntax statement indicates that the delimiter *must* be supplied whenever (a) that parameter is included or (b) that parameter is omitted and any *other* parameter which follows is included. For example:

*itema* [■ *itemb*] [■ *itemc*]

means that the following are allowed:

*itema*  
*itema, itemb*  
*itema, itemb, itemc*  
*itema, , itemc*



# CONVENTIONS (continued)

$\Delta$  When necessary for clarity, the symbol  $\Delta$  may be used in a syntax statement to indicate a required blank or an exact number of blanks. For example:

```
SET[(modifier)] $\Delta$ (variable);
```

underlining When necessary for clarity in an example, user input may be underlined. For example:

```
NEW NAME? ALPHA
```


In addition, brackets, braces or ellipses appearing in syntax or format statements which must be entered as shown will be underlined. For example:

```
LET var[[subscript]] = value
```

**shading**

Shading represents inverse video on the terminal's screen. In addition, it is used to emphasize key portions of an example.



The symbol  may be used to indicate a key on the terminal's keyboard. For example, **RETURN** indicates the carriage return key.

**CONTROL** *char*

Control characters are indicated by **CONTROL** followed by the character. For example, **CONTROL**Y means the user presses the control key and the character Y simultaneously.

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# CONFIGURATION DIALOGUE

SECTION

1

DSN/DS operation requires the installation and configuration of one communications interface for each line to a remote computer.

This section explains how to configure the following:

- Intelligent Network Processor (INP)
- Synchronous Single-Line Controller (SSLC)
- Hardwired Serial Interface (HSI)
- DS Line Monitor (communications driver IODS0 or IODSX)
- DS Virtual Terminals (IODSTRM0, IODSTRMX) -- one for each session that will be allowed on your system from a remote system.

The same communications interface (INP, SSLC, or HSI) can be used by another HP 3000 data communications subsystem (such as DSN/MRJE) when it is not being used by DSN/DS. In such a case, the communications interface is configured once for each subsystem (each time with a unique logical device number, but always with the same DRT number). Keep in mind that the following dialogue applies only when the interface is used for DSN/DS activity, and that a response that is optional for DSN/DS may not be optional for one of the other subsystems. Configuration guidelines pertaining to the other subsystems are given in the reference manual for each subsystem. Configuration summary tables for each of the communications interface types are included in the *Data Communications Handbook* and in the *HP 3000 Computer Systems, System Manager/System Supervisor Reference Manual (HP 3000 Computer Systems, MPE V System Operation and Resource Management Reference Manual, if you are using MPE V/E)*.

For any data communications subsystem to function, CS/3000 modules must be present on the system. It is presumed in this configuration description that the Account Systems Engineer (SE) has already installed CS/3000.

If you are making any other changes to the MPE I/O system, refer to the *System Manager / System Supervisor Reference Manual (HP 3000 Computer Systems, MPE V System Operation and Resource Management Reference Manual, if you are using MPE V/E)*.

Configuration is accomplished through an interactive dialogue between you and the computer system. As the questions or prompts appear on your console, enter the appropriate replies through the console keyboard for your desired system configuration.

## NOTE

In all responses, Y or N can be used for YES or NO. A **RETURN** is equivalent to NO.

## Configuration Dialogue

Prior to entering the dialogue, log onto the system and input a file reference to a magnetic tape, as follows:

```
:FILE name;DEV=TAPE
:SYSDUMP *name
```

The dialogue commences as follows:

STEP NO.	DIALOGUE
1	ANY CHANGES? <u>YES</u>
2	SYSTEM ID = HP 32002 v.uu.ff? <b>RETURN</b>
3	MEMORY SIZE= xxx? <b>RETURN</b>
4	I/O CONFIGURATION CHANGES? <u>YES</u>
5	LIST I/O DEVICES? <u>YES</u>

All I/O devices currently configured on the system are listed with the following column headings:

LOG DEV	Logical device number.
DRT #	Hardware device address (Device Reference Table number) configured on the interface board.
UNIT #	Hardware unit number of device on its controller.
CHAN	Channel number of device on its controller.
TYPE	Device type.
SUBTYPE	Device subtype.
TERM TYPE	Terminal type.
TERM SPEED	Terminal speed.
REC WIDTH	Record width in decimal words.
OUTPUT DEV	Device class name or device ldn.
MODE	J = Accept jobs A = Accept data I = Interactive device D = Duplicative device S = Spooled device
DRIVER NAME	Driver name.
DEVICE CLASSES	Class name assigned to the interface.

<b>NOTE</b>
-------------

The prompt in Step 6, below, appears only if a communications subsystem (CS) device was previously configured into the system.

**STEP NO.      DIALOGUE**6      LIST CS DEVICES? YES

A list of all CS devices currently assigned to the system is printed with the following column headings:

LDN	Logical device number.
PM	Port Mask. (Not used by INP and SSLC)
PRT	Protocol.
LCL MOD	Local mode.
TC	Transmission code.
RCV TMOUT	Receive timeout (in seconds).
CON TMOUT	Connect timeout (in seconds).
MODE	O = Dial out. I = Manual answer. A = Automatic answer. D = Dual speed. H = Half speed. C = Speed changeable.
TRANSMIT SPEED	Transmission speed (characters per second.)
TM	Transmission mode.
BUFFER SIZE	Default buffer capacity, in words.
DC	Driver changeable or not changeable.
DRIVER OPTION	Driver options.



## Configuration Dialogue

### STEP NO. DIALOGUE

If you have a switched device, such as those that are connected through a dial-up telephone line, then you receive the following additional information:

LDN	INP or SSLC logical device number.
CTRL LEN	Not currently implemented.
PHONE NUMBER LIST	A single telephone number -- the default for the data communications line.
LOCAL ID SEQUENCE	The default identification of the local computer.
REMOTE ID SEQUENCE	The default identification of the remote computer.

#### 7 HIGHEST DRT=xx?

In the output, xx is a value denoting the present highest DRT entry number that can be assigned to a device.

To change xx, enter the new value desired. If the highest-numbered device in the configuration is a device that uses more than one DRT entry (such as a terminal controller with one or two data set controllers), be sure to enter the highest of the DRT numbers.

To maintain the current xx, enter RETURN.

#### 8 LOGICAL DEVICE #?

To specify a device to be added or removed, enter the logical device number of that device. An HSI has four ports and thus can be configured up to four times with a unique logical device number for each port. In addition, a communications driver (IODS0) with a unique logical device number must be configured for each HSI port configured.

This prompt is repeated later in the configuration dialogue, so that you can return to this point to configure more than one device.

Entering 0 or RETURN will take you to Step 47.

**STEP NO.      DIALOGUE**

9                DRT #?

To add a device, enter its DRT entry number. For a communications driver and a virtual terminal, you must assign the logical device number of the associated communications interface (INP, SSLC, or the HSI port), preceded by a number sign (#).

Virtual terminals need to be configured for only one port of any HSI (back referenced to only one logical device number for the HSI). The terminals will be dynamically allocated to the proper port when a user opens it.

To remove a device and return to Step 8, enter zero.

10              UNIT #? 011              SOFTWARE CHANNEL #? 0

12              TYPE?

Enter the device type, where

16 = Virtual Terminals (IODSTRM0 or IODSTRMX)

17 = Intelligent Network Processor (INP)

18 = Synchronous Single-Line Controller (SSLC)

19 = Hardwired Serial Interface (HSI)

41 = Communications Driver (IODS0 or IODSX)

<b>NOTE</b>
-------------

When configuring device type 16, consider the maximum number of terminals supported by your system. Each virtual terminal configured is added to the total number of terminals already on the system. This information is available from your HP Sales Representative.

Configuration Dialogue

**STEP NO.      DIALOGUE**

13              SUBTYPE?

Communications Interface:

For an INP, enter 0, 1, or 3

For an SSLC, enter 0 or 1

For an HSI, enter 3, where

0 = switched line with modem

1 = nonswitched line with modem or modem eliminator cable

3 = hardwired line, synchronous transmission

Communications Driver:

For IODS0 or IODSX, enter 0 or 1, where

0 = no data compression

1 = data compression

Virtual Terminal:

For IODSTRM0 or IODSTRMX, always enter 0.

**NOTE**

If you are configuring a terminal (type 16), the dialogue continues to Step 14. If you are configuring an HSI (Type 19), the dialogue skips to Step 16. If you are configuring an SSLC (Type 18), the dialogue skips to Step 17. If you are configuring an INP (type 17), the dialogue skips to Step 20. For all other device types, the dialogue skips to Step 34.

14              For MPE V/E:

ENTER [TERM TYPE #], [DESCRIPTOR FILENAME] ?

This question is asked only if the device type is 16, or if it is 32 with a subtype of 14 or 15. Term type is always 0 for DSN/DS Virtual Terminals.

For MPE IV:

TERM TYPE? 0

This question is asked only if Type is 16. Term Type is always zero for DSN/DS Virtual Terminals.

15              SPEED IN CHARACTERS PER SECOND? 0

This question is asked only if device Type is 16, then the dialogue skips to Step 34.

**STEP NO.      DIALOGUE**

16            PORTMASK?

This question is asked only if device Type is 19 (HSI). The values allowable are shown below and must be entered in decimal. This forms a mask indicating which HSI channel will be used. Only one of the four channels may be designated for each unique logical device number.

Enter 8 for HSI cable connector port 0.

Enter 4 for HSI cable connector port 1.

Enter 2 for HSI cable connector port 2.

Enter 1 for HSI cable connector port 3.

Since only one port on the HSI PCA can be opened at a time, only one block of virtual terminals (entered later in this configuration) are needed for that HSI PCA. This same block is automatically reallocated to each new port opened. One block of virtual terminals serves all ports.

17            PROTOCOL? 1

This response defines Binary Synchronous Communications.

18            LOCAL MODE?

DS/3000 does not use this response. Enter 1.

Configuration Dialogue

**STEP NO.      DIALOGUE**

19              TRANSMISSION CODE?

For an HSI, enter 1.

For an SSLC, enter 1, 2, or 3, where

1 = Automatic code sensing of ASCII and EBCDIC if  
initially receiving; ASCII if initially sending;

2 = ASCII transmission.

3 = EBCDIC transmission.

In DSN/DS, all transmissions are ASCII. Only in certain other data communication subsystems can users optionally transfer EBCDIC characters.

20              RECEIVE TIMEOUT?

Enter the positive number of seconds the CS device will wait to receive text before terminating the read mode. Entering **RETURN** provides a 20-second timeout.

**NOTE**

For all timeout responses, entering 0 disables the timeout. The maximum timeout is 32000 seconds. DS displays an error when the communications software (CS) disconnects because of a timeout.

21              LOCAL TIMEOUT?

Enter the positive number of seconds a connected local station will wait to transmit or receive before disconnecting. Entering **RETURN** provides a 60-second timeout. (Your response is not used for DSN/DS activity.)

22              CONNECT TIMEOUT?

Enter the positive number of seconds the local station will wait after one attempt to make a connection to a remote station. Entering **RETURN** provides a 900-second timeout. For an HSI, 100 to 500 is recommended. For an INP or SSLC, 300 is recommended.

**NOTE**

Steps 23 through 25 apply only to CS devices with switched lines connected through a modem (dial telephones, subtype 0). For CS devices with nonswitched lines connected through a modem (private lines, subtype 1), the dialogue skips to Step 26. If the CS device is either an HSI or a hardwired INP (subtype 3), the dialogue skips to Step 28.

- | STEP NO. | DIALOGUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23       | <p>DIAL FACILITY?</p> <p>Enter YES if manual dial-up is required. Enter the INP LDEV# if the AUTO DIAL feature is used. Enter NO if no dial facility is required.</p>                                                                                                                                                                                                                                                                                                                                                                  |
| 24       | <p>ANSWER FACILITY?</p> <p>Enter YES if the local modem can answer calls, either manually or automatically. Enter NO if it cannot. A NO response causes the next step to be skipped.</p>                                                                                                                                                                                                                                                                                                                                               |
| 25       | <p>AUTOMATIC ANSWER?</p> <p>Enter YES if the local modem can automatically answer calls. Enter NO if manual answering is required.</p>                                                                                                                                                                                                                                                                                                                                                                                                 |
| 26       | <p>DUAL SPEED?</p> <p>Enter YES if the local modem is dual speed (European models). Enter NO if it is single speed. A NO response causes the next step to be skipped.</p>                                                                                                                                                                                                                                                                                                                                                              |
| 27       | <p>HALF SPEED?</p> <p>Enter YES if the local modem is to operate at half speed. Enter NO if it is to operate at full speed. The dialogue skips to Step 29.</p>                                                                                                                                                                                                                                                                                                                                                                         |
| 28       | <p>SPEED CHANGEABLE?</p> <p>For an HSI, enter YES.</p> <p>For an INP, enter YES if the speed of the line is changeable. Enter NO if the line speed is fixed. In general, the speed is changeable when the communications interface provides the clocking, and it is not changeable when a single-speed modem or other external device provides the clocking. You must respond YES if the console operator will be using the speed parameter in the :DSCONTROL command to override the configured transmission speed (see Step 29).</p> |

## Configuration Dialogue

### STEP NO.      DIALOGUE

#### 29              TRANSMISSION SPEED?

For INP (Type 17) or SSLC (Type 18) devices, enter the transmission speed of the line in characters per second (Bit Rate/8). For HSI (Type 19) devices, enter 250000 for cable lengths up to 1000 feet, or enter 125000 for cable lengths greater than 1000 feet.

The transmission speed you specify is ignored for modems that provide internal clocking signals. This allows modems of different speeds to be used without reconfiguring the Operating System. The speed specified is used if the modems are eliminated and the controllers are hardwired together.

The speed you specify becomes the default. The console operator can override the default by including the speed parameter in the :DSCONTROL command, if you answered YES to Step 28.

**STEP NO.      DIALOGUE****30                TRANSMISSION MODE?**

Enter the appropriate number for the transmission mode in use. The mode numbers are:

- 0 = Full duplex
- 1 = Half duplex

**INP and SSLC:**

Configure the communications interface (INP or SSLC) to operate in Full Duplex (0) if your facility uses one of the following:

- A leased line with four-wire, point-to-point installation.
- A dial network with two lines (four-wire equivalent).
- A dial network with Wide Band Service.
- Any Direct Connect cable between two INPs.

Configure the communications interface to operate in Half Duplex (1) if your facility uses the following:

- A dial network with a single-line (two-wire) installation.
- An INP-to-SSLC Direct Connect cable (a "modem eliminator" cable between an INP and an SSLC)

Your response must agree with the remote system's configuration and with the characteristics of the communications line.

**HSI:**

Always configure an HSI as Full Duplex (0).



Configuration Dialogue

**STEP NO.      DIALOGUE**

31            PREFERRED BUFFER SIZE?

Enter, in words, the desired buffer size, to a maximum of 4095 words for an HSI or SSLC, or up to a maximum of 1024 words for an INP. For a dial-up line, 1024 is generally recommended; for a leased line with an SSLC, the size may be larger than 1024 if the line quality is good. Note that although large buffer sizes increase transmission efficiency, they also use up memory space. Match buffer sizes for sender and receiver whenever possible, since the effective buffer size that can be utilized is the smaller of the two.

32            DRIVER CHANGEABLE? NO

33            DRIVER OPTIONS? 0

**NOTE**

The dialogue skips to Step 41.

34            RECORD WIDTH?

For IODS0 and IODSX, enter 128.

For all Virtual Terminals, enter 40.

35            OUTPUT DEVICE?

For the communications drivers, enter 0.

For a virtual terminal, enter the class name or logical device number to be used for the corresponding job/session listing device.

36            ACCEPT JOBS/SESSIONS?

For the communications drivers, enter NO.

For virtual terminals, enter YES.

37            ACCEPT DATA? NO

**STEP NO.      DIALOGUE**

38            INTERACTIVE?

              For the communications drivers, enter NO.

              For virtual terminals, enter YES.

39            DUPLICATIVE?

              For the communications drivers, enter NO.

              For virtual terminals, enter YES.

40            INITIALLY SPOOLED? NO

41            DRIVER NAME?

              Enter the name of the driver for this device as follows:

              IOINP0    = INP

              CSSBSCO   = SSLC

              CSHBSCO   = HSI

              IODS0     = Communications driver, while using the bisync protocol

              IODSX     = Communications driver, while utilizing the X.25 capability

              IODSTRM0 = Virtual terminals, while using the bisync protocol

              IODSTRMX = Virtual terminals, while utilizing the X.25 capability

**NOTE**

Steps 42 through 45 apply to CS devices with switched (dial-up) lines (types 17 and 18, subtype 0). The dialogue for all other devices skips to Step 46.

Configuration Dialogue

**STEP NO.      DIALOGUE**

42              PHONELIST?

Enter YES or NO.

You can supply one number (usually a frequently dialed number) which will be the system default.

43              PHONE NUMBER?

Enter a string of numbers and hyphens, but not more than 30 characters. This number will be included in the I/O request on the system console when a user OPENS a dial-up line.

The characters that can be used for the phone number are:

0 through 9

/ (separator used for automatic call units that have a second dial tone detect)

E (optional end-of-number indicator)

D (one-second delay. Used for European modems and automatic call units that require built-in delays)

# (defined by the local telephone system)

\* (defined by the local telephone system)

44              LOCAL ID SEQUENCE?

The default local ID sequence can be specified in ASCII. Enter **RETURN** for a null local ID sequence, or enter an ASCII string in quotes.

**NOTE**

Do not enter more than 16 characters for the local or remote ID sequence.

**STEP NO.      DIALOGUE**

45            REMOTE ID SEQUENCE?

Enter the default remote ID sequence in the same format as the local ID sequence (above). This can be repeated until **(RETURN)** is entered.

46            DEVICE CLASSES?

Enter a list containing a device class name (up to eight alphanumeric characters, beginning with a letter). Class names are separated from each other by commas. These names are left to the discretion of the System Supervisor. They will be used in certain commands and intrinsics when any member of a group of devices (such as any disc drive) can be referenced. No name need be entered.

**NOTE**

For IODSX entries, the destination logical node name cannot be specified as a device class name.

The dialogue now prints the LOGICAL DEVICE #? prompt described in Step 8. If all I/O configuration is complete, press **(RETURN)** and the dialogue continues at Step 47. Otherwise, enter a logical device number and repeat the configuration procedure from Step 8.

47            MAX # OF OPENED SPOOLFILES= xxx? **(RETURN)**48            LIST OF I/O DEVICES? YES

To print a listing of the new input/output device configuration, enter YES. This list appears in the format described in Step 5.

**NOTE**

Step 49 only appears if you are using MPE V/E.

49            TERMINAL TYPE CHANGES?

Enter NO.

50            LIST CS DEVICES? YES

Enter YES to list the characteristics of the new CS device configuration.

## Configuration Dialogue

STEP NO.	DIALOGUE
51	CLASS CHANGES? <u>RETURN</u>
52	LIST I/O DEVICES? <u>RETURN</u>

### NOTE

The prompt in Step 53 appears only if a CS device is configured or if additional drivers exist (for the CS driver-changeable option in Step 32). If neither case exists, the dialogue skips to Step 55.

53	ADDITIONAL DRIVER CHANGES? <u>NO</u>
54	I/O CONFIGURATION CHANGES? <u>NO</u>
55	SYSTEM TABLE CHANGES? <u>NO</u>
56	MISC CONFIGURATION CHANGES? <u>NO</u>
57	LOGGING CHANGES? <u>NO</u>
58	DISC ALLOCATION CHANGES? <u>NO</u>
59	SCHEDULING CHANGES? <u>NO</u>
60	SEGMENT LIMIT CHANGES? <u>NO</u>
61	SYSTEM PROGRAM CHANGES? <u>NO</u>
62	SYSTEM SL CHANGES? <u>NO</u>

The NO response assumes CS/3000 modules are already present on the system.

**STEP NO.      DIALOGUE**

63            ENTER DUMP DATE?

RETURN      Copies the modified MPE. When this copy is used to COLDSTART the system, the account structure and all files remain intact.

mm/dd/yy    where mm/dd/yy is some date in the future. Copies the modified MPE and the current accounting, but no files.

mm/dd/yy    where mm/dd/yy is usually the date of the most recent system backup. Copies the modified MPE, the current accounting structure, and any files that were changed on or since the specified date.

0            Copies the entire system (MPE, the current accounting structure, and all files).

64            ENTER DUMP FILE SUBSETS?

Enter RETURN, or enter a filename or series of filenames. (Example: @.PUB.SYS)

65            LIST FILES DUMPED? YES or NO

66            The console operator must now use the =REPLY command to assign the magnetic tape drive on which you have arranged for a tape reel to be mounted.

After the SYSDUMP is complete, the tape produced should be used to COLDSTART the system. During COLDSTART, the old I/O device configuration is replaced with the new one from your SYSDUMP tape.

See pages 2-38 through 2-40 for sample configurations.



## INTRODUCTION

The Network Configurator/Network Data Base is used to configure connections to X.21 or X.25 Public Data Networks.

One of the features of the Network Configurator/Network Data Base is the ability to define the network configuration once, then store it away in an IMAGE/3000 data base, and have it automatically used whenever you use the network. In addition, you can later alter the configuration, and again store it away for future use.

The data associated with the configuration is stored in an IMAGE data base in the PUB group of the SYS account. The data in the data base is manipulated by means of the Network Configuration Utility (NETCONF), which also resides in PUB.SYS. Although the Distributed Systems Network (DSN) products have read-only access to the data base so the subsystems can determine the options selected for a particular line, the network manager can change the network configuration.

Information in the NETCON databases serves two basic purposes: first, to validate and accept CALL REQUEST packets from other computers when they connect to IODSX pseudo devices; second, to route calls from the local HP 3000 to other remote HP 3000s.

## ENVIRONMENT

The network configuration information is held in an IMAGE/3000 data base in PUB.SYS. The data base consists of the following files:

- NETCON (Root File)
- NETCON01
- NETCON02
- NETCON03
- NETCON04
- NETCON05

It will be necessary, since the configuration information is kept in a data base, to make a backup copy periodically onto magnetic tape, for purposes of recovery. It is recommended that the backup be taken each time the network configuration is changed, since the data base is only updated by the Network Configuration Utility (NETCONF). By doing this, a secure backup will be held of the latest network configuration.

When backing up the data base, the DBSTORE operation must be done by a user of the PUB.SYS account. It is assumed that this user is also the network manager, as only the network manager would have access to the data base maintenance password.

The data base must be RELEASED using DBUTIL, so that all users may have read access to the data base. See the *IMAGE/3000 Reference Manual*.



## The NETCONF Utility

The purpose of NETCONF is to obtain from the network manager all of the information necessary to describe the network connection(s), the parameter values and options chosen at subscription time, and all information related to the way the connection(s) will be used.

The NETCONF utility can be run by any user with read access to the data base. Only the data base creator has write access to the data base, and it is assumed that the creator is the network manager.

Run NETCONF by entering:

```
RUN NETCONF.PUB.SYS
```

## USING NETCONF

### Data Base Organization

The network configuration data is arranged into two sets (or tables) of information.

The first set of data is known as the Remote Node (RN) table and is only referenced if you are using DSN/DS with DSN/X.25, or are using an HP 2334A X.25 Cluster Controller (see the *DSN/X.25 Reference Manual* in this case). This table contains information for all systems or devices connected to the PDN that will be accessed by users or applications on the local system, as well as information on remote systems whose users may want to access the local system. One entry is required for each of these devices.

The second set of data is known as the Line Characteristics (LC) table and contains information pertaining to a particular line (logical device number). There must be an entry in this table for every line from this node to a PDN and, unlike the RN table, each entry must be unique.

The two tables are related by the line identifier (LDEV number). For every line identifier referenced in the Remote Node table with System Type of HP3000 or HP1000, there should be an entry in the LC table, and vice versa. NETCONF warns of any unsatisfied or illegal relationships when exiting; however, no attempt is made to insist on their being satisfied.

## The Commands

The Network Configuration Utility (NETCONF) has eight first-level commands:

ADD	HELP
CHECK	LIST
DELETE	PRINT
EXIT	UPDATE

Any of these commands can be initiated after NETCONF has issued its identifying banner. The commands may (optionally) be abbreviated to one character, as any other input is ignored. The mode of NETCONF is conversational. After one of the commands has been specified, a series of prompts to the user is issued, as appropriate, for the relevant inputs.

To terminate NETCONF command execution during an interactive session on HP terminals, press **(CONTROL)Y**. This action terminates the current command and prompts for another first-level command.

Refer to the information manual for your particular PDN for the recommended (or required) configuration parameters for X.25 connections.

<b>NOTE</b>
-------------

The following description of the interactive dialogue, initiated by these commands, is presented in a format similar to the one used for the System I/O Configuration Dialogue in Section 1. For additional clarification of this format, refer to page xi, "Conventions Used in This Manual."

**Shaded material** represents NETCONF prompts.

# ADD

## THE A[DD] COMMAND

This command is used to add a new entry to either the Remote Node (RN) table or the Line Characteristic (LC) table. Note that only the creator of the data base can add entries. After specifying the ADD command, the system will print the following message:

\*\*\* DATA BASE NOW BEING ACCESSED EXCLUSIVELY \*\*\*

<b>NOTE</b>
-------------

While in ADD mode, no other program on the system (including the X.25 communications software) will be able to access the data base.

The dialogue proceeds as follows:

STEP NO.	DIALOGUE
----------	----------

0	REMOTE NODE (RN) OR LINE CHARACTERISTICS (LC) TABLE?
---	------------------------------------------------------

Enter one of the following replies:

RN = When this is specified, you will be adding an entry to the Remote Node table, and the dialogue proceeds from there. Skip to Step 1.0.

LC = When this is specified, you will be adding an entry to the Line Characteristics table, and the dialogue proceeds from there. Skip to Step 2.0.

RETURN = When you reply with RETURN, you will receive the following prompt:

CONTINUE ADDING (YES OR NO)?

YES = This response takes you back to the ADD prompt (Step 0).

NO = This response takes you out of the ADD command and prompts for another first-level command. NETCONF will print:

Data Base reopened for concurrent access

INPUT MUST BE RN OR LC

If this message appears, the response was not one of the above. You will be prompted again with the ADD prompt (Step 0).

## Adding to the RN Table

The following prompts cover the remote node characteristics.

### STEP NO.      DIALOGUE

#### 1.0            REMOTE NODE NAME?

Enter a logical node name. This name can be up to eight alphanumeric characters (the first being an alphabetic character).

NODE NAME SHOULD BE UP TO 8 ALPHANUMERIC CHARACTERS

This message appears when the node name is greater than eight alphanumeric characters or when the first character is numeric. You will be prompted again for a logical node name (Step 1.0).

#### 1.1            REMOTE COMPUTER TYPE (HP3000, HP2334, OR HP1000)?

RETURN = The default Remote Computer type (HP 3000) is used.

HP3000 = The type of the Logical Node being addressed is an HP 3000.

HP2334 = The type of the Logical Node being addressed is a device connected to an HP 2334. See the *DSN/X.25 for the HP 3000 Reference Manual* for information.

HP1000 = The type of the Logical Node being addressed is an HP 1000.

INPUT MUST BE HP3000 OR HP1000 OR HP2334

This message is received if the response was not one of the above. You will be prompted again for the Remote Computer type (Step 1.1).

# ADD

## STEP NO. DIALOGUE

### 1.2 LOGICAL DEVICE NUMBER TO BE USED?

Enter the logical device number of the IODSX communications driver associated with the INP connected to the PDN, or the IODS0 driver associated with the X.21 network. This can be a numeric value between 1 and 255 for MPE IV, or between 1 and 999 for MPE V/E.

LOGICAL DEVICE SHOULD BE IN THE RANGE OF 1 TO 255 (MPE IV)

LOGICAL DEVICE SHOULD BE IN THE RANGE OF 1 TO 999 (MPE V/E)

This message appears when a line identifier that is not in the range of 1 to 255 (for MPE IV) or 1 to 999 (for MPE V/E) has been specified. You will be prompted again for a Logical Device number (Step 1.2).

### 1.3 LINE TYPE (X25 OR X21)?

RETURN = The default (X.25) line type is used.

X25 = You will be prompted for the X.25 Remote Node Address. Skip to Step 1.3.1.

X21 = You will be prompted for an X.21 Remote Node Address. Skip to Step 1.3.2.

INPUT MUST BE X25 OR X21

This message appears when the response was not one of the above. You will be prompted again for the Line Type (Step 1.3).

## STEP NO. DIALOGUE

### 1. 3. 1 REMOTE X25 PDN ADDRESS?

Enter one of the following replies:

**RETURN** = Either an X. 25 network address is not necessary because the connection will be across a point-to-point line, rather than a PDN; or the default network address, NULL, will be used if the connection is across a PDN. Skip to Step 1. 4.

An X. 25 PDN Network Address = This will be assigned by the relevant PDN across which you will be talking to the remote node. It should be a numeric address up to 15 digits in length, and it is the actual PDN address of the remote node. If you are using DATEX-P, Swiss TELEPAC, or TRANSPAC, addresses for a different country than the network's country of origin must be preceded with a 0. Skip to Step 1. 4.

#### X25 ADDRESS SHOULD BE UP TO 15 DECIMAL DIGITS

This message appears if the specified address is greater than 15 decimal digits or if a non-numeric network address was entered. You will be prompted again for the X. 25 PDN address (Step 1. 3. 1).

### 1. 3. 2 X21 PDN ADDRESS?

Enter one of the following replies:

**RETURN** = The default X. 21 Address (all blanks) is used.

An X. 21 PDN Network Address = This address must be no more than 30 characters long.

#### X21 ADDRESS SHOULD BE UP TO 30 CHARACTERS

This message appears if the address entered was larger than 30 characters. You will be prompted again for the X. 21 PDN address (Step 1. 3. 2).

# ADD

## STEP NO. DIALOGUE

### 1.4 CONTINUE ADDING (YES OR NO)?

YES = This will take you back to the ADD prompt (Step 0).

NO or any input except YES = This will take you out of the ADD command.  
NETCONF will print:

Data Base reopened for concurrent access,

and prompt for another first-level command.

### ADDITION COMPLETE

This message appears when the Remote Node characteristics have been added to the Remote Node (RN) table.

### DUPLICATE ENTRY - NEW ENTRY NOT ADDED

This message appears when there was already an entry in the Remote Node table with these relationships.

### DATA BASE IS FULL - NEW ENTRY NOT ADDED

This message appears when the data base is full. To correct this situation, exit from NETCONF and enlarge the size of the IMAGE data base. Refer to the *IMAGE/3000 Reference Manual*.

## Adding to the LC Table

The following prompts cover the general line characteristics.

### STEP NO.      DIALOGUE

#### 2.0            LOGICAL DEVICE NUMBER?

Enter a Line Identifier (logical device number). This can be a numeric value between 1 and 255 for MPE IV, or between 1 and 999 for MPE V/E, and it must be the logical device number of the DS/X.25 communications driver (IODSX) if configuring X.25, or IODS0 for X.21.

LOGICAL DEVICE SHOULD BE IN THE RANGE OF 1 TO 255 (MPE IV)

LOGICAL DEVICE SHOULD BE IN THE RANGE OF 1 TO 999 (MPE V/E)

This message appears if a line identifier not in the range 1 to 255 (for MPE IV) or 1 to 999 (for MPE V/E) has been specified. You will be prompted again for a Logical Device number (Step 2.0).

DUPLICATE ENTRY - NEW ENTRY NOT ADDED

This message appears if there was already an entry in the LC table with the same Logical Device number.

#### 2.1            LINE TYPE ( X25 OR X21 )?

Enter one of the following replies:

RETURN = The default protocol (X25) is used.

X25 = X.25 protocol will be used. Skip to Step 2.1.1.

X21 = X.21 protocol will be used. Skip to Step 2.1.2.

INPUT MUST BE X25 OR X21

This message appears if the response was not one of the above. You will be prompted again for a Logical Device number (Step 2.1).



# ADD

## STEP NO. DIALOGUE

### 2.1.1 CONNECTION DIRECT OR VIA PDN?

This prompt is issued only if the connection protocol is X.25.

RETURN = The default connection type (DIRECT) is used. Skip to Step 2.1.3.

DIRECT = The line connection will be via a point-to-point or full duplex link. Skip to Step 2.1.3.

PDN = The line connection will be via Public Data Network. Skip to Step 2.1.4.

INPUT MUST BE DIRECT OR PDN

This message appears if the response was not one of the above. You will be prompted again for the connection type (Step 2.1.1).

### 2.1.2 LINE IS LEASED OR SWITCHED?

This prompt is issued only if the connection protocol is X.21.

RETURN = The default LEASED is used (Step 2.2).

LEASED = The line type is LEASED and the connection is point-to-point. Skip to Step 2.2.

SWITCHED = The line type is SWITCHED and the connection is via PDN. Skip to Step 2.1.3.

INPUT MUST BE LEASED OR SWITCHED

This message appears if the response was not one of the above. You will be prompted again for the line type (Step 2.1.2).

**STEP NO.      DIALOGUE****2. 1. 3      MASTER (DCE) OR SLAVE (DTE) MODE?**

This prompt is issued only if the connection protocol is X. 25 and line connection is DIRECT. Enter one of the following responses:

DTE = The node is set up to act as a DTE, and a local address of 8 is assigned by the system. Note that one end of the connection must be set up as the DTE, while on the destination node it must be set up as a DCE. Skip to Step 2. 2.

DCE = The node is set up to act as a DCE, and a local address of 9 is assigned by the system. Skip to Step 2. 2.

**INPUT MUST BE DCE OR DTE**

This message appears if the response was not one of the above. You will be prompted again for the DTE or DCE mode (Step 2. 1. 3).

**2. 1. 4      LOCAL X25 PDN ADDRESS?**

This prompt is issued only if the connection protocol is X. 25 and line connection is via PDN. Enter one of the following responses:

RETURN = The default local address of all zeroes is used.

Local X25 PDN address = This is the actual local address (from address) assigned by the PDN at subscription time. It should be a numeric address up to 15 digits in length. If you are using Transpac, this field must be all blanks.

**X25 ADDRESS SHOULD BE UP TO 15 DECIMAL DIGITS**

This message appears if the specified address is greater than 15 decimal digits or if a non-numeric network address has been specified. You will be prompted again for the local X. 25 PDN address (Step 2. 1. 4).

# ADD

## STEP NO. DIALOGUE

### 2.1.5 NAME OF PDN?

This prompt is issued only if the connection protocol is X.25 and the line connection is via PDN. Enter one of the following responses:

Name of PDN = The PDN name must be no longer than eight alphanumeric characters. If you are using one of the following networks, it must be spelled exactly as shown:

TELENET	TYMNET
TRANSPAC	EURONET
DATAPAC	DDX-1
DATEX-P	DATANET
PSS	CTNE
NORDIC	DATEX-L

**RETURN** = The default PDN name of all blanks is used.

PDN NAME SHOULD BE UP TO 8 ALPHANUMERIC CHARACTERS

This message appears if the PDN name is greater than eight alphanumeric characters. You will be prompted again for a PDN name (Step 2.1.5).

### 2.2 PRIMARY REMOTE NODE TO BE CONNECTED TO ON THIS LINE?

Reply by entering the Remote Node Name to be used as a default. This must correspond to one of the remote node names associated with this line identifier in the RN table. When a :DSLIN command is issued with a line identifier instead of a node name, the node to which the connection will be established is the one identified here.

#### NOTE

DS/X.25 users are encouraged to use a node name in commands such as :DSLIN, DSCOPY, FCOPY, etc. instead of a line identifier.

NODE NAME SHOULD BE UP TO 8 ALPHANUMERIC CHARACTERS

This message appears if the node name is greater than eight alphanumeric characters or if the first character was numeric. You will be prompted again for Primary Node name (Step 2.2).

The following prompts, covering low-level (Level 2) characteristics, are issued only if the connection protocol is X.25.

**NOTE**

For direct connect X.25 lines, all Level 2 parameters must be configured exactly the same as the corresponding Level 2 parameters on the remote system. For PDN X.25 lines, all Level 2 parameters must be agreed upon with the PDN.

**STEP NO.      DIALOGUE**

2.3      **RESPONSE TIMER (MILLISECONDS) ?**

Enter one of the following replies:

**(RETURN)** = The default value of 200 is used.

Response Timer = This value must be an integer in the range of 1 to 9999. It is defined as T1 in the X.25 standard and it specifies the period of time (in milliseconds) the HP 3000 will wait before retransmission of a frame can be initiated. (In the case of a PDN connection, this is usually the default provided by that PDN.)

**NOTE**

For most HP 3000 installations, a value of 3000 is recommended.

**RESPONSE TIMER SHOULD BE IN THE RANGE 1 TO 9999**

This message appears if your reply was either non-numeric or not in the range of 1 to 9999. You will be prompted again for Response Timer (Step 2.3).

# ADD

## STEP NO.      DIALOGUE

2.4            **RETRY COUNT (1..255) ?**

Enter one of the following replies:

**RETURN** = The default value of 8 is used.

Retry Count = This must be a numeric value in the range of 1 to 255. It is defined as N2 in the X.25 standard and it specifies the maximum number of retransmissions of frames that will be attempted following the expiration of the T1 timer. (In the case of a PDN connection, this is usually the default provided by that PDN.)

RETRY COUNT SHOULD BE IN THE RANGE 1 TO 255

This message appears if your response was either non-numeric or not in the range of 1 to 255. You will be prompted again for Retry Count (Step 2.4).

**STEP NO.      DIALOGUE**

2.5      **WINDOW SIZE (FRAMES) ?**

Enter one of the following replies:

**RETURN** = The default value of 2 is used.

Window size = Window size specifies the maximum number of sequentially numbered I-frames that a DTE/DCE may have outstanding (unacknowledged) at any given time. The minimum value of this parameter is 1, and the maximum value is 7. (In the case of a PDN connection, this is usually the default provided by that PDN.)

**NOTE**

For optimum performance, the Level 2 window size should be 7. However, PDN users must specify the default size provided by the PDN.

WINDOW SIZE SHOULD BE IN THE RANGE 1 TO 7

This message appears if your response was either non-numeric or not in the range 1 to 7. You will be prompted again for Packet Size (Step 2.5).

# ADD

The following prompts cover the upper-level (Level 3) characteristics.

<b>NOTE</b>
-------------

For direct connect X.25 lines, all Level 3 parameters must be configured exactly the same as the corresponding Level 3 parameters on the remote system. For PDN X.25 lines, all Level 3 parameters must be agreed upon with the PDN.

STEP NO.	DIALOGUE
----------	----------

2.6	<b>LOW VC NUMBER (0..4095) ?</b>
-----	----------------------------------

Enter one of the following replies:

**(RETURN)** = The default value of 0 is assigned as the low virtual circuit number.

Virtual Circuit Number = This must be an integer in the range of 0 to 4095. It represents the low end of the virtual circuit identification numbers. (In the case of a PDN connection, this is usually the default provided by that PDN.)

<b>NOTE</b>
-------------

All virtual circuits specified here will be used as 2-way switched virtual circuits.

LOW VC SHOULD BE IN THE RANGE OF 0 TO 4095

This message appears if your response was not numeric or if it was not in the range of 0 to 4095. You will be prompted again for the Low VC Number (Step 2.6).

## STEP NO.      DIALOGUE

## 2.7      HIGH VC NUMBER (0..4095) ?

Enter one of the following replies:

**RETURN** = The default value of the Low Virtual Circuit Number + 255 is assigned as the high virtual circuit number.

Virtual Circuit Number = This must be an integer in the range of 0 to 4095, and it represents the high end of the virtual circuit identification numbers. It has to be greater than the low virtual circuit number, but no more than 255 above that value. (In the case of a PDN connection, this is usually the default provided by that PDN.)

HIGH VC SHOULD BE IN THE RANGE nnnn TO mmmm

This message appears if your response was

- non-numeric,
- not in the range of 0 to 4095,
- less than the low virtual circuit number,
- greater than the low virtual circuit number + 255

You will be prompted again for the high virtual circuit number (Step 2.7).

<b>NOTE</b>
-------------

All virtual circuit numbers are used as 2-way switched virtual circuits on the HP 3000.

## 2.8      PACKET SIZE (32..1024) ?

Enter one of the following replies:

**RETURN** = The default packet size (128 bytes) is used.

Packet Size = This must be a numeric value in the range of 32 to 1024. It represents the maximum number of data bytes in a data packet that will be used across this connection. (In the case of a PDN connection, this is usually the default provided by that PDN.)

PACKET SIZE SHOULD BE IN THE RANGE 32 TO 1024

This message appears if your response was either non-numeric or not in the range of 32 to 1024. You will be prompted again for the packet size (Step 2.8).



# ADD

## STEP NO. DIALOGUE

### 2.9 MODULO COUNT (8 OR 128) ?

Enter one of the following replies:

**RETURN** = The default of 8 is used.

Modulo Count = This is the counting scheme used for packets across this connection. (In the case of a PDN connection, this is usually the default provided by that PDN.)

#### NOTE

The modulo count has no major effect on performance.

### 2.10 WINDOW SIZE (PACKETS) ?

Enter one of the following replies:

**RETURN** = The default value of 2 is used.

Window Size = This must be a numeric value in the range of 1 to 7 (for a modulo count of 8) or in the range of 1 to 15 (for a modulo count of 128). It represents the window size (in packets) that will be used across this connection. (In the case of a PDN connection, this is usually the default provided by that PDN.)

#### NOTE

For optimum performance, the Level 3 window size should be 7 if a modulo count of 8 is being used at Level 3. For a modulo count of 128, any window size greater than 7 has approximately the same performance.

WINDOW SIZE SHOULD BE IN THE RANGE 1 TO 7

This message appears if your response was either non-numeric or not in the range of 1 to 7 when a modulo count of 8 is being used.

WINDOW SIZE SHOULD BE IN THE RANGE 1 TO 15

This message appears if your response was either non-numeric or not in the range of 1 to 15 when a modulo count of 128 is being used. After receiving either of these messages, you will be prompted again for the window size (Step 2.10).

# ADD

## STEP NO.      DIALOGUE

2.11      CONTINUE ADDING (YES OR NO)?

YES    = This will take you back to the ADD prompt (Step 0).

NO or any input except YES = This will take you out of the ADD command.  
NETCONF will print:

Data Base reopened for concurrent access,  
and prompt for another first-level command.

ADDITION COMPLETE

This message appears when the line characteristics have been added to the Line Characteristics (LC) table.

DATA BASE IS FULL - NEW ENTRY NOT ADDED

This message appears when the data base is full. To correct this situation, exit from NETCONF and enlarge the size of the IMAGE data base. Refer to the *IMAGE/3000 Reference Manual*.

# CHECK

## THE C[HECK] COMMAND

This command is used to check the relationships, and report any discrepancies, between the RN and LC tables. Three basic checks are performed; and since they are always done, there is no dialogue following the command.

The first check scans the Remote Node table. For every Line Identifier (LDEV number) that is used with System Type of HP3000 or HP1000, it checks that there is a corresponding entry in the LC table. If there is no such entry, the following warning is printed:

```
LDEV nnn is not entered in the LC table
```

The second check scans the LC table. For each entry, it checks that the primary node name specified for a logical device has a corresponding entry in the Remote Node table. If there is no such entry, the following warning is printed:

```
aaaaaaaa ( using LDEV nnn ) is not entered in the RN table
```

The third check also scans the LC table. For each entry, it checks that all RN entries with the same LDEV have the same line type as the LC entry. For each entry in the RN table where the line types do not match, the following warning is printed:

```
aaaaaaaa (LDEV nnn) line type differs from LC line type
```

# DELETE

## THE D[ELETE] COMMAND

This command is used to remove data entries from the RN table or the LC table. Note that only the creator of the data base can delete entries. After specifying the DELETE command, the system will print the following message:

\*\*\* DATA BASE NOW BEING ACCESSED EXCLUSIVELY \*\*\*

### NOTE

While in DELETE mode, no other program on the system (including the X.25 communications software) will be able to access the data base.

The dialogue proceeds as follows:

#### STEP NO.      DIALOGUE

0                REMOTE NODE (RN) OR LINE CHARACTERISTICS (LC) TABLE?

Enter one of the following replies:

RN    = When this is specified, you will be deleting an entry from the Remote Node table, and the dialogue proceeds from there. Skip to Step 1.0.

LC    = When this is specified, you will be deleting an entry from the Line Characteristics table, and the dialogue proceeds from there. Skip to Step 2.0.

RETURN = When you reply with RETURN, you will receive the following prompt:

CONTINUE DELETING (YES OR NO)?

YES    = This response takes you back to the DELETE prompt (Step 0).

NO     = This response takes you out of the DELETE command. NETCONF will print:

Data Base reopened for concurrent access,

and prompts for another first-level command.

INPUT MUST BE RN OR LC

If this message appears, the response was not one of the above. You will be prompted again with the DELETE prompt (Step 0).

# DELETE

## Deleting from the RN Table

The following prompts cover the remote node characteristics.

STEP NO.	DIALOGUE
----------	----------

1.0	REMOTE NODE NAME?
-----	-------------------

Enter the remote node name that is presently configured in the RN Table.

NODE NAME SHOULD BE UP TO 8 ALPHANUMERIC CHARACTERS

This message appears when the node name is greater than eight alphanumeric characters or when the first character is numeric. You will be prompted again for a logical node name (Step 1.0).

NO SUCH ENTRY IN THE RN TABLE

This message appears if a legal remote node name has been specified, but there is no entry in the RN table for it. NETCONF will print:

Data Base reopened for concurrent access,

and you will be prompted for another first-level command.

If a valid remote node name has been specified, you are about to delete an entry or entries from the RN table. NETCONF also prompts to enable you to delete a corresponding entry from the LC table. Since there can be multiple entries in the RN table for the name you have specified, NETCONF repeats the following sequence of prompts until all entries have been covered, whereupon NETCONF will print:

Data Base reopened for concurrent access,

and you will be prompted for a first-level command.

# DELETE

## STEP NO. DIALOGUE

RN TABLE ENTRY WITH NODE NAME = xxxxxxxx USING LDEV = nnn

CONFIRM DELETION (YES OR NO) ?

Enter one of the following replies:

NO or any input except YES (including RETURN) = This reply results in the message:

ENTRY NOT DELETED

The delete is not confirmed, and processing proceeds. If there are further entries in the RN table satisfying the Remote Node Name specified, this step will be repeated; otherwise, NETCONF will print:

Data Base reopened for concurrent access,  
and you will be prompted for a first-level command.

YES = This reply results in the message:

ENTRY HAS BEEN DELETED

The entry has been deleted from the RN table, and processing proceeds. If there is an LC entry corresponding to this entry (having the same logical device number), processing proceeds to the next step; if there is not a corresponding LC entry and there are further entries in the RN table satisfying the remote node name specified, this step will be repeated. Otherwise, NETCONF will print:

Data Base reopened for concurrent access,  
and you will be prompted for a first-level command.

# DELETE

## STEP NO. DIALOGUE

ASSOCIATED LC TABLE ENTRY WITH LDEV = nnn

CONFIRM DELETION (YES OR NO) ?

Enter one of the following replies:

NO or any input except YES (including RETURN) = The delete will not be confirmed, and processing proceeds. If there are further entries in the RN table satisfying the logical node name specified, the previous prompt is repeated; if there are not, NETCONF will print:

Data Base reopened for concurrent access,  
and you will be prompted for a first-level command.

YES = The entry is deleted from the LC table, and processing proceeds. If there are further entries in the RN table satisfying the logical node name specified, the previous prompt is repeated; if there are not, NETCONF will print:

Data Base reopened for concurrent access,  
and you will be prompted for a first-level command.

## Deleting from the LC Table

STEP NO.      DIALOGUE

2.0            LOGICAL DEVICE NUMBER?

Enter the line identifier (logical device number) that is currently configured in the LC table.

LOGICAL DEVICE SHOULD BE IN THE RANGE OF 1 TO 255 (MPE IV)

LOGICAL DEVICE SHOULD BE IN THE RANGE OF 1 TO 999 (MPE V/E)

This message appears if a line identifier not in the range 1 to 255 (for MPE IV) or 1 to 999 (for MPE V/E) has been specified. You will be prompted again for a logical device number (Step 2.0).

NO SUCH ENTRY IN THE LC TABLE

This message appears if a legal line identifier was specified, but there is no entry in the LC table for it. iNETCONF will print:

Data Base reopened for concurrent access,

and you will be prompted for another first-level command.

A valid logical device number has been specified, and you are about to delete an entry from the LC table. NETCONF also prompts to enable you to delete a corresponding entry or entries from the RN table.



# DELETE

## STEP NO. DIALOGUE

LC TABLE ENTRY WITH LOGICAL DEVICE NUMBER = nnn

CONFIRM DELETION (YES OR NO) ?

Enter one of the following replies:

NO or any input except YES (including RETURN) = The delete will not be confirmed, and processing proceeds. NETCONF will print:

Data Base reopened for concurrent access,

and you will be prompted for a first-level command.

YES = The entry is deleted from the LC table, and processing proceeds. If there is an entry (or entries) in the RN table corresponding to this line identifier, processing proceeds to the next step; if not, NETCONF will print:

Data Base reopened for concurrent access,

and you will be prompted for a first-level command.

# DELETE

## STEP NO. DIALOGUE

ASSOCIATE RN TABLE ENTRIES USING LDEV = nnn

**CONFIRM DELETION (YES OR NO) ?**

Enter one of the following replies:

NO or any input except YES (including RETURN) = The delete is not confirmed, NETCONF will print:

Data Base reopened for concurrent access,  
and you will be prompted for a first-level command.

YES = All entries in the RN table that use this line identifier (LDEV) are deleted, NETCONF will print:

Data Base reopened for concurrent access,  
and you will be prompted for a first-level command.

# EXIT

## THE E[XIT] COMMAND

This command is used to terminate the execution of the Network Configurator. Prior to termination, if NETCONF is being used by the data base creator, a call is automatically made to the CHECK command. Any discrepancies in the relationship between the RN and LC tables are printed.

If there are no discrepancies, NETCONF terminates. If there are discrepancies, processing proceeds as follows:

STEP NO.	DIALOGUE
----------	----------

	IS IT OK TO EXIT ?
--	--------------------

Enter one of the following replies:

NO or any input except YES (including RETURN) = You will be prompted for a first-level command.

YES = NETCONF terminates execution.

## THE H[ELP] COMMAND

This command provides a basic description of each of the commands in the Network Configuration Utility (NETCONF) command set. Since the commands are only being described, there is no follow-up dialogue in the HELP command. Only a very basic description of functionality is provided by the HELP command; so when more detail is required, refer to the descriptions presented in this manual.

# LIST

## THE L[IST] COMMAND

This command provides a display on your terminal screen of the current content of the network configuration data base. The data is arranged in the Remote Node (RN) and Line Characteristics (LC) tables, under the following headings:

Remote Node Table				
Node Name	System Type	Ldev No	Line Type	Remote PDN Address/Phone Number

Line Characteristics Table				
Ldev No	Line Type	Connect Method	DCE/DTE	Remote Primary Node

Line Characteristics Table (X25)									
Ldev No	Local X25 Address	Level 2			Level 3				
		T1 Timer	Retry Count	Win-dow	Low VC	High VC	Packet Size	Win-dow	Mod Cnt

# LIST

## NOTE

The Line Characteristics Table (X. 25) will not be printed unless there are entries in the LC table that have the X. 25 line type. If there are any X. 25-related entries in the general LC table, then the LC (X. 25) table will contain entries only for those X. 25-related LDEVs.

Since all of the information is automatically provided upon specifying the LIST command, there is no following dialogue.

# PRINT

## THE P[RINT] COMMAND

The PRINT command lists the current contents of the Remote Node (RN) and Line Characteristics (LC) tables to a line printer and validates the node name and logical device relationship between the two tables. It executes the LIST and CHECK commands, with the output device being a line printer rather than \$STDLIST. The formal designator is NETLIST and the default device name is LP. FILE equations are permitted, which enables you to specify a file or device to which the data base contents are to be printed.

# UPDATE

## THE U[PDATE] COMMAND

This command is used to update entries in the Remote Node (RN) or Line Characteristics (LC) table which already exist. Note that only the creator of the data base can update the data base. After specifying the UPDATE command, the system will print the following message:

\*\*\* DATA BASE NOW BEING ACCESSED EXCLUSIVELY \*\*\*

### NOTE

While in UPDATE mode, no other program on the system (including the X.25 communications software) will be able to access the data base.

The dialogue proceeds as follows:

#### STEP NO.      DIALOGUE

0              REMOTE NODE (RN) OR LINE CHARACTERISTICS (LC) TABLE?

Enter one of the following replies:

RN      = When this is specified, you will be modifying an entry in the Remote Node table, and the dialogue proceeds from there. Skip to Step 1.0.

LC      = When this is specified, you will be modifying an entry in the Line Characteristics table, and the dialogue proceeds from there. Skip to Step 2.0.

RETURN = When you reply with RETURN, you will receive the following prompt:

CONTINUE UPDATING (YES OR NO)?

YES    = This response takes you back to the UPDATE prompt (Step 0).

NO     = This response takes you out of the UPDATE command. NETCONF will print:

Data Base reopened for concurrent access,

and prompts for another first-level command.

INPUT MUST BE RN OR LC

If this message appears, the response was not one of the above. You will be prompted again with the UPDATE prompt (Step 0).



# UPDATE

## Updating the RN Table

The following prompts cover the remote node characteristics.

STEP NO.	DIALOGUE
----------	----------

1.0	<b>REMOTE NODE NAME?</b>
-----	--------------------------

Enter a currently configured remote node name.

NODE NAME SHOULD BE UP TO 8 ALPHANUMERIC CHARACTERS

This message appears when the node name is greater than eight alphanumeric characters or when the first character is numeric. You will be prompted again for a remote node name (Step 1.0).

NO SUCH ENTRY IN THE RN TABLE

This message appears if a legal remote node name was specified, but there is no entry in the RN table for it. NETCONF will print:

Data Base reopened for concurrent access,

and you will be prompted for another first-level command.

Prior to issuing any prompts, NETCONF first prints all entries in the RN table that qualify with the remote node name specified. Since there can be multiple entries in the RN table for the remote node name that you have specified, you will be prompted for the logical device number associated with the remote node name.

# UPDATE

## STEP NO. DIALOGUE

### 1.2 LOGICAL DEVICE NUMBER ?

Enter one of the following replies:

**(RETURN)** = You will be prompted again for an LDEV.

A Logical Device Number = This must be the LDEV that specifies which of the entries in the RN table for a particular remote node name you wish to update.

LOGICAL DEVICE SHOULD BE IN THE RANGE OF 1 TO 255 (MPE IV)

LOGICAL DEVICE SHOULD BE IN THE RANGE OF 1 TO 999 (MPE V/E)

This message appears when a non-numeric LDEV or an LDEV that is not in the range of 1 to 255 for MPE IV, or 1 to 999 for MPE V/E, has been specified. You will be prompted again for a logical device number (Step 1.2).

NO SUCH ENTRY IN THE RN TABLE

This message appears if a valid LDEV was specified, but none of the qualifying RN entries uses this line identification. NETCONF will print:

Data Base reopened for concurrent access,  
and you will be prompted for a first-level command.

All other prompts, responses, and error messages are the same as for the ADD command. For each variable in the entry, the current value is printed, followed by a prompt for a new value. A **(RETURN)** maintains the current value.

# UPDATE

## Updating the LC Table

STEP NO.      DIALOGUE

2.0

**LOGICAL DEVICE NUMBER?**

Enter a line identifier (logical device number). This can be a numeric value between 1 and 255 for MPE IV, or 1 and 999 for MPE V/E, and it must refer to the logical device number of the DS/X.25 communications driver (IODSX) or IODS0 for X.21.

LOGICAL DEVICE SHOULD BE IN THE RANGE OF 1 TO 255 (MPE IV)

LOGICAL DEVICE SHOULD BE IN THE RANGE OF 1 TO 999 (MPE V/E)

This message appears if a line identifier not in the range of 1 to 255 for MPE IV, or 1 to 999 for MPE V/E, has been specified. You will be prompted again for a logical device number (Step 2.0).

NO SUCH ENTRY IN LC TABLE

This message appears if a legal line identifier was specified, but there is no entry in the LC table for it. NETCONF will print:

Data Base reopened for concurrent access,

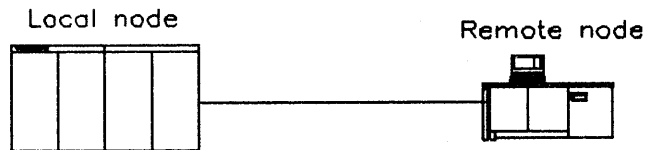
and you will be prompted for another first-level command.

This procedure follows that of adding to the LC table. For each variable in the entry, the current value is printed, followed by a prompt for a new value. A **RETURN** maintains the current value. All other prompts, responses, and error messages are the same as for the ADD command.

## EXAMPLES

### DS (Bisync) Only

#### Case 1: HP32189A



### I/O CONFIGURATION

You need to configure an INP, the DS communications driver (IODS0), and one IODSTRM0 driver for each user who will log on from the remote HP 3000 at the same time. For example, if there are 10 remote terminals but only 5 will be logged on at any point in time, then you need to configure only 5 IODSTRM0 devices. The following sample I/O configuration assumes that all remote terminal users may need to log on at the same time. Also, the default mode of operation will be no data compression as IODS0 subtype 0.

LOG DEV #	DRT #	U N	C H	T Y	SUB TYPE	REC WIDTH	OUTPUT DEV	MODE	DRIVER NAME	DEVICE CLASSES
#		I T	A N	P E	TERMINAL TYPE	SPEED				
16	20	0	0	17	3	0	0		IOINPO	CSINP
60	#16	0	0	41	0	128	0		IODS0	REMOTE
66	#16	0	0	16	0	??	??	J ID	IODSTRM0	DSTERM
67	#16	0	0	16	0	??	??	J ID	IODSTRM0	DSTERM
68	#16	0	0	16	0	??	??	J ID	IODSTRM0	DSTERM
69	#16	0	0	16	0	??	??	J ID	IODSTRM0	DSTERM
70	#16	0	0	16	0	??	??	J ID	IODSTRM0	DSTERM

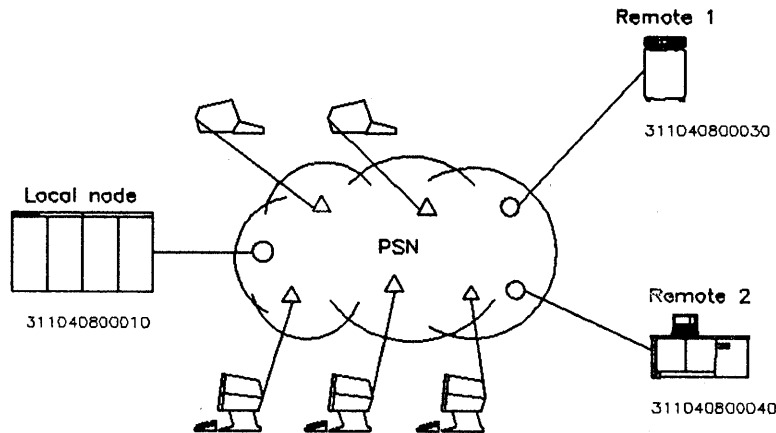
LDN	PM	PRT	LCL MOD	TC	RCV TMOUT	LCL TMOUT	CON TMOUT	MODE	TRANSMIT SPEED	TM	BUFFER SIZE	D	DRIVER C	OPTIONS
16	0	X	X	X	20	60	900		C 7000	0	1024	N	0	

### NETWORK DATABASE CONFIGURATION

This example only shows a DS configuration for use with the bisync protocol. This means no network database configuration is necessary.

## DS with X.25

### Case 2: HP32189A and HP32191A



KEY:

- IS A NETWORK SWITCHING NODE (DCE)
- △ IS A NETWORK-SUPPLIED PAD

### I/O CONFIGURATION

You need to configure an INP, the X.25 communications driver (IODSX), one IODSTRMX driver for each user who will log on from a remote HP 3000 at a given time, and one PAD terminal driver (IOPAD0) for each user who will log on from a remote PAD terminal at a given time. For example, if there are 10 remote PAD terminals but only 5 will be logged on at any point in time, then you need to configure only 5 IOPAD0 devices. The following sample I/O configuration assumes that all remote PAD terminal users may need to log on at the same time. The default mode of operation for DS users will be no data compression as the subtype of IODSX is 0.

LOG DEV #	DRT #	U N	C H	T Y	SUB TYPE	REC WIDTH	OUTPUT DEV	MODE	DRIVER NAME	DEVICE CLASSES
#		I A P T N E			TERMINAL TYPE SPEED					
16	20	0	0	17	1	0	0		IOINP0	CSINP
60	#16	0	0	41	0	128	0		IODSX	
61	#16	0	0	16	0	??	??	J ID	IOPAD0	PADTERM
62	#16	0	0	16	0	??	??	J ID	IOPAD0	PADTERM
63	#16	0	0	16	0	??	??	J ID	IOPAD0	PADTERM
64	#16	0	0	16	0	??	??	J ID	IOPAD0	PADTERM
65	#16	0	0	16	0	??	??	J ID	IOPAD0	PADTERM
66	#16	0	0	16	0	??	??	J ID	IODSTRMX	DSTERM
67	#16	0	0	16	0	??	??	J ID	IODSTRMX	DSTERM
68	#16	0	0	16	0	??	??	J ID	IODSTRMX	DSTERM
69	#16	0	0	16	0	??	??	J ID	IODSTRMX	DSTERM
70	#16	0	0	16	0	??	??	J ID	IODSTRMX	DSTERM

```

LDN PM PRT LCL TC RCV LCL CON MODE TRANSMIT TM BUFFER D DRIVER
      MOD TMOUT TMOUT TMOUT SPEED SIZE C OPTIONS
16 0 X X X 20 60 900 C 1200 0 1024 N 0
    
```

The TRANSMIT SPEED should match the speed of the link to the PDN.

**NETWORK DATABASE CONFIGURATION**

One remote node table entry is required for each remote HP 3000 with which you would like to communicate across the PDN, as well as for those remote nodes that need to communicate with the local system. If the HP 3000 receives an incoming call from a remote HP 3000 with a calling address that has not been specified in the remote node table, the call will be cleared. Remote node names cannot be configured on the system as device class names because DS uses the node name to determine the remote node's PDN address.

You also need to define the X.25 line parameters in the line characteristics table.

The following example (produced by the PRINT command) shows the NETCONF information generated for the I/O configuration shown above.

```

Network Configuration Utility - Wed, Nov 30, 1983, 11:27 PM
Version: A.05.07000 (C) Hewlett-Packard Co. 1981
    
```

Remote Node Table				
Node Name	System Type	Ldev No	Line Type	Remote PDN Address/Phone Number
REMOTE1	HP3000	60	X25	311040800030
REMOTE2	HP3000	60	X25	311040800040

X.25 Network Configurator

Line Characteristics Table				
Ldev No	Line Type	Connect Method	DCE/DTE	Remote Primary Node
60	X25	PDNNAME	DTE	REMOTE1

Line Characteristics Table (X25)									
Ldev No	Local X25 Address	Level 2			Level 3				
		T1 Timer	Retry Count	Win-dow	Low VC	High VC	Packet Size	Win-dow	Mod Cnt
60	311040800010	3000	20	7	1	20	128	2	8

Valid Configuration

For an example with the HP 2334A Cluster Controller, please see pages 5-36 to 5-49 in the *DSN/X.25 for the HP 3000 Reference Manual*.

# TRACING DSN/DS LINE ACTIVITY WITH BISYNC

SECTION

3

The CS/3000 Trace Facility is used to provide a record of the line actions, CS states and events that occur during DSN/DS operation. When problems occur during operation, the trace facility provides the means to pinpoint the problem area.

The internal procedures that DSN/DS uses for controlling the line are called CS intrinsics. Each call to a CS intrinsic generates a series of actions, states and events. An action is something that the CS driver performs, and an event is an external occurrence that requires an action from the driver according to the driver's state.

The trace facility is invoked by the operator with a :DSCONTROL command. Tracing can be enabled/disabled when OPENing the line, or before or after the line is opened. Tracing can be invoked for any communication line that DSN/DS uses. Once invoked for a particular communications line, the trace facility continues to record line activity until either the user issues a new :DSCONTROL command with the TRACE, OFF parameter. The trace facility keeps track of actions, states and events in the form of trace entries.

The trace entries are grouped into trace records: one trace record for each CS intrinsic called by DSN/DS. The trace records are permanently stored in a system-generated file named DSTRCxxx, or in a user-specified trace file. The contents of a CS/3000 trace file can be formatted and printed through the use of a trace dump utility program, described later in this section. Refer to the *Data Communications Handbook* for additional information on the CS Trace Facility.

## INVOKING THE TRACE FACILITY

To invoke the CS/3000 trace facility, include the following trace parameter in the :DSCONTROL command:

```
;TRACE,ON[ALL][mask][numentries][WRAP][filename]
```

where

**ALL** generates trace records for all CS intrinsic calls. If **ALL** is not specified, then trace records are written only when an intrinsic call completes with a transmission error. The word **ERROR** appears on the trace listing.

**mask** indicates the type of activities to be traced, as follows (PCMP entries are generated automatically):

%000, or omitted, means use the driver default mask (%037, so all entries except PSTN and INP interconnect entries are generated)

%001 = generate PSTX entries

%002 = generate PSCT entries

%004 = generate PRTX entries



## Tracing DSN/DS Line Activity with Bisync Protocol

%010 = generate PRCT entries

%020 = generate POPR and PEDT entries

%040 = generate PSTN entries

%100 = generate INP interconnect entries

### *numentries*

is a decimal integer for the maximum number of trace entries in a trace record. It cannot be greater than 248. The value actually used by the trace facility will be the largest integer multiple of eight that is not greater than the number you enter. For an INP the value may not exceed 24. (If the value requested for an INP is greater than 24, a warning message will be printed and the maximum default of 24 will be used.) If *numentries* is set to zero or omitted, there will be a maximum of 24 trace entries per trace record for the INP, and 25 for the SSLC. It is not possible to change the value of *numentries* once a trace file has been built. If the value you choose is inadequate, you will have to purge the file and rebuild it, or let DSN/DS rebuild it.

### WRAP

causes trace entries that overflow the trace record area (greater than *numentries*) to overlay the prior trace entries. If WRAP is omitted, overflow trace entries are discarded, and NOWRAP appears on the trace listing. (This parameter does not affect the EOF marker of the file.)

If WRAP is specified then entries are deposited in a trace record in a circular pattern. For example, with a maximum of 35 trace entries per trace record, trace entries beyond the 35th will overlay the first, second, third (and so on) trace entries in the record. When this happens, the overlaid trace entries will be missing from the listing; a warning message will appear in the listing stating that the entries are missing.

### *filename*

names the file the user wants the trace information to be written to. If no name is supplied, DSN/DS will create a file named DSTRCnnn, where nnn is the right-justified LDEV number of the DS device. For example, if the IODS0 LDEV is 51, the trace filename is DSTRC051. If a trace file exists it will be purged, and a new trace file will be created.

## The Trace File

Refer to Section II of the *MPE Intrinsic Reference Manual* for a description of the FOPEN and FCLOSE intrinsic call. If tracing has been requested, the CS/3000 trace facility issues an FOPEN intrinsic call with the following parameters:

## Tracing DSN/DS Line Activity with Bisync Protocol

Parameter	Value	Meaning	
Formal File Designator	DSTRCnnn		
FOPTIONS	Bits 14, 15	11	Old file
	Bits 13	0	Binary file
	Bits 10,11,12	000	Use actual file designator
	Bits 8,9	11	Variable length records
	Bit 7	0	No carriage control
AOPTIONS	Bits 12 to 15	1111	Write only; purge old contents
	Bit 11	0	No multi-record option
	Bit 10	0	Disallow dynamic locking/unlocking
	Bits 8,9	00	Exclusive access
	Bits 0 to 7	00000000	None
BLOCKFACTOR	1		

If the trace file cannot be opened because it does not exist, then a new file is opened in the system domain. If an error occurs when trying to open the trace file, the particular :DSCONTROL command fails and the trace file printout will be displayed on the console.

When the line is closed, the CS/3000 trace facility issues an FCLOSE intrinsic call with the following parameters:

Parameter	Value	Meaning
DISPOSITION	1	Save
SECCODE	0	Unrestricted access

## Trace Entry Mnemonics

There are eight types of trace entries used in DSN/DS. They are summarized in Table 3-1 and described in greater detail on the pages following this table.

**Table 3-1. Trace Entry Type Mnemonics**

Mnemonic	Entry Type	Definition
POPR	Operation	Generated each time the physical driver (a segment of the CS driver) is called upon to perform an operation. The POPR trace entry tells what operation is to be performed.
PSTN	State Transition	Generated each time the driver transfers from one internal state to another. The PSTN entry is for internal HP use and should be ignored by the user.
PEDT	Editor	Generated each time a text message or control character sequence is received from the remote station. In the case of a text message, the PEDT trace entry shows the first 14 words of the DSN/DS buffer; BSC control characters, pad characters, and CRC parity sequences are omitted. In the case of a BSC control character sequence, the PEDT trace entry supplies a mnemonic phrase telling what was received.
PRCT	Receive Control Sequence	Generated each time a BSC control character sequence is received from the remote station. The PRCT trace entry shows (in octal or hexadecimal) the exact sequence of bytes that was received.
PSCT	Send Control Sequence	Generated each time the driver sends a BSC control character sequence to the remote station. The PSCT trace entry shows (in octal or hexadecimal) the exact sequence of bytes that was sent.
PRTX	Receive Text	Generated each time a text message is received from the remote station. The PRTX trace entry shows (in octal or hexadecimal) the exact sequence of bytes received.
PSTX	Send Text	Generated each time the driver sends a text message to the remote station. The PSTX entry shows (in octal or hexadecimal) the exact sequence of bytes received.
PCMP	User Request Completed	Generated each time a CS intrinsic call is completed. The PCMP trace entry summarizes the line activity, such as the number of frames sent and received and the number of errors that have occurred.

## TERMINATING THE CS/3000 TRACE FACILITY

To terminate the CS/3000 trace facility, include the following parameter in the :DSCONTROL command:

```
;TRACE,OFF
```

The trace facility must be terminated before CSDUMP and DSDUMP can be run.

## FORMATTING A TRACE FILE

There are two trace formatting programs for DS: CSDUMP and DSDUMP. CSDUMP does some formatting and displays all trace file data in a raw form. DSDUMP allows you to choose a subset of the trace file to be formatted, and will also analyze the chosen data. In addition, CSDUMP will display all of the bisynchronous line protocol, while DSDUMP only displays the DS protocol.

### Defining a Trace File for CSDUMP

The program expects a trace file named CSTRACE. If your trace file has a different name, such as the default file name DSTRCnnn, you will need to equate the trace file name to CSTRACE. Use the MPE :FILE command this way:

```
:FILE CSTRACE=DSTRCnnn.PUB.SYS
```

### Defining a CSDUMP Listing File

The formal file designator of the trace listing file for CSDUMP is LIST. The file may be defined as a CRT terminal, a line printer, or a disc file. To define the list file, enter an MPE :FILE command prior to initiating the CSDUMP program. Some typical examples are:

```
:FILE LIST;DEV=LP
```

LP is assumed to be the device class name for one or more line printers.

```
:FILE LIST=FILENAME
```

FILENAME is assumed to be the name of an old temporary or permanent disc file.

If a list file does not exist or is not designated by a :FILE command, and PARM of the RUN command is not 1, the CSDUMP program employs the user's session/job output device as the list file. If PARM is set to 1, then the dump program attempts to open the file LIST as an old job or system file. If this fails because LIST does not exist, then LIST is opened as a new file in the system domain. After the CSDUMP program has run, the contents of this file may be accessed via EDIT/3000.

## Initiating the CSDUMP Program

After the CSTRACE and LIST files have been defined, enter the following command:

```
:RUN CSDUMP.PUB.SYS[,OCTAL][;PARM={0  
1  
2}]
```

The trace dump program uses the CSTRACE file as input and produces a formatted trace listing on the LIST file. The format of the trace listing is described in the following text. If the secondary entry point OCTAL is specified when CSDUMP is run, the numeric codes for both control characters and data will be printed in octal instead of hexadecimal. If you specify PARM=0 or 1, all entries will be output by time; however, if you specify PARM=2 only CS/3000 intrinsics will be output by time.

## Formatted CSDUMP Trace Listing

As you can see from Figure 3-1, a CSDUMP Trace listing has a specific format. The components of a Trace listing are a header message; the beginning-of-trace message; the opening Line Information Display box; a series of trace records, each consisting of a record header and one or more consecutively numbered entries; an end-of-trace message; and the closing Line Information Display box. These components are discussed in detail on the pages following Figure 3-1. Figure 3-1 shows portions of a trace of a line connected to an Synchronous Single Line Controller (SSLC).

CS TRACE ANALYZER (A.05.07) MON, JUN 6, 1983, 11:48 AM

TRACE FILE IS DSTRC130.PUB.SYS  
ALL ENTRIES DUMPED BY TIME

LAST OPENED ON MON, APR 18, 1983, 11:46 AM

SYSTEM ID=00.20

```
*****
* BEGIN TRACING FOR DEVICE 19 *
*****

*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 4 LOGICAL DEV. NUMBER: 19 *
* DEV. TYPE: 18 SUBTYPE: 0 VER: A.05.06 *
* 0123456789012345 *
* COPTIONS: 0000100010000010 *
* AOPTIONS: 0000000100001101 *
* DOPTIONS: 0000010000000000 *
* NETWORK ID: 0000000000000000 *
* NUMBUFFERS: 0 BUFFSIZE: 4095 (WORDS) *
* INSPEED: 600 OUTSPEED: 600 *
* MISCARRAY: RECEIVE TIMEOUT: 20 SECS. *
* LOCAL TIMEOUT: 0 SECS. *
* CONNECT TIMEOUT: 0 SECS. *
* RESPONSE TIMEOUT: 300 HSECS. *
* LINE BID TIMEOUT: 29 SECS. *
* NO. ERROR RETRIES: 15 *
* CLEAR-TO-SEND DELAY: 00.0 SECS. *
* DATA-SET-READY DELAY: DISABLED. *
* TRANSMISSION MODE: HALF DUPLEX. *
* MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: CSSBCO *
* DOWNLOAD FILE: *
* CTRACEINFO: ENTRIES=24 MASK=011111000 *
* TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0 INDEX=0 *
* IDLIST: ENTRIES=0 INDEX=0 *
* ERRORCODE: RECOVERABLE=0 IRRECOVERABLE=0 *
* MSGSENT: 0 MSGRECV: 0 *
```

Figure 3-1. CSDUMP Trace Listing.

Tracing DSN/DS Line Activity with Bisync Protocol

```
* RECOVERERRORS: 0          IRRECOVERERRORS: 1          *
*****

*****
* CREAD                      REQUEST ID=%044347(!48E7)      *
* CALLER: SEGMENT=PRG %000    ADDRESS=%000276              *
* STATE: LINE STATE=DISCONNECT COPTIONS=%004201 DOPTIONS=%002000 *
* INPUT: IN BUF=%000000 LENGTH=0      SPEC. STATION #=0  COMP #=0  *
* OUTPUT: TRANSMISSION LOG=0          RESP. STATION #=0  COMP #=0  *
*****

0          4.668 POPR REQUEST ID=%044347(!48E7)
          WAIT FOR CONNECTION

*****
* CCONTROL - INTRINSIC EXECUTED REQUEST ID=NONE            *
* CALLER: SEGMENT=PRG %002    ADDRESS=%000027              *
* STATE: LINE STATE=DISCONNECT COPTIONS=%004201 DOPTIONS=%002000 *
* PARAM: CONTROL CODE=0        PARAMETER=0          (%000000)  *
* OUTPUT: ERROR CODE=0                                                *
*****

1          17.014 POPR REQUEST ID=%044347(!48E7)
          CLEAR CURRENT OPERATION UNLESS IN PROGRESS

2          17.016 POPR REQUEST ID=%044347(!48E7)
          DISCONNECT

3          17.021 PCMP REQUEST ID=%044347(!48E7)
          ERROR CODE=201  LAST RECOVERABLE ERROR CODE= 0
          #MSG SENT=0      #MSG RECV=0      STATE=DISCONNECT
          # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=1

0          17.073 PCMP REQUEST ID=%043136(!465E)
          ERROR CODE=0    LAST RECOVERABLE ERROR CODE= 0
          #MSG SENT=0      #MSG RECV=0      STATE=DISCONNECT
          # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=1

*****
* CCLOSE                      REQUEST ID=%000170(!0078)      *
* CALLER: SEGMENT=PRG %002    ADDRESS=%000305              *
* STATE: LINE STATE=DISCONNECT COPTIONS=%004201 DOPTIONS=%002000 *
*****

*****
* END OF TRACE FOR DEVICE 19 *
*****

*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
```

Figure 3-1. CSDUMP Trace Listing (continued).

Tracing DSN/DS Line Activity with Bisync Protocol

```

*****
* LINE NUMBER: 4      LOGICAL DEV. NUMBER: 19 *
* DEV. TYPE: 18      SUBTYPE: 0   VER: A.05.06 *
*                   0123456789012345 *
* COPTIONS: 00001000010000010 *
* AOPTIONS: 0000000100001101 *
* DOPTIONS: 0000010000000000 *
* NETWORK'ID: 0000000000000000 *
* NUMBUFFERS: 0      BUFFSIZE: 4095 (WORDS) *
* INSPEED: 600      OUTSPEED: 600 *
* MISCARRAY:        RECEIVE TIMEOUT: 20 SECS. *
*                   LOCAL TIMEOUT: 0 SECS. *
*                   CONNECT TIMEOUT: 0 SECS. *
*                   RESPONSE TIMEOUT: 300 HSECS. *
*                   LINE BID TIMEOUT: 29 SECS. *
*                   NO. ERROR RETRIES: 15 *
*                   CLEAR-TO-SEND DELAY: 00.0 SECS. *
*                   DATA-SET-READY DELAY: DISABLED. *
*                   TRANSMISSION MODE: HALF DUPLEX. *
*                   MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: CSSBSCO *
* DOWNLOAD FILE: *
* CTRACEINFO: ENTRIES=24      MASK=011111000 *
*                   TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0      INDEX=0 *
* IDLIST: ENTRIES=0      INDEX=0 *
* ERRORCODE: RECOVERABLE=0  IRRECOVERABLE=0 *
* MSGSENT: 0      MSGRECV: 0 *
* RECOVERERRORS: 0      IRRECOVERERRORS: 1 *
*****

```

```

*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 4      LOGICAL DEV. NUMBER: 19 *
* DEV. TYPE: 18      SUBTYPE: 0   VER: A.05.06 *
*                   0123456789012345 *
* COPTIONS: 00001000010000010 *
* AOPTIONS: 0000000100000000 *
* DOPTIONS: 0000010000000000 *
* NETWORK'ID: 0000000000000000 *
* NUMBUFFERS: 0      BUFFSIZE: 4095 (WORDS) *
* INSPEED: 600      OUTSPEED: 600 *
* MISCARRAY:        RECEIVE TIMEOUT: 20 SECS. *
*                   LOCAL TIMEOUT: 0 SECS. *
*                   CONNECT TIMEOUT: 0 SECS. *
*                   RESPONSE TIMEOUT: 300 HSECS. *
*                   LINE BID TIMEOUT: 21 SECS. *
*                   NO. ERROR RETRIES: 15 *
*                   CLEAR-TO-SEND DELAY: 00.0 SECS. *
*                   DATA-SET-READY DELAY: DISABLED. *
*                   TRANSMISSION MODE: HALF DUPLEX. *
*                   MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: CSSBSCO      LINESTATE: UNCONNECTED *

```

Figure 3-1. CSDUMP Trace Listing (continued).



Tracing DSN/DS Line Activity with Bisync Protocol

```

* DOWNLOAD FILE: *
* CTRACEINFO: ENTRIES=24 MASK=011111000 *
* TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0 INDEX=0 *
* IDLIST: ENTRIES=0 INDEX=0 *
* ERRORCODE: RECOVERABLE=0 IRRECOVERABLE=0 *
* MSGSENT: 0 MSGRCV: 0 *
* RECOVERERRORS: 0 IRRECOVERERRORS: 0 *
*****

0 19.060 PCMP REQUEST ID=%045005(!4A05)
      ERROR CODE=0 LAST RECOVERABLE ERROR CODE= 0
      #MSG SENT=0 #MSG RCV=0 STATE=DISCONNECT
      # RECOVERABLE ERR=0 # IRRECOVERABLE ERR=0

*****

* CCONTROL - INTRINSIC EXECUTED REQUEST ID=NONE *
* CALLER: SEGMENT=PRG %000 ADDRESS=%000173 *
* STATE: LINE STATE=DISCONNECT COPTIONS=%004102 DOPTIONS=%002000 *
* PARAM: CONTROL CODE=46 PARAMETER=0 (%000000) *
* OUTPUT: ERROR CODE=0 *
*****

*****

* CWRITE REQUEST ID=%043622(!4792) *
* CALLER: SEGMENT=PRG %000 ADDRESS=%001205 *
* STATE: LINE STATE=CONNECTED COPTIONS=%004102 DOPTIONS=%002000 *
* INPUT: OUT BUF=%147644 LENGTH=8 IN BUF=%157634 LENGTH=4081 *
* STATION #=0 COMPONENT #=0 *
* OUTPUT: TRANSMISSION LOG=8 *
*****

0 19.161 POPR REQUEST ID=%043622(!4792)
      WAIT FOR CONNECTION

1 56.034 POPR REQUEST ID=%043622(!4792)
      SEND CONTROL SEQ THEN RECEIVE CONTROL SEQ
      SEND SEQ=ID ENQ TIMEOUT= 2.700
      OUT BFR=%0.000000 LENGTH=0
      IN BUFR=%0.015173 LENGTH=-16

2 56.036 PSCT REQUEST ID=%043622(!4792)
      8 5.7 F
      ENQ DEL

3 58.742 POPR REQUEST ID=%043622(!4792)
      SEND CONTROL SEQ THEN RECEIVE CONTROL SEQ
      SEND SEQ=ID ENQ TIMEOUT= 2.700
      OUT BFR=%0.000000 LENGTH=0
      IN BUFR=%0.015173 LENGTH=-16

```

Figure 3-1. CSDUMP Trace Listing (continued).

Tracing DSN/DS Line Activity with Bisync Protocol

```

4      58.743 PSCT REQUEST ID=%043622(!4792)
      8 5.7 F
      ENQ DEL

5      59.274 PRCT REQUEST ID=%043622(!4792)
      1 0.B 0 F F.5 F
      DLE 0 DEL _

6      59.276 PEDT REQUEST ID=%043622(!4792)
      RECV ACK0 XLOG=0

7      59.282 POPR REQUEST ID=%043622(!4792)
      SEND TEXT THEN RECEIVE TEXT
      TIMEOUT= 3.000
      OUT BFR=%3.036467 LENGTH=-16
      IN BUFR=%3.046457 LENGTH=-8162

8      59.286 PSTX REQUEST ID=%043622(!4792)
      1 0.0 2 0 8.0 0 0 0.0 2 0 0.1 0 1 0.F F F F.0 0
      DLE STX BS NUL NUL STX NUL DLE DLE DEL DEL NUL
      0 0.0 0 0 0.7 0 0 0.0 0 0 0.1 0 8 3.4 3 7 1.0 0
      NUL NUL NUL p NUL NUL NUL DLE ETX C q NUL

9      59.752 PRTX REQUEST ID=%043622(!4792)
      1 0.0 2 0 8.0 0 0 0.0 3 8 0.1 0 1 0.0 0 3 F.0 0
      DLE STX BS NUL NUL ETX NUL DLE DLE NUL ? NUL
      0 0.0 0 0 0.F 8 0 0.0 0 0 0.1 0 8 3.6 A 4 5.F F
      NUL NUL NUL x NUL NUL NUL DLE ETX j E DEL

10     59.755 PEDT REQUEST ID=%043622(!4792)
      RECV TEXT XLOG=-16
      0 8.0 0 0 0.0 3 8 0.1 0 0 0.3 F 0 0.0 0 0 0.0 0
      BS NUL NUL ETX NUL DLE NUL ? NUL NUL NUL NUL
      F 8.0 0 0 0.0 0
      x NUL NUL NUL

11     59.760 PCMP REQUEST ID=%043622(!4792)
      ERROR CODE=0 LAST RECOVERABLE ERROR CODE= 7
      #MSG SENT=1 #MSG RECV=1 STATE=CONNECTED
      # RECOVERABLE ERR=1 # IRRECOVERABLE ERR=0

*****
* CCONTROL - DRIVER EXECUTED REQUEST ID=%044670(!49B8) *
* CALLER: SEGMENT=PRG %002 ADDRESS=%002101 *
* STATE: LINE STATE=CONNECTED COPTIONS=%004102 DOPTIONS=%002000 *
* PARAM: CONTROL CODE=40 PARAMETER=15 (%000017) *
* OUTPUT: ERROR CODE=0 *
*****

0      72.326 PCMP REQUEST ID=%044670(!49B8)
      ERROR CODE=0 LAST RECOVERABLE ERROR CODE= 0
      #MSG SENT=1 #MSG RECV=1 STATE=CONNECTED
      # RECOVERABLE ERR=1 # IRRECOVERABLE ERR=0

```

Figure 3-1. CSDUMP Trace Listing (continued).

Tracing DSN/DS Line Activity with Bisync Protocol

```
*****
* CWRITE                                REQUEST ID=%043533(!475B)          *
* CALLER: SEGMENT=PRG %000              ADDRESS=%001160                *
* STATE: LINE STATE=CONNECTED           COPTIONS=%004102  DOPTIONS=%002000 *
* INPUT: OUT BUF=%171444 LENGTH=2       IN BUF=%173454 LENGTH=1025    *
* STATION #=0      COMPONENT #=0        *
* OUTPUT: TRANSMISSION LOG=2            *
*****
```

```
0      72.342 POPR REQUEST ID=%043533(!475B)
      SEND TEXT THEN RECEIVE TEXT
      TIMEOUT=      3.000
      OUT BFR=%3.060267 LENGTH=-4
      IN BUFR=%3.062277 LENGTH=-2050
```

```
1      72.344 PSTX REQUEST ID=%043533(!475B)
      1 0.0 2 F F.F F 0 0.0 0 1 0.8 3 6 5.A 1
      DLE STX DEL DEL NUL NUL DLE ETX e  !
```

```
2      72.710 PRTX REQUEST ID=%043533(!475B)
      1 0.0 2 F F.F F 0 0.0 0 1 0.8 3 6 5.A 1 F F.F F
      DLE STX DEL DEL NUL NUL DLE ETX e  !  DEL DEL
```

```
3      72.713 PEDT REQUEST ID=%043533(!475B)
      RECV TEXT      XLOG=-4
      F F.F F 0 0.0 0
      DEL DEL NUL NUL
```

```
4      72.717 PCMP REQUEST ID=%043533(!475B)
      ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
      #MSG SENT=2      #MSG RECV=2      STATE=CONNECTED
      # RECOVERABLE ERR=1      # IRRECOVERABLE ERR=0
```

```
*****
* CCONTROL - DRIVER EXECUTED           REQUEST ID=%044553(!496B)          *
* CALLER: SEGMENT=PRG %000              ADDRESS=%001437                *
* STATE: LINE STATE=CONNECTED           COPTIONS=%004102  DOPTIONS=%002000 *
* PARAM: CONTROL CODE=1                  PARAMETER=0      (%000000)          *
* OUTPUT: ERROR CODE=0                  *
*****
```

```
0      72.729 POPR REQUEST ID=%044553(!496B)
      SEND CONTROL SEQ
      SEND SEQ=EOT
```

```
1      72.730 PSCT REQUEST ID=%044553(!496B)
      1 6.0 4
      SYN EOT
```

```
2      72.883 PCMP REQUEST ID=%044553(!496B)
      ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
      #MSG SENT=2      #MSG RECV=2      STATE=CONNECTED
      # RECOVERABLE ERR=1      # IRRECOVERABLE ERR=0
```

Figure 3-1. CSDUMP Trace Listing (continued).

Tracing DSN/DS Line Activity with Bisync Protocol

```
*****
* CCONTROL - INTRINSIC EXECUTED   REQUEST ID=NONE           *
* CALLER: SEGMENT=PRG %000        ADDRESS=%000173           *
* STATE:  LINE STATE=CONNECTED    COPTIONS=%004102  DOPTIONS=%002000 *
* PARAM:  CONTROL CODE=46         PARAMETER=1             (%000001) *
* OUTPUT: ERROR CODE=0                                     *
*****
```

```
*****
* CREAD                            REQUEST ID=%043431(!4719)    *
* CALLER: SEGMENT=PRG %000        ADDRESS=%000362           *
* STATE:  LINE STATE=CONNECTED    COPTIONS=%004102  DOPTIONS=%002000 *
* INPUT:  IN BUF=%000000 LENGTH=0   SPEC. STATION #=0   COMP #=0 *
* OUTPUT: TRANSMISSION LOG=0       RESP. STATION #=0   COMP #=0 *
*****
```

```
0      72.898 POPR REQUEST ID=%043431(!4719)
          RECEIVE CONTROL SEQ
          TIMEOUT= 21.000
```

```
*****
* CCONTROL - INTRINSIC EXECUTED   REQUEST ID=NONE           *
* CALLER: SEGMENT=PRG %000        ADDRESS=%000560           *
* STATE:  LINE STATE=CONNECTED    COPTIONS=%004102  DOPTIONS=%002000 *
* PARAM:  CONTROL CODE=0         PARAMETER=0             (%000000) *
* OUTPUT: ERROR CODE=0                                     *
*****
```

```
1      79.516 POPR REQUEST ID=%043431(!4719)
          CLEAR CURRENT OPERATION UNLESS IN PROGRESS
```

```
2      79.519 PCMP REQUEST ID=%043431(!4719)
          ERROR CODE=201   LAST RECOVERABLE ERROR CODE= 0
          #MSG SENT=2     #MSG RECV=2     STATE=CONNECTED
          # RECOVERABLE ERR=1   # IRRECOVERABLE ERR=0
```

```
*****
* CCONTROL - INTRINSIC EXECUTED   REQUEST ID=NONE           *
* CALLER: SEGMENT=PRG %000        ADDRESS=%000173           *
* STATE:  LINE STATE=CONNECTED    COPTIONS=%004102  DOPTIONS=%002000 *
* PARAM:  CONTROL CODE=46         PARAMETER=0             (%000000) *
* OUTPUT: ERROR CODE=0                                     *
*****
```

```
*****
* CWRITE                            REQUEST ID=%044614(!498C)    *
* CALLER: SEGMENT=PRG %000        ADDRESS=%001160           *
* STATE:  LINE STATE=CONNECTED    COPTIONS=%004102  DOPTIONS=%002000 *
* INPUT:  OUT BUF=%175455 LENGTH=17   IN BUF=%173454 LENGTH=1025 *
*          STATION #=0             COMPONENT #=0 *
*****
```

Figure 3-1. CSDUMP Trace Listing (continued).

Tracing DSN/DS Line Activity with Bisync Protocol

\* OUTPUT: TRANSMISSION LOG=2 \*  
 \*\*\*\*\*

```

0      79.538 POPR REQUEST ID=%044614(!498C)
          SEND CONTROL SEQ THEN RECEIVE CONTROL SEQ
          SEND SEQ=ENQ      TIMEOUT=      2.700

1      79.540 PSCT REQUEST ID=%044614(!498C)
          1 6.8 5
          SYN ENQ

2      79.901 PRCT REQUEST ID=%044614(!498C)
          1 0.B 0 F F.E F
          DLE 0   DEL 0

3      79.902 PEDT REQUEST ID=%044614(!498C)
          RECV ACK0      XLOG=0

4      79.908 POPR REQUEST ID=%044614(!498C)
          SEND TEXT THEN RECEIVE TEXT
          TIMEOUT=      3.000
          OUT BFR=%3.100500 LENGTH=-34
          IN BUFR=%3.076477 LENGTH=-2050

5      79.913 PSTX REQUEST ID=%044614(!498C)
          1 0.0 2 1 0.1 0 0 6.0 0 0 0.0 0 1 0.1 0 0 0.0 0
          DLE STX DLE DLE ACK NUL NUL NUL DLE DLE NUL NUL
          5 D.0 0 0 0.0 0 0 0.0 0 0 0.0 F 4 8.4 5 4 C.4 C
          ] NUL NUL NUL NUL NUL NUL SI H E L L
          4 F.2 0 4 D.4 7 5 2.2 E 5 3.4 5
          0 M G R . S E

6      79.915 PSTX REQUEST ID=%044614(!498C)
          3 3.3 3 3 8.0 D 6 1.4 0 1 0.8 3 A 1.E 8
          3 3 8 CR a @ DLE ETX ! h

7      80.357 PRTX REQUEST ID=%044614(!498C)
          1 0.0 2 F F.F F 0 0.0 1 1 0.8 3 6 4.3 1 F F.B F
          DLE STX DEL DEL NUL SOH DLE ETX d 1 DEL ?

8      80.360 PEDT REQUEST ID=%044614(!498C)
          RECV TEXT      XLOG=-4
          F F.F F 0 0.0 1
          DEL DEL NUL SOH

9      80.364 PCMP REQUEST ID=%044614(!498C)
          ERROR CODE=0 LAST RECOVERABLE ERROR CODE= 0
          #MSG SENT=3 #MSG RECV=3 STATE=CONNECTED
          # RECOVERABLE ERR=1 # IRRECOVERABLE ERR=0

*****
* CWRITE - ERROR REQUEST ID=%044601(!4981) *
* CALLER: SEGMENT=PRG %000 ADDRESS=%001160 *
  
```

Figure 3-1. CSDUMP Trace Listing (continued).

Tracing DSN/DS Line Activity with Bisync Protocol

```
* INPUT:  OUT BUF=%000000 LENGTH=0      IN BUF=%000000 LENGTH=0      *
*          STATION #=0      COMPONENT #=0                                *
* OUTPUT:  RECOVERABLE ERRCODE=0  IRRECOVERABLE ERRCODE=210          *
*****
```

```
0      80.385 POPR REQUEST ID=%044601(!4981)
        SEND TEXT THEN RECEIVE TEXT
        TIMEOUT=      3.000
        OUT BFR=%3.074467 LENGTH=-4
        IN BUFR=%3.076477 LENGTH=-2050

1      80.388 PSTX REQUEST ID=%044601(!4981)
        1 0.0 2 F F F F 0 0.0 0 1 0.8 3 6 5.A 1
        DLE STX DEL DEL NUL NUL DLE ETX e  !

2      80.739 PRTX REQUEST ID=%044601(!4981)
        0 4.F F
        EOT DEL

3      80.741 PEDT REQUEST ID=%044601(!4981)
        RECV EOT      XLOG=0

4      80.745 PCMP REQUEST ID=%044601(!4981)
        ERROR CODE=210  LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=3      #MSG RECV=3      STATE=CONNECTED
        # RECOVERABLE ERR=1      # IRRECOVERABLE ERR=0
```

```
*****
* CCONTROL - INTRINSIC EXECUTED  REQUEST ID=NONE      *
* CALLER: SEGMENT=PRG %000      ADDRESS=%000173      *
* STATE:  LINE STATE=CONNECTED  COPTIONS=%004102  DOPTIONS=%002000 *
* PARAM:  CONTROL CODE=46      PARAMETER=1      (%000001)      *
* OUTPUT: ERROR CODE=0      *
*****
```

```
*****
* CREAD      REQUEST ID=%044375(!48FD)      *
* CALLER: SEGMENT=PRG %000      ADDRESS=%000362      *
* STATE:  LINE STATE=CONNECTED  COPTIONS=%004102  DOPTIONS=%002000 *
* INPUT:  IN BUF=%000000 LENGTH=0      SPEC. STATION #=0  COMP #=0 *
* OUTPUT: TRANSMISSION LOG=0      RESP. STATION #=0  COMP #=0 *
*****
```

```
0      80.762 POPR REQUEST ID=%044375(!48FD)
        RECEIVE CONTROL SEQ
        TIMEOUT=      21.000

1      82.188 PRCT REQUEST ID=%044375(!48FD)
        8 5.F F
        ENQ DEL
```

Figure 3-1. CSDUMP Trace Listing (continued).

Tracing DSN/DS Line Activity with Bisync Protocol

```

2      82.189 PEDT REQUEST ID=%044375(!48FD)
          RECV ENQUIRY      XLOG=0

3      82.194 PCMP REQUEST ID=%044375(!48FD)
          ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
          #MSG SENT=3       #MSG RECV=3      STATE=CONNECTED
          # RECOVERABLE ERR=1     # IRRECOVERABLE ERR=0

*****
* CSIOWAIT          REQUEST ID=%044375(!48FD)      *
* CALLER: SEGMENT=PRG %000      ADDRESS=%000453      *
* STATE: LINE STATE=CONNECTED    COPTIONS=%004102 DOPTIONS=%002000 *
* OUTPUT: TRANSMISSION LOG=0      IN BUF=%000000      *
* RESPONDING STATION=0          *
*****

*****
* CCONTROL - INTRINSIC EXECUTED  REQUEST ID=NONE      *
* CALLER: SEGMENT=PRG %000      ADDRESS=%000173      *
* STATE: LINE STATE=CONNECTED    COPTIONS=%004102 DOPTIONS=%002000 *
* PARAM: CONTROL CODE=46        PARAMETER=0          (%000000)      *
* OUTPUT: ERROR CODE=0          *
*****

*****
* CREAD            REQUEST ID=%044217(!488F)      *
* CALLER: SEGMENT=PRG %000      ADDRESS=%001310      *
* STATE: LINE STATE=CONNECTED    COPTIONS=%004102 DOPTIONS=%002000 *
* INPUT: IN BUF=%173454 LENGTH=1025  SPEC. STATION #=0  COMP #=0 *
* OUTPUT: TRANSMISSION LOG=12      RESP. STATION #=0  COMP #=0 *
*****

0      82.213 POPR REQUEST ID=%044217(!488F)
          SEND CONTROL SEQ THEN RECEIVE TEXT
          SEND SEQ=ACK0      TIMEOUT= 20.000
          OUT BFR=%0.000000 LENGTH=0
          IN BUFR=%3.076477 LENGTH=-2050

1      82.214 PSCT REQUEST ID=%044217(!488F)
          1 O.B 0
          DLE 0

2      82.601 PRTX REQUEST ID=%044217(!488F)
          1 0.0 2 0 B.0 5 0 0.0 0 0 0.1 3 0 0.0 0 1 2.5 D
          DLE STX VT ENQ NUL NUL NUL DC3 NUL NUL DC2 ]
          0 0.0 0 0 0.0 0 0 0.0 6 0 0.0 1 F F.F E 0 0.0 0
          NUL NUL NUL NUL NUL ACK NUL SOH DEL ~ NUL NUL
          0 0.0 1 1 0.8 3 D 3.D E F F.F 7
          NUL SOH DLE ETX S ^ DEL w

```

Figure 3-1. CSDUMP Trace Listing (continued).

Tracing DSN/DS Line Activity with Bisync Protocol

```

3      82.605 PEDT REQUEST ID=%044217(!488F)
      RECV TEXT          XLOG=-24
      0 B.0 5 0 0.0 0 0 0.1 3 0 0.0 0 1 2.5 D 0 0.0 0
      VT ENQ NUL NUL NUL DC3 NUL NUL DC2 ] NUL NUL
      0 0.0 0 0 0.0 6 0 0.0 1 F F.F E 0 0.0 0 0 0.0 1
      NUL NUL NUL ACK NUL SOH DEL ~ NUL NUL NUL SOH

4      82.609 PCMP REQUEST ID=%044217(!488F)
      ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
      #MSG SENT=3      #MSG RECV=4      STATE=CONNECTED
      # RECOVERABLE ERR=1      # IRRECOVERABLE ERR=0

*****
* CWRITE                REQUEST ID=%044362(!48F2)      *
* CALLER: SEGMENT=PRG %000      ADDRESS=%001160      *
* STATE: LINE STATE=CONNECTED      COPTIONS=%004102      DOPTIONS=%002000      *
* INPUT: OUT BUF=%175455 LENGTH=11      IN BUF=%173454 LENGTH=1025      *
* STATION #=0      COMPONENT #=0      *
* OUTPUT: TRANSMISSION LOG=12      *
*****

0      82.653 POPR REQUEST ID=%044362(!48F2)
      SEND TEXT THEN RECEIVE TEXT
      TIMEOUT= 3.000
      OUT BFR=%3.100500 LENGTH=-22
      IN BUFR=%3.076477 LENGTH=-2050

1      82.657 PSTX REQUEST ID=%044362(!48F2)
      1 0.0 2 0 A.0 5 0 0.0 0 8 0.1 3 0 0.0 0 5 D.1 2
      DLE STX LF ENQ NUL NUL NUL DC3 NUL NUL ] DC2
      0 0.0 0 0 0.0 0 0 0.0 4 0 0.0 1 0 0.0 0 4 F.0 9
      NUL NUL NUL NUL NUL EOT NUL SOH NUL NUL 0 HT
      1 0.8 3 4 F.9 0
      DLE ETX 0 DLE

2      83.062 PRTX REQUEST ID=%044362(!48F2)
      1 0.0 2 0 B.0 5 0 0.0 0 0 0.1 3 0 0.0 0 1 2.5 D
      DLE STX VT ENQ NUL NUL NUL DC3 NUL NUL DC2 ]
      0 0.0 0 0 0.0 0 0 0.0 6 0 0.0 1 F F.F E 0 0.0 0
      NUL NUL NUL NUL NUL ACK NUL SOH DEL ~ NUL NUL
      0 0.0 A 1 0.8 3 D 4.E E F F.4 7
      NUL LF DLE ETX T n DEL G

3      83.066 PEDT REQUEST ID=%044362(!48F2)
      RECV TEXT          XLOG=-24
      0 B.0 5 0 0.0 0 0 0.1 3 0 0.0 0 1 2.5 D 0 0.0 0
      VT ENQ NUL NUL NUL DC3 NUL NUL DC2 ] NUL NUL
      0 0.0 0 0 0.0 6 0 0.0 1 F F.F E 0 0.0 0 0 0.0 A
      NUL NUL NUL ACK NUL SOH DEL ~ NUL NUL NUL LF

4      83.071 PCMP REQUEST ID=%044362(!48F2)
      ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
  
```

Figure 3-1. CSDUMP Trace Listing (continued).





Tracing DSN/DS Line Activity with Bisync Protocol

```
NUL NUL NUL 9  NUL NUL NUL NUL H  P  3  0
3 0.3 0 2 0.2 F
0 0 /
```

- (Several entries have been
- intentionally omitted.)
- 

```
*****
* END OF TRACE FOR DEVICE 19 *
*****
```

```
*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 4 LOGICAL DEV. NUMBER: 19 *
* DEV. TYPE: 18 SUBTYPE: 0 VER: A.05.06 *
* 0123456789012345 *
* COPTIONS: 0000100010000010 *
* AOPTIONS: 0000000100001101 *
* DOPTIONS: 0000010000000000 *
* NETWORK ID: 0000000000000000 *
* NUMBUFFERS: 0 BUFFSIZE: 4095 (WORDS) *
* INSPEED: 600 OUTSPEED: 600 *
* MISCARRAY: RECEIVE TIMEOUT: 20 SECS. *
* LOCAL TIMEOUT: 0 SECS. *
* CONNECT TIMEOUT: 0 SECS. *
* RESPONSE TIMEOUT: 300 HSECS. *
* LINE BID TIMEOUT: 29 SECS. *
* NO. ERROR RETRIES: 15 *
* CLEAR-TO-SEND DELAY: 00.0 SECS. *
* DATA-SET-READY DELAY: DISABLED. *
* TRANSMISSION MODE: HALF DUPLEX. *
* MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: CSSBSCO *
* DOWNLOAD FILE: *
* CTRACEINFO: ENTRIES=24 MASK=011111000 *
* TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0 INDEX=0 *
* IDLIST: ENTRIES=0 INDEX=0 *
* ERRORCODE: RECOVERABLE=0 IRRECOVERABLE=0 *
* MSGSENT: 0 MSGRECV: 0 *
* RECOVERERRORS: 0 IRRECOVERERRORS: 1 *
*****
```

END OF JOB.

Figure 3-1. CSDUMP Trace Listing (continued).

## CSDUMP Listing Header Message

<b>NOTE</b>
-------------

Items under discussion are shaded for easy identification.

At the start of the trace listing is a header message (Figure 3-2) that tells the date and time of day when the listing was printed and the fully-qualified name of the trace file. The meanings of the two remaining items in the header message are:

Item	Meaning
LAST OPENED ON ...	This tells you the date and time of day when the trace was executed.
SYSTEM ID=nn.mm	This tells you the update level (nn) and the fix level (mm) of the MPE operating system that was being used when the trace was performed.

```
CS TRACE ANALYZER (A.05.07)      MON, JUN 6, 1983, 11:48 AM
TRACE FILE IS DSTRC130.PUB.SYS
ALL ENTRIES DUMPED BY TIME

LAST OPENED ON MON, APR 18, 1983, 11:46 AM
SYSTEM ID=00.20
```

Figure 3-2. Trace Listing Header.

## Begin Tracing and Line Information Messages

The BEGIN TRACING... message appears in the listing when the line to be traced is opened. The message tells you the decimal logical device number of the line (19 in the example in Figure 3-3). It indicates the line's activities are now being monitored by the trace facility. It is followed by the Line Information Display describing the state of the line when tracing started.

```
*****
* BEGIN TRACING FOR DEVICE 19 *
*****

*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 4          LOGICAL DEV. NUMBER: 19  *
* DEV. TYPE: 18          SUBTYPE: 0      VER: A.05.06 *
*          0123456789012345          *
*   COPTIONS: 0000100010000010          *
*   AOPTIONS: 0000000100001101          *
*   DOPTIONS: 0000010000000000          *
* NETWORK ID: 0000000000000000          *
* NUMBUFFERS: 0          BUFFSIZE: 4095 (WORDS) *
* INSPEED: 600          OUTSPEED: 600      *
* MISCARRAY:          RECEIVE TIMEOUT: 20   SECS. *
*          LOCAL TIMEOUT: 0       SECS. *
*          CONNECT TIMEOUT: 0     SECS. *
*          RESPONSE TIMEOUT: 300  HSECS. *
*          LINE BID TIMEOUT: 29   SECS. *
*          NO. ERROR RETRIES: 15          *
*          CLEAR-TO-SEND DELAY: 00.0 SECS. *
*          DATA-SET-READY DELAY: DISABLED. *
*          TRANSMISSION MODE: HALF DUPLEX. *
*          MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: CSSBSCO          *
* DOWNLOAD FILE:          *
* CTRACEINFO: ENTRIES=24      MASK=011111000 *
*          TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0      INDEX=0          *
* IDLIST: ENTRIES=0      INDEX=0          *
* ERRORCODE: RECOVERABLE=0  IRRECOVERABLE=0 *
* MSGSENT: 0          MSGRECV: 0          *
* RECOVERERRORS: 0      IRRECOVERERRORS: 1  *
*****
```

Figure 3-3. Begin Tracing and Line Information Messages.

## Tracing DSN/DS Line Activity with Bisync Protocol

The opening Line Information Display box contains detailed information on how the line was opened, how the communications controller was configured (transmission speeds, timeout values, logical device number, etc) and trace parameters selected. In the example in Figure 3-3, we know that:

- the communications controller is an SSLC, because DEV. TYPE (device type) is 18 and DRIVERNAME is CSSBSCO (the second S stands for SSLC),
- it is a synchronous, switched line (i.e., dial-up), because it is SUBTYPE 0,
- BUFFSIZE is 4095 WORDS, so the configured line buffer size is 4095,
- INSPEED and OUTSPEED (transmission speeds) are 600 characters per second, so the dial-up line transmission speed is 4800 bps,
- MASK is 011111000 (%37; for DSN/DS ignore the three zeroes on the right),
- ENTRIES=24 is the maximum number of entries in each trace record. (24 is the default.)
- ALL events will be traced
- Overflow record entries will be discarded (NOWRAP).

## Trace Record and Header Message

The trace listing is organized into a series of trace records, each consisting of a series of trace entries. Every trace record pertains to a particular DSN/DS request (intrinsic call).

A trace record is signified by a header message. The header message identifies the CS intrinsic call that generated the trace record. The header (see the example in Figure 3-4) shows the name of the CS intrinsic, where the intrinsic was called from the DSN/DS program, the calling parameters and a REQUEST ID that is the same as the REQUEST ID for the corresponding record entries.

```
*****
* CREAD                                REQUEST ID=%044347(!48E7)          *
* CALLER: SEGMENT=PRG %000              ADDRESS=%000276                *
* STATE: LINE STATE=DISCONNECT          COPTIONS=%004201  DOPTIONS=%002000 *
* INPUT: IN BUF=%000000 LENGTH=0        SPEC. STATION #=0   COMP #=0   *
* OUTPUT: TRANSMISSION LOG=0            RESP. STATION #=0   COMP #=0   *
*****
```

Figure 3-4. Trace Record Header.

## Trace Entry Format

All entries in a trace listing contain a prefix consisting of four fields:

1. An entry number (0 in the example in Figure 3-5).
2. A "time stamp" in seconds and thousandths of seconds (17.073 in the example).
3. An entry-type mnemonic (PCMP in the example).
4. A "request ID" that correlates the entry with a particular intrinsic call (%043136 in Figure 3-5).

The first entry is numbered zero, and successive entries throughout the rest of this trace record are numbered consecutively in ascending order (1, 2, 3 and so on). The "time stamp" makes it possible for you to determine the elapsed time between one trace entry and another. The mnemonic tells you what type of trace entry you are examining. There are eight types of trace entries used in DSN/DS. They are summarized in Table 3-1 (page 3-5) and described in greater detail on the pages following this table. The body of each trace entry tells you the pertinent information for the particular activity that has happened or is about to happen.

```
0      17.073 PCMP REQUEST ID=%043136 (! 465E)
      ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
      #MSG SENT=0      #MSG RECV=0      STATE=DISCONNECT
      # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=1
```

Figure 3-5. Sample Trace Entry.

## Missing Entries Message

If MISSING ENTRIES appears in the listing, it means that the record was not large enough to accommodate all of the trace entries and some entries were lost. If WRAP was not specified (NOWRAP), then the missing entries were at the end just before the PCMP entry; otherwise they are missing from the beginning where they were overlaid by the trace entries that extended past the end of the record. If the missing entries are crucial:

1. Purge the trace file.
2. Invoke trace again, issuing :DSCONTROL with
  - a. a larger *numentries* value
  - b. a mask setting that will produce only those trace entries you are really interested in.

## POPR Trace Entries

A POPR trace entry is generated each time the physical driver is called upon to perform an operation. An example is shown in Figure 3-6.

```

1      56.034 POPR REQUEST ID=%043622(!4792)
          SEND CONTROL SEQ THEN RECEIVE CONTROL SEQ
          SEND SEQ=ID ENQ   TIMEOUT=    2.700
          OUT BFR=%0.000000 LENGTH=0
          IN BUFR=%0.015173 LENGTH=-16
    
```

Figure 3-6. POPR Trace Entry.

The elements of a POPR trace entry are:

Item	Meaning
SEND CONTROL SEQ....	This item tells you what operation is being performed.
SEND SEQ= ...	This item tells you what BSC control character sequence, if any, is about to be sent to the remote station (ID ENQ in the example).
TIMEOUT	This item tells you the starting value of the applicable timer in seconds. In the example the driver sends a ID ENQ to the remote station and then waits for a character response. TIMEOUT=2.700 specifies that the response timeout timer will be activated and set to 2.7 seconds.
OUT BFR=n.mmmmmm	This item specifies the memory bank number (n) and the octal address (mmmmm) of the output buffer.
IN BFR=n.mmmmmm	This item specifies the memory bank number (n) and octal address (mmmmm) of the input buffer.
LENGTH	For output, this specifies the amount of text to be sent (+ indicates words, - bytes). For input, this specifies the maximum amount of text that can be received for this message (+ for words, - for bytes).

## PRCT Trace Entries

A PRCT trace entry is generated each time a BSC control character sequence is received or sent. The body of an PRCT trace entry shows you the exact sequence of bytes received. An example is shown in Figure 3-7.

```
5          59.274 PRCT REQUEST ID=%043622(!4792)
           10.B0FF5F
           DLE 0 DEL _
```

Figure 3-7. PRCT Trace Entry.

Control character sequences are terminated by a trailing pad character (FF hexadecimal). When interpreting the body of an PRCT trace entry, ignore anything following the FF code. In the example, an ACK0 control character sequence was received. The hexadecimal codes are interpreted as follows:

10.B0	ACK0*
FF	PAD character
5F	data to be ignored, since it follows PAD

\* This character is read with the parity bit set to odd parity, so it would not resemble an ACK0 if read during a trace.

Whenever possible, the CSDUMP program converts the hex (or octal) codes to an ASCII character and displays the character beneath its code. In the case of bisync control characters, the number shown may not match the ASCII character display because the number may reflect the parity bit. (The parity bit is ignored when CSDUMP converts from octal or hexadecimal to ASCII.) Note that DSN/DS uses odd parity on all control characters, and no parity on text characters.

## PSCT Trace Entries

A PSCT trace entry is generated each time the driver sends a BSC control character to the remote station. The body of a PSCT trace entry shows you the exact sequence of bytes that was sent to the remote station. An example is shown in Figure 3-8.

```
4          58.743 PSCT REQUEST ID=%043622(!4792)
           8 5.7 F
           ENQ DEL
```

Figure 3-8. PSCT Trace Entry.

In the above example, an ENQ control character was sent.

Whenever possible, the CSDUMP program converts the hex (or octal) codes to ASCII characters and displays each character beneath its code.



# Tracing DSN/DS Line Activity with Bisync Protocol

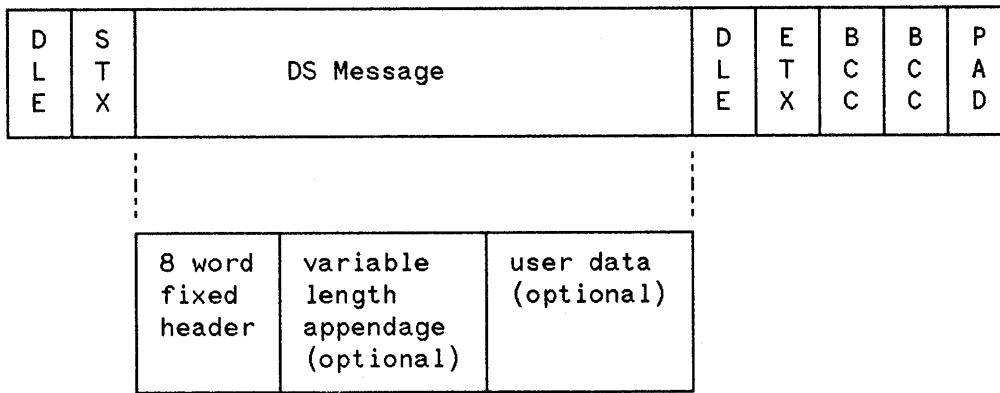


Figure 3-9. Data Format for PRTX or PSTX Entries.

## PRTX Trace Entries

PRTX trace entries are generated each time a text message is received from the remote station. The body of a PRTX trace entry shows you the exact sequence of bytes that was received. An example is shown in Figure 3-10.

```

2      83.529 PRTX REQUEST ID=%044451(!4929)
          1 0.0 2 0 A.0 5 0 0.0 0 0 0.1 0 1 0.8 0 0 0.1 2
          DLE STX LF ENQ NUL NUL NUL DLE DLE NUL NUL DC2
          5 D.0 0 0 0.0 0 0 0.0 0 3 9.0 0 0 0.0 0 0 0.4 8
          ] NUL NUL NUL NUL NUL 9 NUL NUL NUL NUL H
          5 0.3 3 3 0.3 0 3 0.2 0 2 F.2 0
          P 3 0 0 0 /

```

Figure 3-10. PRTX Trace Entry.

In our example:

```

10.02      DLE STX
0A.05      word 0 DS fixed header
00 00      " 1 " " "
00.10      " 2 " " "
10         DLE to be ignored (transparent text)
80 00      word 3 DS fixed header
12 5D      " 4 " " "
00 00      " 5 " " "
00 00      " 6 " " "
00 39      " 7 " " "
00 00      word 1 of DS appendage
00 00      " 2 " " "
48         H
50         P
33         3
30         0
30         0
30         0
20         20
2F         /
20

```

- user data continued in
- other PRTX entries
- following

See Section 5 for DSN/DS message formats to interpret the fixed header and the DS appendages.

By examining the user data, we see that we are receiving a log on message from the remote system.

Each PRTX trace entry can show a maximum of 32 bytes. If a text message exceeds this length, successive PRTX trace entries are generated as are necessary.

All text messages are terminated by a two-byte Block Check Character sequence (BCC). The BCC is a CRC (cyclic redundancy check) sequence. The BCC is followed by a trailing PAD character (FF hex).

## Tracing DSN/DS Line Activity with Bisync Protocol

When interpreting the body of a PRTX trace entry, ignore anything following the FF code. DS always transmits data in transparent mode. Therefore, inserted DLEs in PRTX entries must be ignored.

Whenever possible, the CSDUMP program converts the hex (or octal) codes to an ASCII character and displays the character beneath its code. In the case of bisync control characters, the number shown may not match the ASCII character display because the number may reflect the parity bit. (The parity bit is ignored when CSDUMP converts from octal or hexadecimal to ASCII.) Note that DS uses odd parity on all control characters, and no parity on text characters.

## PEDT Trace Entries

PEDT trace entries are generated to identify received text messages and received BSC control character sequences. An example is shown in Figure 3-11.

```

5      83.620 PEDT REQUEST ID=%044451(!4929)
          RECV TEXT          XLOG=-76
          0 A.0 5 0 0.0 0 0 0.1 0 8 0.0 0 1 2.5 D 0 0.0 0
          LF ENQ NUL NUL NUL DLE NUL NUL DC2 ] NUL NUL
          0 0.0 0 0 0.3 9 0 0.0 0 0 0.0 0 4 8.5 0 3 3.3 0
          NUL NUL NUL 9 NUL NUL NUL NUL H P 3 0
          3 0.3 0 2 0.2 F
          0 0 /
  
```

Figure 3-11. PEDT Trace Entry.

The PEDT entry in Figure 3-11 shows that a text message was received from the remote station. To interpret the DS message see Section 5 for the DS message formats.

```

0A.05      word 0 of DS fixed header
00.00      " 1 " " " "
00.10      " 2 " " " "
80.00      " 3 " " " "
12.5D      " 4 " " " "
00.00      " 5 " " " "
00.00      " 6 " " " "
00.39      " 7 " " " "
00.00      word 1 of DS appendage
00.00      " 2 " " " "

48         H
50         P
33         3
30         0
30         0
30         0
20
2F         /
  
```

This entry is the edited version of the PRTX entry in Figure 3-10. Note that DLE STX and the inserted DLE for transparent text have been removed.

One PEDT trace entry is generated for each received text message, regardless of how long the text message is. Only the first 14 words of the received message are displayed. Bisync control characters, pad characters, and CRC parity sequences are omitted. XLOG specifies the total number of words or bytes (+ indicates words, - indicates bytes) passed from the communications controller to the DS subsystem.

In the case of a received BSC control character sequence (PRCT), the PEDT trace entry includes a mnemonic phrase telling what control character sequence was received. If the control character sequence was accompanied by an ID sequence, the ID sequence is shown in octal below the mnemonic phrase. XLOG is normally zero, except in the case when an ID sequence was also received. In the latter case, XLOG specifies the length of the ID sequence (+ indicates words, - indicates bytes).

Whenever possible, the CSDUMP program converts the received hexadecimal (or octal) codes to ASCII characters and displays each character beneath its code.

## PSTX Trace Entries

PSTX trace entries are generated each time the driver sends a message to the remote station. The body of a PSTX trace entry shows you the exact sequence of bytes that was sent to the remote station. An example is shown in Figure 3-12.

```

5      79.913 PSTX REQUEST ID=%044614(!498C)
          1 0.0 2 1 0.1 0 0 6.0 0 0 0.0 0 1 0.1 0 0 0.0 0
          DLE STX DLE DLE ACK NUL NUL NUL DLE DLE NUL NUL
          5 D.0 0 0 0.0 0 0 0.0 0 0 0.0 F 4 8.4 5 4 C.4 C
          ] NUL NUL NUL NUL NUL NUL SI H E L L
          4 F.2 0 4 D.4 7 5 2.2 E 5 3.4 5
          0 M G R . S E
    
```

Figure 3-12. PSTX Trace Entry.

In our example:

```

10.02      DLE STX
10          DLE to be ignored
10 06      word 0 of DS fixed header
00 00      " 1 " " " "
00 10      " 2 " " " "
10          DLE to be ignored
00 00      word 3 of DS fixed header
5D 00      " 4 " " " "
00 00      " 5 " " " "
00 00      " 6 " " " "
00 0F      " 7 " " " "
48          H
45          E
4C          L
4C          L
4F          O
20
40          M
47          G
52          R
2E
53          S
45          E
          • user data continued
          • in following PSTX
          • entries
    
```

The data format for the PSTX entry is the same as that for the PRTX entry (see Figure 3-9).

See Section 5 for the DSN/DS message formats to interpret the fixed header and DS appendage.

Each PSTX trace entry can show a maximum of 32 bytes. If a text message exceeds this length, as many successive PSTX trace entries are generated as are necessary.

All text messages are terminated by a two-byte Block Check Character sequence (BCC). The BCC is a CRC (cyclic redundancy check) sequence. The BCC is followed by a trailing PAD character (FF hex). When interpreting the body of a PRTX trace entry, ignore anything following the FF code. DS always transmits data in transparent mode. Therefore, inserted DLEs in PSTX entries must be ignored.

Whenever possible, the CSDUMP program converts the hex (or octal) codes to an ASCII character and displays the character beneath its code.

## PCMP Trace Entries

A PCMP trace entry is generated each time a CS intrinsic call is completed. An example is shown in Figure 3-13.

```

4          72.717 PCMP REQUEST ID=%043533(!475B)
          ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
          #MSG SENT=2      #MSG RECV=2      STATE=CONNECTED
          # RECOVERABLE ERR=1      # IRRECOVERABLE ERR=0

```

Figure 3-13. PCMP Trace Entry.

The meanings of the various items are as follows:

ERROR CODE:	The code of the request's most recent Recoverable Error (see the CS trace section of the <i>Data Communications Handbook</i> for CS error codes).
LAST RECOVERABLE ERROR CODE:	If a Recoverable Error occurred previously, this identifies its error code.
# MSG SENT:	The total number of text messages sent so far for this connection.
# MSG RECV:	The total number of text messages received so far for this connection.
STATE:	The line state after the completion of the user request. In the example it is in the connected state.
# RECOVERABLE ERR:	The total number of Recoverable Errors that have occurred so far for this connection.
# IRRECOVERABLE ERR:	The total number of Irrecoverable Errors that have occurred so far for this connection.

## End of Trace and Line Information Messages

The END OF TRACE... message appears in the listing when the trace is turned off. The message tells you the decimal logical number of the line (19 in the example in Figure 3-14) and indicates that the line's activities are no longer being monitored by the trace facility. It is followed by the Line Information Display, showing the state of the line just before tracing was stopped. Note the counts of messages sent (41 in our example), messages received (44 in our example), number of recoverable errors (4 in our example), and number of irrecoverable errors (0 in our example).

```
*****
* END OF TRACE FOR DEVICE 19 *
*****

*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 4          LOGICAL DEV. NUMBER: 19 *
* DEV. TYPE: 18          SUBTYPE: 0   VER: A.05.06 *
*          0123456789012345 *
* COPTIONS: 0000100010000010 *
* AOPTIONS: 0000000100001101 *
* DOPTIONS: 0000010000000000 *
* NETWORK ID: 0000000000000000 *
* NUMBUFFERS: 0          BUFFSIZE: 4095 (WORDS) *
* INSPEED: 600          OUTSPEED: 600 *
* MISCARRAY:          RECEIVE TIMEOUT: 20 SECS. *
*          LOCAL TIMEOUT: 0 SECS. *
*          CONNECT TIMEOUT: 0 SECS. *
*          RESPONSE TIMEOUT: 300 HSECS. *
*          LINE BID TIMEOUT: 29 SECS. *
*          NO. ERROR RETRIES: 15 *
*          CLEAR-TO-SEND DELAY: 00.0 SECS. *
*          DATA-SET-READY DELAY: DISABLED. *
*          TRANSMISSION MODE: HALF DUPLEX. *
*          MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: CSSBSCO *
* DOWNLOAD FILE: *
* CTRACEINFO: ENTRIES=24   MASK=011111000 *
*          TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0     INDEX=0 *
* IDLIST: ENTRIES=0     INDEX=0 *
* ERRORCODE: RECOVERABLE=0 IRRECOVERABLE=0 *
* MSGSENT: 41          MSGRECV: 44 *
* RECOVERERRORS: 4     IRRECOVERERRORS: 0 *
*****
```

END OF JOB.

Figure 3-14. End of Trace and Closing Line Information.

## THE DSDUMP FORMATTING PROGRAM

The CSDUMP program formats the CS trace file to show all the line activity, including text and bisync control characters being sent and received. This allows the user to troubleshoot protocol or line problems easily, but diagnosing DS or user-level errors requires decoding of DS messages. DSDUMP is designed to decode DS messages and allow the user to choose a subset of the trace file to examine based on time stamps, user process numbers, type of DS messages, or only DS messages that complete with an error code not equal to zero.

### Defining a Trace File for DSDUMP

DSDUMP allows you to specify the trace file by using a file equation for the formal file designator CSTRACE; DSDUMP will prompt the user (interactive mode only) for the name of the trace file if the CSTRACE file does not exist.

A sample file equation is:

```
FILE CSTRACE=DSTRCnnn.PUB.SYS
```

### Defining a Trace Listing File for DSDUMP

The formal file designator of the trace listing file for DSDUMP is DSLIST. In interactive mode, a file equation for the output file is not permitted. Instead, you will be prompted for the output destination.

## Initiating the DSDUMP Program

### RUNNING DSDUMP INTERACTIVELY

When the DSDUMP program is being run interactively, it is not necessary to specify any file equations. DSDUMP commands can be read from a file, but a file equation for the output file is not permitted. The program will ask you whether you want the output to go to the terminal or to the printer. If you do not specify a device, the program defaults to the line printer. If no priority is specified, the default is 6. After the FOPEN has been performed, you will be prompted for commands. If the output is going to the printer, all DSDUMP commands are echoed. If the output is going to the terminal, then after all messages have been listed, the CSTRACE file is rewound and control goes to the Command Interpreter.

If you are in Interactive Mode (that is, not a stream job), and a printer is enabled, pressing **CONTROL**Y will return control to the command interface, after you respond to a new output device, and will close the output file. If you are in Interactive Mode without a printer, pressing **CONTROL**Y will return control to the user.

### RUNNING DSDUMP IN BATCH MODE

A file equation for the CS trace file is required for batch jobs. However, file equations for the command input file and the output files are optional, since the default designators are \$STDINX and \$STDLIST. The formal designator for the list file is DSLIST. The HELP, NEWDEV, and NEWFILE commands are ignored in batch mode. Any error in the command file will terminate the program. If



## Tracing DSN/DS Line Activity with Bisync Protocol

command input is supplied on \$STDINX, it must be terminated by :EOD if the GO command is not used.

### DSDUMP Commands

The following commands can be used with the DSDUMP program:

CLEAR	Resets all options to their default values.
DATA=	Places a limit on the number of words in the data section to be printed per frame.
DISPLAY	Shows the status of all commands and parameters.
ERRORS	To format only those requests whose completion entry has an error code not equal to zero.
EXIT	Terminates the program. This command may be used any time the user is prompted.
GO	To get out of the Command Interpreter and start the dump.
HELP	For an explanation of the commands. HELP does not accept any parameters. (Only allowed in a session.)
ONES	To include idle (-1) DS messages in the dump. The default is to exclude these messages.
NEWDEV	To specify a new output device. (Only allowed in a session.)
NEWFILE	To change CSTRACE files. (Only allowed in a session.)
PINS=	To format only those frames whose TO or FROM PIN is equal to one of the specified PINs. (Up to ten PINs are permitted.)
RANGE	To find the trace times of the first and last entries.
TIMES=	To format only those frames whose trace times are within the specified range.
TYPES=	To format only the specified type of DS messages. The parameters for the TYPES= command are:
COMMANDS	Formats the REMOTE command, Remote HELLO, Remote BYE, (CONTROL)Y message, (BREAK) message, RESUME message, ABORT message, KILLJOB message, and First Slave DSOPEN.
PTOP	Formats PREAD, PWRITE, PCONTROL, POPEN, PCLOSE, ACCEPT, and REJECT.
RFA	Formats RFA, KSAM, and IMAGE messages.
RTE	Formats RTE DS messages.
QTOQ	Formats QTOQ (NFT) DS messages.

## Tracing DSN/DS Line Activity with Bisync Protocol

**TERMINAL**      Formats PRINT messages, READ and READX messages, and FCONTROLS to the terminal.

**ENABLE**        ENABLE turns X.25 options on, and DISABLE turns options off. They are only  
**DISABLE**        available if you are using DSN/DS with DSN/X.25.

Several commands can be combined on one line if they are separated with a semicolon (;). All parameters for a command must be on the same line. When the PINS= command or the TYPES= command is entered several times, it does not cancel the previous command, but instead is added to the previous parameters. The PINS= command checks for duplicate PINs. A new TIMES= or DATA= command, however, does replace the previous command. If a colon (:) is typed in the first column of a line, that line is assumed to contain an MPE command. An End-of-File will initiate the dump. The default designator is \$STDINX. The command file may be equated to \$NULL if no options are desired.

The file equation for the Command Interpreter is:

:FILE COMFILE=command file name

## Formatted DSDUMP Trace Listing

Sequence of commands used to generate example:

```
:FILE CSTRACE=DSTRC130.PUB.SYS
:RUN DSDUMP.PUB.SYS
HEWLETT-PACKARD CO. MON, APR 18, 1983 11:49 AM
DSDUMP DS/3000-X.25 TRACE DUMP HP30131A.00.00
OUTPUT LISTING TO PRINTER OR TERMINAL?P
>GO
>EXIT
:
```

- or -

```
:RUN DSDUMP.PUB.SYS
HEWLETT-PACKARD CO. MON, APR 18, 1983 11:49 AM
DSDUMP DS/3000-X.25 TRACE DUMP HP30131A.00.00
PLEASE ENTER CSTRACE FILE:DSTRC130.PUB.SYS
OUTPUT LISTING TO PRINTER OR TERMINAL?P
>GO
>EXIT
:
```

### EXAMPLE

```
HEWLETT-PACKARD CO. MON, APR 18, 1983, 11:49 AM
DSDUMP DS/3000-X.25 TRACE DUMP HP32190A.04.03
TRACE FILE IS DSTRC130.PUB.SYS
TRACE DATE IS MON, APR 18, 1983, 11:46 AM
CS LDEV = 19
DRIVER IS CSSBSCO
>GO
Sent text is on the left, received text on the right
```

```
*** OPR - ID=%043622
*****
* Time=59.286 *
*      INITIALIZATION request *
* 000002 Software ID=%000002 *
* 000002 Compression Cap. *
* 177777 Maximum Size=255 *
* 177777 Current Size=255 *
* 070000 Capability Mask=%070000 *
* Header: *
* %004000 000002 000020 177777 000000 *
* 000000 070000 000000 *
*****
* Time=59.752 *
*      INITIALIZATION reply *
* 000003 Software ID=%000003 *
* 000003 Compression Cap. *
* 000077 Actual Size=63 *
* 174000 Capability Mask=%174000 *
```

Figure 3-15. DSDUMP Trace Listing.

Tracing DSN/DS Line Activity with Bisync Protocol

```

* Header:
* %004000 000003 100020 000077 000000
* 000000 174000 000000
*****

*** CMP - ID=%043622 ERROR CODE=0
*** OPR - ID=%044614
*****
* Time=79.915
* From PIN=%135 To PIN=%0
* REMOTE HELLO request
* 010006 HeadLength (words)=16
* 000000 Remote Computer ID=0
* 000000 Substream Type=%000000
* 000017 DSDataL (bytes)=15
* Header:
* %010006 000000 000020 000000 056400
* 000000 000000 000017
* Appendage:
* 044105 046114 047440 046507 051056
* H E L L O M G R .
* 051505 031463 034015
* S E 3 3 8 .
*****
*** OPR - ID=%044217
*****
* Time=82.601
* From PIN=%22 To PIN=%135
* FCONTROL-TO TERM. request
* File Num=1
* Control Code=-2
* Param=0
* 005405 HeadLength (words)=11
* 000000 Remote Computer ID=0
* 000000 Substream Type=%000000
* 000006 DSDataL (bytes)=6
* Header:
* %005405 000000 000023 000000 011135
* 000000 000000 000006
* Appendage:
* 000001 177776 000000
* . . .
*****

*** CMP - ID=%044217 ERROR CODE=0
*** OPR - ID=%044362
*****
* Time=82.657
* From PIN=%135 To PIN=%22
* FCONTROL-TO TERM. reply
* Status Word=%000001
* Status=CCG
* Param=0
* 005005 HeadLength (words)=10
* 000000 Remote Computer ID=0
* 000000 Substream Type=%000000

```

Figure 3-15. DSDUMP Trace Listing (continued).

Tracing DSN/DS Line Activity with Bisync Protocol

```

* 000004   DSDataL (bytes)=4           *
* Header:                               *
* %005005 000000 100023 000000 056422 *
* 000000 000000 000004                *
* Appendage:                             *
* 000001 000000                          *
* . . . .                                *
*****
* Time=83.062                             *
*   From PIN=%22 To PIN=%135             *
*   FCONTROL-TO TERM. request           *
*   File Num=1                           *
*   Control Code=-2                      *
*   Param=0                               *
* 005405   HeadLength (words)=11        *
* 000000   Remote Computer ID=0         *
* 000000   Substream Type=%000000      *
* 000006   DSDataL (bytes)=6           *
* Header:                               *
* %005405 000000 000023 000000 011135 *
* 000000 000000 000006                *
* Appendage:                             *
* 000001 177776 000000                  *
* . . . .                                *
*****
*** CMP - ID=%044362 ERROR CODE=0
*** OPR - ID=%044451
*****
* Time=83.118                             *
*   From PIN=%135 To PIN=%22           *
*   FCONTROL-TO TERM. reply           *
*   Status Word=%000001                *
*   Status=CCG                          *
*   Param=0                              *
* 005005   HeadLength (words)=10        *
* 000000   Remote Computer ID=0         *
* 000000   Substream Type=%000000      *
* 000004   DSDataL (bytes)=4           *
* Header:                               *
* %005005 000000 100023 000000 056422 *
* 000000 000000 000004                *
* Appendage:                             *
* 000001 000000                          *
* . . . .                                *
*****
* Time=83.617                             *
*   From PIN=%22 To PIN=%135           *
*   PRINT-TO TERMINAL request          *
*   AttachIO Parm1=%000000             *
*   AttachIO Parm2=%000000             *
* 005005   HeadLength (words)=10        *
* 000000   Remote Computer ID=0         *

```

Figure 3-15. DSDUMP Trace Listing (continued).

Tracing DSN/DS Line Activity with Bisync Protocol

```
* 100000 Substream Type=%100000 *
* 000071 DSDataL (bytes)=57 *
* Header: *
* %005005 000000 000020 100000 011135 *
* 000000 000000 000071 *
* Appendage: *
* 000000 000000 *
* . . . . *
* Data: *
* 044120 031460 030060 020057 020115 *
* H P 3 0 0 0 / M *
* 050105 020111 053040 041456 030060 *
* P E I V C . 0 0 *
* 027062 030056 020040 046517 047054 *
* . 2 0 . M O N , *
* 020101 050122 020061 034054 020061 *
* A P R 1 8 , 1 *
* 034470 031454 020061 030472 032067 *
* 9 8 3 , 1 1 : 4 7 *
* 020101 046525 *
* A M U *
*****
```

\*\*\* CMP - ID=%044451 ERROR CODE=0

- (Remainder of DSDUMP
- listing has been
- intentionally deleted)

Figure 3-15. DSDUMP Trace Listing (continued).

## DSDUMP Listing Header Message

The output heading provides information about the trace file being analyzed.

```
HEWLETT-PACKARD CO.  MON, APR 18, 1983, 11:49 AM
DSDUMP DS/3000-X.25 TRACE DUMP HP32190A.04.03
TRACE FILE IS DSTRC130.PUB.SYS
TRACE DATE IS MON, APR 18, 1983, 11:46 AM
CS LDEV = 19
DRIVER IS CSSBSCO
>GO
```

Sent text is on the left, received text on the right

Figure 3-16. DSDUMP Output Heading.

Item	Meaning
TRACE FILE IS ...	Provides name of trace file being analyzed. In our case, it is DSTRC130.PUB.SYS.
TRACE DATE IS ...	Date trace file was created. In our case, it is MON, APR 18, 1983, 11:46 AM.
CS LDEV = ...	LDEV of device being traced. In our case, it is 19.
DRIVER IS ..	Defines driver being used. In our case, it is CSSBSCO, where the second stands for SSLC and BSCO indicates a bisynchronous point-to-point protocol driver.
>GO	DSDUMP command that the user has entered.

Sent text is on the left, received text on the right implies that DS messages sent appear on the left side of the page, while DS messages received will appear on the right.

## DSDUMP Entry Format

PRTX or PSTX entry in trace file are formatted as follows:

```
*****
* time stamp *
* From PIN=%nnn To PIN=%nnn *
* DS msg/stream class interpretation *
* Header words Interpretation of *
* " header words using DS *
* " message formats *
* Header: *
* raw header data *
* Appendage: *
* (optional) *
* raw data *
* Data: *
* (optional) *
* user data *
*****
```

Item	Meaning
*** OPR - ID=%nnnnn	POPR entry in trace file
*** CMP - ID=%nnnnnn	PCMP entry in trace file
ERROR CODE=n	CS error number from PCMP entry

Figure 3-17. The DSDUMP Data Format.



## PRTX Trace Entries

```

*****
* Time=83.617 *
* From PIN=%22 To PIN=%135 *
* PRINT-TO TERMINAL request *
* AttachIO Parm1=%000000 *
* AttachIO Parm2=%000000 *
* 005005 HeadLength (words)=10 *
* 000000 Remote Computer ID=0 *
* 100000 Substream Type=%100000 *
* 000071 DSDataL (bytes)=57 *
* Header: *
* %005005 000000 000020 100000 011135 *
* 000000 000000 000071 *
* Appendage: *
* 000000 000000 *
* . . . *
* Data: *
* 044120 031460 030060 020057 020115 *
* H P 3 0 0 0 / M *
* 050105 020111 053040 041456 030060 *
* P E I V C . 0 0 *
* 027062 030056 020040 046517 047054 *
* . 2 0 . M O N , *
* 020101 050122 020061 034054 020061 *
* A P R 1 8 , 1 *
* 034470 031454 020061 030472 032067 *
* 9 8 3 , 1 1 : 4 7 *
* 020101 046525 *
* A M U *
*****

```

Figure 3-18. PRTX Trace Entry.

This DSDUMP entry is an analysis of three CSDUMP PRTX entries (see Figure 3-10 for the first of these three entries as displayed by CSDUMP, or see Figure 3-1, Time=83.529 for all 3 entries). Note in Figure 3-1 that the time stamp reported by DSDUMP matches the time stamp of the last PRTX entry used to record this received message. In this case, we are receiving a logon message from the remote system.

## PSTX Trace Entries

```

*****
* Time=79.915 *
* From PIN=%135 To PIN=%0 *
* REMOTE HELLO request *
* 010006 HeadLength (words)=16 *
* 000000 Remote Computer ID=0 *
* 000000 Substream Type=%000000 *
* 000017 DSDataL (bytes)=15 *
* Header: *
* %010006 000000 000020 000000 056400 *
* 000000 000000 000017 *
* Appendage: *
* 044105 046114 047440 046507 051056 *
* H E L L O M G R . *
* 051505 031463 034015 *
* S E 3 3 8 . *
*****

```

Figure 3-19. PSTX Trace Entry.

This DSDUMP entry is an analysis of two CSDUMP PSTX entries (see Figure 3-12 for the first of these two entries as displayed by CSDUMP, or see Figure 3-1, Time=79.913 for all 3 entries). Note in Figure 3-1 that the time stamp reported by DSDUMP matches the time stamp of the last PSTX entry used to record this transmission. Note that the :REMOTE HELLO request message format (see Section 5) indicates that the HELLO command is placed in the appendage field.



# TRACING DSN/X.25 LINE ACTIVITY

SECTION

4

The CS/3000 Trace Facility is used to provide a record of the line actions, CS states and events that occur during DSN/DS/X.25 operation. When problems occur during operation, the trace facility provides the means to pinpoint the problem area.

The internal procedures that DSN/DS and DSN/X.25 use for controlling the line are called CS intrinsic calls. Each call to a CS intrinsic generates a series of actions, states and events. An action is something that the CS driver performs, and an event is an external happening that requires an action from the driver according to the driver's state.

The trace facility is invoked by the operator with a :DSCONTROL command. Tracing can be enabled/disabled when OPENING the line, or before or after the line is opened. Tracing can be invoked for any communication line that DSN/DS uses. Once invoked for a particular communications line, the trace facility continues to record line activity until either the user issues a new :DSCONTROL command with the TRACE, OFF parameter. The trace facility keeps track of actions, states and events in the form of trace entries. The trace entries are grouped into trace records: one trace record for each user request made by DSN/DS/X.25. The trace records are permanently stored in a system-generated file named DSTRCxxx or in a user-specified trace file. The contents of a trace file can be formatted and printed through the use of trace dump utility programs, described later in this section. Refer to the *Data Communications Handbook* for additional information on the CS Trace Facility.

## INITIATING THE CS/3000 TRACE FACILITY

To invoke the CS/3000 trace facility, include the following trace parameter in the :DSCONTROL command:

```
;TRACE,ON[,,ALL][,,mask][,,numentries][,,WRAP][,,filename]
```

where

**ALL** generates trace records for all CS intrinsic calls. If ALL is not specified, then trace records are written only when an intrinsic call completes with a transmission error. The word ERROR appears on the trace listing.

**mask** indicates the type of activities to be traced, as follows (PCMP entries are generated automatically):

%000, or omitted, means use the driver default mask (%037, so all entries except PSTN and INP interconnect entries are generated)

%001 = generate PSTX entries

%002 = generate PSCT entries

%004 = generate PRTX entries

## Tracing and DSN/X.25 Line Activity

- %010 = generate PRCT entries
- %020 = generate POPR and PEDT entries (see NOTE)
- %040 = generate PSTN entries
- %100 = generate INP interconnect entries

<b>NOTE</b>
-------------

POPR and PEDT entries do not apply to X.25

### *numentries*

is a decimal integer for the maximum number of trace entries in a trace record. The value actually used by the trace facility will be the largest integer multiple of eight that is not greater than the number you enter. For an INP the value may not exceed 24. (If the value requested for an INP is greater than 24, a warning message will be printed and the maximum default of 24 will be used.) If *numentries* is set to zero or omitted, there will be a maximum of 24 trace entries per trace record for the INP. It is not possible to change the value of *numentries* once a trace file has been built. If the value you choose is inadequate, you will have to purge the file and rebuild it, or let DSN/DS/X.25 rebuild it. Currently for DSN/DS with DSN/X.25, you must specify a value of 16 for *numentries*.

### WRAP

causes trace entries that overflow the trace record area (greater than *numentries*) to overlay the prior trace entries. If WRAP is omitted, overflow trace entries are discarded, and NOWRAP appears on the trace listing. (This parameter does not affect the EOF marker of the file.)

If WRAP is specified then entries are deposited in a trace record in a circular pattern. For example, with a maximum of 35 trace entries per trace record, trace entries beyond the 35th will overlay the first, second, third (and so on) trace entries in the record. When this happens, the overlaid trace entries will be missing from the listing; a warning message will appear in the listing stating that the records are missing.

### *filename*

names the file the user wants the trace information to be written to. If no name is supplied, DSN/DS/X.25 will create a file named DSTRCnnn, where nnn is the right-justified LDEV number of the DS device. For example, if the IODSX LDEV is 51, trace filename is DSTRC051. If a trace file exists it will be purged, and a new trace file will be created.

## The Trace File

Refer to Section II of the *MPE Intrinsic Reference Manual* for a description of the FOPEN and FCLOSE intrinsic call. If tracing has been requested, the CS/3000 trace facility issues an FOPEN intrinsic call with the following parameters:

Parameter		Value	Meaning
Formal File Designator		DSTRCnnn	
FOPTIONS	Bits 14, 15	11	Old file
	Bits 13	0	Binary file
	Bits 10,11,12	000	Use actual file designator
	Bits 8,9	11	Variable length records
	Bit 7	0	No carriage control
AOPTIONS	Bits 12 to 15	1111	Write only; purge old contents
	Bit 11	0	No multi-record option
	Bit 10	0	Disallow dynamic locking/unlocking
	Bits 8,9	00	Exclusive access
	Bits 0 to 7	00000000	None
BLOCKFACTOR		1	

If the trace file cannot be opened because it does not exist, then a new file is opened in the system domain. If an error occurs when trying to open the trace file, the particular :DSCONTROL command fails and the trace file printout will be displayed on the console.

When the line is closed, the CS/3000 trace facility issues an FCLOSE intrinsic call with the following parameters:

Parameter	Value	Meaning
DISPOSITION	1	Save
SECCODE	0	Unrestricted access

## Trace Entry Mnemonics

There are six types of trace entries used in DSN/DS/X.25. They are summarized in Table 4-1 and described in greater detail on the pages following this table.

**Table 4-1. Trace Entry Type Mnemonics**

Mnemonic	Entry Type	Definition
PSTN	State Transition	Generated each time the driver transfers from one internal state to another. The PSTN entry is for internal HP use and should be ignored by the user.
PRCT	Receive Control Sequence	Generated each time a frame is received from the remote station. The PRCT trace entry shows (in octal or hexadecimal) the exact sequence of bytes that was received. <sup>1</sup>
PSCT	Send Control Sequence	Generated each time the driver sends a frame to the remote station. The PSCT trace entry shows (in octal or hexadecimal) the exact sequence of bytes that was sent. <sup>1</sup>
PRTX	Receive Text	Generated only when the received frame is longer than 32 bytes. The PRTX trace entry shows (in octal or hexadecimal) the exact sequence of bytes received. <sup>2</sup>
PSTX	Send Text	Generated only when the frame sent to the remote station is longer than 32 bytes. The PSTX entry shows (in octal or hexadecimal) the exact sequence of bytes received. <sup>2</sup>
PCMP	User Request Completed	Generated each time a CS intrinsic call is completed. The PCMP trace entry summarizes the line activity, such as the number of frames sent and received and the number of errors that have occurred.

<sup>1</sup> The PRCT or PSCT trace entry omits the Flag characters and Frame checking sequence (FCS) and shows the first 27 bytes maximum of the I field. One byte of the FCS may appear if the frame doesn't end on a word boundary.

<sup>2</sup> PRTX or PSTX entries will be used to display the remainder of the I field that was not displayed in the PRCT or PSCT entry. Trailing Flag and FCS bytes are omitted except when the frame does not end on a word boundary; then one byte of the FCS will appear.

## TERMINATING THE CS/3000 TRACE FACILITY

To terminate the CS/3000 trace facility, include the following parameter in the :DSCONTROL command:

```
;TRACE,OFF
```

The trace facility must be terminated before CSDUMP and DSDUMP can be run.

## FORMATTING A TRACE FILE

There are two trace formatting programs for X.25: CSDUMP and DSDUMP. CSDUMP does some formatting and displays all trace file data in a raw form. DSDUMP allows you to choose a subset of the trace file to be formatted, and will also analyze the chosen data. You need a thorough understanding of the X.25 protocols to interpret information in an X.25 trace file.

## THE CSDUMP FORMATTING PROGRAM

The CSDUMP program formats the CS trace file to show line activity by displaying all frames being sent and received. CSDUMP will also analyze the X.25 Level 2 header as defined in the 1980 CCITT Recommendation.

### Defining a CS Trace File for CSDUMP

The CSDUMP program expects a trace file named CSTRACE. If your trace file has a different name, such as the default file name DSTRCnnn, you will need to equate the trace file name to CSTRACE. Use the MPE :FILE command this way:

```
:FILE CSTRACE=DSTRCnnn.PUB.SYS
```

### Defining a CSDUMP Listing File

The formal file designator of the trace listing file for CSDUMP is LIST. The file may be defined as a CRT terminal, a line printer, or a disc file. To define the list file, enter an MPE :FILE command prior to initiating the CSDUMP program. Some typical examples are:

:FILE LIST;DEV=LP	LP is assumed to be the device class name for one or more line printers.
:FILE LIST=FILENAME	FILENAME is assumed to be the name of an old temporary or permanent disc file.

If a list file does not exist or is not designated by a :FILE command, and PARM of the RUN command is not a one, the CSDUMP program employs the user's session/job output device as the list file. If PARM is set to one, then the dump program attempts to open the file LIST as an old job or system file. If this fails because LIST does not exist, then LIST is opened as a new file in the system domain. After the CSDUMP program has run, the contents of this file may be accessed via EDIT/3000.



## Initiating the CSDUMP Program

After the CSTRACE and LIST files have been defined, enter the following command:

```
:RUN CSDUMP.PUB.SYS[,OCTAL][;PARM= $\left. \begin{array}{c} 0 \\ 1 \\ 2 \end{array} \right\}$ ]
```

The trace dump program uses the CSTRACE file as input and produces a formatted trace listing on the LIST file. The format of the trace listing is described in the following text. If the secondary entry point OCTAL is specified when CSDUMP is run, the numeric codes for both control characters and data will be printed in octal instead of hexadecimal. If you specify PARM=0 or 1, all entries will be output by time; however, if you specify PARM=2 only CS/3000 intrinsics will be output by time.

## Formatted CSDUMP Trace Listing

As you can see from Figure 4-1, a CSDUMP Trace listing has a specific format. The components of a Trace listing are a header message; the beginning-of-trace message; the opening Line Information Display box; one or more consecutively numbered entries; an end-of-trace message; and the closing Line Information Display box. These components are discussed in detail on the pages following Figure 4-1. Figure 4-1 shows portions of a trace of a line connected to an Intelligent Network Processor (INP).

CS TRACE ANALYZER (A.05.07) MON, JUN 6, 1983, 11:50 AM

TRACE FILE IS DSTRC059.PUB.SYS  
ALL ENTRIES DUMPED BY TIME

LAST OPENED ON MON, APR 18, 1983, 11:40 AM

SYSTEM ID=00.20

```
*****
* BEGIN TRACING FOR DEVICE 11 *
*****

*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 3      LOGICAL DEV. NUMBER: 11 *
* DEV. TYPE: 17      SUBTYPE: 3   VER: A.05.06 *
*           0123456789012345           *
* COPTIONS: 0000100101000000           *
* AOPTIONS: 0000001100001101           *
* DOPTIONS: 00000000000000111         *
* NETWORK ID: 0000000000000000         *
* NUMBUFFERS: 242      BUFFSIZE: 514 (WORDS) *
* INSPEED: 7000      OUTSPEED: 7000 *
* MISCARRAY: RECEIVE TIMEOUT: 20 SECS. *
*           LOCAL TIMEOUT: 60 SECS. *
*           CONNECT TIMEOUT: 50 SECS. *
*           RESPONSE TIMEOUT: 300 HSECS. *
*           LINE BID TIMEOUT: 60 SECS. *
*           NO. ERROR RETRIES: 20 *
*           CLEAR-TO-SEND DELAY: 00.0 SECS. *
*           DATA-SET-READY DELAY: DISABLED. *
*           TRANSMISSION MODE: DUPLEX. *
*           MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: IOINPO *
* DOWNLOAD FILE: CSDLAPB0 *
* CTRACEINFO: ENTRIES=16      MASK=011111000 *
*           TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0      INDEX=0 *
* IDLIST: ENTRIES=0      INDEX=0 *
* ERRORCODE: RECOVERABLE=0 IRRECOVERABLE=0 *
```

Figure 4-1. CSDUMP Trace Listing.

Tracing and DSN/X.25 Line Activity

```

* MSGSENT: 0           MSGRCV: 0           *
* RECOVERORS: 0       IRRECOVERORS: 0     *
*****
0      2.300 PCMP REQUEST ID=%044273(!48BB)
        ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=0       #MSG RCV=0       STATE=DISCONNECT
        # RECOVERABLE ERR=0   # IRRECOVERABLE ERR=0

1      2.320 PCMP REQUEST ID=%045573(!4B7B)
        ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=0       #MSG RCV=0       STATE=DISCONNECT
        # RECOVERABLE ERR=0   # IRRECOVERABLE ERR=0

2      2.650 PSCT REQUEST ID=NONE
        SABM      ADDR=B   P/F=0
        0 1.2 F
        SOH /

3      2.660 PRCT REQUEST ID=NONE
        UA      ADDR=B   P/F=0
        0 1.6 3
        SOH c

4      2.970 PSCT REQUEST ID=NONE
        I-FRAME ADDR=B   P/F=0 N(R)=0 N(S)=0
        0 1.0 0 1 0.0 0 F B.0 0 F A.0 0
        SOH NUL DLE NUL { NUL z NUL

5      2.980 PRCT REQUEST ID=NONE
        RR      ADDR=B   P/F=0 N(R)=1
        0 1.2 1
        SOH !

6      2.980 PCMP REQUEST ID=%044703(!49C3)
        ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=1       #MSG RCV=0       STATE=CONNECTED
        # RECOVERABLE ERR=0   # IRRECOVERABLE ERR=0

7      3.020 PRCT REQUEST ID=NONE
        I-FRAME ADDR=A   P/F=0 N(R)=1 N(S)=0
        0 3.2 0 1 0.0 0 F F.5 8
        ETX      DLE NUL DEL X

8      3.030 PCMP REQUEST ID=%044130(!4858)
        ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=1       #MSG RCV=1       STATE=CONNECTED
        # RECOVERABLE ERR=0   # IRRECOVERABLE ERR=0

9      3.030 PSCT REQUEST ID=NONE
        RR      ADDR=A   P/F=0 N(R)=1
        0 3.2 1
        ETX !

```

Figure 4-1. CSDUMP Trace Listing (continued).

```

10      9.190 PSCT REQUEST ID=NONE
        I-FRAME ADDR=B P/F=0 N(R)=1 N(S)=1
        0 1.2 2 1 0.1 4 0 B.1 0 8 0.0 0
        SOH " DLE DC4 VT DLE NUL NUL

11      9.200 PRCT REQUEST ID=NONE
        RR ADDR=B P/F=0 N(R)=2
        0 1.4 1
        SOH A

12      9.200 PCMP REQUEST ID=%045606(!4B86)
        ERROR CODE=0 LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=2 #MSG RECV=1 STATE=CONNECTED
        # RECOVERABLE ERR=0 # IRRECOVERABLE ERR=0

13      12.830 PRCT REQUEST ID=NONE
        I-FRAME ADDR=A P/F=0 N(R)=2 N(S)=1
        0 3.4 2 1 0.1 4 0 F.3 C
        ETX B DLE DC4 SI <

14      12.830 PCMP REQUEST ID=%044375(!48FD)
        ERROR CODE=0 LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=2 #MSG RECV=2 STATE=CONNECTED
        # RECOVERABLE ERR=0 # IRRECOVERABLE ERR=0

15      12.840 PSCT REQUEST ID=NONE
        RR ADDR=A P/F=0 N(R)=2
        0 3.4 1
        ETX A

0       21.830 PSCT REQUEST ID=NONE
        I-FRAME ADDR=B P/F=0 N(R)=2 N(S)=2
        0 1.4 4 1 0.1 4 0 0.1 0 0 6.0 0 0 1.0 0 1 0.0 0
        SOH D DLE DC4 NUL DLE ACK NUL SOH NUL DLE NUL
        0 0.5 D 0 0.0 0 0 0.0 0 0 0.0 0 0 F.4 8 4 5.4 C
        NUL ] NUL NUL NUL NUL NUL NUL SI H E L
        4 C.4 F 2 0.4 D 4 7.5 2 2 E.5 3
        L O M G R . S

1       21.830 PSTX REQUEST ID=NONE
        4 5.3 3 3 3.3 8 0 D.C E
        E 3 3 8 CR N

2       21.850 PRCT REQUEST ID=NONE
        RR ADDR=B P/F=0 N(R)=3
        0 1.6 1
        SOH a

3       21.850 PCMP REQUEST ID=%044306(!48C6)
        ERROR CODE=0 LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=3 #MSG RECV=2 STATE=CONNECTED
        # RECOVERABLE ERR=0 # IRRECOVERABLE ERR=0

```

Figure 4-1. CSDUMP Trace Listing (continued).

Tracing and DSN/X.25 Line Activity

```

4      22.980 PRCT REQUEST ID=NONE
        I-FRAME  ADDR=A   P/F=0  N(R)=3  N(S)=2
        0 3.6 4 1 0.1 4 2 1.5 8
        ETX d   DLE DC4 !   X

5      22.980 PCMP REQUEST ID=%043403(!4703)
        ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=3      #MSG RECV=3      STATE=CONNECTED
        # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0

6      22.990 PSCT REQUEST ID=NONE
        RR          ADDR=A   P/F=0  N(R)=3
        0 3.6 1
        ETX a

7      23.830 PRCT REQUEST ID=NONE
        I-FRAME  ADDR=A   P/F=0  N(R)=3  N(S)=3
        0 3.6 6 1 0.1 4 2 0.0 B 0 5.0 0 0 0.0 0 1 3.0 0
        ETX f   DLE DC4      VT  ENQ NUL NUL NUL DC3 NUL
        0 0.1 1 5 D.0 0 0 0.0 0 0 0.0 0 0 6.0 0 0 1.F F
        NUL DC1 ]   NUL NUL NUL NUL NUL ACK NUL SOH DEL
        F E.0 0 0 0.0 5
        ~
        NUL NUL ENQ

8      23.830 PCMP REQUEST ID=%044334(!48DC)
        ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=3      #MSG RECV=4      STATE=CONNECTED
        # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0

9      23.840 PSCT REQUEST ID=NONE
        RR          ADDR=A   P/F=0  N(R)=4
        0 3.8 1
        ETX SOH

10     23.980 PSCT REQUEST ID=NONE
        I-FRAME  ADDR=B   P/F=0  N(R)=4  N(S)=3
        0 1.8 6 1 0.1 4 2 1.0 0
        SOH ACK DLE DC4 !   NUL

11     23.990 PRCT REQUEST ID=NONE
        RR          ADDR=B   P/F=0  N(R)=4
        0 1.8 1
        SOH SOH

12     23.990 PCMP REQUEST ID=%043444(!4724)
        ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=4      #MSG RECV=4      STATE=CONNECTED
        # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0

13     24.540 PSCT REQUEST ID=NONE
        I-FRAME  ADDR=B   P/F=0  N(R)=4  N(S)=4
        0 1.8 8 1 0.1 4 2 2.0 A 0 5.0 0 0 1.8 0 1 3.0 0
        SOH BS  DLE DC4 "   LF  ENQ NUL SOH NUL DC3 NUL
        0 0.5 D 1 1.0 0 0 0.0 0 0 0.0 0 0 4.0 0 0 1.0 0
    
```

Figure 4-1. CSDUMP Trace Listing (continued).

Tracing and DSN/X.25 Line Activity

```

NUL ] DC1 NUL NUL NUL NUL NUL EOT NUL SOH NUL
0 0.0 0
NUL NUL

0      24.550 PRCT REQUEST ID=NONE
        RR      ADDR=B      P/F=0      N(R)=5
        0 1.A 1
        SOH !

1      24.560 PCMP REQUEST ID=%043561(!4771)
        ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=5      #MSG RECV=4      STATE=CONNECTED
        # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0

2      24.680 PRCT REQUEST ID=NONE
        I-FRAME ADDR=A      P/F=0      N(R)=5      N(S)=4
        0 3.A 8 1 0.1 4 4 2.0 B 0 5.0 0 0 0.0 0 1 3.0 0
        ETX ( DLE DC4 B VT ENQ NUL NUL NUL DC3 NUL
        0 0.1 1 5 D.0 0 0 0.0 0 0 0.0 0 0 6.0 0 0 1.F F
        NUL DC1 ] NUL NUL NUL NUL NUL ACK NUL SOH DEL
        F E.0 0 0 0.9 B
        ~ NUL NUL ESC

3      24.690 PCMP REQUEST ID=%045341(!4AE1)
        ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=5      #MSG RECV=5      STATE=CONNECTED
        # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0

4      24.690 PSCT REQUEST ID=NONE
        RR      ADDR=A      P/F=0      N(R)=5
        0 3.A 1
        ETX !

5      25.500 PSCT REQUEST ID=NONE
        I-FRAME ADDR=B      P/F=0      N(R)=5      N(S)=5
        0 1.A A 1 0.1 4 4 4.0 A 0 5.0 0 0 1.8 0 1 3.0 0
        SOH * DLE DC4 D LF ENQ NUL SOH NUL DC3 NUL
        0 0.5 D 1 1.0 0 0 0.0 0 0 0.0 0 0 4.0 0 0 1.0 0
        NUL ] DC1 NUL NUL NUL NUL NUL EOT NUL SOH NUL
        0 0.0 0
        NUL NUL

6      25.510 PRCT REQUEST ID=NONE
        RR      ADDR=B      P/F=0      N(R)=6
        0 1.C 1
        SOH A

7      25.520 PCMP REQUEST ID=%044540(!4960)
        ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
        #MSG SENT=6      #MSG RECV=5      STATE=CONNECTED
        # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0

8      25.610 PRCT REQUEST ID=NONE
        I-FRAME ADDR=A      P/F=0      N(R)=6      N(S)=5

```

Figure 4-1. CSDUMP Trace Listing (continued).

Tracing and DSN/X.25 Line Activity

```

0 3.C A 1 0.1 4 6 4.0 A 0 5.0 0 0 0.0 0 1 0.A 0
ETX J   DLE DC4 d   LF ENQ NUL NUL NUL DLE
0 0.1 1 5 D.0 0 0 0.0 0 0 0.0 0 4 E.0 0 0 0.0 0
NUL DC1 ]   NUL NUL NUL NUL NUL N   NUL NUL NUL
0 0.0 A 0 5.0 0 0 0.0 0 1 0.8 0
NUL LF ENQ NUL NUL NUL DLE NUL

9      25.610 PRTX REQUEST ID=NONE
0 0.1 1 5 D.0 0 0 0.0 0 0 0.0 0 3 9.0 0 0 0.0 0
NUL DC1 ]   NUL NUL NUL NUL NUL 9   NUL NUL NUL
0 0.4 8 5 0.3 3 3 0.3 0 3 0.2 0 2 F.2 0 4 D.5 0
NUL H   P   3   0   0   0   /           M   P
4 5.2 0 4 9.5 6 2 0.4 3 2 E.3 0
E       I   V       C   .   0

10     25.610 PRTX REQUEST ID=NONE
3 0.2 E 3 2.3 0 2 E.2 0 2 0.4 D 4 F.4 E 2 C.2 0
0   .   2   0   .           M   O   N   ,
4 1.5 0 5 2.2 0 3 1.3 8 2 C.2 0 3 1.3 9 3 8.3 3
A   P   R           1   8   ,           1   9   8   3
2 C.2 0 3 1.3 1 3 A.3 4 3 0.2 0
,       1   1   :   4   0

11     25.610 PRTX REQUEST ID=NONE
4 1.4 D 5 5.0 A
A   M   U   LF

```

- (Several entries have
- been omitted.)
- 

```

*****
* END OF TRACE FOR DEVICE 11 *
*****

```

```

*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 3          LOGICAL DEV. NUMBER: 11 *
* DEV. TYPE: 17          SUBTYPE: 3   VER: A.05.06 *
*           0123456789012345 *
* COPTIONS: 0000100101000000 *
* AOPTIONS: 0000001100001101 *
* DOPTIONS: 0000000000000111 *
* NETWORK ID: 0000000000000000 *
* NUMBUFFERS: 242        BUFFSIZE: 514 (WORDS) *
* INSPEED: 7000          OUTSPEED: 7000 *
* MISCARRAY:            RECEIVE TIMEOUT: 20 SECS. *
*                       LOCAL TIMEOUT: 60 SECS. *
*                       CONNECT TIMEOUT: 50 SECS. *
*                       RESPONSE TIMEOUT: 300 HSECS. *
*                       LINE BID TIMEOUT: 60 SECS. *
*                       NO. ERROR RETRIES: 20 *
*                       CLEAR-TO-SEND DELAY: 00.0 SECS. *
*                       DATA-SET-READY DELAY: DISABLED. *

```

Figure 4-1. CSDUMP Trace Listing (continued).

```

*           TRANSMISSION MODE: DUPLEX.           *
*           MMSTAT TRACE FACILITY: ENABLED.      *
* DRIVENAME: IOINPO                               *
* DOWNLOAD FILE: CSDLAPB0                         *
* CTRACEINFO: ENTRIES=16      MASK=011111000     *
*           TYPE OF TRACE = ALL, NOWRAP         *
* PHONELIST: ENTRIES=0      INDEX=0              *
* IDLIST: ENTRIES=0      INDEX=0                *
* ERRORCODE: RECOVERABLE=0  IRRECOVERABLE=202   *
* MSGSENT: 54      MSGRECV: 34                  *
* RECOVERERRORS: 0      IRRECOVERERRORS: 0      *
*****
11      86.180 PCMP REQUEST ID=%043164(!4674)
          ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
          #MSG SENT=54      #MSG RECV=34      STATE=DISCONNECT
          # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0

12      86.220 PCMP REQUEST ID=%044655(!49AD)
          ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
          #MSG SENT=54      #MSG RECV=34      STATE=DISCONNECT
          # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0

0       86.330 PCMP REQUEST ID=%044067(!4837)
          ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
          #MSG SENT=54      #MSG RECV=34      STATE=DISCONNECT
          # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0

END OF JOB.

```

Figure 4-1. CSDUMP Trace Listing (continued).



## CSDUMP Listing Header Message

At the start of the trace listing is a header message (Figure 4-2) that tells the date and time of day when the listing was printed and the fully-qualified name of the trace file. The meanings of the two remaining items in the header message are:

Item	Meaning
LAST OPENED ON ...	This tells you the date and time of day when the trace was executed.
SYSTEM ID=nn.mm	This tells you the update level (nn) and the fix level (mm) of the MPE operating system that was being used when the trace was performed.

CS TRACE ANALYZER (A.05.07)	MON, JUN 6, 1983, 11:50 AM
TRACE FILE IS DSTRC059.PUB.SYS	
ALL ENTRIES DUMPED BY TIME	
LAST OPENED ON MON, APR 18, 1983, 11:40 AM	
SYSTEM ID=00.20	

Figure 4-2. Trace Listing Header.

## Begin Tracing and Line Information Messages

The BEGIN TRACING... message appears in the listing when the line to be traced is opened. The message tells you the decimal logical device number of the line (11 in the example in Figure 4-3). It indicates the line's activities are now being monitored by the trace facility. It is followed by the Line Information Display describing the state of the line when tracing started.

```
*****
* BEGIN TRACING FOR DEVICE 11 *
*****

*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 3 LOGICAL DEV. NUMBER: 11 *
* DEV. TYPE: 17 SUBTYPE: 3 VER: A.05.06 *
* 0123456789012345 *
* COPTIONS: 0000100101000000 *
* AOPTIONS: 0000001100001101 *
* DOPTIONS: 0000000000000111 *
* NETWORK ID: 0000000000000000 *
* NUMBUFFERS: 242 BUFFSIZE: 514 (WORDS) *
* INSPEED: 7000 OUTSPEED: 7000 *
* MISCARRAY: RECEIVE TIMEOUT: 20 SECS. *
* LOCAL TIMEOUT: 60 SECS. *
* CONNECT TIMEOUT: 50 SECS. *
* RESPONSE TIMEOUT: 300 HSECS. *
* LINE BID TIMEOUT: 60 SECS. *
* NO. ERROR RETRIES: 20 *
* CLEAR-TO-SEND DELAY: 00.0 SECS. *
* DATA-SET-READY DELAY: DISABLED. *
* TRANSMISSION MODE: DUPLEX. *
* MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: IOINP0 *
* DOWNLOAD FILE: CSDLAPB0 *
* CTRACEINFO: ENTRIES=16 MASK=011111000 *
* TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0 INDEX=0 *
* IDLIST: ENTRIES=0 INDEX=0 *
* ERRORCODE: RECOVERABLE=0 IRRECOVERABLE=0 *
* MSGSENT: 0 MSGRCV: 0 *
* RECOVERERRORS: 0 IRRECOVERERRORS: 0 *
*****
```

Figure 4-3. Begin Tracing and Line Information Messages.

## Tracing and DSN/X.25 Line Activity

The opening Line Information Display box contains detailed information on how the line was opened, how the communications controller was configured (transmission speeds, timeout values, logical device number, etc) and trace parameters selected. In the example in Figure 4-3, we know that:

- the communications controller is an INP (we know this because DEV. TYPE (device type) is 17 and DRIVERNAME is IOINP0),
- it is a hardwired line (because it is SUBTYPE 3),
- BUFFSIZE is 514 WORDS, or 1028 bytes, which provides for a packet size of 1024 bytes, plus 3 bytes for the packet header and 1 byte to fill to the word boundary,
- INSPEED and OUTSPEED (transmission speeds) are 7000 characters per second (56000 bps),
- RESPONSE TIMEOUT is 300 HSEC, which is 3000 milliseconds, which is the timer T1 (as defined in LAP-B protocol),
- NO. ERROR RETRIES is 20, which is the retry count N2 (as defined in LAP-B protocol),
- DOWNLOAD FILE is CSDLAPB0, which means we are using the LAP-B protocol,
- CTRACEINFO ENTRIES is 16, so *numentries* is 16,
- MASK is 011111000 (=%37; for DSN/DS/X.25 ignore the three zeroes on the right),
- ALL events will be traced,
- overflow record entries will be discarded (NOWRAP).

## Trace Entry Format

All entries in a trace listing contain a prefix consisting of four fields:

1. An entry number (0 in the example in Figure 4-4).
2. A "time stamp" in seconds and thousandths of seconds (2.300 in Figure 4-4).
3. An entry-type mnemonic (PCMP in Figure 4-4).
4. A "request ID" that correlates the entry with a particular intrinsic call (%044273 in Figure 4-4).

The first entry is numbered zero, and successive entries throughout the rest of this trace record are numbered consecutively in ascending order (1, 2, 3 and so on). The "time stamp" makes it possible for you to determine the elapsed time between one trace entry and another. The mnemonic tells you what type of trace entry you are examining. The body of each trace entry tells you the pertinent information for the particular activity that has happened or is about to happen.

```
0      2.300 PCMP REQUEST ID=%044273(148BB)
      ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
      #MSG SENT=0      #MSG RECV=0      STATE=DISCONNECT
      # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0
```

Figure 4-4. Sample Trace Entry.

## Missing Entries Message

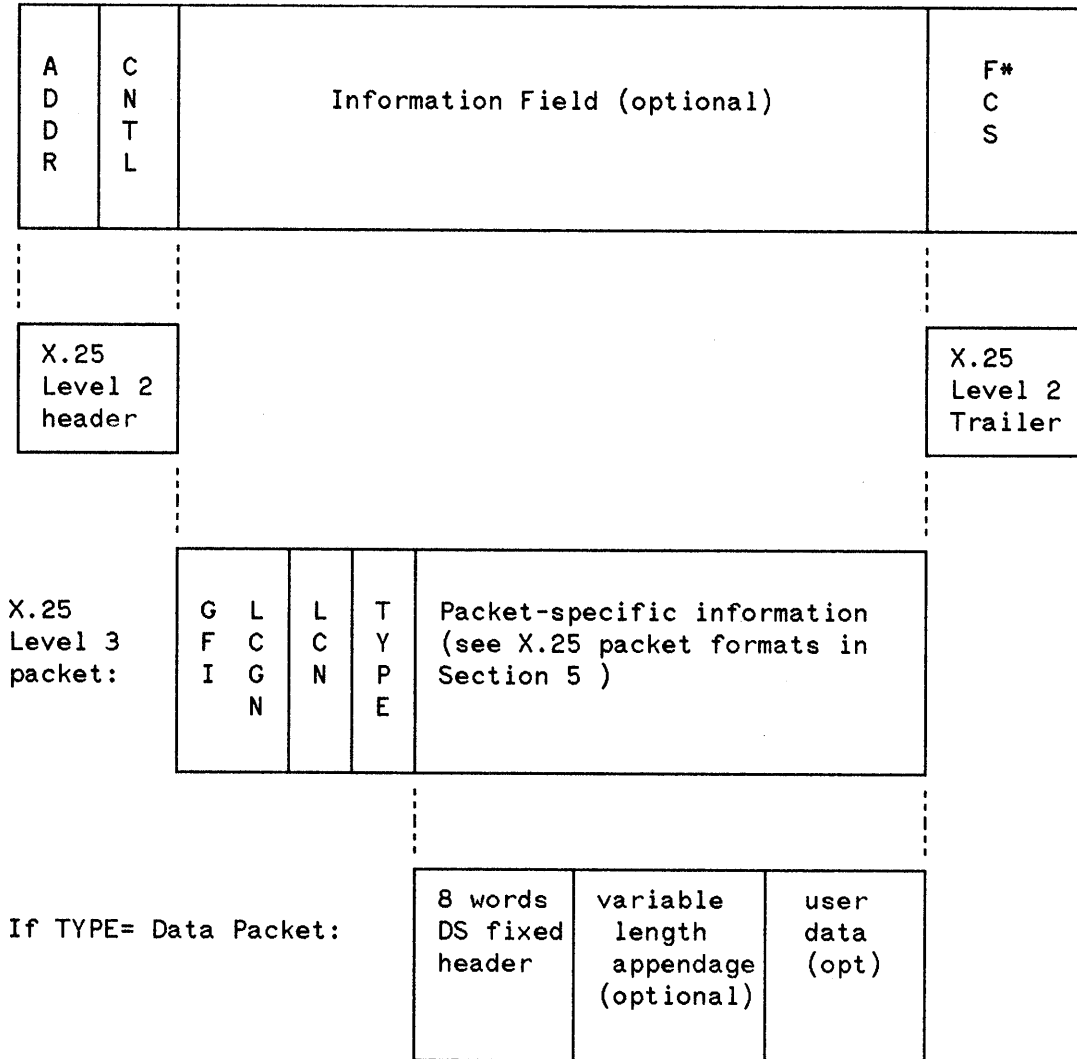
If MISSING ENTRIES appears in the listing, it means that the record was not large enough to accommodate all of the trace entries and some entries were lost. If WRAP was not specified (NOWRAP), then the missing entries were at the end just before the PCMP entry; otherwise they are missing from the beginning where they were overlaid by the trace entries that extended past the end of the record. If the missing entries are crucial:

1. Purge the trace file.
2. Invoke trace again, issuing :DSCONTROL with
  - a. a larger *numentries* value
  - b. a mask setting that will produce only those trace entries you are really interested in.

## PSCT/PSTX and PRCT/PRTX Trace Entries

The following is the data format as defined by X.25 and recorded in the CS Trace file for PRCT/PRTX or PSCT/PSTX entries:

Level 2 frame:



\* One FCS byte will appear if the frame ends on an odd-byte boundary.

Figure 4-5. The X.25 Data Format.

## PRCT Trace Entries

A PRCT trace entry is generated each time a frame is received from the remote station. The body of an PRCT trace entry shows you the exact sequence of bytes received. An example is shown in Figure 4-6.

```

8      25.610 PRCT REQUEST ID=NONE
          I-FRAME ADDR=A P/F=0 N(R)=6 N(S)=5
          03.CA10.1464.0A05.0000.00010.A0
          ETX J DLE DC4 d LF ENQ NUL NUL NUL DLE
          00.115D.0000.0000.0004E.0000.000
          NUL DC1 ] NUL NUL NUL NUL N NUL NUL NUL
          00.0A05.0000.00010.80
          NUL LF ENQ NUL NUL NUL DLE NUL
    
```

Figure 4-6. PRCT Trace Entry.

In the example shown in Figure 4-6 (see Figure 4-5 for the data format) note that the X.25 level 2 header is analyzed by CSDUMP in the line under REQUEST ID.

03 => Address=A	}	as defined by LAP-B
CA => CNTL=I frame P/F=0 N(R)=6 N(S)=5		
10 => Q=0 so this packet does not contain X.29 information, modulo 8 is in use, LCGN=0	}	as defined in X.25 level 3 packet protocol
14 => LCN=20		
64 => Data packet M=0 P(R)=3 P(S)=2		

0A 05	word 0 of DS fixed header
00 00	" 1 " " " "
00 10	" 2 " " " "
A0 00	" 3 " " " "
11 5D	" 4 " " " "
00 00	" 5 " " " "
00 00	" 6 " " " "
00 4E	" 7 " " " "
00 00	word 1 of DS appendage
00 00	" 2 " " " "
0A ...	user data that continues in a PRTX entry to show MPE logon message

Whenever possible, the CSDUMP program converts the hex (or octal) codes to ASCII and displays the character beneath its code.

## PSCT Trace Entries

A PSCT trace entry is generated each time a frame is sent to the remote station. The body of a PSCT trace entry shows you the exact sequence of bytes that was sent to the remote station. An example is shown in Figure 4-7.

```

0      21.830 PSCT REQUEST ID=NONE
          I-FRAME ADDR=B P/F=0 N(R)=2 N(S)=2
          0 1.4 4 1 0.1 4 0 0.1 0 0 6.0 0 0 1.0 0 1 0.0 0
          SOH D DLE DC4 NUL DLE ACK NUL SOH NUL DLE NUL
          0 0.5 D 0 0.0 0 0 0.0 0 0 0.0 0 0 0.0 0 0 F.4 B 4 5.4 C
          NUL ] NUL NUL NUL NUL NUL NUL SI H E L
          4 C.4 F 2 0.4 D 4 7.5 2 2 E.5 3
          L O M G R . S
    
```

Figure 4-7. PSCT Trace Entry.

In the example shown in Figure 4-7 (see Figure 4-5 for the data format), note that the X.25 level 2 header is analyzed by CSDUMP in the line under REQUEST ID.

01 => Address=B	}	as defined by LAP-B
44 => CNTL=I frame P/F=0 N(R)=2 N(S)=2		
10 => Q bit=0, so this packet does not contain X.29 information, modulo 8 is in use, and LCGN=0		
14 => LCN=20		
00 => packet type=data packet, M=0 P(R)=0 P(S)=0	}	as defined by X.25 level 3 packet protocol

```

10 06      word 0 of DS fixed header
00 01      " 1 " " " "
00 10      " 2 " " " "
00 00      " 3 " " " "
5D 00      " 4 " " " "
00 00      " 5 " " " "
00 00      " 6 " " " "
00 0F      " 7 " " " "
    
```

```

DS appendage: H
               E
48             L
45             L
4C             O
4C
4F             etc.
•
•
•
    
```

continues into PSTX entry to show user's remote MPE log on request.

Whenever possible, the CSDUMP program converts the hex (or octal) codes to ASCII and displays each character beneath its code.

## PRTX Trace Entries

PRTX trace entries are generated only when the received frame is longer than 32 bytes. In this case, PRTX entries will be used to display the remainder of the data that was not displayed in the PRCT entry. Each PRTX trace entry can show a maximum of 32 bytes. If a frame exceeds this length, as many successive PRTX trace entries are generated as are necessary to display all the data received. An example is shown in Figure 4-8.

```

8      25.610 PRCT REQUEST ID=NONE
        I-FRAME ADDR=A P/F=0 N(R)=6 N(S)=5
        0 3.C A 1 0.1 4 6 4.0 A 0 5.0 0 0 0.0 0 1 0.A 0
        ETX J DLE DC4 d LF ENQ NUL NUL NUL DLE
        0 0.1 1 5 D.0 0 0 0.0 0 0 0.0 0 4 E.0 0 0 0.0 0
        NUL DC1 ] NUL NUL NUL NUL NUL N NUL NUL NUL
        0 0.0 A 0 5.0 0 0 0.0 0 1 0.8 0
        NUL LF ENQ NUL NUL NUL DLE NUL

9      25.610 PRTX REQUEST ID=NONE
        0 0.1 1 5 D.0 0 0 0.0 0 0 0.0 0 3 9.0 0 0 0.0 0
        NUL DC1 ] NUL NUL NUL NUL NUL 9 NUL NUL NUL
        0 0.4 8 5 0.3 3 3 0.3 0 3 0.2 0 2 F.2 0 4 D.5 0
        NUL H P 3 0 0 0 / M P
        4 5.2 0 4 9.5 6 2 0.4 3 2 E.3 0
        E I V C 0

10     25.610 PRTX REQUEST ID=NONE
        3 0.2 E 3 2.3 0 2 E.2 0 2 0.4 D 4 F.4 E 2 C.2 0
        0 2 0 M O N
        4 1.5 0 5 2.2 0 3 1.3 8 2 C.2 0 3 1.3 9 3 8.3 3
        A P R 1 8 1 9 8 3
        2 C.2 0 3 1.3 1 3 A.3 4 3 0.2 0
        1 1 : 4 0

11     25.610 PRTX REQUEST ID=NONE
        4 1.4 D 5 5.0 A
        A M U LF
  
```

Figure 4-3. PRTX Trace Entry

In the example, we see that the data displayed in the PRTX entry is continued from the preceding PRCT entry. Our example shows an MPE logon message. Whenever possible, the CSDUMP program converts the octal or hexadecimal codes to an ASCII character and displays the character beneath its code.



## PSTX Trace Entries

PSTX trace entries are generated only when the sent frame is longer than 32 bytes. In this case, PSTX entries will be used to display the remainder of the data that was not displayed in the PSCT entry. Each PSTX trace entry can show a maximum of 32 bytes. If a frame exceeds this length, as many successive PSTX trace entries are generated as are necessary to display all of the sent data. An example is shown in Figure 4-9.

```

0      21.830 PSCT REQUEST ID=NONE
          I-FRAME ADDR=B   P/F=0  N(R)=2  N(S)=2
          0 1.4 4 1 0.1 4 0 0.1 0 0 6.0 0 0 1.0 0 1 0.0 0
          SOH D   DLE DC4 NUL DLE ACK NUL SOH NUL DLE NUL
          0 0.5 D 0 0.0 0 0 0.0 0 0 0.0 0 0 F.4 8 4 5.4 C
          NUL ]   NUL NUL NUL NUL NUL NUL SI  H E L
          4 C.4 F 2 0.4 D 4 7.5 2 2 E.5 3
          L O M G R . S

1      21.830 PSTX REQUEST ID=NONE
          4 5.3 3 3 3.3 8 0 D.C E
          E 3 3 8 CR N
    
```

Figure 4-9. PSTX Trace Entry

In our example, we see that the data displayed in the PSTX entry is continued from the preceding PSCT entry. In this case, the user is logging on to the remote system. Note that the last character is an FCS byte.

Whenever possible, the CSDUMP program converts the octal or hexadecimal codes to an ASCII character and displays the character beneath its code.

## PCMP Trace Entries

A PCMP trace entry is generated each time a user request is completed. An example is shown in Figure 4-10.

```

12     9.200 PCMP REQUEST ID=%045606(!4B86)
          ERROR CODE=0      LAST RECOVERABLE ERROR CODE= 0
          #MSG SENT=2      #MSG RECV=1      STATE=CONNECTED
          # RECOVERABLE ERR=0      # IRRECOVERABLE ERR=0
    
```

Figure 4-10. PCMP Trace Entry.

The meanings of the various items are as follows:

- |                              |                                                                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| ERROR CODE:                  | The code of the request's most recent Recoverable Error (see the CS trace section of the <i>Data Communications Handbook</i> for error codes). |
| LAST RECOVERABLE ERROR CODE: | If a Recoverable Error occurred previously, this identifies its error code.                                                                    |
| # MSG SENT:                  | The total number of frames that have so far been sent for this connection.                                                                     |

# MSG RECV:

The total number of frames that have been received so far for this connection.

STATE:

The line state after the completion of the user request. In the example it is in the connected state.

# RECOVERABLE ERR:

The total number of Recoverable Errors that have occurred so far for this connection.

# IRRECOVERABLE ERR

The total number of Irrecoverable Errors that have occurred so far for this connection.

## End of Trace and Line Information Messages

The END OF TRACE . . . message appears in the listing when the line being traced is closed. The message tells you the decimal logical number of the device (11 in the example in Figure 4-11) and indicates that the line's activities are no longer being monitored by the trace facility. It is followed by the Line Information Display, showing the state of the line just before tracing was stopped.

```
*****
* END OF TRACE FOR DEVICE 11 *
*****

*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 3          LOGICAL DEV. NUMBER: 11 *
* DEV. TYPE: 17          SUBTYPE: 3   VER: A.05.06 *
*          0123456789012345 *
* COPTIONS: 0000100101000000 *
* AOPTIONS: 0000001100001101 *
* DOPTIONS: 0000000000000111 *
* NETWORK'ID: 0000000000000000 *
* NUMBUFFERS: 242        BUFFSIZE: 514 (WORDS) *
* INSPEED: 7000          OUTSPEED: 7000 *
* MISCARRAY:          RECEIVE TIMEOUT: 20 SECS. *
*                   LOCAL TIMEOUT: 60 SECS. *
*                   CONNECT TIMEOUT: 50 SECS. *
*                   RESPONSE TIMEOUT: 300 HSECS. *
*                   LINE BID TIMEOUT: 60 SECS. *
*                   NO. ERROR RETRIES: 20 *
*                   CLEAR-TO-SEND DELAY: 00.0 SECS. *
*                   DATA-SET-READY DELAY: DISABLED. *
*                   TRANSMISSION MODE: DUPLEX. *
*                   MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: IOINPO *
* DOWNLOAD FILE: CSDLAPBO *
* CTRACEINFO: ENTRIES=16 MASK=011111000 *
*                   TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0 INDEX=0 *
* IDLIST: ENTRIES=0 INDEX=0 *
* ERRORCODE: RECOVERABLE=0 IRRECOVERABLE=202 *
* MSGSENT: 54          MSGRECV: 34 *
* RECOVERERRORS: 0          IRRECOVERERRORS: 0 *
*****
```

Figure 4-11. End of Trace and Closing Line Information.

Note the counts of messages sent, messages received, and recoverable and irrecoverable errors that have transpired while the trace facility was enabled.

## THE DSDUMP FORMATTING PROGRAM

The CSDUMP program formats the trace file to show all line activity by displaying all messages being sent out and received. CSDUMP will analyze only the level 2 (LAP-B) header. DSDUMP formats the trace file to allow for easy and quick analysis. DSDUMP can analyze all levels of X.25 protocol headers in the data, if you wish, that are defined in the 1980 CCITT standard such as diagnostic packets, modulo 8 and 128 decoding of the packet header, all 18 X.3 parameters, and PAD call requests and call confirmation packets. In general, for DS/X.25 DSDUMP allows you to troubleshoot any line problems or software protocol problems more easily than with CSDUMP which requires you to analyze all protocol headers except level 2 LAP-B.

DSDUMP segmentation requires a code segment size of 15285K words. This may require your system manager to reconfigure your system table size.

### Defining a Trace File for DSDUMP

DSDUMP allows you to specify the trace file by using a file equation for the formal file designator CSTRACE; DSDUMP will prompt the user (interactive mode only) for the name of the trace file if the CSTRACE file does not exist.

A sample file equation is:

```
FILE CSTRACE=DSTRCnnn.PUB.SYS
```

### Defining a Trace Listing File for DSDUMP

The formal file designator of the trace listing file for DSDUMP is DSLIST. In interactive mode, a file equation for the output file is not permitted. Instead, you will be prompted for the output destination.

## Initiating the DSDUMP Program

### RUNNING DSDUMP INTERACTIVELY

When the DSDUMP program is being run interactively, it is not necessary to specify any file equations. DSDUMP commands can be read from a file, but a file equation for the output file is not permitted. The program will ask you whether you want the output to go to the terminal or to the printer. If you do not specify a device, the program defaults to the line printer. If no priority is specified, the default is 6. After the FOPEN has been performed, you will be prompted for commands. If the output is going to the printer, all DSDUMP commands are echoed. If the output is going to the terminal, then after all messages have been listed, the CSTRACE file is rewound and control goes to the Command Interpreter.

If you are in Interactive Mode (that is, not a stream job), and a printer is enabled, pressing **CONTROL**Y will return control to the command interface, after you respond to a new output device, and will close the output file. If you are in Interactive Mode without a printer, pressing **CONTROL**Y will return control to the user.

## RUNNING DSDUMP IN BATCH MODE

A file equation for the CS trace file is required for batch jobs. However, file equations for the command input file and the output files are optional, since the default designators are \$STDINX and \$STDLIST. The formal designator for the list file is DSLIST. The HELP, NEWDEV, and NEWFILE commands are ignored in batch mode. Any error in the command file will terminate the program. If command input is supplied on \$STDINX, it must be terminated by :EOD if the GO command is not used.

## DSDUMP Commands

The following commands can be used with the DSDUMP program:

CLEAR	Resets all options to their default values.
DATA=	Places a limit on the number of words in the data section to be printed per frame.
DISPLAY	Shows the status of all commands and parameters.
ERRORS	To format only those requests whose completion entry has an error code not equal to zero.
EXIT	Terminates the program. This command may be used any time the user is prompted.
GO	To get out of the Command Interpreter and start the dump.
HELP	For an explanation of the commands. HELP does not accept any parameters. (Only allowed in a session.)
ONES	To include idle (-1) DS messages in the dump. The default is to exclude these messages.
NEWDEV	To specify a new output device. (Only allowed in a session.)
NEWFILE	To change CSTRACE files. (Only allowed in a session.)
PINS=	To format only those frames whose TO or FROM PIN is equal to one of the specified PINs. (Up to ten PINs are permitted.)
RANGE	To find the trace times of the first and last entries.
TIMES=	To format only those frames whose trace times are within the specified range.
TYPES=	To format only the specified type of DS messages. The parameters for the TYPES= command are:  COMMANDS      Formats the REMOTE command, Remote HELLO, Remote BYE, <u>CONTROL</u> Y message, <u>BREAK</u> message, RESUME message, ABORT message, KILLJOB message, and First Slave DSOPEN.  PTOP            Formats PREAD, PWRITE, PCONTROL, POPEN, PCLOSE, ACCEPT, and REJECT.

RFA	Formats RFA and IMAGE messages.
RTE	Formats RTE DS messages.
QTOQ	Formats QTOQ (NFT) DS messages.
TERMINAL	Formats PRINT messages, READ and READX messages, and FCONTROLS to the terminal.

ENABLE turns options on, and DISABLE turns options off. Otherwise, the syntax for these commands is identical.

Parameters can be ENABLEd or DISABLEd using either = or ,. That is, DISABLE=PLINE and DISABLE,PLINE are identical.

Only one parameter is permitted for each command. Additional parameters are flagged as errors.

The options for the ENABLE/DISABLE commands are:

#### High Level Command Parameters

DEFAULT	Using ENABLE=DEFAULT enables the following settings (explained in more detail below):  LEVEL2 LEVEL3 DS1 USERD PLINE ASCII OCTAL L3ALL all settings with an L2 prefix except L2STN  DISABLE=DEFAULT is meaningless.
LEVEL2	The X.25 level 2 display. Use ENABLE to see it, and DISABLE if you do not wish to see it.
LEVEL3	The X.25 level 3 display. Use ENABLE to see it, and DISABLE if you do not wish to see it.
USERD	Controls printing of the user data. The user data is contained in two areas: the first portion is contained in both the level 2 and level 3 display, while the remaining portion(s) is contained in the PRTX/PSTX entry(s). Thus, to see all of the user data, either level 2 or level 3 must be enabled. Otherwise, you would only see the last half of each display. For instance, to display level 3 and the user data, you could type the following:  DISABLE=LEVEL2 ENABLE=LEVEL3 DISABLE=L3ALL ENABLE=L3DATA GO

Or, to get the level 2 and user data display, you could type the following:

## Tracing and DSN/X.25 Line Activity

```
DISABLE=LEVEL3
DISABLE=L2ALL
ENABLE=L2CTX
ENABLE=LEVEL2
GO
```

- PROMPT** Prompt facility that asks the user, at the end of a full screen, whether or not to continue. Type n or N to stop. The program will return to the DSDUMP Command Interpreter. This command applies for interactive mode only.
- PLINE** Controls the printing of the line status after calling PRINTLINEINFO.
- ASCII** If enabled, ASCII format will be used whenever possible.
- OCTAL** As in ASCII, but using OCTAL.
- HEX** As in ASCII, but using HEX.

### High Level Command Parameters for Level 2 and Level 3

- L2ALL** Controls the entire level 2 display. Its primary use is when you only wish to see a single command. For example, you may only want to see level 2 SABM requests. You would type in the following commands:

```
DISABLE=L2ALL
ENABLE=L2SABM
GO
```

- L3ALL** As in L2ALL, but for level 3.
- L3HIGH** Controls the printing of the following calls:
- |           |              |
|-----------|--------------|
| Call      | Call Confirm |
| Clear     | Clear Conf   |
| Interrupt | Interr Conf  |
| RNR       | Reset        |
| Reset Con | Diagnostic   |
| Reject    |              |

- L2SUP** Controls level 2 supervisory calls (RNR, RR, and REJ).

### Level 2-specific Parameters

- L2CMP** Controls the display of Level 2 Completion entries.
- L2RNR** Controls the display of Level 2 Receive Not Ready frames.
- L2TXT** Controls the display of Level 2 STX and RTX entries. Does not affect user data display.
- L2UA** Controls the display of Level 2 UA frames.

L2FRMR	Controls the display of Level 2 FRMR frames.
L2DISC	Controls the display of Level 2 DISC frames.
L2SABM	Controls the display of Level 2 SABM frames.
L2REJ	Controls the display of Level 2 reject frames.
L2STN	Controls the display of Level 2 state transition entries. Enabling these entries results in a very long trace file. Typically, up to 80% of the trace file consists of these entries. HP suggests that you enable this option only upon request from your SE.
L2RR	Controls the display of Level 2 receive ready frames.
L2DM	Controls the display of Level 2 DM frames.
L2CTX	Controls the display of Level 2 control text frames. The information field of these frames contains the header information and the user data display for Level 3. You should enable this parameter when you are displaying any Level 3 information.

#### Level 3-specific Parameters

L3INT	Controls the display of Level 3 interrupt packets.
L3CALL	Controls the display of Level 3 call request packets.
L3DATA	Controls the display of Level 3 data packets. These frames contain the header information and some of the user data display for Level 3.
L3RESET	Controls the display of Level 3 reset packets.

Several commands can be combined on one line if they are separated with a semicolon (;). All parameters for a command must be on the same line. When the PINS= command or the TYPES= command is entered several times, it does not cancel the previous command, but instead is added to the previous parameters. The PINS= command checks for duplicate PINS. A new TIMES= or DATA= command, however, does replace the previous command. If a colon (:) is typed in the first column of a line, that line is assumed to contain an MPE command. An End-of-File will initiate the dump. The default designator is \$STDINX. The command file may be equated to \$NULL if no options are desired.

The file equation for the Command Interpreter is:

```
:FILE COMFILE=command file name
```



## Formatted DSDUMP Trace Listing

Sequence of commands used to generate example:

```
:FILE CSTRACE=DSTRC059.PUB.SYS
:RUN DSDUMP.PUB.SYS
HEWLETT-PACKARD CO. MON, APR 18, 1983 11:42 AM
DSDUMP DS/3000-X.25 TRACE DUMP HP32190B.00.00
OUTPUT LISTING TO PRINTER OR TERMINAL?P
>GO
>EXIT
:
```

- or -

```
:RUN DSDUMP.PUB.SYS
HEWLETT-PACKARD CO. MON, APR 18, 1983 11:42 AM
DSDUMP DS/3000-X.25 TRACE DUMP HP32190B.00.00
PLEASE ENTER CSTRACE FILE:DSTRC059.PUB.SYS
OUTPUT LISTING TO PRINTER OR TERMINAL?P
>GO
>EXIT
:
```

### EXAMPLE

```
HEWLETT-PACKARD CO. MON, APR 18, 1983, 11:42 AM
DSDUMP DS/3000-X.25 TRACE DUMP HP32190A.04.03
TRACE FILE IS DSTRC059.PUB.SYS
TRACE DATE IS MON, APR 18, 1983, 11:40 AM
CS LDEV = 11
DOWNLOAD FILE IS CSDLAPBO
>GO
Sent text is on the left, received text on the right
```

```
*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 3 LOGICAL DEV. NUMBER: 11 *
* DEV. TYPE: 17 SUBTYPE: 3 VER: A.05.06 *
* 0123456789012345 *
* COPTIONS: 0000100101000000 *
* AOPTIONS: 0000001100001101 *
* DOPTIONS: 0000000000000111 *
* NETWORK'ID: 0000000000000000 *
* NUMBUFFERS: 242 BUFFSIZE: 514 (WORDS) *
* INSPEED: 7000 OUTSPEED: 7000 *
* MISCARRAY: RECEIVE TIMEOUT: 20 SECS. *
* LOCAL TIMEOUT: 60 SECS. *
* CONNECT TIMEOUT: 50 SECS. *
* RESPONSE TIMEOUT: 300 HSECS. *
* LINE BID TIMEOUT: 60 SECS. *
* NO. ERROR RETRIES: 20 *
* CLEAR-TO-SEND DELAY: 00.0 SECS. *
```

Figure 4-12. DSDUMP Trace Listing.

```

*          DATA-SET-READY DELAY: DISABLED.      *
*          TRANSMISSION MODE: DUPLEX.           *
*          MMSTAT TRACE FACILITY: ENABLED.      *
* DRIVERNAM: IOINPO                             *
* DOWNLOAD FILE: CSDLAPBO                       *
* CTRACEINFO:  ENTRIES=16      MASK=011111000  *
*              TYPE OF TRACE = ALL, NOWRAP     *
* PHONELIST:   ENTRIES=0       INDEX=0         *
* IDLIST:      ENTRIES=0       INDEX=0         *
* ERRORCODE:   RECOVERABLE=0   IRRECOVERABLE=0 *
* MSGSENT:    0                MSGRECV: 0     *
* RECOVERERRS: 0              IRRECOVERERRS: 0 *
*****
oooooooooooooooooooooooooooooooooooooooooooo
o PCMP          STATE=DISCON.  o
o 2.30          LEVEL 2. ID=%044273 !48BBo
o Error Code=   0      Last Recov Err=0  o
o # MSG Sent=0   # MSG Rec=0      o
o # Recov Err=0  # Irrec Errs=0  o
oooooooooooooooooooooooooooooooooooooooooooo
oooooooooooooooooooooooooooooooooooooooooooo
o PCMP          STATE=DISCON.  o
o 2.32          LEVEL 2. ID=%045573 !4B7Bo
o Error Code=   0      Last Recov Err=0  o
o # MSG Sent=0   # MSG Rec=0      o
o # Recov Err=0  # Irrec Errs=0  o
oooooooooooooooooooooooooooooooooooooooooooo
+++++
+ PSCT      SABM          P/F=0      +
+ 2.65      LEVEL 2.          DCE +
+++++
+++++
+ PRCT      UA          P/F=0      +
+ 2.66      LEVEL 2.          DCE +
+++++
+++++
+ PSCT      I Frame N(R)= 0 P=0 N(S)= 0 +
+ 2.97      LEVEL 2.          DCE +
+ SCT/RCT Control Frame data display +
+ 020.000  373.000  372.000      +
+ DLE.NUL  !!! .NUL  !!! .NUL      +
+++++
* Length=8   Packet ID=251 %373  !FB *
* Type=Restart Request & Restart Ind. *
* Log Channel No=0      %000000 !0000 *
* Restart Cause =0      %000000 !0000 *
* DTE Restart          *
* Diagnostic Code=250   %000372 !00FA *
* TELENET. Line Stat Chng of down to up*
*****
+++++
+ PRCT      RR          N(R)= 1 P/F=0      +
+ 2.98      LEVEL 2.          DCE +
+++++

```

Figure 4-12. DSDUMP Trace Listing (continued).

Tracing and DSN/X.25 Line Activity

```

oooooooooooooooooooooooooooooooooooooooooooooooooooo
o PCMP STATE=CONN. o
o 2.98 LEVEL 2. ID=%044703 !49C3o
o Error Code= 0 Last Recov Err=0 o
o # MSG Sent=1 # MSG Rec=0 o
o # Recov Err=0 # Irrec Errs=0 o
oooooooooooooooooooooooooooooooooooooooooooooooooooo
+++++
+ PRCT I Frame N(R)= 1 P=0 N(S)= 0 +
+ 3.02 LEVEL 2. DTE +
+ SCT/RCT Control Frame data display +
+ 020.000 377.130 +
+ DLE.NUL !!! X +
+++++ LEVEL 3. ++++++
* Length=6 Packet ID=255 %377 !FF *
* Type=DTE/DCE Restart Confirmation *
* Log Channel No=0 %000000 !0000 *
*****
oooooooooooooooooooooooooooooooooooooooooooooooooooo
o PCMP STATE=CONN. o
o 3.03 LEVEL 2. ID=%044130 !4858o
o Error Code= 0 Last Recov Err=0 o
o # MSG Sent=1 # MSG Rec=1 o
o # Recov Err=0 # Irrec Errs=0 o
oooooooooooooooooooooooooooooooooooooooooooooooooooo

+++++
+ PSCT RR N(R)= 1 P/F=0 +
+ 3.03 LEVEL 2. DTE +
+++++
+++++
+ PSCT I Frame N(R)= 1 P=0 N(S)= 1 +
+ 9.19 LEVEL 2. DCE +
+ SCT/RCT Control Frame data display +
+ 020.024 013.020 200.000 +
+ DLE.DC4 VT .DLE !!! .NUL +
+++++ LEVEL 3. ++++++
* Length=8 Packet ID=11 %013 !0B *
* Type=Call Request and Incoming Call *
* Log Channel No=20 %000024 !0014 *
* Called Address= 8 *
*****

+++++
+ PRCT RR N(R)= 2 P/F=0 +
+ 9.20 LEVEL 2. DCE +
+++++
oooooooooooooooooooooooooooooooooooooooooooooooooooo
o PCMP STATE=CONN. o
o 9.20 LEVEL 2. ID=%045606 !4B86o
o Error Code= 0 Last Recov Err=0 o
o # MSG Sent=2 # MSG Rec=1 o
o # Recov Err=0 # Irrec Errs=0 o
oooooooooooooooooooooooooooooooooooooooooooooooooooo
+++++
+ PRCT I Frame N(R)= 2 P=0 N(S)= 1 +

```

Figure 4-12. DSDUMP Trace Listing (continued).

```

+ 12.83          LEVEL 2.                      DTE +
+ SCT/RCT Control Frame data display          +
+ 020.024 017.074                              +
+ DLE.DC4 SI . <                                +
+++++          LEVEL 3. ++++++
* Length=6 Packet ID=15 %017 !0F *
* Type=Call Accepted                          *
* Log Channel No=20 %000024 !0014 *
*****
oooooooooooooooooooooooooooooooooooooooooooo
o PCMP STATE=CONN. o
o 12.83          LEVEL 2. ID=%044375 !48FD o
o Error Code= 0 Last Recov Err=0 o
o # MSG Sent=2 # MSG Rec=2 o
o # Recov Err=0 # Irrec Errs=0 o
oooooooooooooooooooooooooooooooooooooooooooo

+++++
+ PSCT RR N(R)= 2 P/F=0 +
+ 12.84          LEVEL 2.                      DTE +
+++++
+++++
+ PSCT I Frame N(R)= 2 P=0 N(S)= 2 +
+ 21.83          LEVEL 2.                      DCE +
+ SCT/RCT Control Frame data display          +
+ 020.024 000.020 006.000 001.000 +
+ DLE.DC4 NUL.DLE ACK.NUL SOH.NUL +
+ 020.000 000.135 000.000 000.000 +
+ DLE.NUL NUL. ] NUL.NUL NUL.NUL +
+ 000.000 017.110 105.114 114.117 +
+ NUL.NUL SI . H E. L L. O +
+ 040.115 107.122 056.123 +
+ . M G. R .. S +
+++++          LEVEL 3. ++++++
* Length=32 Packet ID=0 %000 !00 *
* Type=DTE/DCE Data Packet *
* Log Channel No=20 %000024 !0014 *
* P(R)=0 P(S)=0 Q=0 M=0 D=0 *
* User Data Display *
* 020.006 000.001 000.020 000.000 *
* DLE.ACK NUL.SOH NUL.DLE NUL.NUL *
* 135.000 000.000 000.000 000.017 *
* ].NUL NUL.NUL NUL.NUL NUL.SI *
* 110.105 114.114 117.040 115.107 *
* H. E L. L O. M. G *
* 122.056 123. *
* R. . S. *
*****
*****
* Time=21.83 *
* From PIN=%135 To PIN=%0 *
* REMOTE HELLO request *
* 010006 HeadLength (words)=16 *
* 000001 Remote Computer ID=1 *
* 000000 Substream Type=%000000 *

```

Figure 4-12. DSDUMP Trace Listing (continued).

Tracing and DSN/X.25 Line Activity

```
* 000017      DSDataL (bytes)=15      *  
* Header:                                          *  
* %010006 000001 000020 000000 056400 *  
* 000000 000000 000017                *  
* Appendage:                                     *  
* 044105 046114 047440 046507 051056 *  
* H E L L O      M G R .                  *  
* 051440                                       *  
* S                                           *  
* DS MESSAGE IS TRUNCATED                   *
```

```
*****  
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^  
^ PSTX LIMIT=138      Entry Length=6  ^  
^ 105.063  063.070  015.316          ^  
^   E 3    3    8  CR   !!!           ^  
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```

```
+++++  
+ PRCT      RR      N(R)= 3 P/F=0      +  
+ 21.85     LEVEL 2.                   DCE +  
+++++  
ooooooooooooooooooooooooooooooooooooo  
o PCMP                        STATE=CONN.  o  
o 21.85     LEVEL 2. ID=%044306 !48C6o  
o Error Code= 0 Last Recov Err=0  o  
o # MSG Sent=3      # MSG Rec=2    o  
o # Recov Err=0    # Irrec Errs=0  o  
ooooooooooooooooooooooooooooooooooooo  
+++++  
+ PRCT      I Frame N(R)= 3 P=0 N(S)= 2 +  
+ 22.98     LEVEL 2.                   DTE +  
+ SCT/RCT Control Frame data display +  
+ 020.024 041.130                    +  
+ DLE.DC4  !. X                        +  
+++++ LEVEL 3. ++++++  
* Length=6 Packet ID=1 %001 !01 *  
* Type=DTE/DCE Receive Ready (RR) *  
* Log Channel No=20 %000024 !0014 *  
* P(R)=1 %000001 !1 *  
*****  
ooooooooooooooooooooooooooooooooooooo  
o PCMP                        STATE=CONN.  o  
o 22.98     LEVEL 2. ID=%043403 !4703o  
o Error Code= 0 Last Recov Err=0  o  
o # MSG Sent=3      # MSG Rec=3    o  
o # Recov Err=0    # Irrec Errs=0  o  
ooooooooooooooooooooooooooooooooooooo
```

```
+++++  
+ PSCT      RR      N(R)= 3 P/F=0      +  
+ 22.99     LEVEL 2.                   DTE +  
+++++
```

```
+++++  
+ PRCT      I Frame N(R)= 3 P=0 N(S)= 3 +  
+ 23.83     LEVEL 2.                   DTE +  
+ SCT/RCT Control Frame data display +
```

Figure 4-12. DSDUMP Trace Listing (continued).

```

+ 020.024 040.013 005.000 000.000 +
+ DLE.DC4 .VT ENQ.NUL NUL.NUL +
+ 023.000 000.021 135.000 000.000 +
+ DC3.NUL NUL.DC1 ].NUL NUL.NUL +
+ 000.000 006.000 001.377 376.000 +
+ NUL.NUL ACK.NUL SOH.!!! !!! .NUL +
+ 000.005 +
+ NUL.ENQ +
+++++ LEVEL 3. ++++++
* Length=28 Packet ID=0 %000 !00 *
* Type=DTE/DCE Data Packet *
* Log Channel No=20 %000024 !0014 *
* P(R)=1 P(S)=0 Q=0 M=0 D=0 *
* User Data Display *
* 013.005 000.000 000.023 000.000 *
* VT .ENQ NUL.NUL NUL.DC3 NUL.NUL *
* 021.135 000.000 000.000 000.006 *
* DC1. ] NUL.NUL NUL.NUL NUL.ACK *
* 000.001 377.376 000.000 005. *
* NUL.SOH !!!!!! NUL.NUL ENQ. *
*****
*****
* Time=23.83 *
* From PIN=%21 To PIN=%135 *
* FCONTROL-TO TERM. request *
* File Num=1 *
* Control Code=-2 *
* Param=0 *
* 005405 HeadLength (words)=11 *
* 000000 Remote Computer ID=0 *
* 000000 Substream Type=%000000 *
* 000006 DSDataL (bytes)=6 *
* Header: *
* %005405 000000 000023 000000 010535 *
* 000000 000000 000006 *
* Appendage: *
* 000001 177776 000000 *
* . . . *
*****
oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
o PCMP STATE=CONN. o
o 23.83 LEVEL 2. ID=%044334 !48DCo
o Error Code= 0 Last Recov Err=0 o
o # MSG Sent=3 # MSG Rec=4 o
o # Recov Err=0 # Irrec Errs=0 o
oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

+++++
+ PSCT RR N(R)= 4 P/F=0 +
+ 23.84 LEVEL 2. DTE +
+++++
+++++
+ PSCT I Frame N(R)= 4 P=0 N(S)= 3 +
+ 23.98 LEVEL 2. DCE +
+ SCT/RCT Control Frame data display +

```

Figure 4-12. DSDUMP Trace Listing (continued).

Tracing and DSN/X.25 Line Activity

```

+ 020.024 041.000      +
+ DLE.DC4  !.NUL      +
+++++ LEVEL 3. ++++++
* Length=6  Packet ID=1  %001 !01 *
* Type=DTE/DCE Receive Ready (RR) *
* Log Channel No=20  %000024 !0014 *
* P(R)=1  %000001 !1 *
*****
+ PRCT      RR      N(R)= 4 P/F=0      +
+ 23.99      LEVEL 2.      DCE +
+++++
oooooooooooooooooooooooooooooooooooooooo
o PCMP      STATE=CONN.      o
o 23.99      LEVEL 2. ID=%043444 !4724o
o Error Code= 0  Last Recov Err=0 o
o # MSG Sent=4      # MSG Rec=4      o
o # Recov Err=0      # Irrec Errs=0 o
oooooooooooooooooooooooooooooooooooooooo

+++++
+ PSCT      I Frame N(R)= 4 P=0 N(S)= 4 +
+ 24.54      LEVEL 2.      DCE +
+ SCT/RCT Control Frame data display +
+ 020.024 042.012 005.000 001.200 +
+ DLE.DC4  ".LF  ENQ.NUL  SOH.!!! +
+ 023.000 000.135 021.000 000.000 +
+ DC3.NUL  NUL.  ] DC1.NUL  NUL.NUL +
+ 000.000 004.000 001.000 000.000 +
+ NUL.NUL  EOT.NUL  SOH.NUL  NUL.NUL +
+++++ LEVEL 3. ++++++
* Length=26  Packet ID=0  %000 !00 *
* Type=DTE/DCE Data Packet *
* Log Channel No=20  %000024 !0014 *
* P(R)=1  P(S)=1  Q=0  M=0  D=0 *
* User Data Display *
* 012.005 000.001 200.023 000.000 *
* LF .ENQ  NUL.SOH  !!! .DC3  NUL.NUL *
* 135.021 000.000 000.000 000.004 *
*  ].DC1  NUL.NUL  NUL.NUL  NUL.EOT *
* 000.001 000.000 000. *
* NUL.SOH  NUL.NUL  NUL. *
*****
*****
* Time=24.54 *
* From PIN=%135 To PIN=%21 *
* FCONTROL-TO TERM. reply *
* Status Word=%000001 *
* Status=CCG *
* Param=0 *
* 005005  HeadLength (words)=10 *
* 000001  Remote Computer ID=1 *
* 000000  Substream Type=%000000 *
* 000004  DSDataL (bytes)=4 *
* Header: *

```

Figure 4-12. DSDUMP Trace Listing (continued).

```

* %005005 000001 100023 000000 056421 *
* 000000 000000 000004 *
* Appendage: *
* 000001 000000 *
* . . . *
*****
+++++
+ PRCT RR N(R)= 5 P/F=0 +
+ 24.55 LEVEL 2. DCE +
+++++
oooooooooooooooooooooooooooooooooooooooooooo
o PCMP STATE=CONN. o
o 24.56 LEVEL 2. ID=%043561 !4771o
o Error Code= 0 Last Recov Err=0 o
o # MSG Sent=5 # MSG Rec=4 o
o # Recov Err=0 # Irrec Errs=0 o
oooooooooooooooooooooooooooooooooooooooooooo
+++++
+ PRCT I Frame N(R)= 5 P=0 N(S)= 4 +
+ 24.68 LEVEL 2. DTE +
+ SCT/RCT Control Frame data display +
+ 020.024 102.013 005.000 000.000 +
+ DLE.DC4 B.VT ENQ.NUL NUL.NUL +
+ 023.000 000.021 135.000 000.000 +
+ DC3.NUL NUL.DC1 ].NUL NUL.NUL +
+ 000.000 006.000 001.377 376.000 +
+ NUL.NUL ACK.NUL SOH.!!! !!! .NUL +
+ 000.233 +
+ NUL.!!! +
+++++
* Length=28 Packet ID=0 %000 !00 *
* Type=DTE/DCE Data Packet *
* Log Channel No=20 %000024 !0014 *
* P(R)=2 P(S)=1 Q=0 M=0 D=0 *
* User Data Display *
* 013.005 000.000 000.023 000.000 *
* VT .ENQ NUL.NUL NUL.DC3 NUL.NUL *
* 021.135 000.000 000.000 000.006 *
* DC1. ] NUL.NUL NUL.NUL NUL.ACK *
* 000.001 377.376 000.000 233. *
* NUL.SOH !!!!!! NUL.NUL !!! *
*****
* Time=24.68 *
* From PIN=%21 To PIN=%135 *
* FCONTROL-TO TERM. request *
* File Num=1 *
* Control Code=-2 *
* Param=0 *
* 005405 HeadLength (words)=11 *
* 000000 Remote Computer ID=0 *
* 000000 Substream Type=%000000 *
* 000006 DSDataL (bytes)=6 *
* Header: *

```

Figure 4-12. DSDUMP Trace Listing (continued).



Tracing and DSN/X.25 Line Activity

```

* %005405 000000 000023 000000 010535 *
* 000000 000000 000006 *
* Appendage: *
* 000001 177776 000000 *
* . . . . . *
*****
oooooooooooooooooooooooooooooooooooooooooooooooooooo
o PCMP STATE=CONN. o
o 24.69 LEVEL 2. ID=%045341 !4AE1o
o Error Code= 0 Last Recov Err=0 o
o # MSG Sent=5 # MSG Rec=5 o
o # Recov Err=0 # Irrec Errs=0 o
oooooooooooooooooooooooooooooooooooooooooooooooooooo

+++++
+ PSCT RR N(R)= 5 P/F=0 +
+ 24.69 LEVEL 2. DTE +
+++++
+++++
+ PSCT I Frame N(R)= 5 P=0 N(S)= 5 +
+ 25.50 LEVEL 2. DCE +
+ SCT/RCT Control Frame data display +
+ 020.024 104.012 005.000 001.200 +
+ DLE.DC4 D.LF ENQ.NUL SOH.!!! +
+ 023.000 000.135 021.000 000.000 +
+ DC3.NUL NUL. ] DC1.NUL NUL.NUL +
+ 000.000 004.000 001.000 000.000 +
+ NUL.NUL EOT.NUL SOH.NUL NUL.NUL +
+++++ LEVEL 3. ++++++
* Length=26 Packet ID=0 %000 !00 *
* Type=DTE/DCE Data Packet *
* Log Channel No=20 %000024 !0014 *
* P(R)=2 P(S)=2 Q=0 M=0 D=0 *
* User Data Display *
* 012.005 000.001 200.023 000.000 *
* LF .ENQ NUL.SOH !!! .DC3 NUL.NUL *
* 135.021 000.000 000.000 000.004 *
* ].DC1 NUL.NUL NUL.NUL NUL.EOT *
* 000.001 000.000 000. *
* NUL.SOH NUL.NUL NUL. *
*****
*****
* Time=25.50 *
* From PIN=%135 To PIN=%21 *
* FCONTROL-TO TERM. reply *
* Status Word=%000001 *
* Status=CCG *
* Param=0 *
* 005005 HeadLength (words)=10 *
* 000001 Remote Computer ID=1 *
* 000000 Substream Type=%000000 *
* 000004 DSDataL (bytes)=4 *
* Header: *
* %005005 000001 100023 000000 056421 *
* 000000 000000 000004 *

```

Figure 4-12. DSDUMP Trace Listing (continued).

```

* Appendage:
* 000001 000000
* . . .
*****
+++++
+ PRCT      RR      N(R)= 6 P/F=0      +
+ 25.51      LEVEL 2.                  DCE +
+++++
oooooooooooooooooooooooooooooooooooooooo
o PCMP                      STATE=CONN.  o
o 25.52      LEVEL 2. ID=%044540 !4960o
o Error Code=  0  Last Recov Err=0  o
o # MSG Sent=6      # MSG Rec=5      o
o # Recov Err=0     # Irrec Errs=0    o
oooooooooooooooooooooooooooooooooooooooo
+++++
+ PRCT      I Frame N(R)= 6 P=0 N(S)= 5 +
+ 25.61      LEVEL 2.                  DTE +
+ SCT/RCT Control Frame data display +
+ 020.024 144.012 005.000 000.000 +
+ DLE.DC4  d.LF  ENQ.NUL  NUL.NUL +
+ 020.240 000.021 135.000 000.000 +
+ DLE.!!!  NUL.DC1  ].NUL  NUL.NUL +
+ 000.000 116.000 000.000 000.012 +
+ NUL.NUL  N.NUL  NUL.NUL  NUL.LF +
+ 005.000 000.000 020.200 +
+ ENQ.NUL  NUL.NUL  DLE.!!! +
+++++
* Length=32 Packet ID=0 %000 !00 *
* Type=DTE/DCE Data Packet *
* Log Channel No=20 %000024 !0014 *
* P(R)=3 P(S)=2 Q=0 M=0 D=0 *
* User Data Display *
* 012.005 000.000 000.020 240.000 *
* LF .ENQ NUL.NUL NUL.DLE !!! .NUL *
* 021.135 000.000 000.000 000.116 *
* DC1. ] NUL.NUL NUL.NUL NUL. N *
* 000.000 000.000 012.005 000.000 *
* NUL.NUL NUL.NUL LF .ENQ NUL.NUL *
* 000.020 200. *
* NUL.DLE !!! *
*****
*****
* Time=25.61 *
* From PIN=%21 To PIN=%135 *
* PRINT-TO TERMINAL request *
* AttachIO Parm1=%000000 *
* AttachIO Parm2=%000000 *
* 005005 HeadLength (words)=10 *
* 000000 Remote Computer ID=0 *
* 120000 Substream Type=%120000 *
* 000116 DSDataL (bytes)=78 *
* Header: *
* %005005 000000 000020 120000 010535 *

```

Figure 4-12. DSDUMP Trace Listing (continued).



```

*          NO. ERROR RETRIES: 20          *
*          CLEAR-TO-SEND DELAY: 00.0 SECS. *
*          DATA-SET-READY DELAY: DISABLED. *
*          TRANSMISSION MODE: DUPLEX.      *
*          MMSTAT TRACE FACILITY: ENABLED. *
* DRIVENAME: IOINPO                       *
* DOWNLOAD FILE: CSDLAPB0                 *
* CTRACEINFO:  ENTRIES=16      MASK=011111000 *
*              TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST:  ENTRIES=0        INDEX=0      *
* IDLIST:     ENTRIES=0        INDEX=0      *
* ERRORCODE:  RECOVERABLE=0    IRRECOVERABLE=202 *
* MSGSENT:   54                MSGRECV: 34  *
* RECOVERRO: 0                 IRRECOVERRO: 0 *
*****
oooooooooooooooooooooooooooooooooooooooooooo
o PCMP                STATE=DISCON.  o
o 86.33              LEVEL 2. ID=%044067 !4837o
o Error Code=      0    Last Recov Err=0 o
o # MSG Sent=54    # MSG Rec=34      o
o # Recov Err=0    # Irrec Errs=0    o
oooooooooooooooooooooooooooooooooooooooooooo
>EXIT

```

Figure 4-12. DSDUMP Trace Listing (continued).

## DSDUMP Listing Header Message

The output heading provides information about the trace file being analyzed.

```
HEWLETT-PACKARD CO.  MON, APR 18, 1983, 11:42 AM
DSDUMP DS/3000-X.25 TRACE DUMP HP32190A.04.03
TRACE FILE IS DSTRC059.PUB.SYS
TRACE DATE IS MON, APR 18, 1983, 11:40 AM
CS LDEV = 11
  DOWNLOAD FILE IS CSDLAPB0
>GO
```

Figure 4-13. Output Heading.

Item	Meaning
MON, APR 18, 1983, 11:42 AM	Date run
TRACE FILE IS ...	Provides name of trace file being analyzed. In our case, it is DSTRC059.PUB.SYS.
TRACE DATE IS ...	Date trace file was created. In our case, it is MON, APR 18, 1983, 11:40 AM.
CS LDEV = ...	LDEV of device being traced. In our case, it is 11.
DOWNLOAD FILE IS ...	Defines the download file being used. In our case, it is CSDLAPB0; therefore, we are using the LAP-B protocol.
>GO	DSDUMP command that the user has entered.

## Begin Tracing and Line Information Messages

Sent text is on the left, received text on the right

```
*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 3          LOGICAL DEV. NUMBER: 11 *
* DEV. TYPE: 17         SUBTYPE: 3   VER: A.05.06 *
*           0123456789012345 *
*   COPTIONS: 0000100101000000 *
*   AOPTIONS: 0000001100001101 *
*   DOPTIONS: 0000000000000111 *
* NETWORK ID: 0000000000000000 *
* NUMBUFFERS: 242        BUFFSIZE: 514 (WORDS) *
* INSPEED: 7000          OUTSPEED: 7000 *
* MISCARRAY:            RECEIVE TIMEOUT: 20 SECS. *
*                       LOCAL TIMEOUT: 60 SECS. *
*                       CONNECT TIMEOUT: 50 SECS. *
*                       RESPONSE TIMEOUT: 300 HSECS. *
*                       LINE BID TIMEOUT: 60 SECS. *
*                       NO. ERROR RETRIES: 20 *
*                       CLEAR-TO-SEND DELAY: 00.0 SECS. *
*                       DATA-SET-READY DELAY: DISABLED. *
*                       TRANSMISSION MODE: DUPLEX. *
*                       MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: IOINPO *
* DOWNLOAD FILE: CSDLAPBO *
* CTRACEINFO: ENTRIES=16 MASK=011111000 *
*             TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0 INDEX=0 *
* IDLIST: ENTRIES=0 INDEX=0 *
* ERRORCODE: RECOVERABLE=0 IRRECOVERABLE=0 *
* MSGSENT: 0 MSGRECV: 0 *
* RECOVERERRORS: 0 IRRECOVERERRORS: 0 *
*****
```

Figure 4-14. Line Information Display.

Item	Meaning
Sent text is on the left...	Implies PSCT and PSTX entries will appear on the left side of the page, while PRCT and PRTX entries will appear on the right side.

The Line Information Display that follows can be interpreted as in CSDUMP (page 4-15).

## DSDUMP Format for PRCT/PRTX and PSCT/PSTX entries

The following is the data format as displayed by DSDUMP from the CS Trace file for PRCT/PRTX or PSCT/PSTX entries. Refer to Figure 4-5 for the data format in the CSTRACE file.

```

+++++
+ PRCT/PSCT          control field values  +
+ time stamp        LEVEL 2.              +
+                               Addr  1    +
+ Information field display                +
+ (if present)                                     +
+-----+-----+-----+-----+-----+
* length  2          Type field value  3    *
*
* Type field interpretation
* Logical channel identifier (LCI)  4=value  3
* Packet-specific information
*
* If type=Data and not X.29 (Q=0) then USER DATA
* is displayed with a . between left and right
* bytes of each word
*****
* time stamp
*   From PIN=%nnn To PIN=%nnn
* DS msg/stream class interpretation
* Header words  Interpretation of
*   "           header words using DS
*   "           message formats
* Header:
* raw header data
* Appendage:
* (optional)
* raw data
* Data:
* (optional)
* user data
*****
^ PRTX/PSTX  DATA limit value  length  2  ^
^                               (set by user) ^
^
^ USER DATA continued
^-----^

```

appears only if level 2 is an I-frame

appears only if level 3 is data packet and Q=0

appears only if frame is longer than 32 bytes

See footnotes on next page.

Figure 4-15. The DSDUMP Data Format.

Footnotes:

<sup>1</sup> Addr A = DTE } as defined  
 Addr B = DCE } by LAP-B

<sup>2</sup> where length = length of trace entry in bytes

<sup>3</sup> where value is given in decimal, %octal, or !hexadecimal

<sup>4</sup> where LCI=

0 1 2 3 4 5 6 7 8 9 10 11

L C G N	L C N
---------	-------

Figure 4-15. The DSDUMP Data Format (continued).



## PRCT Trace Entries

```

+++++++
+ PRCT      I Frame N(R)= 6 P=0 N(S)= 5 +
+ 25.61      LEVEL 2.                      DTE +
+ SCT/RCT Control Frame data display +
+ 020.024 144.012 005.000 000.000 +
+ DLE.DC4 d.LF ENQ.NUL NUL.NUL +
+ 020.240 000.021 135.000 000.000 +
+ DLE.!!! NUL.DC1 ] .NUL NUL.NUL +
+ 000.000 116.000 000.000 000.012 +
+ NUL.NUL N.NUL NUL.NUL NUL.LF +
+ 005.000 000.000 020.200 +
+ ENQ.NUL NUL.NUL DLE.!!! +
+++++++ LEVEL 3. ++++++++
* Length=32 Packet ID=0 %000 !00 *
* Type=DTE/DCE Data Packet *
* Log Channel No=20 %000024 !0014 *
* P(R)=3 P(S)=2 Q=0 M=0 D=0 *
* User Data Display *
* 012.005 000.000 000.020 240.000 *
* LF .ENQ NUL.NUL NUL.DLE !!! .NUL *
* 021.135 000.000 000.000 000.116 *
* DC1. ] NUL.NUL NUL.NUL NUL. N *
* 000.000 000.000 012.005 000.000 *
* NUL.NUL NUL.NUL LF .ENQ NUL.NUL *
* 000.020 200. *
* NUL.DLE !!! . *
*****
*****
* Time=25.61 *
* From PIN=%21 To PIN=%135 *
* PRINT-TO TERMINAL request *
* AttachIO Parm1=%000000 *
* AttachIO Parm2=%000000 *
* 005005 HeadLength (words)=10 *
* 000000 Remote Computer ID=0 *
* 120000 Substream Type=%120000 *
* 000116 DSDataL (bytes)=78 *
* Header: *
* %005005 000000 000020 120000 010535 *
* 000000 000000 000116 *
* Appendage: *
* 000000 000000 *
* . . . *
* Data: *
* 005005 000000 000020 100040 *
* . . . . . *
* DS MESSAGE IS TRUNCATED *
*****

```

Figure 4-16. PRCT Trace Entry.

The X.25 Level 2 header interpretation here tells us that ADDR=DTE (it would be interpreted as A by CSDUMP), and this is an I frame so the Information field is present and is displayed.

The X.25 Level 3 header interpretation tells us this is a data packet on logical channel 20 (or virtual circuit 20) and since Q=0 the user data display shows the beginning of a DS message.

The DS level header interpretation tells us this is a print to terminal request, from PIN %21 on the remote system to PIN %135 on this system.

## PSCT Trace Entries

```

+++++
+ PSCT      I Frame N(R)= 2 P=0 N(S)= 2 +
+ 21.83      LEVEL 2.                    DCE +
+ SCT/RCT Control Frame data display +
+ 020.024  000.020  006.000  001.000  +
+ DLE.DC4  NUL.DLE  ACK.NUL  SOH.NUL  +
+ 020.000  000.135  000.000  000.000  +
+ DLE.NUL  NUL.   ] NUL.NUL  NUL.NUL  +
+ 000.000  017.110  105.114  114.117  +
+ NUL.NUL  SI . H   E. L   L. O   +
+ 040.115  107.122  056.123                +
+ . M     G. R     .. S                +
+++++ LEVEL 3. ++++++
* Length=32 Packet ID=0 %000 !00 *
* Type=DTE/DCE Data Packet *
* Log Channel No=20 %000024 !0014 *
* P(R)=0 P(S)=0 Q=0 M=0 D=0 *
* User Data Display *
* 020.006  000.001  000.020  000.000  *
* DLE.ACK  NUL.SOH  NUL.DLE  NUL.NUL  *
* 135.000  000.000  000.000  000.017  *
* ].NUL   NUL.NUL  NUL.NUL  NUL.SI   *
* 110.105  114.114  117.040  115.107  *
* H. E    L. L    O.      M. G    *
* 122.056  123.                *
* R. .    S.                *
*****
*****
* Time=21.83 *
* From PIN=%135 To PIN=%0 *
* REMOTE HELLO request *
* 010006 HeadLength (words)=16 *
* 000001 Remote Computer ID=1 *
* 000000 Substream Type=%000000 *
* 000017 DSDataL (bytes)=15 *
* Header: *
* %010006 000001 000020 000000 056400 *
* 000000 000000 000017 *
* Appendage: *
* 044105 046114 047440 046507 051056 *
* H E L L O M G R . *
* 051440 *
* S *
* DS MESSAGE IS TRUNCATED *
*****

```

Figure 4-17. PSCT Trace Entry.

The X.25 Level 2 header interpretation here tells us ADDR=DCE (it would be interpreted as B by CSDUMP), and this is an I frame so the Information field is present and is displayed.

The X.25 Level 3 header interpretation tells us this is a data packet on logical channel 20 (or virtual circuit 20), and since Q=0, the user data display shows the beginning of a DS message.

The DS level header interpretation tells us this is a :REMOTE HELLO request from PIN %135 to the remote system. Examination of the appendage section shows the beginning of the user's logon.

**PRTX Trace Entries**

```

+++++
+ PRCT      I Frame N(R)= 6 P=0 N(S)= 5 +
+ 25.61          LEVEL 2.                DTE +
+ SCT/RCT Control Frame data display +
+ 020.024 144.012 005.000 000.000 +
+ DLE.DC4  d.LF  ENQ.NUL  NUL.NUL  +
+ 020.240 000.021 135.000 000.000 +
+ DLE.!!!  NUL.DC1  ] .NUL  NUL.NUL  +
+ 000.000 116.000 000.000 000.012 +
+ NUL.NUL  N.NUL  NUL.NUL  NUL.LF  +
+ 005.000 000.000 020.200          +
+ ENQ.NUL  NUL.NUL  DLE.!!!          +
+++++
* Length=32 Packet ID=0 %000 !00 *
* Type=DTE/DCE Data Packet *
* Log Channel No=20 %000024 !0014 *
* P(R)=3 P(S)=2 Q=0 M=0 D=0 *
* User Data Display *
* 012.005 000.000 000.020 240.000 *
* LF .ENQ NUL.NUL NUL.DLE !!! .NUL *
* 021.135 000.000 000.000 000.116 *
* DC1. ] NUL.NUL NUL.NUL NUL. N *
* 000.000 000.000 012.005 000.000 *
* NUL.NUL NUL.NUL LF .ENQ NUL.NUL *
* 000.020 200. *
* NUL.DLE !!! . *
*****
*****
* Time=25.61 *
* From PIN=%21 To PIN=%135 *
* PRINT-TO TERMINAL request *
* AttachIO Parm1=%000000 *
* AttachIO Parm2=%000000 *
* 005005 HeadLength (words)=10 *
* 000000 Remote Computer ID=0 *
* 120000 Substream Type=%120000 *
* 000116 DSDataL (bytes)=78 *
* Header: *
* %005005 000000 000020 120000 010535 *
* 000000 000000 000116 *
* Appendage: *
* 000000 000000 *
* . . . *
* Data: *
* 005005 000000 000020 100040 *
* . . . *
* DS MESSAGE IS TRUNCATED *
*****
^ PRTX LIMIT=138 Entry Length=32 ^
^ 000.021 135.000 000.000 000.000 ^
^ NUL DC1 ] NUL NUL NUL NUL ^

```

Figure 4-18. PRTX Trace Entry.

```

^ 071.000 000.000 000.110 120.063 ^
^ 9 NUL NUL NUL NUL H P 3 ^
^ 060.060 060.040 057.040 115.120 ^
^ 0 0 0 / M P ^
^ 105.040 111.126 040.103 056.060 ^
^ E I V C . 0 ^
^-----^
^ PRTX LIMIT=138 Entry Length=32 ^
^ 060.056 062.060 056.040 040.115 ^
^ 0 . 2 0 . M ^
^ 117.116 054.040 101.120 122.040 ^
^ O N , A P R ^
^ 061.070 054.040 061.071 070.063 ^
^ 1 8 , 1 9 8 3 ^
^ 054.040 061.061 072.064 060.040 ^
^ , 1 1 : 4 0 ^
^-----^
^ PRTX LIMIT=138 Entry Length=4 ^
^ 101.115 125.012 ^
^ A M U LF ^
^-----^

```

Figure 4-18. PRTX Trace Entry (continued).

The PRTX entries here, when appended to the user data display at level 3, form a complete DS message. The MPE logon message from the remote system is being printed on user PIN %135's terminal.

### PSTX Trace Entries

```

+++++
+ PSCT      I Frame N(R)= 2 P=0 N(S)= 2 +
+ 21.83          LEVEL 2.                      DCE +
+ SCT/RCT Control Frame data display +
+ 020.024 000.020 006.000 001.000 +
+ DLE.DC4 NUL.DLE ACK.NUL SOH.NUL +
+ 020.000 000.135 000.000 000.000 +
+ DLE.NUL NUL. ] NUL.NUL NUL.NUL +
+ 000.000 017.110 105.114 114.117 +
+ NUL.NUL SI . H E. L L. O +
+ 040.115 107.122 056.123 +
+ . M G. R .. S +
+++++ LEVEL 3. +++++
* Length=32 Packet ID=0 %000 !00 *
* Type=DTE/DCE Data Packet *
* Log Channel No=20 %000024 !0014 *
* P(R)=0 P(S)=0 Q=0 M=0 D=0 *
* User Data Display *
* 020.006 000.001 000.020 000.000 *
* DLE.ACK NUL.SOH NUL.DLE NUL.NUL *
* 135.000 000.000 000.000 000.017 *
* ].NUL NUL.NUL NUL.NUL NUL.SI *
* 110.105 114.114 117.040 115.107 *
* H. E L. L O. M. G *
* 122.056 123. *
* R. . S. *
*****
*****
* Time=21.83 *
* From PIN=%135 To PIN=%0 *
* REMOTE HELLO request *
* 010006 HeadLength (words)=16 *
* 000001 Remote Computer ID=1 *
* 000000 Substream Type=%000000 *
* 000017 DSDataL (bytes)=15 *
* Header: *
* %010006 000001 000020 000000 056400 *
* 000000 000000 000017 *
* Appendage: *
* 044105 046114 047440 046507 051056 *
* H E L L O M G R . *
* 051440 *
* S *
* DS MESSAGE IS TRUNCATED *
*****
^ PSTX LIMIT=138 Entry Length=6 ^
^ 105.063 063.070 015.316 ^
^ E 3 3 8 CR !!! ^
^

```

Figure 4-19. PSTX Trace Entry.

This PSTX entry, when appended to the user data display at level 3, forms a complete DS message. The user (PIN %135) is logging on to the remote system.

## PCMP Trace Entries

```

oooooooooooooooooooooooooooooooooooooooooooooooooooo
o PCMP STATE=CONN. o
o 9.20 LEVEL 2. ID=%045606 !4B86o
o Error Code= 0 Last Recov Err=0 o
o # MSG Sent=2 # MSG Rec=1 o
o # Recov Err=0 # Irrec Errs=0 o
oooooooooooooooooooooooooooooooooooooooooooooooooooo
    
```

Figure 4-20. PCMP Trace Entry.

DSDUMP displays all the information in the PCMP entry as recorded by the CS Trace facility with no further analysis. See the CSDUMP discussion (page 4-22) for explanation of this entry.



## End of Trace and Line Information Messages

```

*****
*-L-I-N-E---I-N-F-O-R-M-A-T-I-O-N---D-I-S-P-L-A-Y*
*****
* LINE NUMBER: 3          LOGICAL DEV. NUMBER: 11 *
* DEV. TYPE: 17          SUBTYPE: 3    VER: A.05.06 *
*          0123456789012345 *
* COPTIONS: 0000100101000000 *
* AOPTIONS: 0000001100001101 *
* DOPTIONS: 0000000000000111 *
* NETWORK ID: 0000000000000000 *
* NUMBUFFERS: 242          BUFFSIZE: 514 (WORDS) *
* INSPEED: 7000           OUTSPEED: 7000 *
* MISCARRAY: RECEIVE TIMEOUT: 20 SECS. *
*          LOCAL TIMEOUT: 60 SECS. *
*          CONNECT TIMEOUT: 50 SECS. *
*          RESPONSE TIMEOUT: 300 HSECS. *
*          LINE BID TIMEOUT: 60 SECS. *
*          NO. ERROR RETRIES: 20 *
*          CLEAR-TO-SEND DELAY: 00.0 SECS. *
*          DATA-SET-READY DELAY: DISABLED. *
*          TRANSMISSION MODE: DUPLEX. *
*          MMSTAT TRACE FACILITY: ENABLED. *
* DRIVERNAME: IOINP0 *
* DOWNLOAD FILE: CSDLAPB0 *
* CTRACEINFO: ENTRIES=16    MASK=011111000 *
*          TYPE OF TRACE = ALL, NOWRAP *
* PHONELIST: ENTRIES=0      INDEX=0 *
* IDLIST: ENTRIES=0        INDEX=0 *
* ERRORCODE: RECOVERABLE=0  IRRECOVERABLE=202 *
* MSGSENT: 54          MSGRCV: 34 *
* RECOVERERRORS: 0      IRRECOVERERRORS: 0 *
*****

```

Figure 4-21. End of Trace and Closing Line Information.

The Line Information Display gives us the state of the line just before tracing was stopped. Note the counts of messages sent (54), messages received (34), and recoverable and irrecoverable errors (0 and 0) that have transpired while the trace facility was enabled.

# DS MESSAGE FORMATS

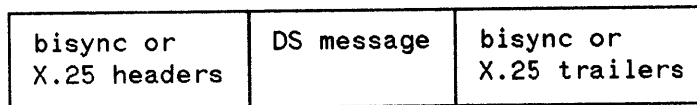
SECTION

5

## HOW TO USE THIS SECTION

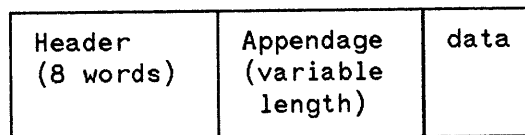
This section is intended to aid in the debugging of DS application programs. It is assumed that you are analyzing a CSDUMP trace listing, or output from a line monitor.

The Bisync and X.25 each add various headers and trailers to the DS messages. (See Figure 5-1.) These headers and trailers are not HP-specific, and so will not be discussed here. We will discuss only the DS message formats. The Bisync and X.25 headers and trailers are discussed in sections 3 and 4, respectively.



**Figure 5-1. DS message with bisync and X.25 headers and trailers.**  
(not to scale)

The DS message format is as follows:



**Figure 5-2. Basic DS message format.**  
(not to scale)

The DS header (also known as the DS fixed header) is always 8 words long. The appendage is of variable length; the 8th word of the DS header tells how long the appendage and data are. Data can include such items as information that has been read or is to be written, and so on.

This section only explains the format of each message, and shows what the various parts of the message represent. For details on the values and meanings of the message, you must consult the appropriate reference manual.

## Message Formats

Use the following table to find the appropriate reference manual.

**Table 5-1. Manuals to use with message formats.**

Messages and starting letter:	Refer to the:
System Intrinsic (Print, Read)  File System Intrinsic (start with F)	MPE Intrinsic Reference Manual
DSCOPY Intrinsic (start with Q)  PTOP Intrinsic (start with P)	DSN/DS User/Programmer Reference Manual
KSAM Intrinsic (start with K)	KSAM/3000 Reference Manual
Database Intrinsic (start with DB)	IMAGE/3000 Reference Manual

## HEADER FORMATS

### General Header Format

This section will explain the standard DS header. This header, 8 words long, will be present as shown for all messages except for those of Class 0 (Initialization and Termination Request and Reply). Those messages are explained following this section.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	Length of header and appendage in words							Message Class								
1	VC number (X.25) or 0 (bisync)															
2	RP	RJ	CN	BR	CM	NB	Stream type									
3	CL	0													PR	
4	C.I. from process							C.I. to process								
5	RTE sequence number															
6	0				V	0										
7	Length (in bytes) of appendage and data															

Word 0 (0:8) is the length of the header and appendage in words. The length of the fixed header is 8 words. Therefore, the length of appendage is Word 0(0:8)-8 in words.

(8:8) is the message class, which can be 0, 3, 4, 5, 6, 7, 8, or 9.

Word 1 Virtual circuit number for X.25. For bisync, this is 0.

Word 2 (0:1) RP -- Reply bit. On if the message is a reply.

(1:1) RJ -- Reject bit. On if the message received has been rejected by the remote system.

(2:1) CN -- Continue bit. On if a continuation message is to follow.

(3:1) BR -- Break bit. On if the user's session is in break mode.

(4:1) CM -- Compression bit. On if the message has been compressed.

(5:1) NB -- Non-PTOP break bit. On if a break for non-PTOP activity has been detected.

(8:8) Stream type -- the message stream types are currently %20 (#10, 16) to %32 (#1A, 26).

## Message Formats

- Word 3 (0:1) CL -- On implies clear break mode for the terminal.
- (14:2) PR -- Pre-emptive bits.  
0 -- not a pre-emptive message  
1 -- soft pre-emptive message  
2 -- hard pre-emptive message
- Word 4 (0:8) -- Command Interpreter main From process identification number (PIN). For an HP1000, this is an LU number, or 0. For MPE V/E this is a virtual pin.
- (8:8) -- Command Interpreter main To process identification number (PIN). For an HP1000, this is an LU number, or 0. For MPE V/E this is a virtual pin.
- Word 5 RTE sequence number for HP 1000. If talking to an HP 3000, it is 0. DSN/DS just sends back the same sequence number received from the HP 1000. DSN/DS 1000-IV increments this with each message and uses it as a "timestamp."
- Word 6 0 (6:1) -- If the message is REMOTE HELLO, this bit is set to 1 if MPE V is being used. If the message is not REMOTE HELLO, or if MPE V is not being used, it is 0.
- Word 7 Length in bytes of the appendage and data. Thus, the length of data in bytes is Word 7 - ((Word 0(0:8)-8) \* 2).

# MESSAGE FORMATS

## Message Class 0

(This message class applies to DS using the bisync protocol only.)

### Initialization Request/Reply

Message Class = 0

Stream Type =%20(#10,16)

#### Initialization Request

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	$8_{16}$						0									
1	0											MC	0			
2	$10_{16}$															
3	Max buffer size						Current buffer size									
4	0															
5	0															
6	0	S	E	C	M	0										
7	0															

#### Initialization Reply

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	$8_{16}$						0									
1	0											MC	SC			
2	1	$10_{16}$														
3	Max buffer size						Current buffer size									
4	0															
5	0															
6	R	S	E	C	M	0										
7	0															

## Message Formats

- Word 0 (0:8) is the length in words of the header and appendage.
- Word 1 (14:1) MC=1 if the master can compress data (for request only).  
(14:1) MC=0 for reply.  
(15:1) SC=0 for request.  
(15:1) SC=1 if the slave can compress data (for reply only).
- Word 2 (0:1) Bit 0 is the reply bit. The stream type is %20 (#10, 16).  
  
(0:1) Bit 0=1 implies that this is a reply.
- Word 3 All buffer sizes are  $((\text{actual size})_{10}/16) - 1$  in words.  
Max size = 0 => exclusive mode requested.  
Actual size = 0 => exclusive mode rejected.
- Word 6 R is the mask reply bit -- on only if the mask is transmitted in an Initialization Reply.  
S is the sequence bit -- on only if Sequence Numbers are supported  
E is the exclusive bit -- on only if DS supports exclusive mode without exclusive mode protocol.  
C is the continuation bit -- on only if DS supports low level continuation records.  
M is the maximum buffer size this side can handle.
- Potential expansion can take place in the capability mask for future enhanced capabilities.

## Termination Request/Reply

Message Class = 0

Stream Type = %21(#11, 17)

### Termination Request

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	8 <sub>16</sub>							0								
1	0															
2	11 <sub>16</sub>															
3	0															
4	0															
5	0															
6	0															
7	0															

### Termination Reply

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	8 <sub>16</sub>							0								
1	0															
2	RP	RJ	11 <sub>16</sub>													
3	0															
4	0															
5	0															
6	0															
7	0															

Word 2 (0:1) RP -- Reply bit. Set if and only if termination request is accepted.

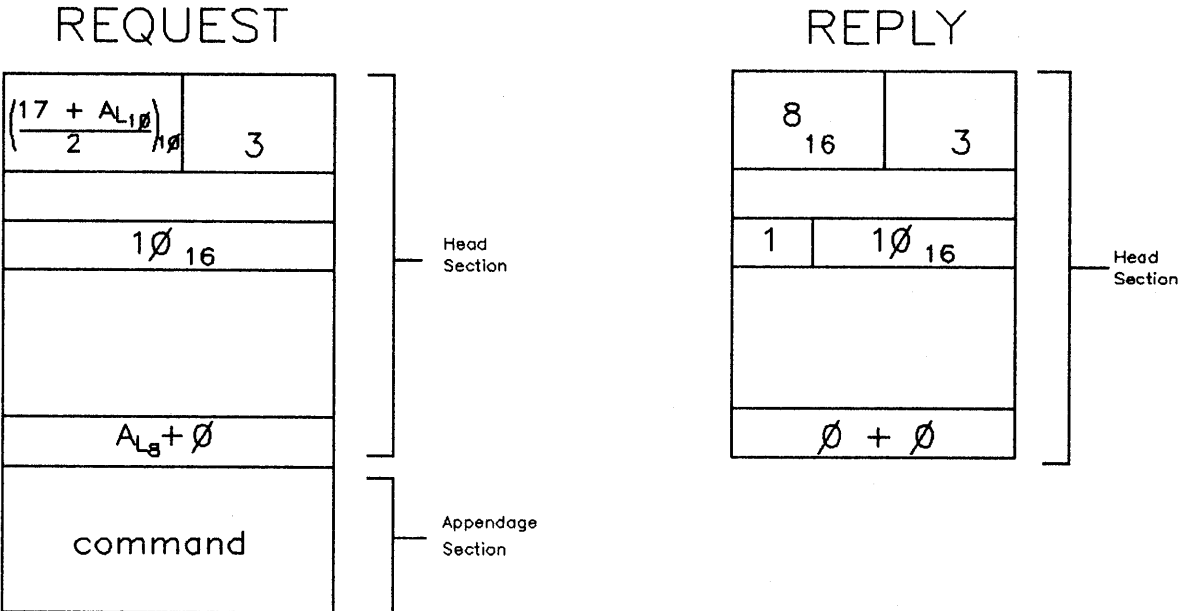
(reply only) (1:1) RJ -- Reject bit. Set if and only if the termination request is rejected.



### Message Class 3

#### REMOTE COMMAND (Exclusive of HELLO and BYE)

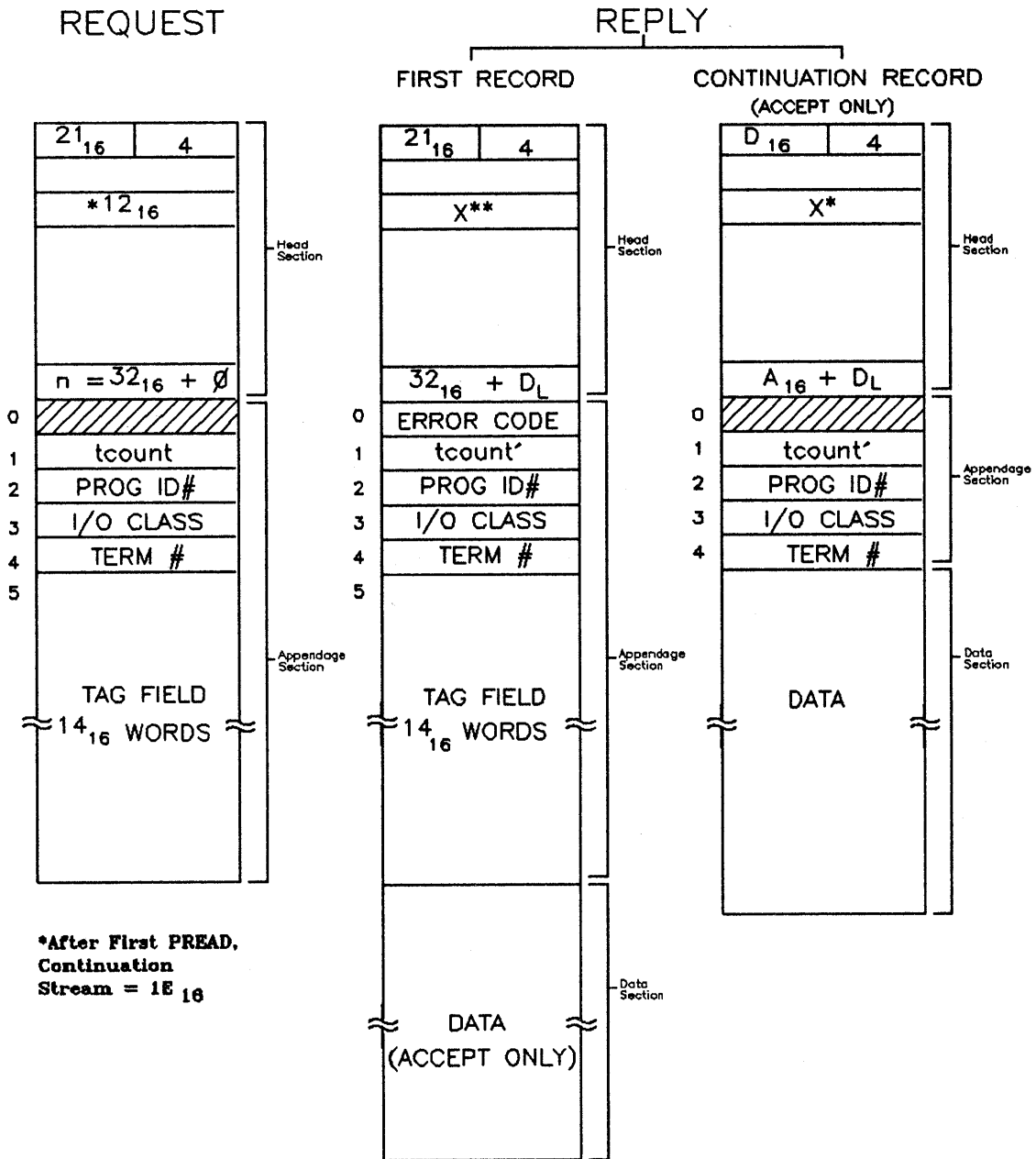
Message Class = 3  
Stream Type = %20 (#10, 16)



# Message Class 4

## PREAD

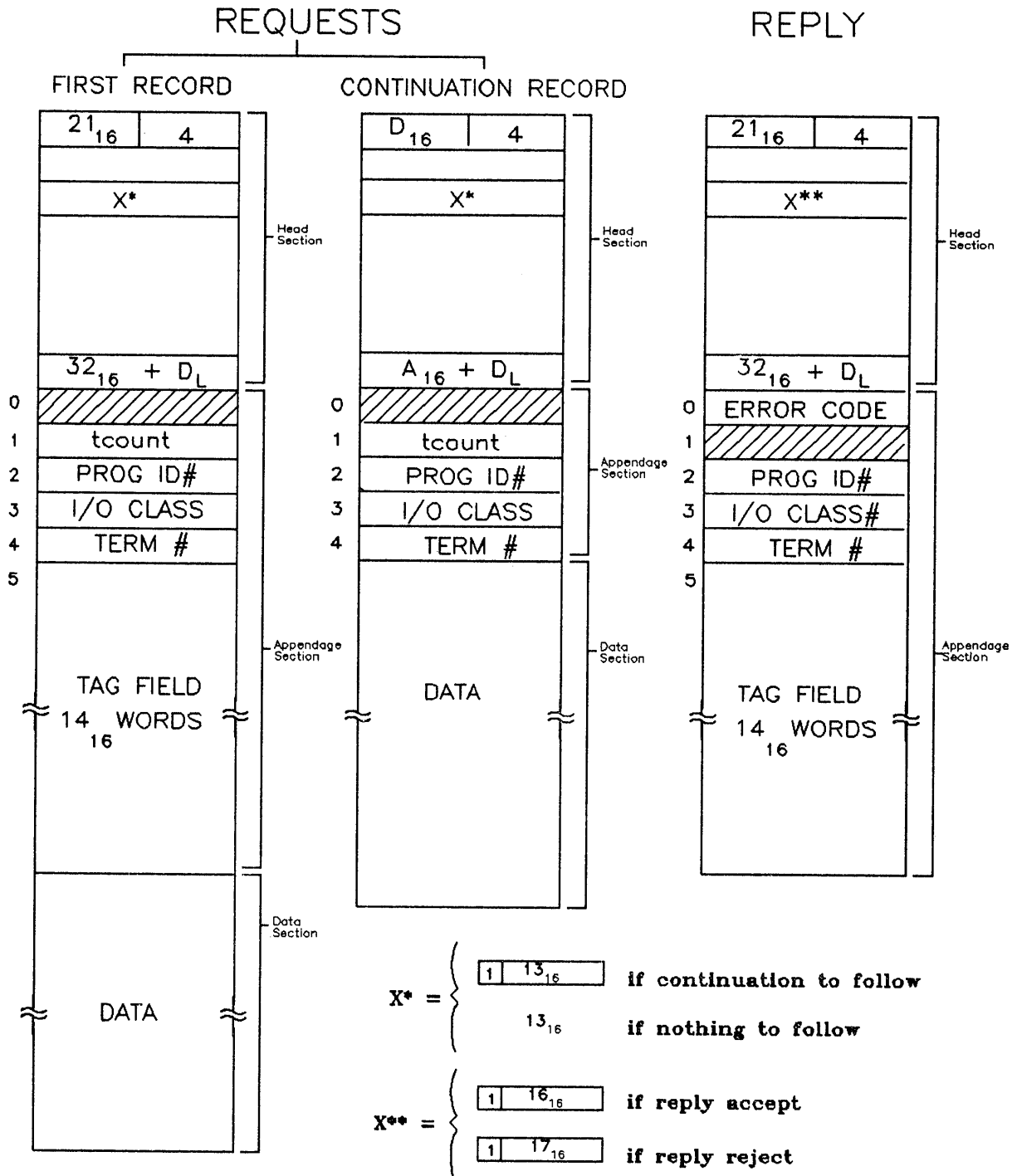
Message Class = 4  
 Stream Type = %22 (#12, 18) Request  
 = %26 (#16, 22) Reply Accept  
 = %27 (#17, 23) Reply Reject



## PWRITE

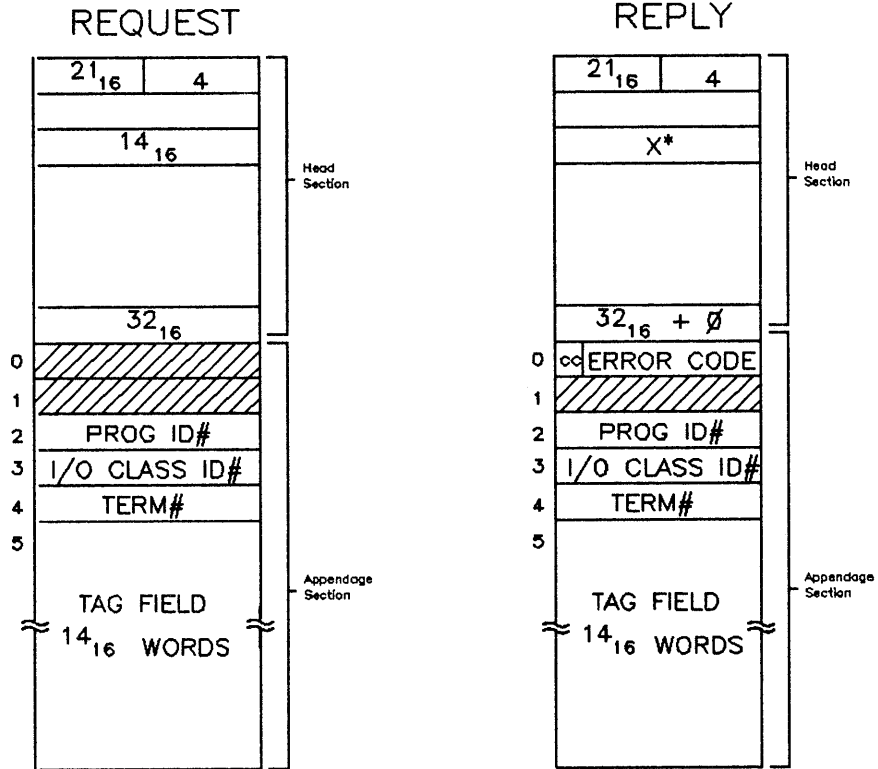
Message Class = 4

Stream Type = %23 (#13, 19) Request  
 = %26 (#16, 22) Reply Accept  
 = %27 (#17, 23) Reply Reject



### PCONTROL

Message Class = 4  
 Stream Type = %24 (#14, 20) Request  
 = %26 (#16, 22) Reply Accept  
 = %27 (#17, 23) Reply Reject

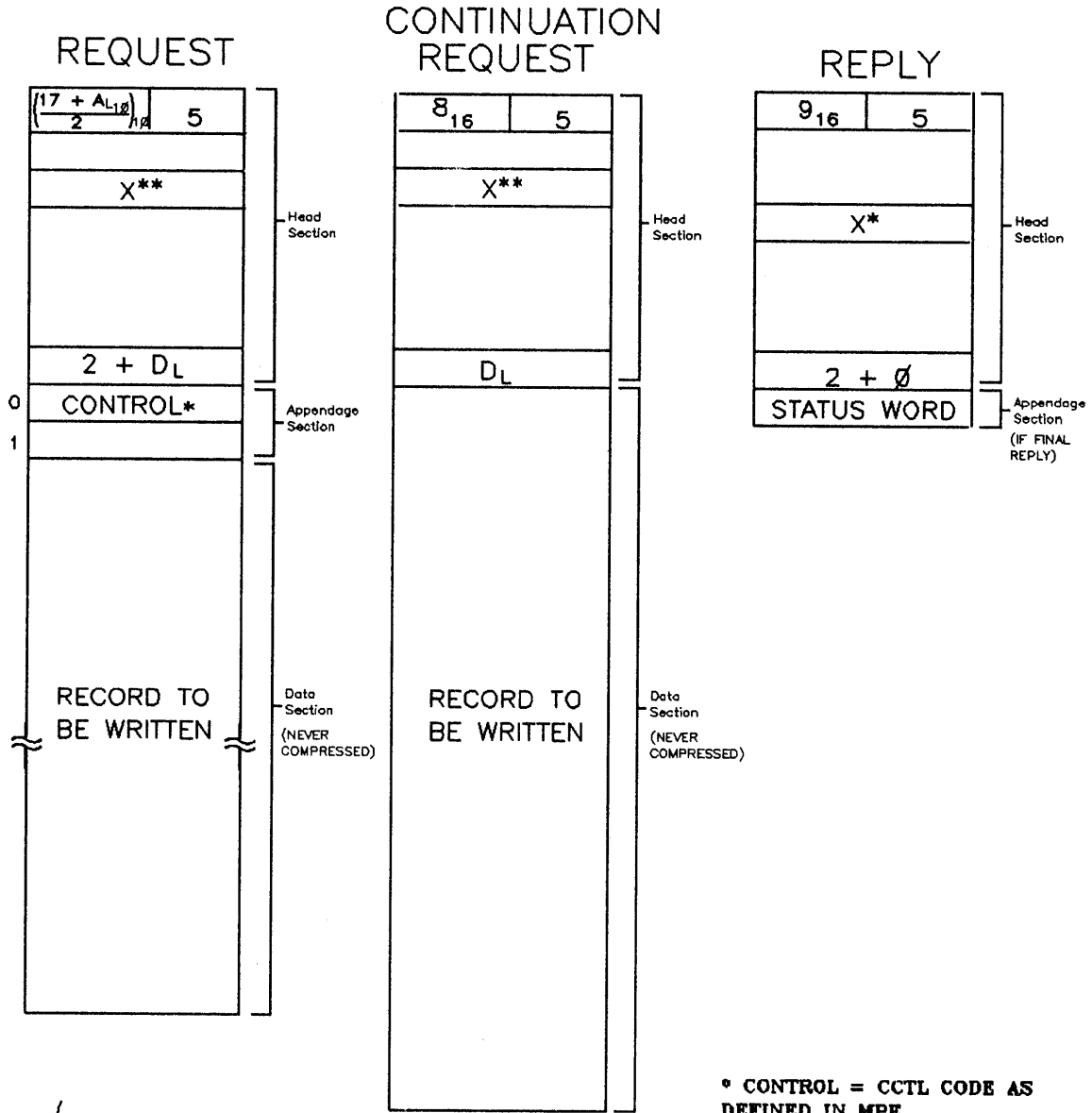


$$X^* = \begin{cases} \boxed{1 \mid 16_{16}} & \text{if reply accept} \\ \boxed{1 \mid 17_{16}} & \text{if reply reject} \end{cases}$$

# Message Class 5

## Print to \$STDLIST

Message Class = 5  
Stream Type = %20 (#10, 16)

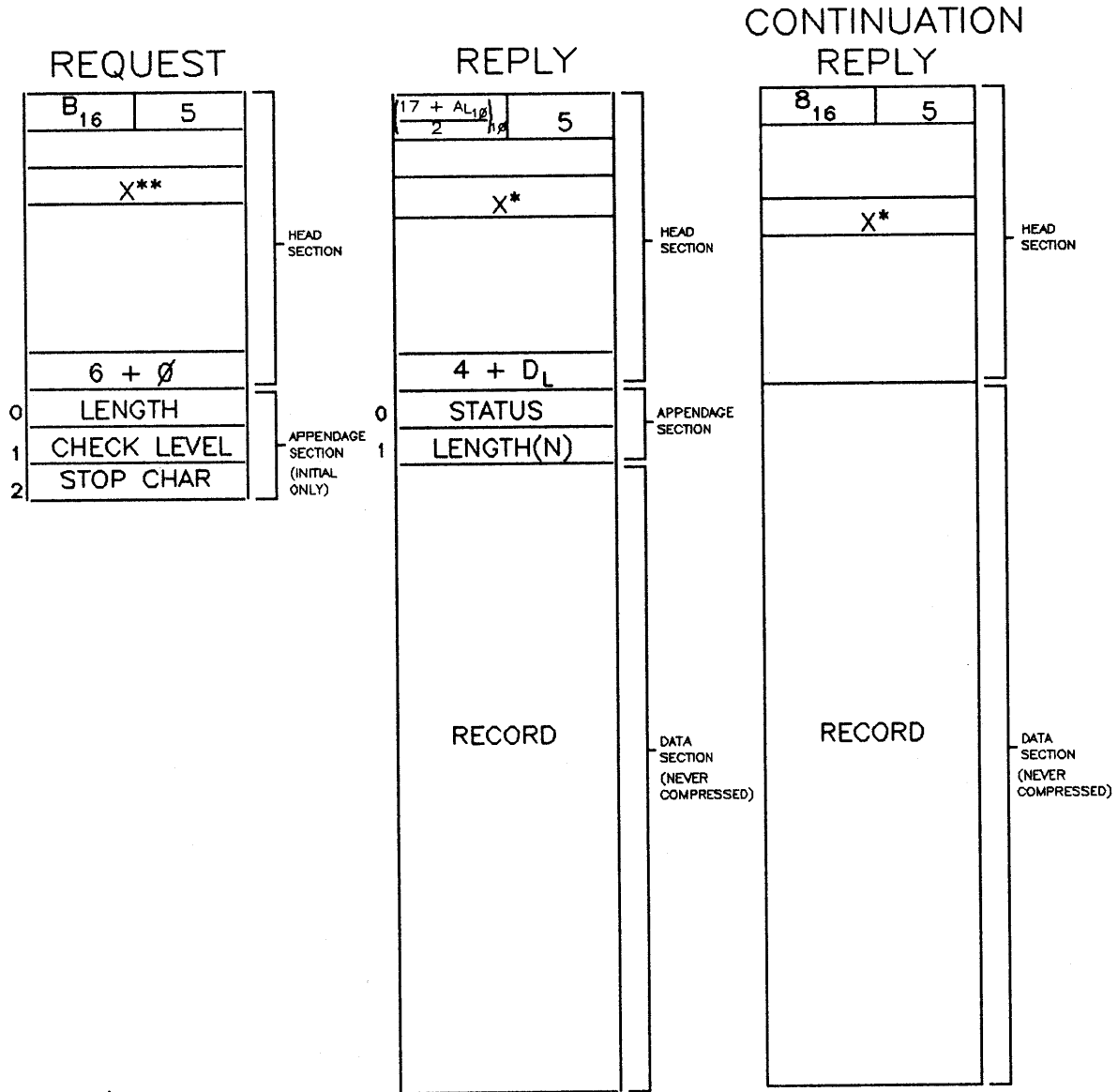


$X^* = \begin{cases} \begin{matrix} 1\emptyset_1 & 1\emptyset_{16} \end{matrix} & \text{if continuation reply} \\ \begin{matrix} 1 & 1\emptyset_{16} \end{matrix} & \text{if final reply} \end{cases}$   
 $X^{**} = \begin{cases} \begin{matrix} \emptyset\emptyset_1 & 1\emptyset_{16} \end{matrix} & \text{if continuation to follow} \\ 1\emptyset_{16} & \text{if nothing to follow} \end{cases}$

\* CONTROL = CCTL CODE AS DEFINED IN MPE

Read from \$STDIN

Message Class = 5  
 Stream Type = %21 (#11, 17)

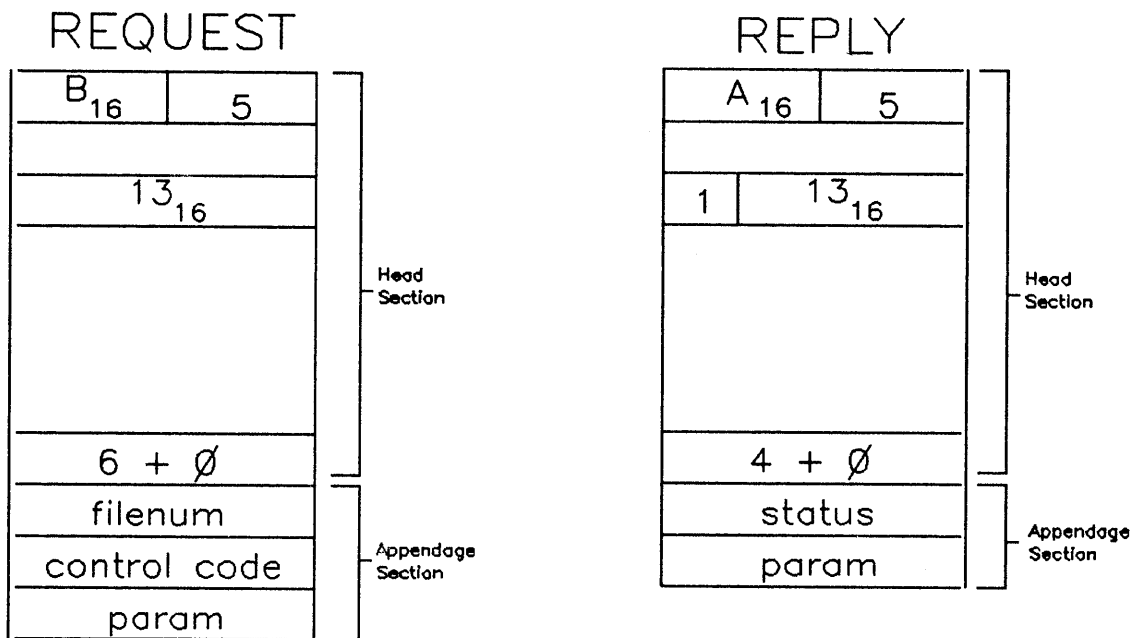


$X^* = \begin{cases} \boxed{1\emptyset 1 \quad 11_{16}} & \text{if continuation to follow} \\ \boxed{1 \quad 11_{16}} & \text{if nothing to follow} \end{cases}$

$X^{**} = \begin{cases} \boxed{\emptyset\emptyset 1 \quad 1\emptyset_{16}} & \text{if continuation request} \\ 1\emptyset_{16} & \text{if initial request} \end{cases}$

### FCONTROL for \$STDIN/\$STDLIST

Message Class = 5  
 Stream Type = %23 (#13, 19)



Negative FCONTROL codes are used to cause ATTACHIOs on the real terminal with a request code equal to the absolute value of the FCONTROL code.

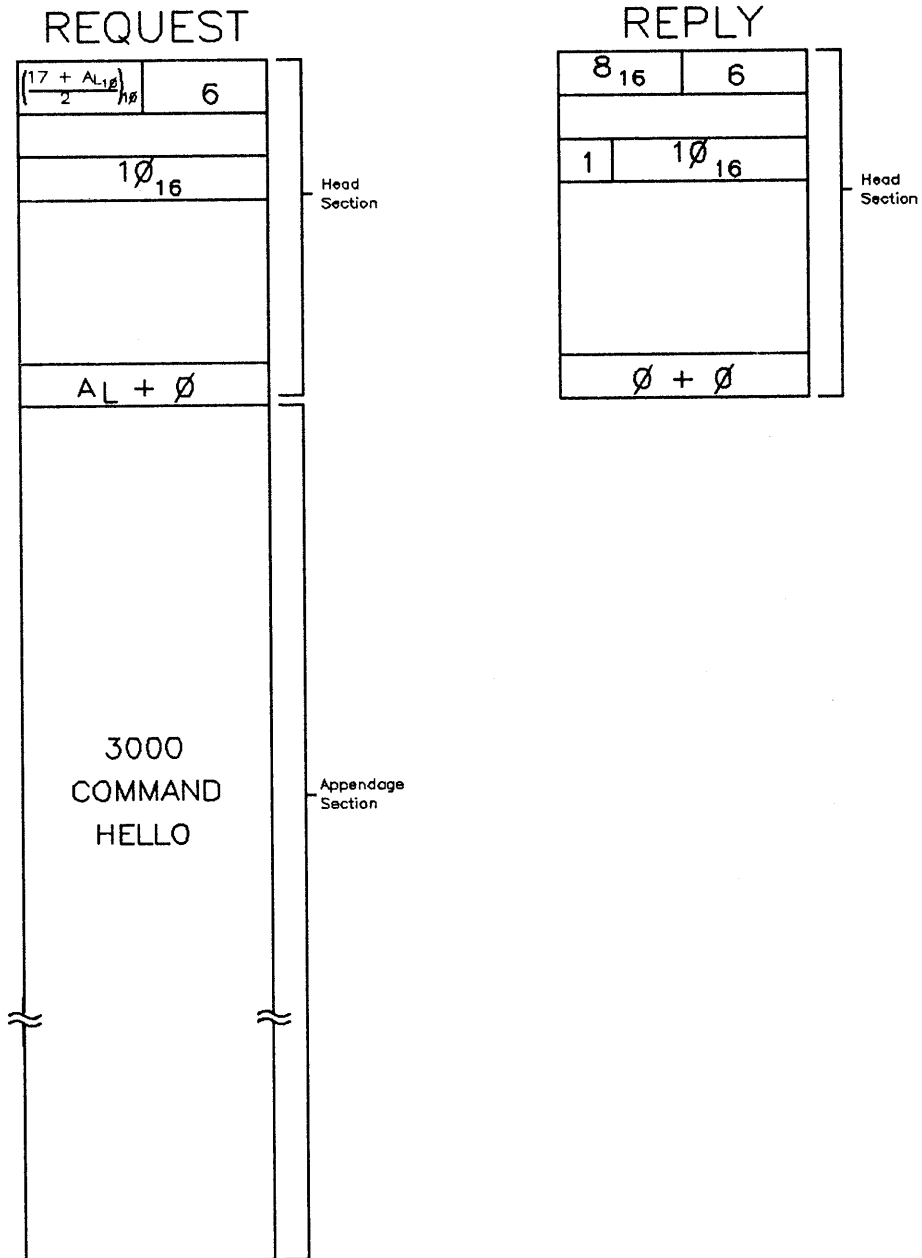
Exception: A control code of -28 is a request to expand the print buffer on the master side. The appendage is as follows:

filenum
-28
required word size/ actual word granted in reply

## Message Class 6

### Remote HELLO

Message Class = 6  
Stream Type = %20 (#10, 16)

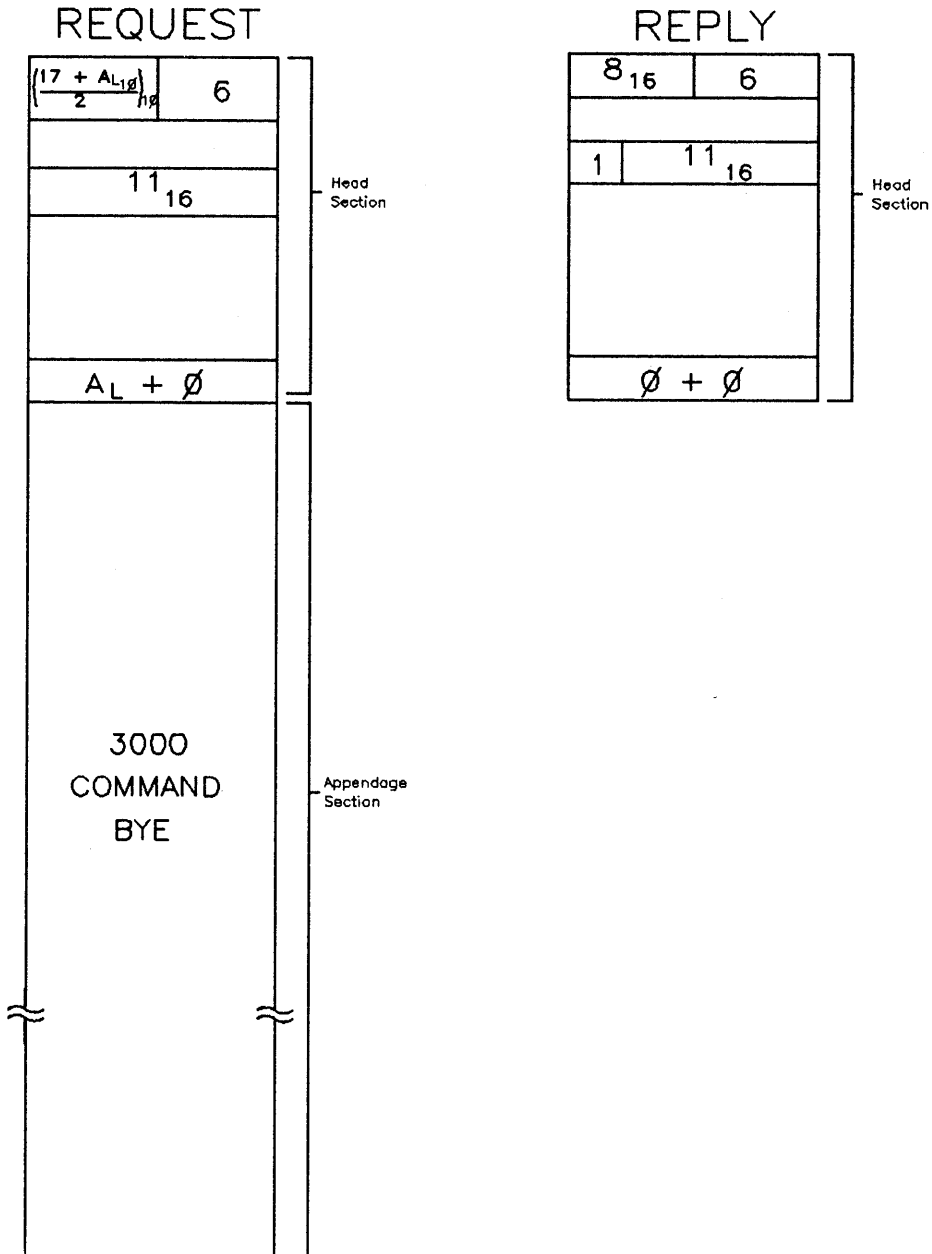




Message Formats

Remote BYE

Message Class = 6  
Stream Type = %21 (#11, 17)

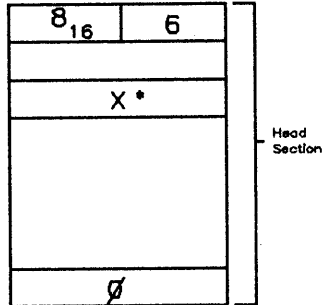


### CONTROL MESSAGE

Message Class = 6

Stream Type = %22 (#12, 18) - %27 (#17, 23)

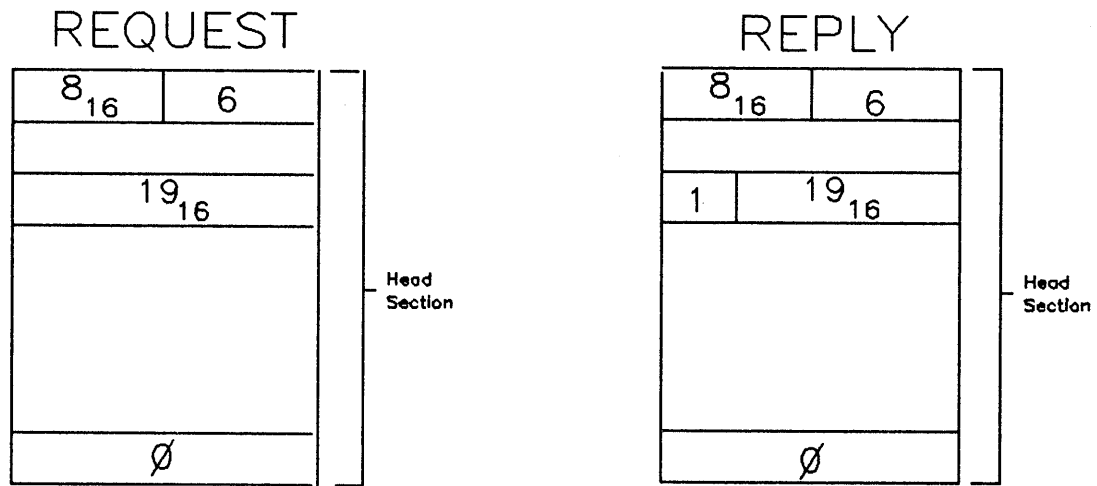
#### REQUEST/REPLY



X* = {	∅	12 <sub>16</sub>	request break message
	∅	13 <sub>16</sub>	request abort message
	∅	14 <sub>16</sub>	request resume message
	∅	15 <sub>16</sub>	request control-y message
	∅	17 <sub>16</sub>	request kill job message
	1	12 <sub>16</sub>	reply break message
	1	13 <sub>16</sub>	reply abort message
	1	14 <sub>16</sub>	reply resume message
	1	15 <sub>16</sub>	reply control-y message
	1	17 <sub>16</sub>	reply kill job message

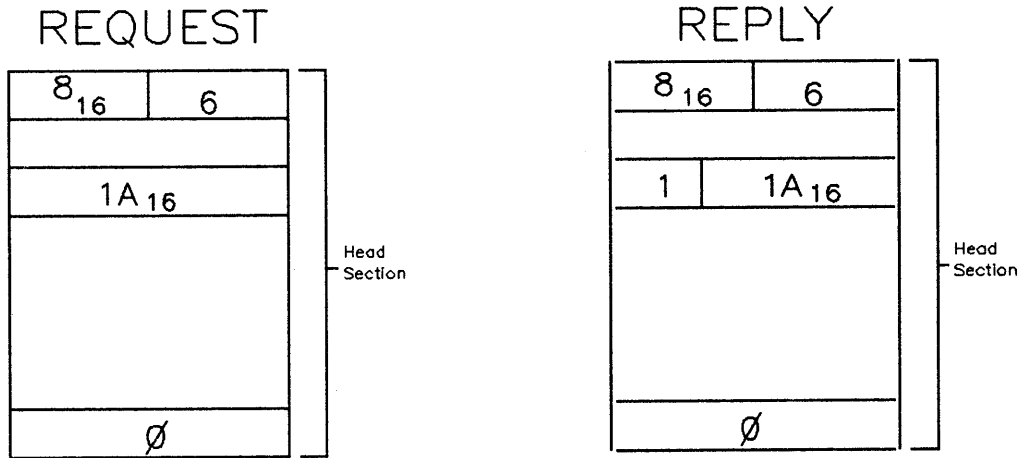
### PTOP Flow Message

Message Class = 6  
Stream Type = %31(#19, 25)



**PTOP Flow Resume Message**

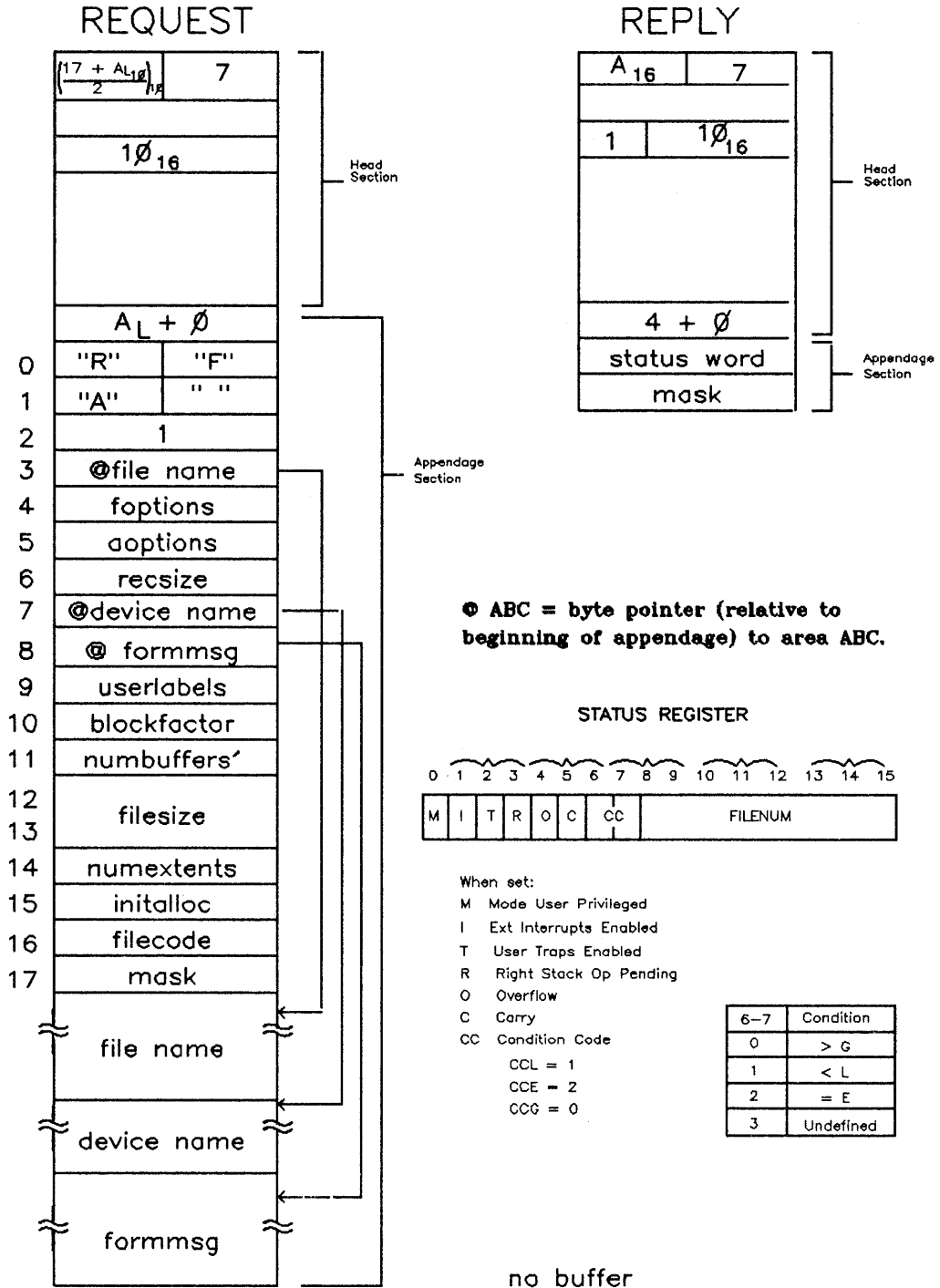
Message Class = 6  
 Stream Type = %32 (#1A, 26)



# Message Class 7

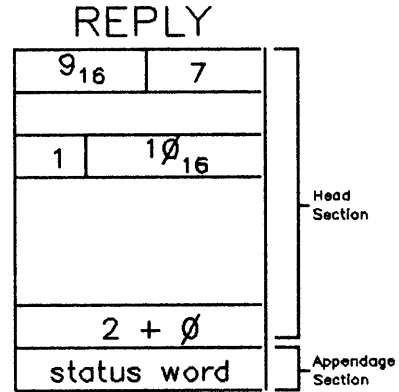
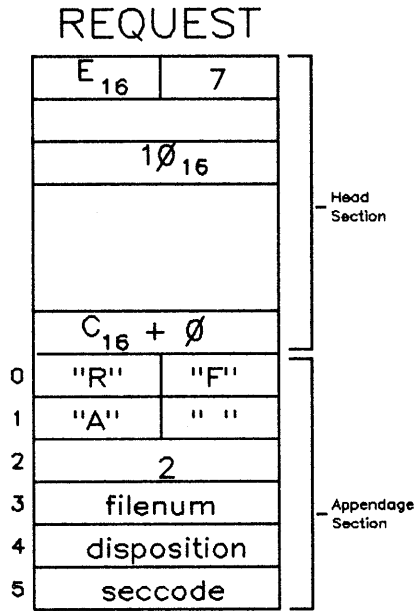
## FOPEN

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = 1



**FCLOSE**

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = 2



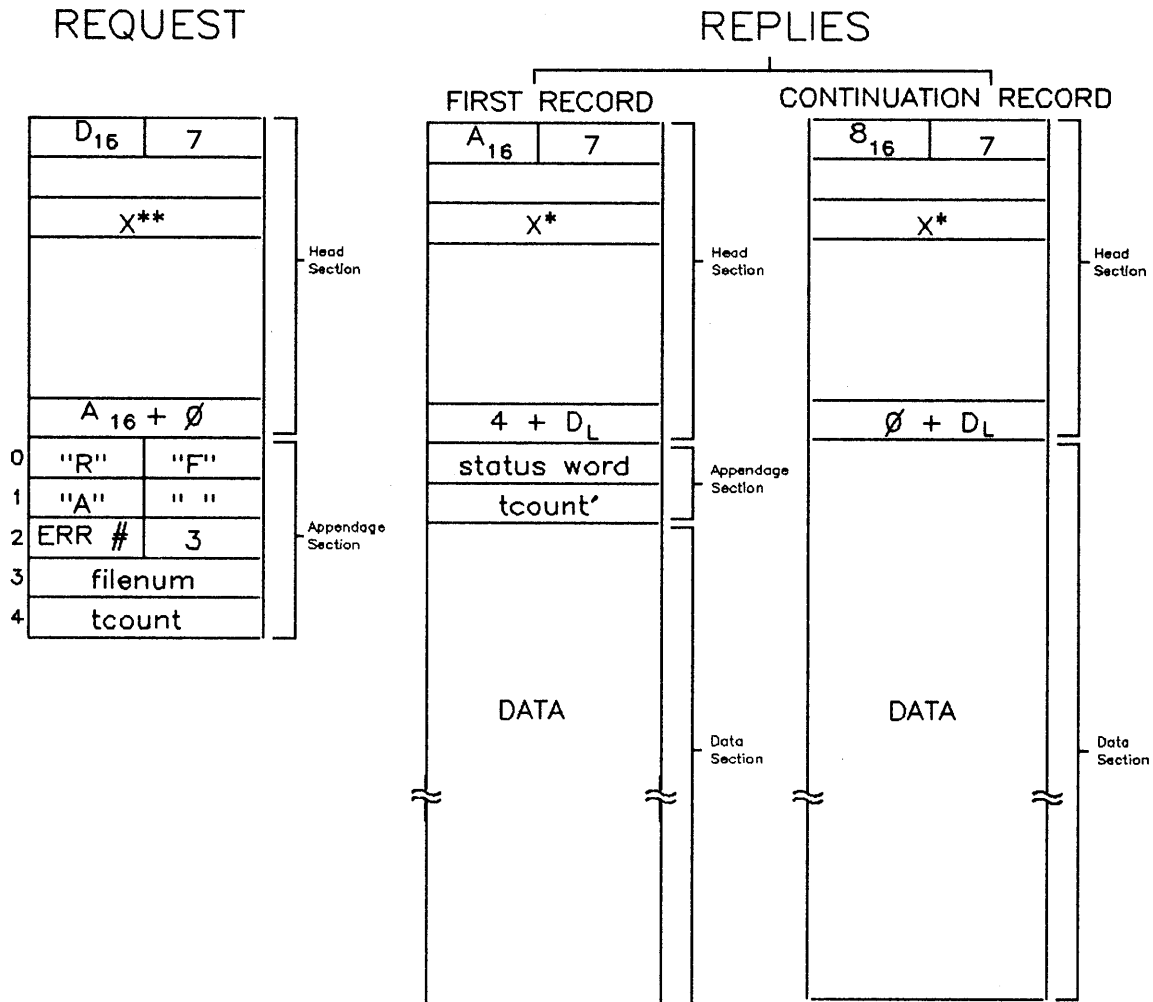
**Status Word - See FOPEN**  
**(Status Word filenum = ∅)**

no buffer

Message Formats

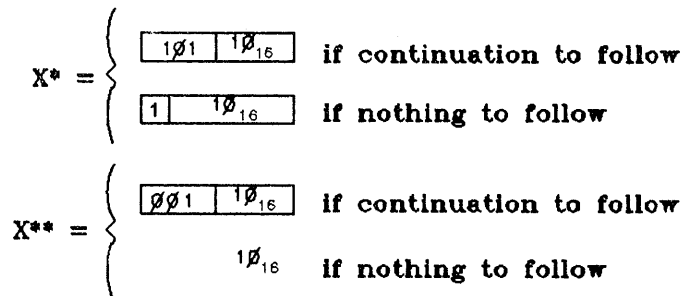
## FREAD (Not Multirecord)

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = 3



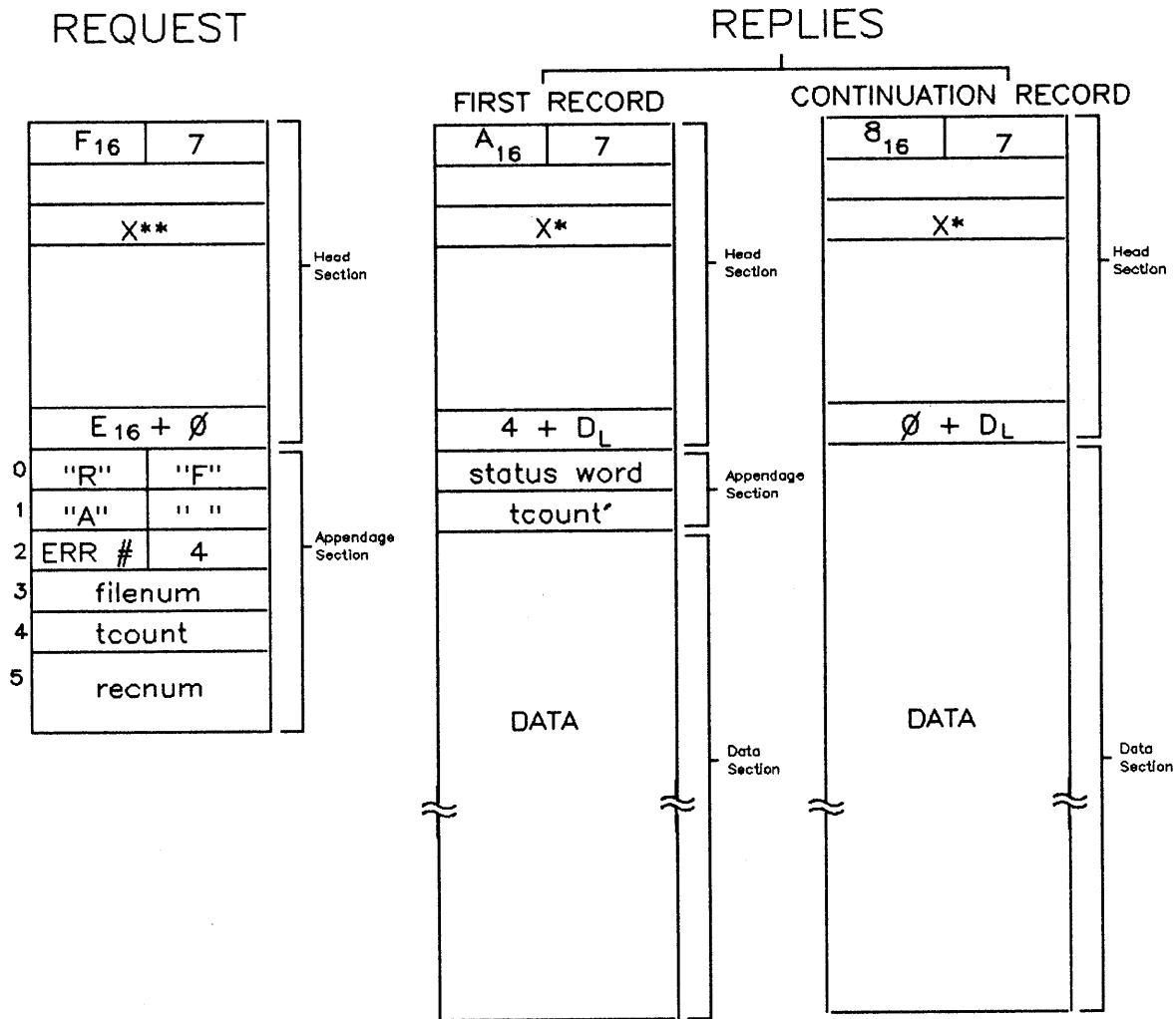
**tcount** - Amount to be read  
**tcount'** - Amount read  
 Status Word - See FOPEN

**ERR #** - used when local system finds an error in a file. Err # passed to remote system is to be included in FCHECK returned by remote system.



## FREADDIR (Not Multirecord)

Message Class = 7  
Stream Type = %20 (#10, 16)  
F.S. Intrinsic Number = 4



tcount - Amount to be read  
tcount' - Amount read  
Status Word - See FOPEN

ERR # - used when local system finds an error in a file. Err # passed to remote system is to be included in FCHECK returned by remote system.

X\* = { 

1∅ <sub>1</sub>   1∅ <sub>16</sub>	if continuation to follow
1   1∅ <sub>16</sub>	if nothing to follow

X\*\* = { 

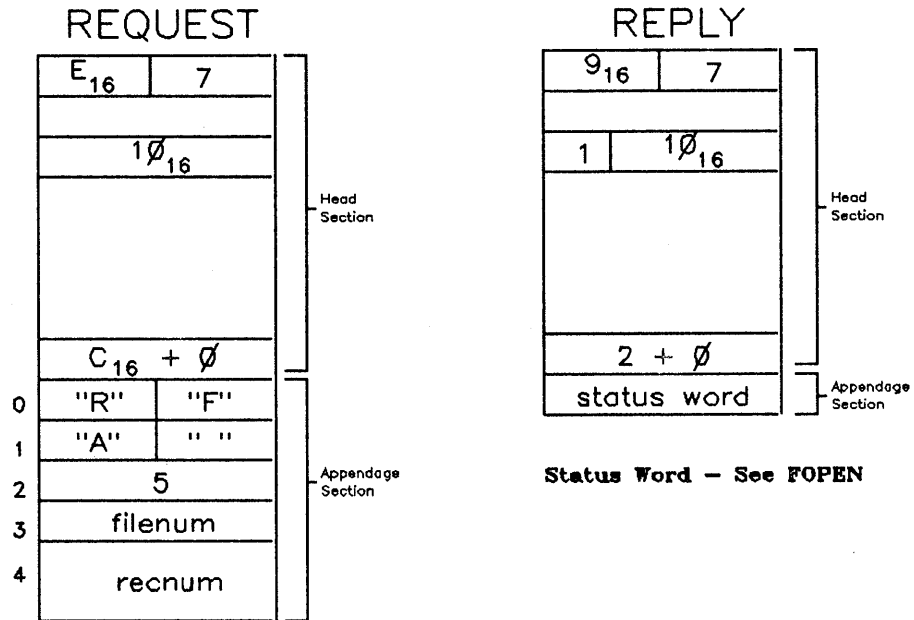
∅∅ <sub>1</sub>   1∅ <sub>16</sub>	if continuation to follow
1∅ <sub>16</sub>	if nothing to follow



Message Formats

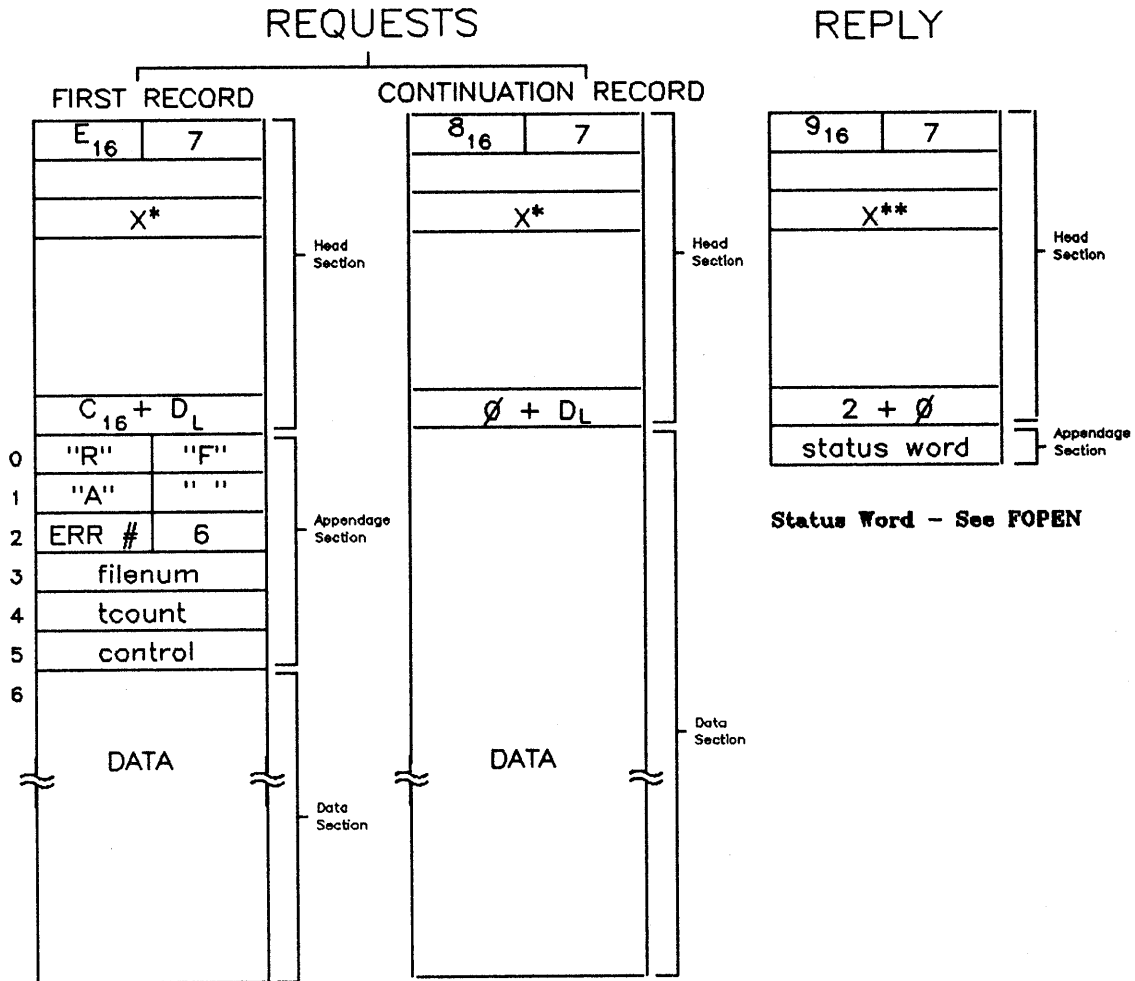
**FREADSEEK**

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = 5



## FWRITE (Not Multirecord)

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = 6



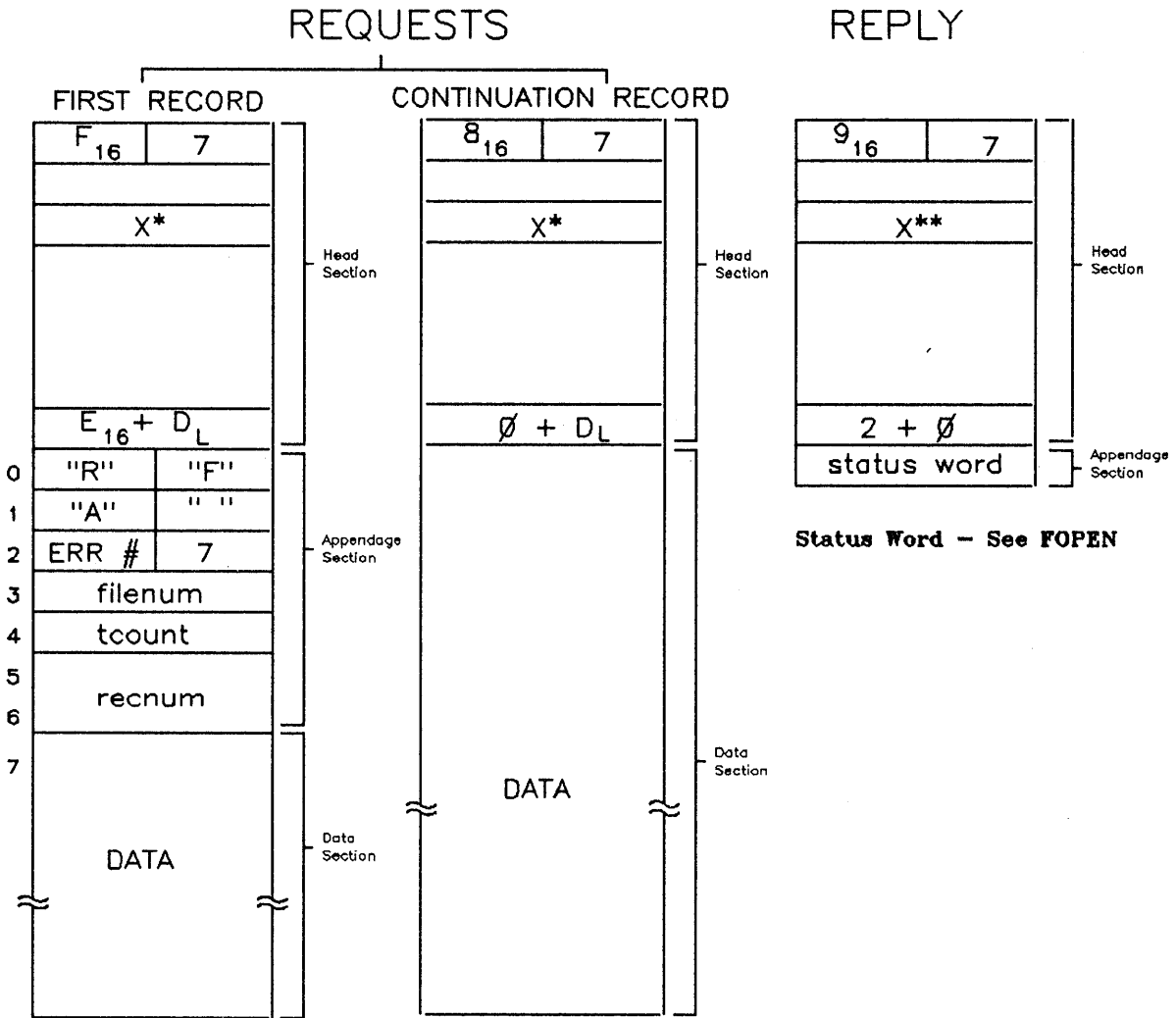
**ERR #** - used when local system finds an error in a file. Err # passed to remote system is to be included in FCHECK returned by remote system.

$X^* = \begin{cases} \boxed{\emptyset\emptyset_1 \quad 1\emptyset_{16}} & \text{if continuation to follow} \\ \boxed{1 \quad 1\emptyset_{16}} & \text{if nothing to follow} \end{cases}$

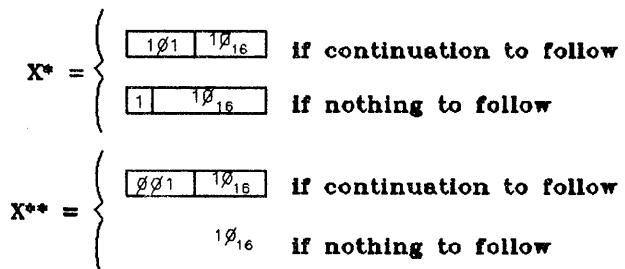
$X^{**} = \begin{cases} \boxed{1\emptyset_1 \quad 1\emptyset_{16}} & \text{if continuation to follow} \\ 1\emptyset_{16} & \text{if nothing to follow} \end{cases}$

## FWRITEDIR (Not Multirecord)

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = 7

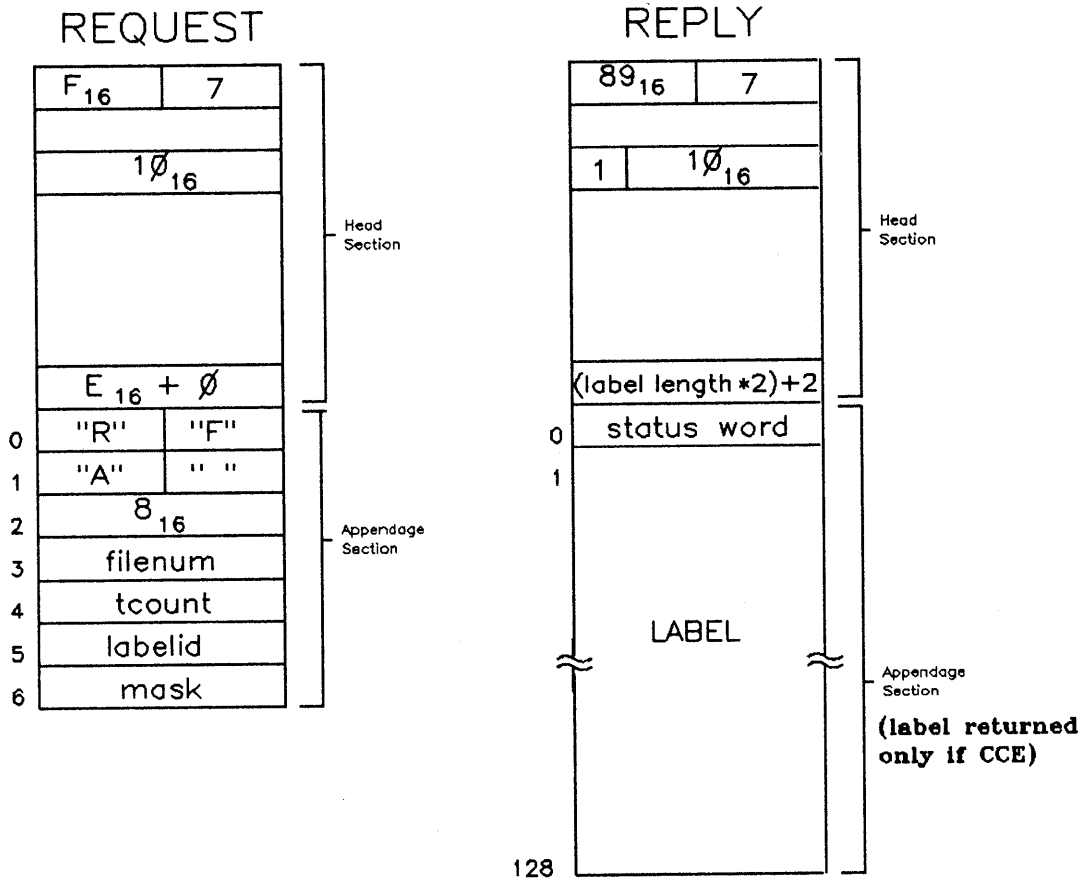


**ERR #** - used when local system finds an error in a file. Err # passed to remote system is to be included in FCHECK into returned by remote system.



## FREADLABEL

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %10 (#8, 8)

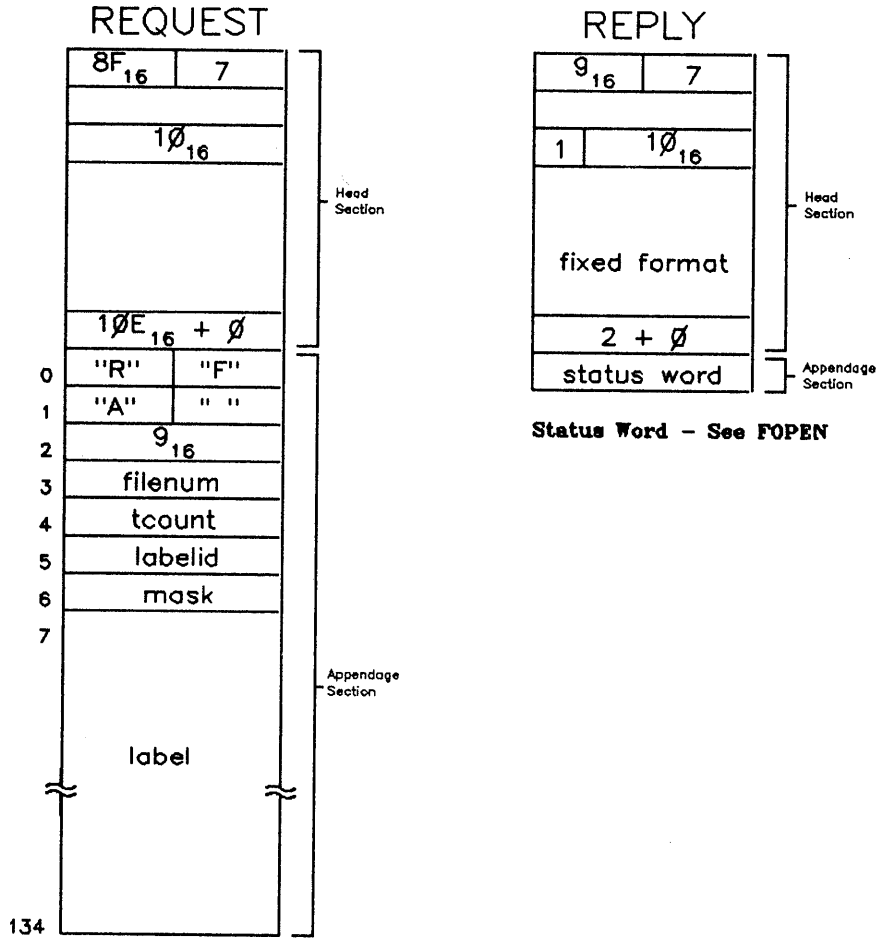


Status Word - See FOPEN

Message Formats

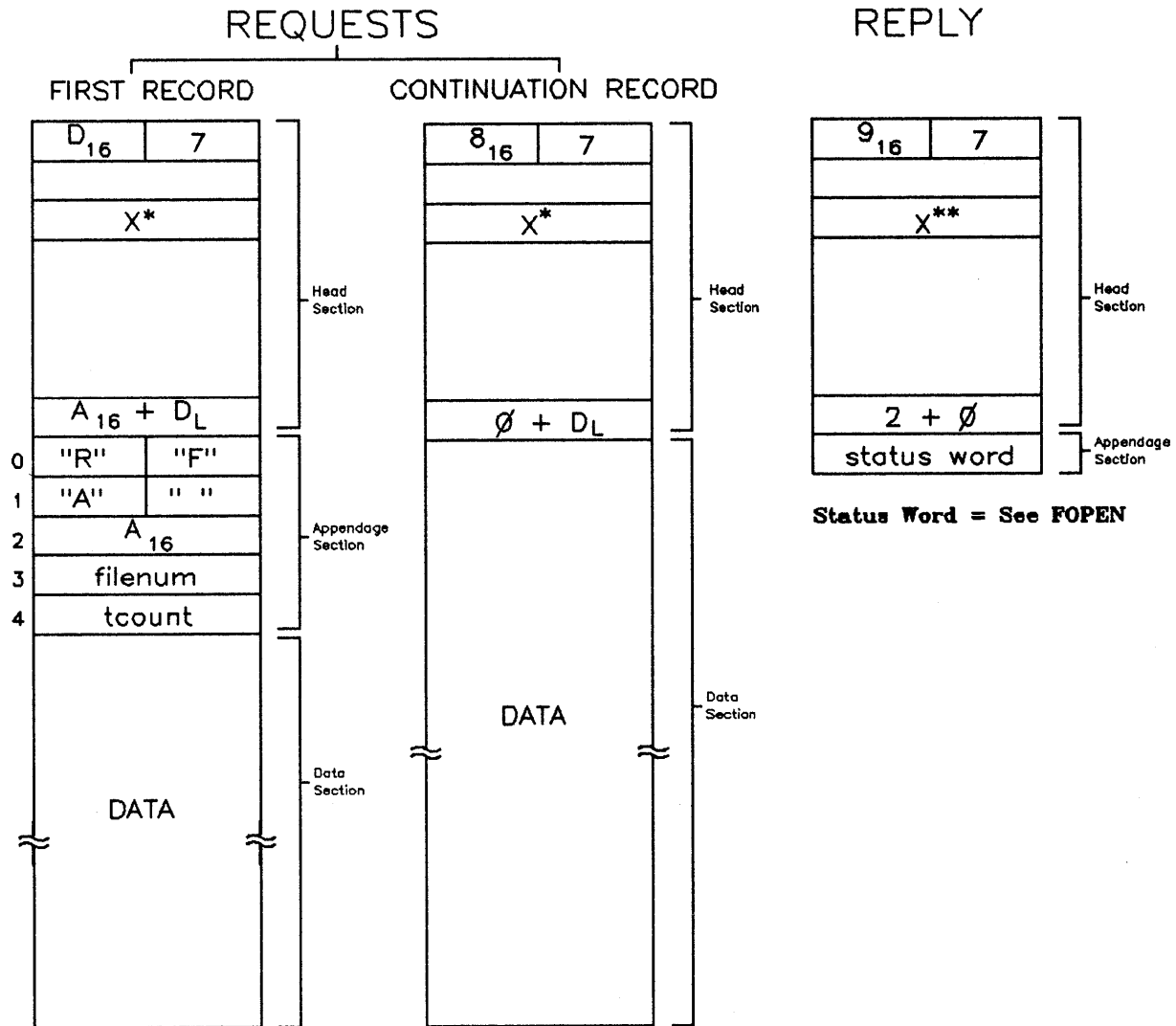
**FWRITELABEL**

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %11 (#9, 9)



## FUPDATE (Not Multirecord)

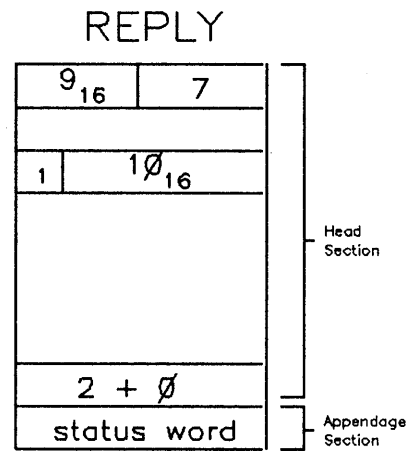
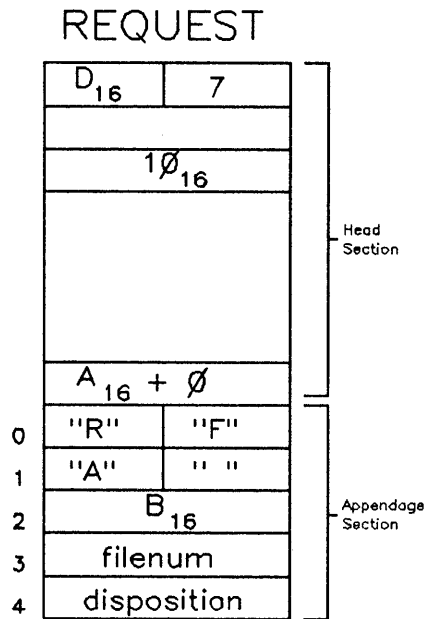
Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %12 (#A, 10)



Message Formats

FSPACE

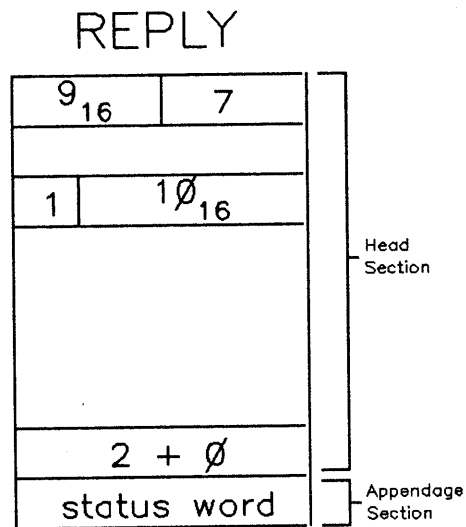
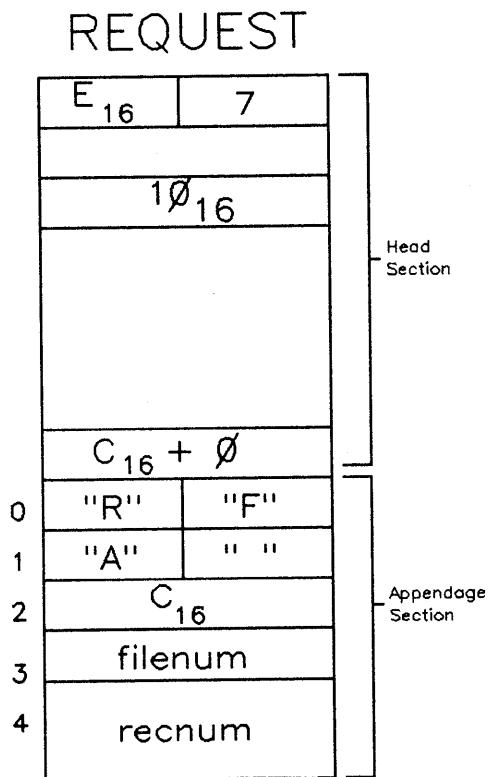
Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %13 (#B, 11)



**Status Word = See FOPEN**

FPOINT

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %14 (#C, 12)



**Status Word - See FOPEN**

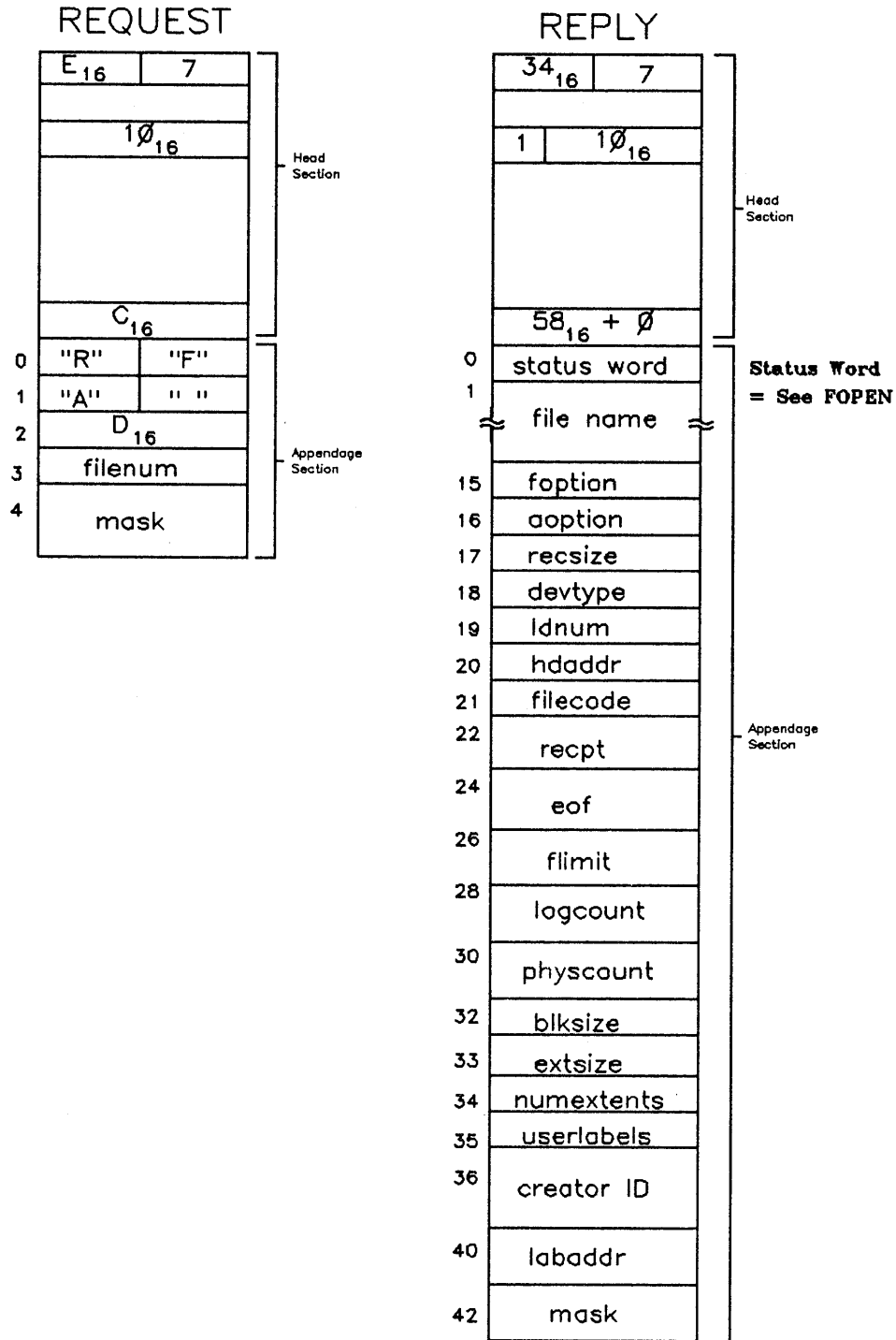


## FGETINFO

Message Class = 7

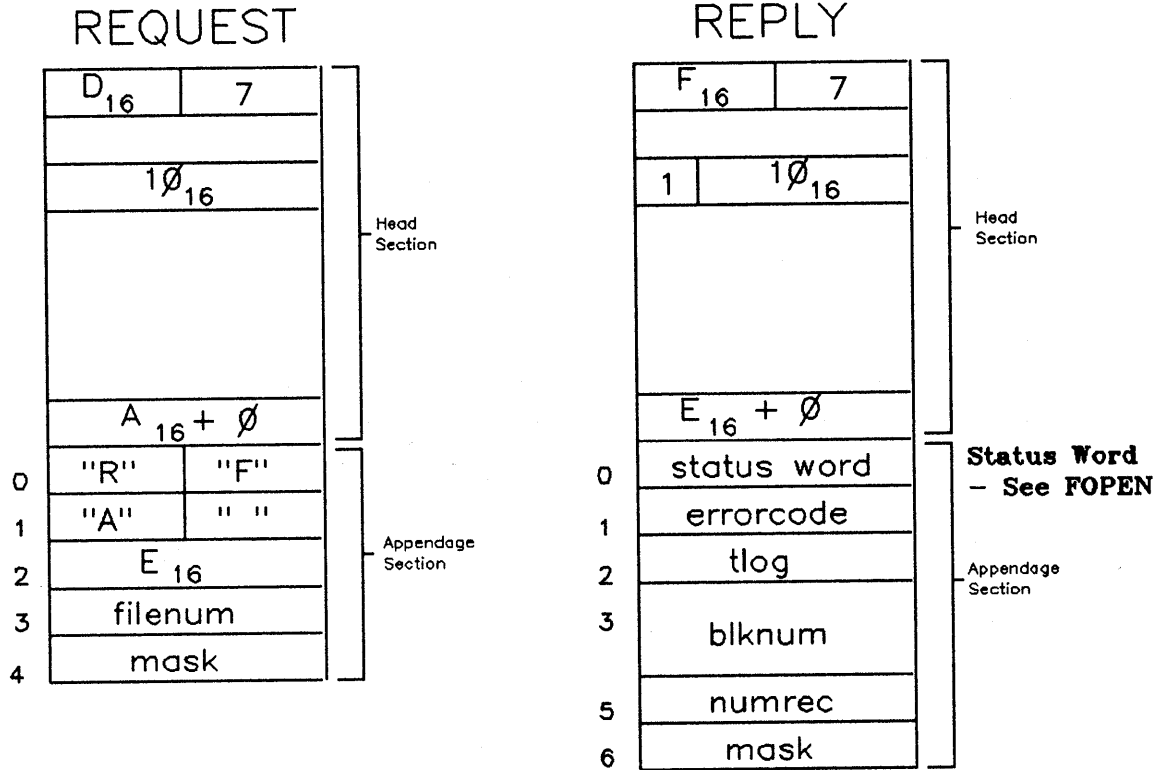
Stream Type = %20 (#10, 16)

F.S. Intrinsic = %15 (#D, 13)



FCHECK

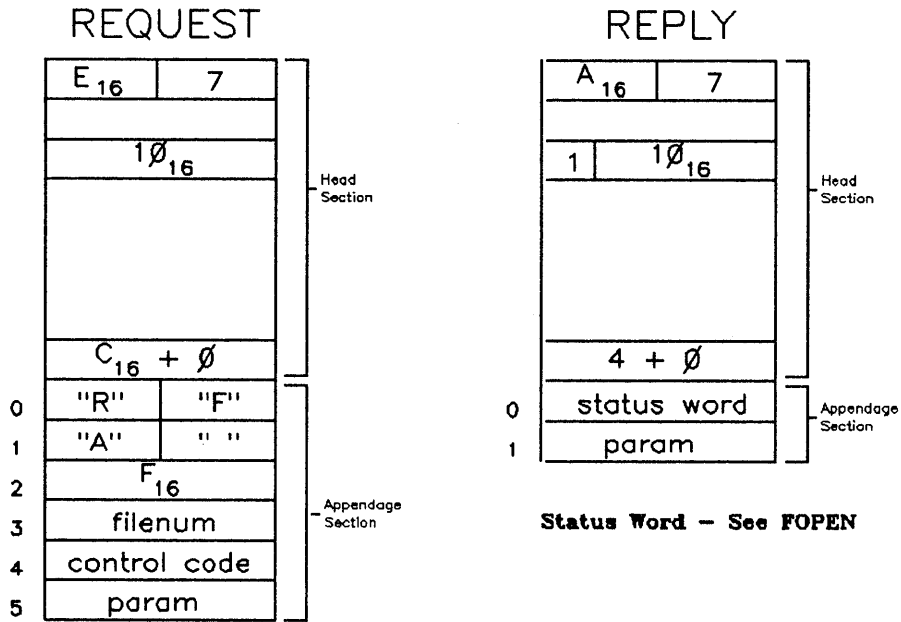
Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %16 (#E, 14)



Message Formats

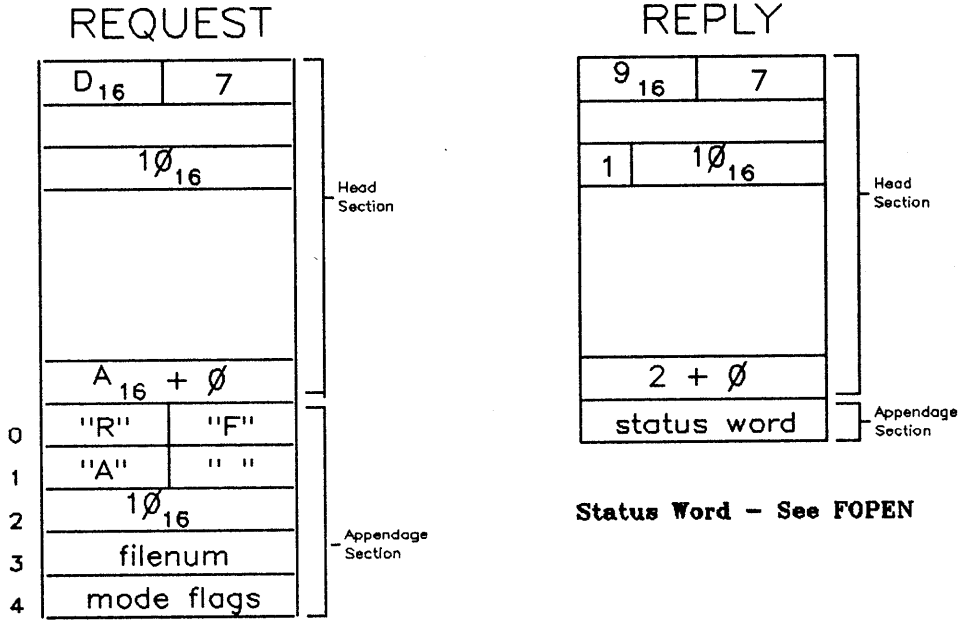
**FCONTROL**

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %17 (#F, 15)



### FSETMODE

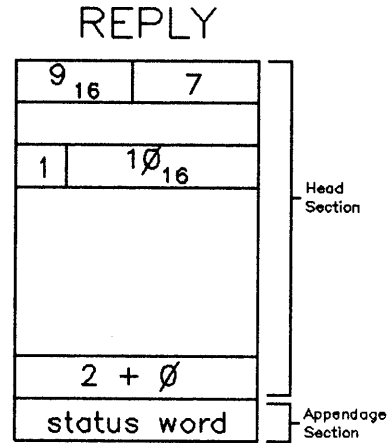
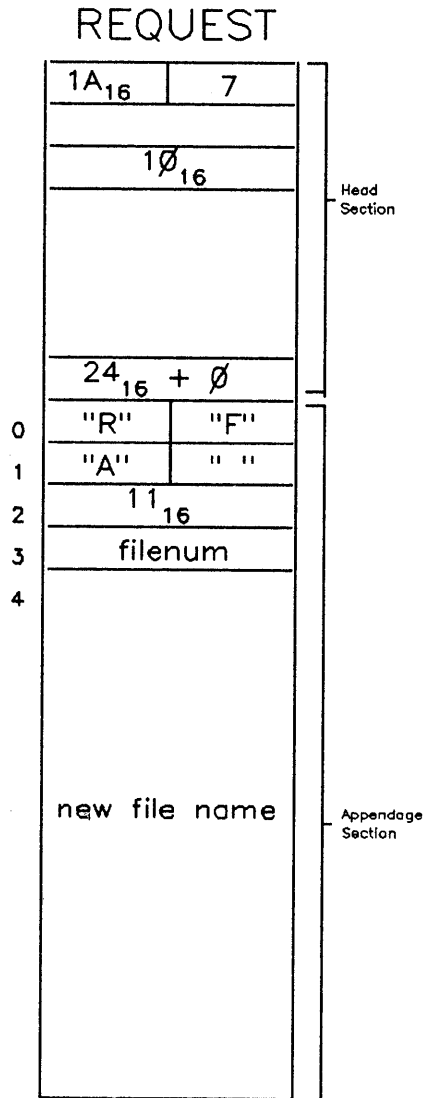
Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic = %20 (#10, 16)



Message Formats

**FRENAME**

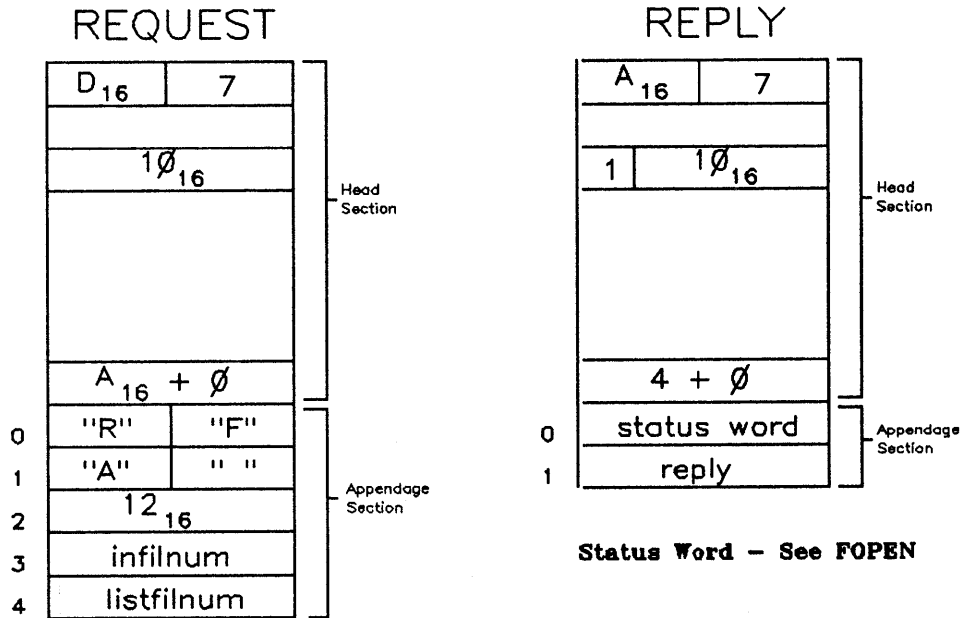
Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %21 (#11, 17)



**Status Word - See FOPEN**

**FRELATE**

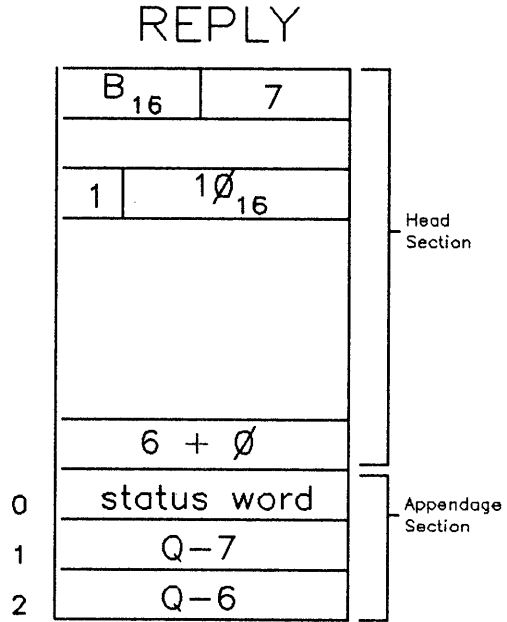
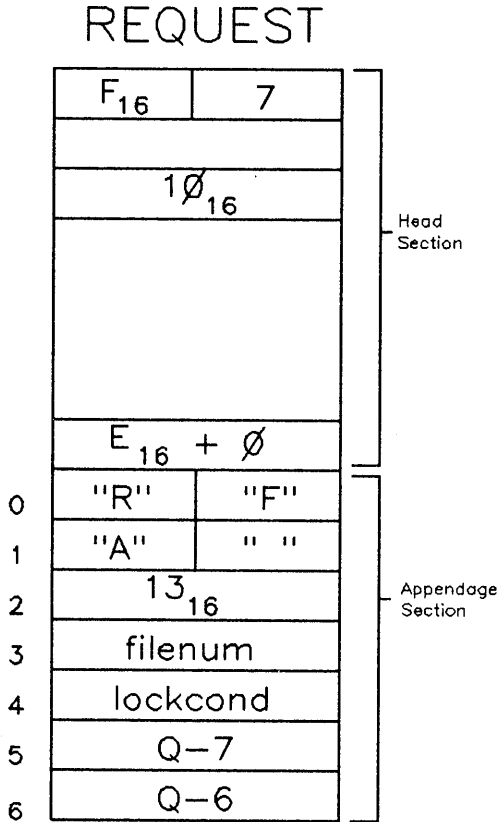
Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %22 (#12, 18)



Message Formats

FLOCK

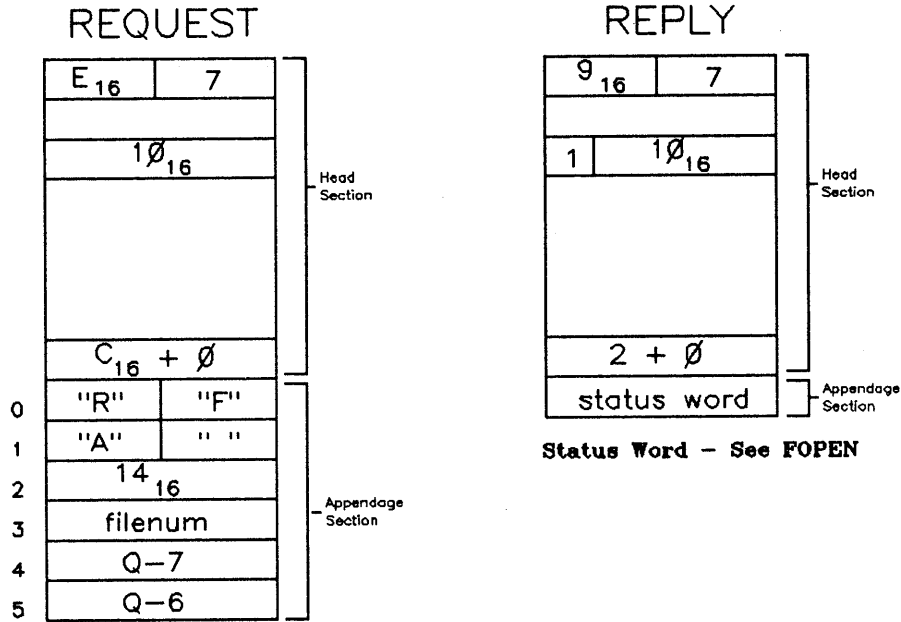
Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %23 (#13, 19)



Status Word - See FOPEN

## FUNLOCK

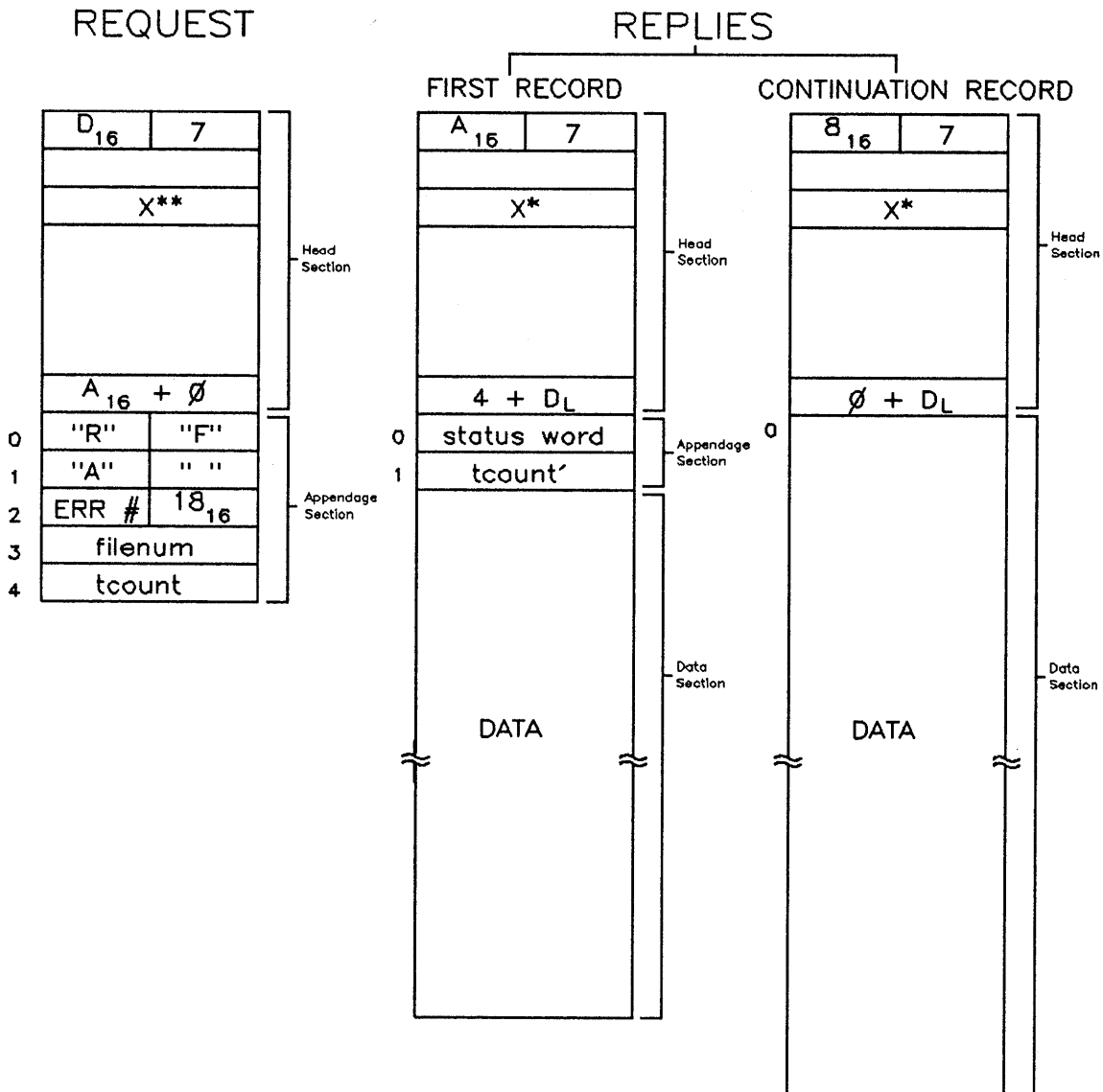
Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %24 (#14, 20)





## FREAD (Multirecord)

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %30 (#18, 24)



**tcount** - Amount to be read

**tcount'** - Amount read

**Status Word** - See FOPEN

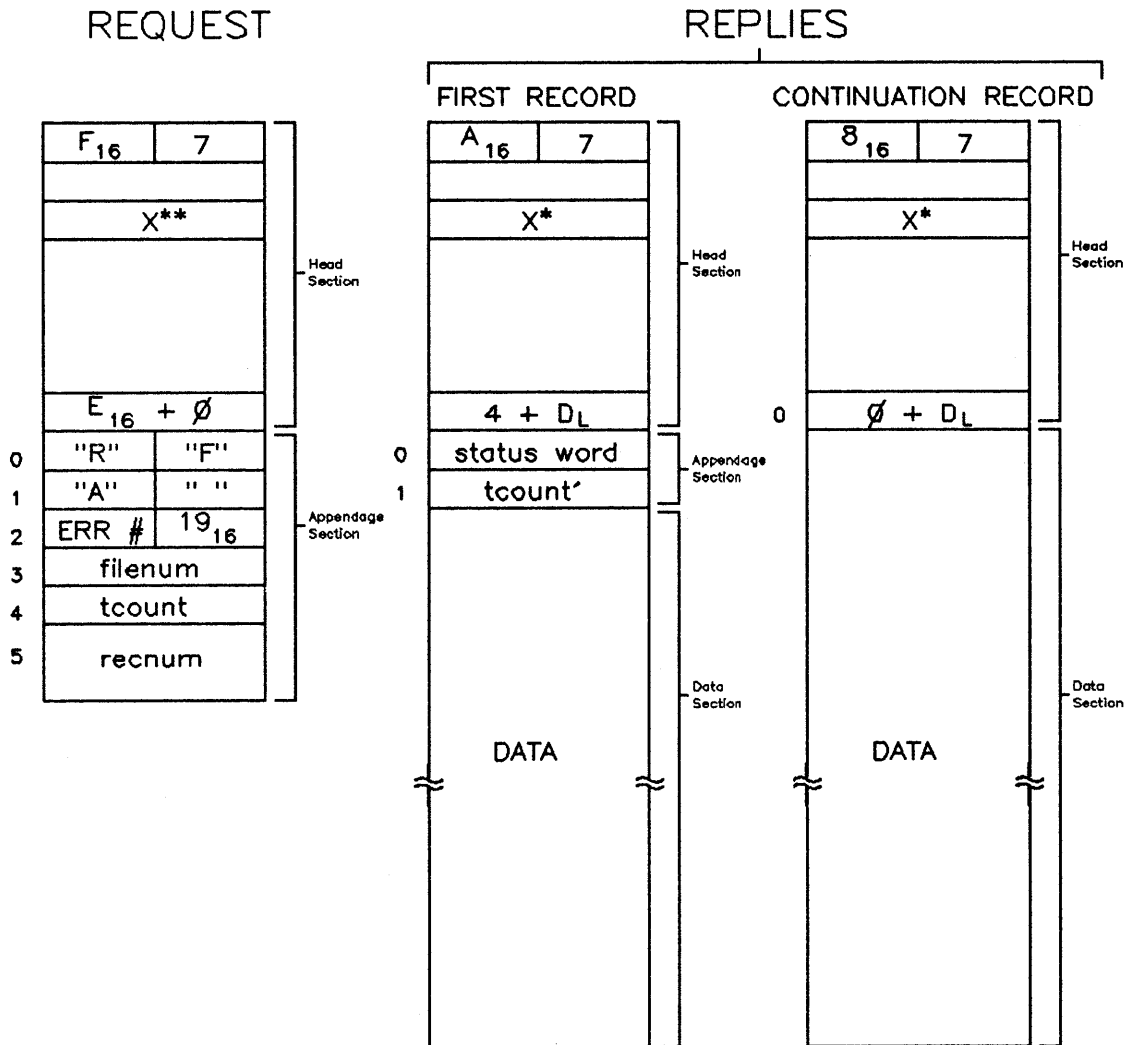
**Err #** - used when local system finds an error in a file. ERR # passed to remote system is to be included in FCHECK returned by remote system.

$$X^* = \begin{cases} \begin{matrix} 1\emptyset_1 & 1\emptyset_{16} \end{matrix} & \text{if continuation to follow} \\ \begin{matrix} 1 & 1\emptyset_{16} \end{matrix} & \text{if nothing to follow} \end{cases}$$

$$X^{**} = \begin{cases} \begin{matrix} \emptyset\emptyset_1 & 1\emptyset_{16} \end{matrix} & \text{if continuation to follow} \\ 1\emptyset_{16} & \text{if nothing to follow} \end{cases}$$

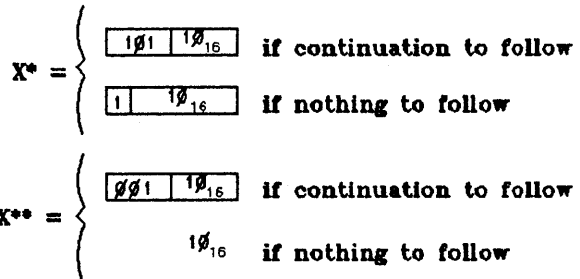
## FREADDIR (Multirecord)

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %31 (#19, 25)



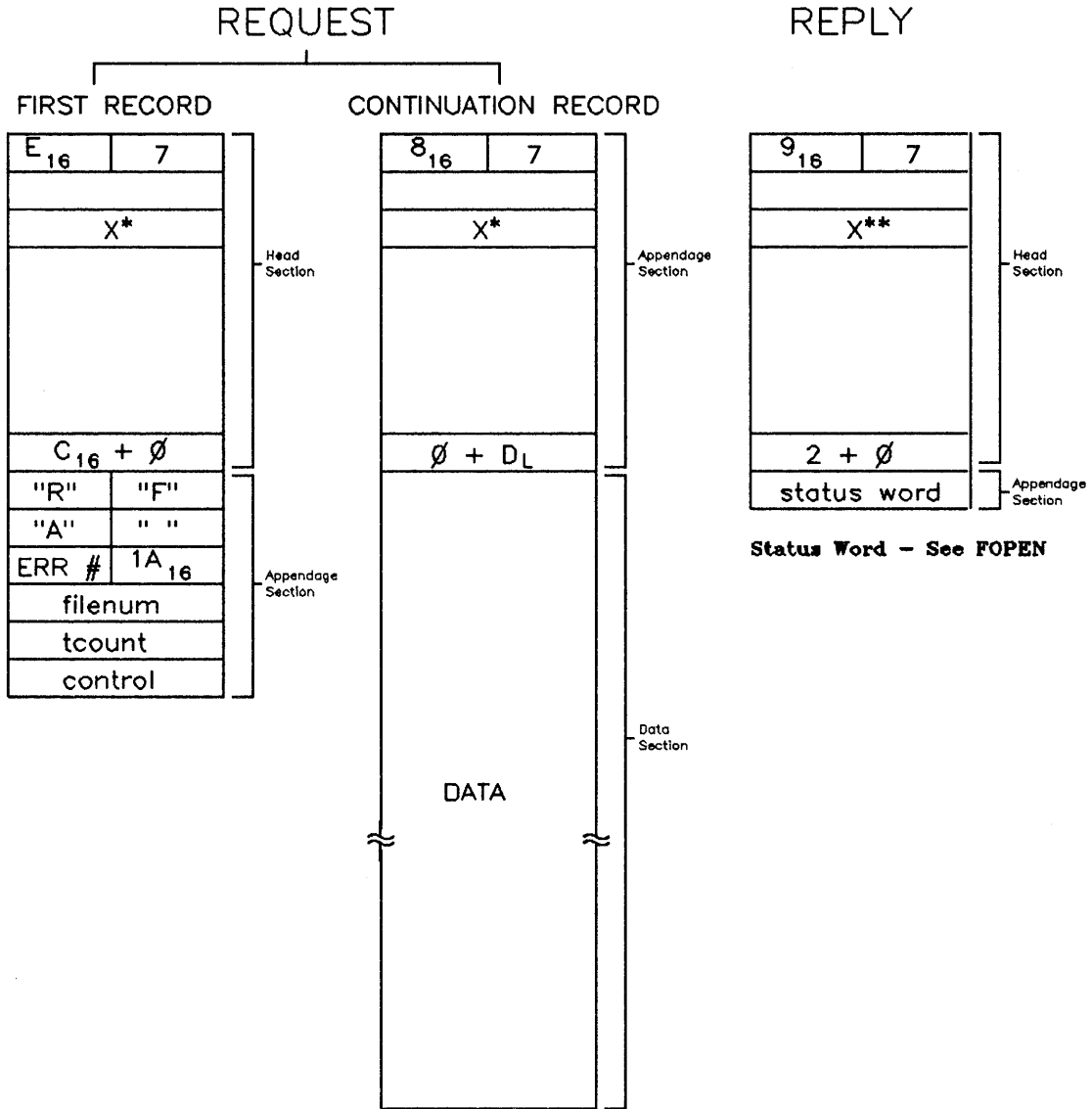
tcount - Amount to be read  
 tcount' - Amount read  
 Status Word - See FOPEN

Err # - used when local system finds an error in a file. ERR # passed to remote system is to be included in FCHECK returned by remote system.



## FWRITE (Multirecord)

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %32 (#1A, 26)

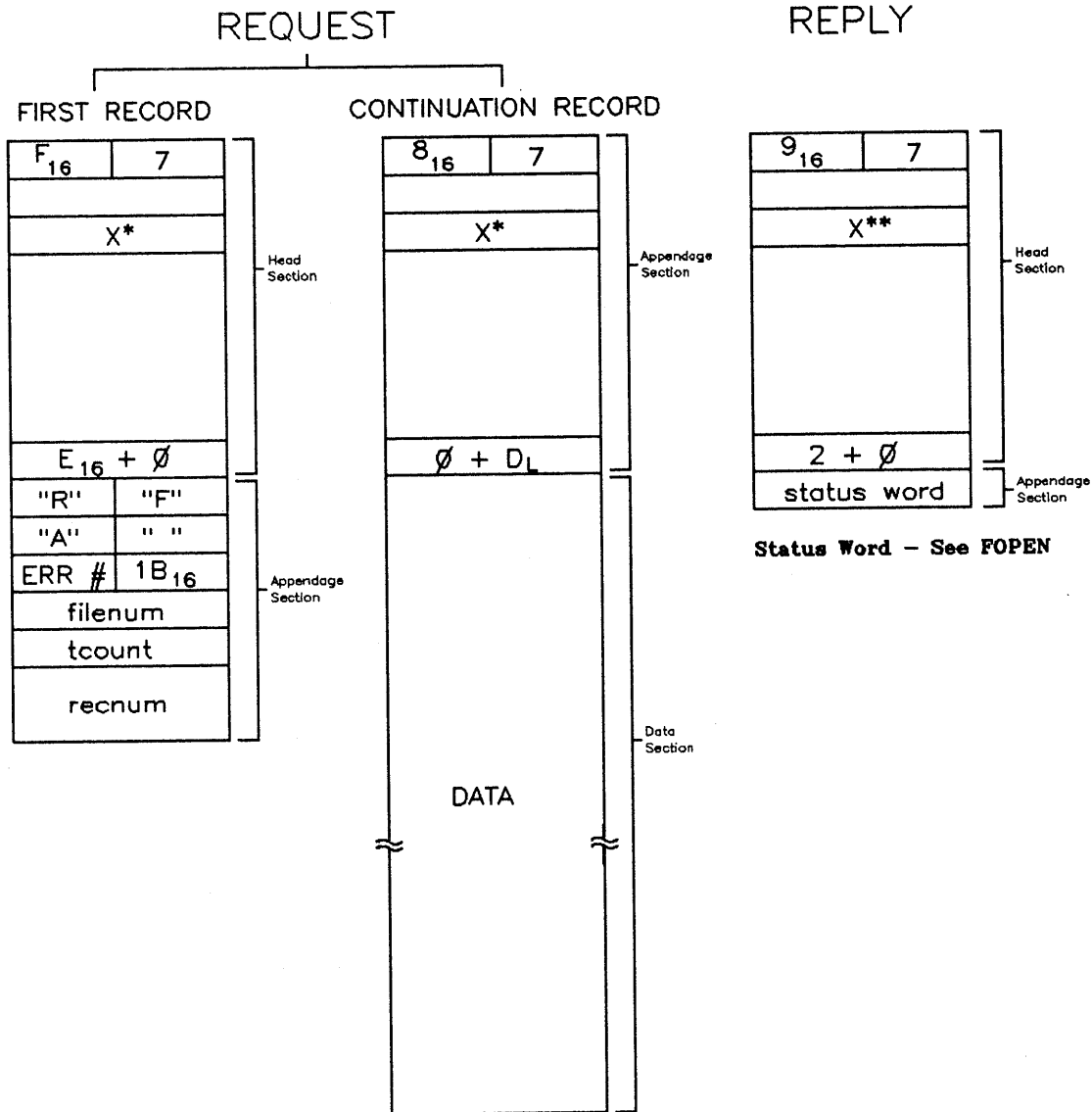


Err # - used when local system finds an error in a file. ERR # passed to remote system is to be included in FCHECK returned by remote systems.

$X^* = \begin{cases} \boxed{\emptyset\emptyset_1 \quad 1\emptyset_{16}} & \text{if continuation to follow} \\ \boxed{1 \quad 1\emptyset_{16}} & \text{if nothing to follow} \end{cases}$ 
  
 $X^{**} = \begin{cases} \boxed{1\emptyset_1 \quad 1\emptyset_{16}} & \text{if continuation to follow} \\ \boxed{1\emptyset_{16}} & \text{if nothing to follow} \end{cases}$

## FWRITEDIR (Multirecord)

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %33 (#1B, 27)



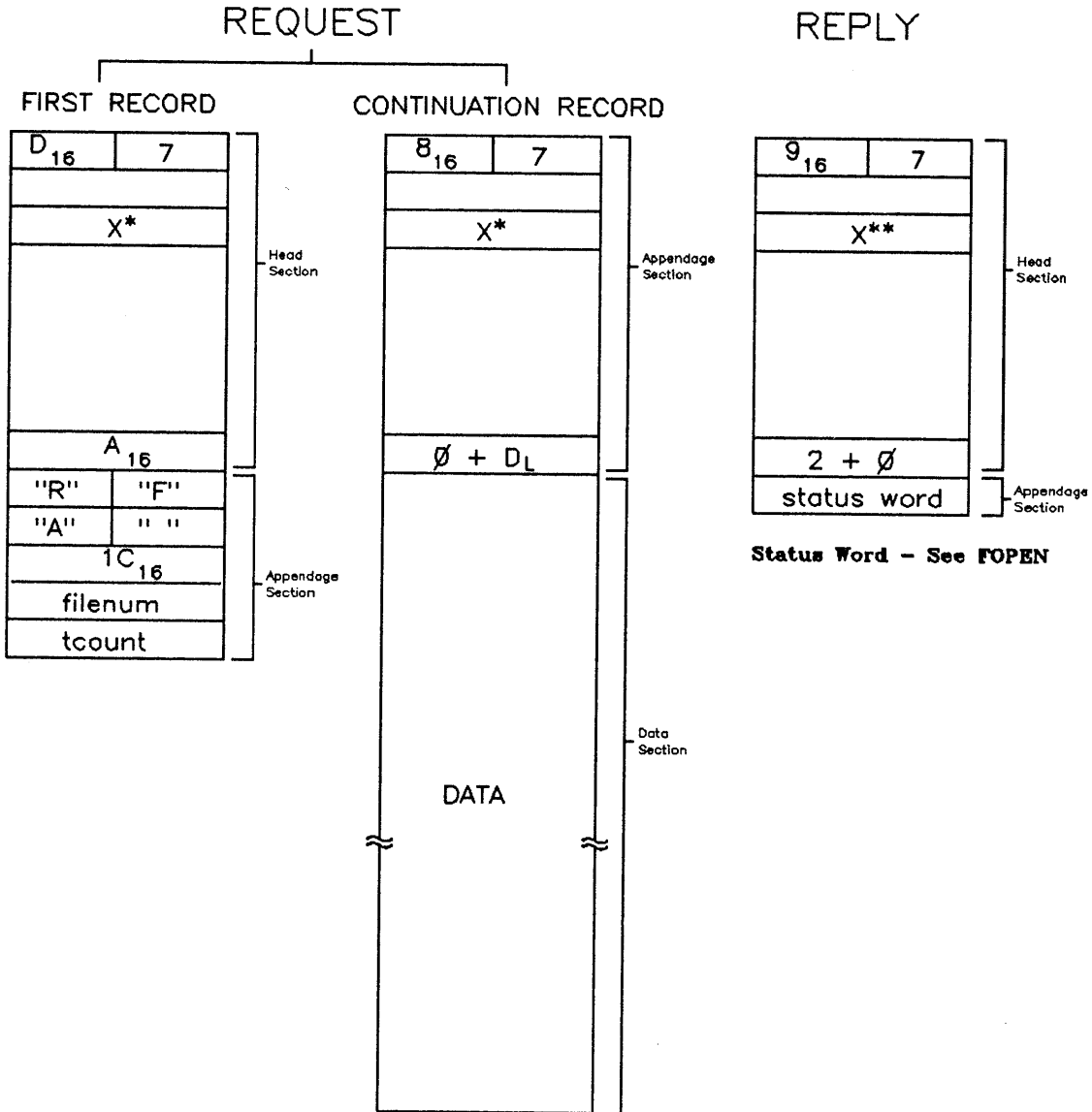
Err # - used when local system finds an error in a file. ERR # passed to remote system is to be included in FCHECK returned by remote systems.

$X^* = \begin{cases} \begin{matrix} \emptyset\emptyset_1 & 1\emptyset_{16} \end{matrix} & \text{if continuation to follow} \\ \begin{matrix} 1 & 1\emptyset_{16} \end{matrix} & \text{if nothing to follow} \end{cases}$

$X^{**} = \begin{cases} \begin{matrix} 1\emptyset_1 & 1\emptyset_{16} \end{matrix} & \text{if continuation to follow} \\ 1\emptyset_{16} & \text{if nothing to follow} \end{cases}$

## FUPDATE (Multirecord)

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %34 (#1C, 28)

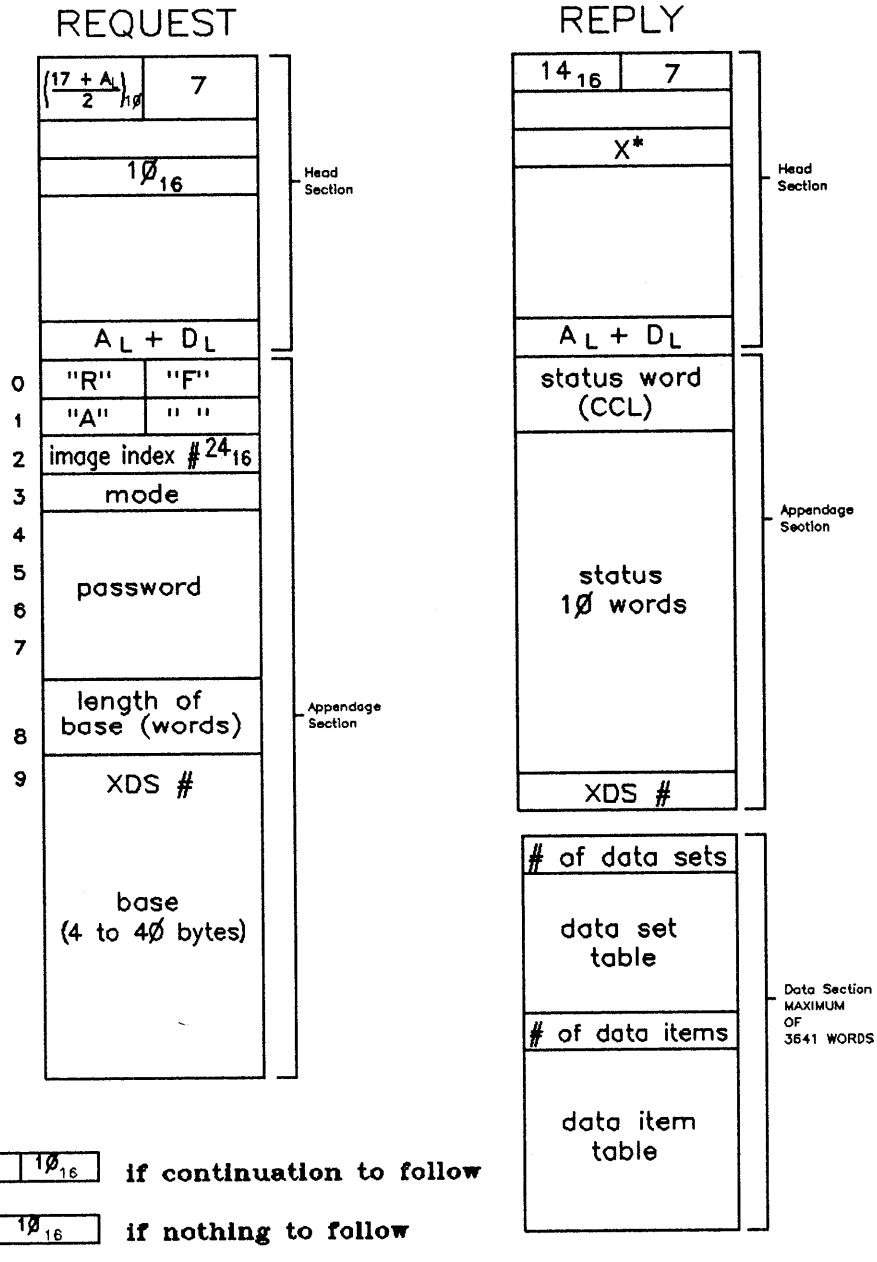


$$X^* = \begin{cases} \left[ \begin{array}{|c|c|} \hline \emptyset \emptyset 1 & 1 \emptyset_{16} \\ \hline \end{array} \right] & \text{if continuation to follow} \\ \left[ \begin{array}{|c|c|} \hline 1 & 1 \emptyset_{16} \\ \hline \end{array} \right] & \text{if nothing to follow} \end{cases}$$

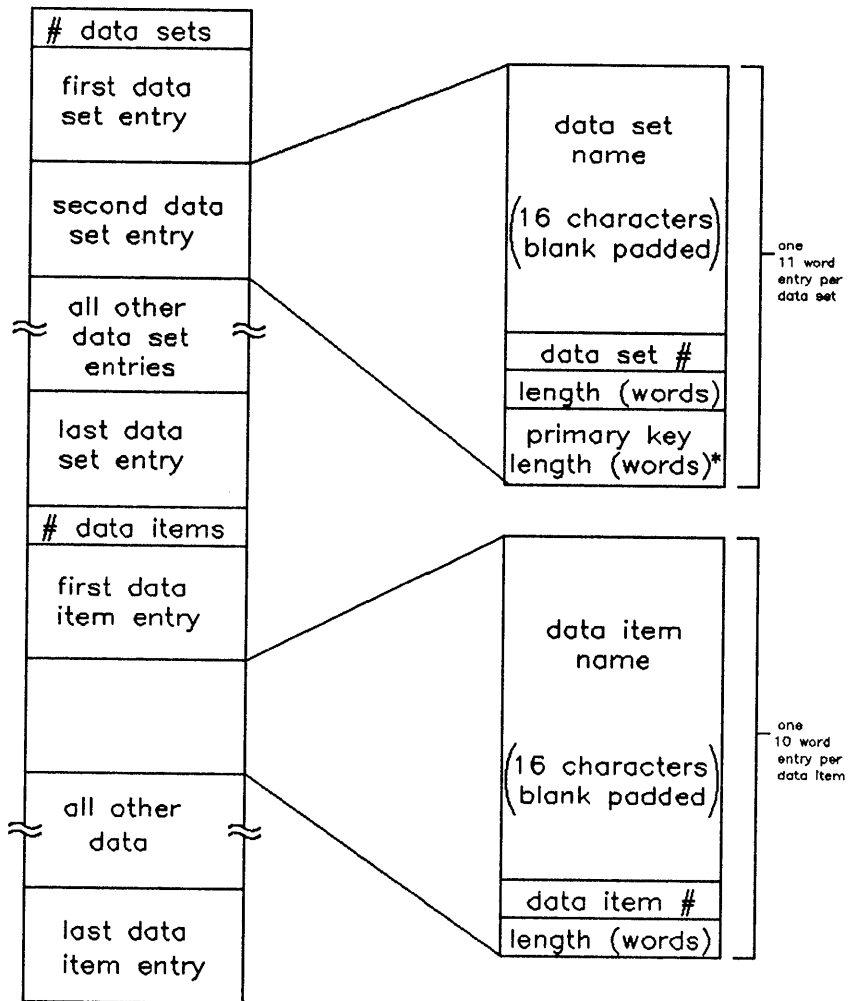
$$X^{**} = \begin{cases} \left[ \begin{array}{|c|c|} \hline 1 \emptyset 1 & 1 \emptyset_{16} \\ \hline \end{array} \right] & \text{if continuation to follow} \\ 1 \emptyset_{16} & \text{if nothing to follow} \end{cases}$$

DBOPEN

Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %44(#24, 36)



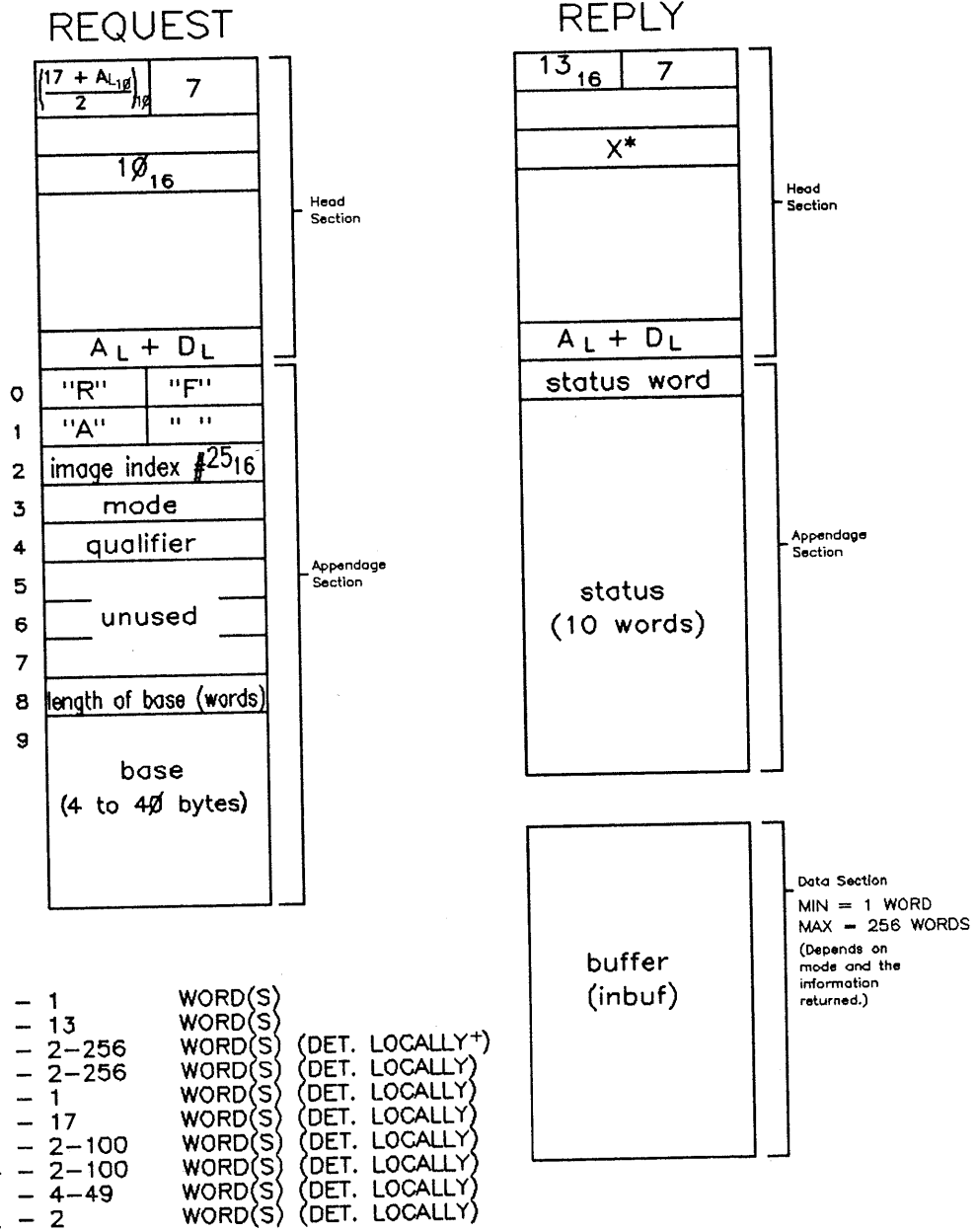
### DBOPEN (Detail of Data Section)



**\*Master data sets only. Detail data set entries contain a Ø in this position.**

**DBINFO**

Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %45(#25, 37)



+ DET.= DETERMINED

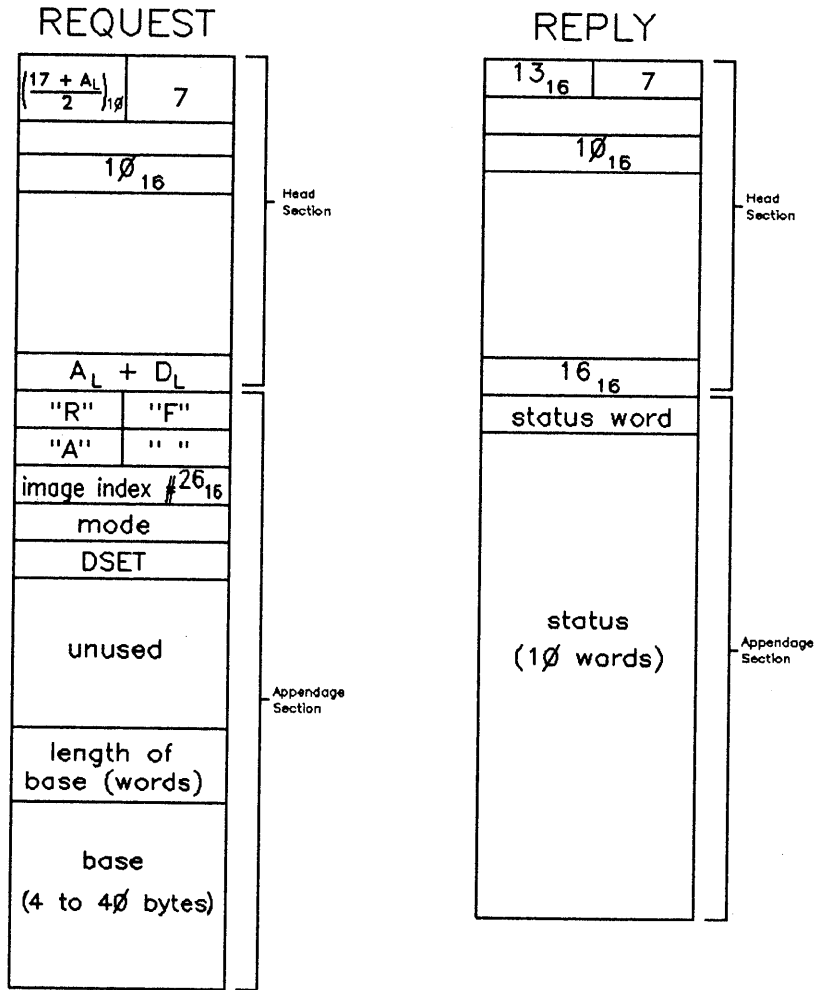
NOTE: Local DBINFO will convert qualifier to numeric form if necessary.

$X^* = \begin{cases} 1\emptyset1 \quad 1\emptyset_{16} & \text{if continuation to follow} \\ 1 \quad 1\emptyset_{16} & \text{if nothing to follow} \end{cases}$



## DBCLOSE

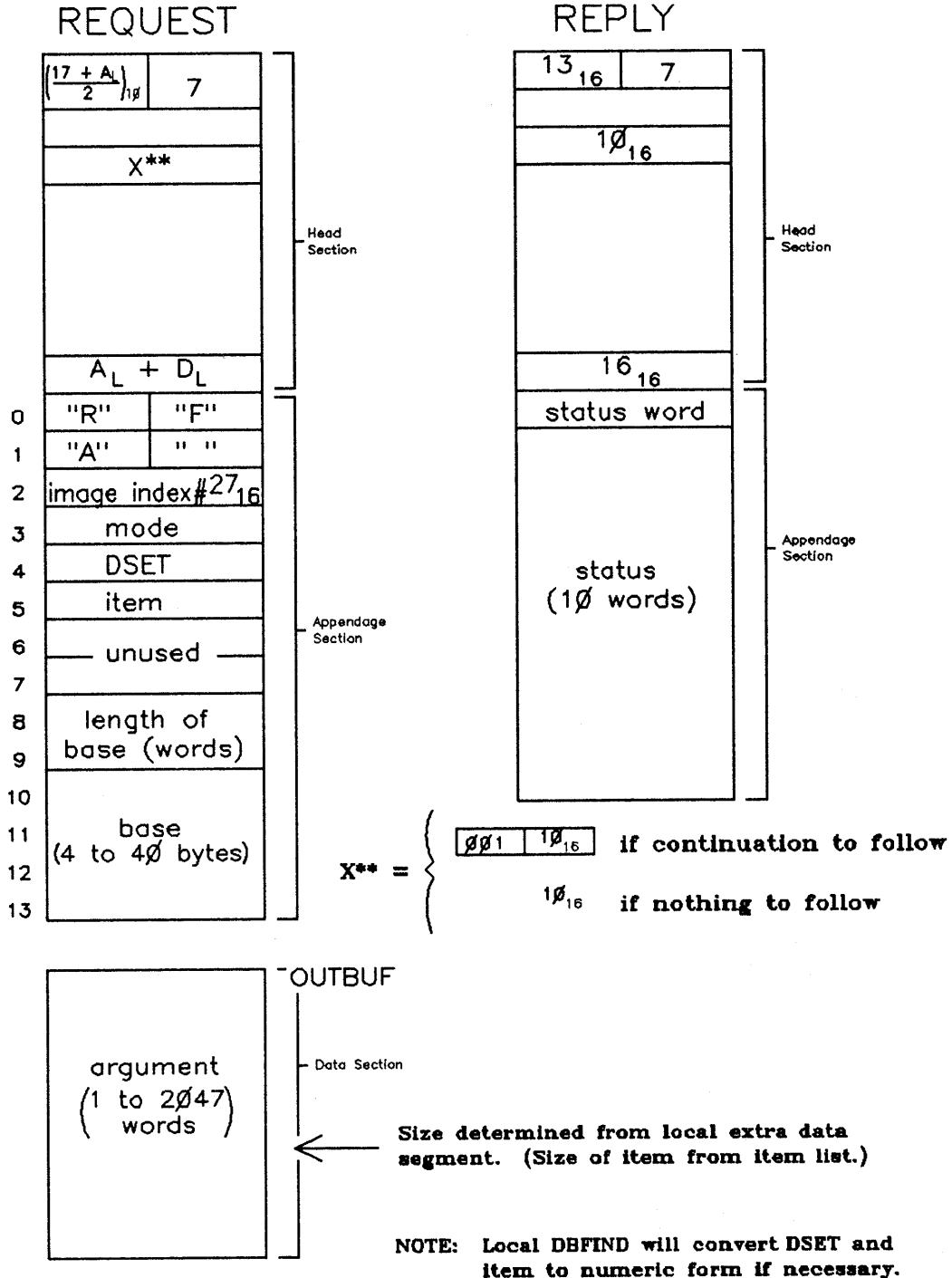
Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %46(#26, 38)



**NOTE: Local DBCLOSE will convert DSET to numeric form if necessary.**

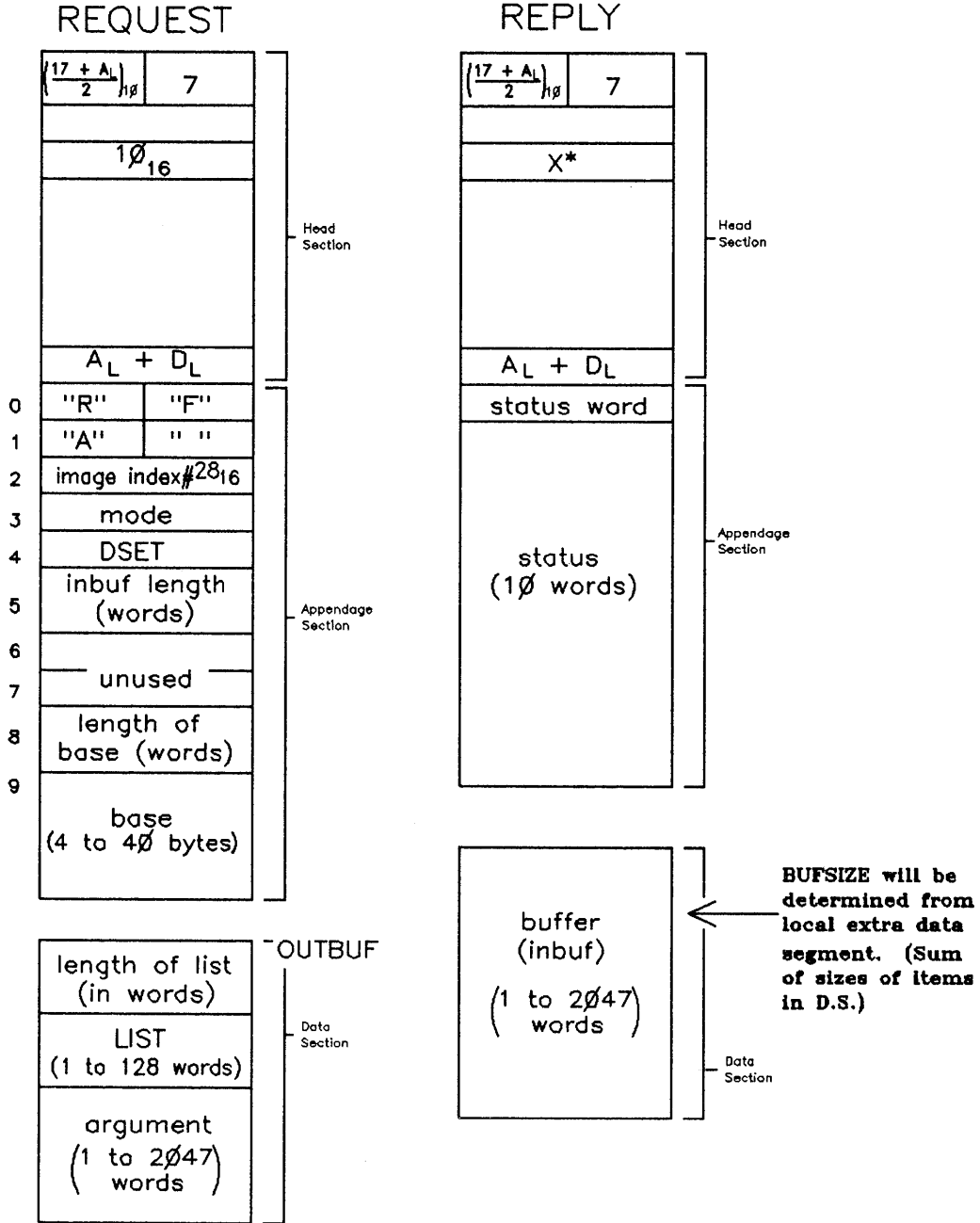
### DBFIND

Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %47(#27, 39)



DBGET

Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %50(#28, 40)

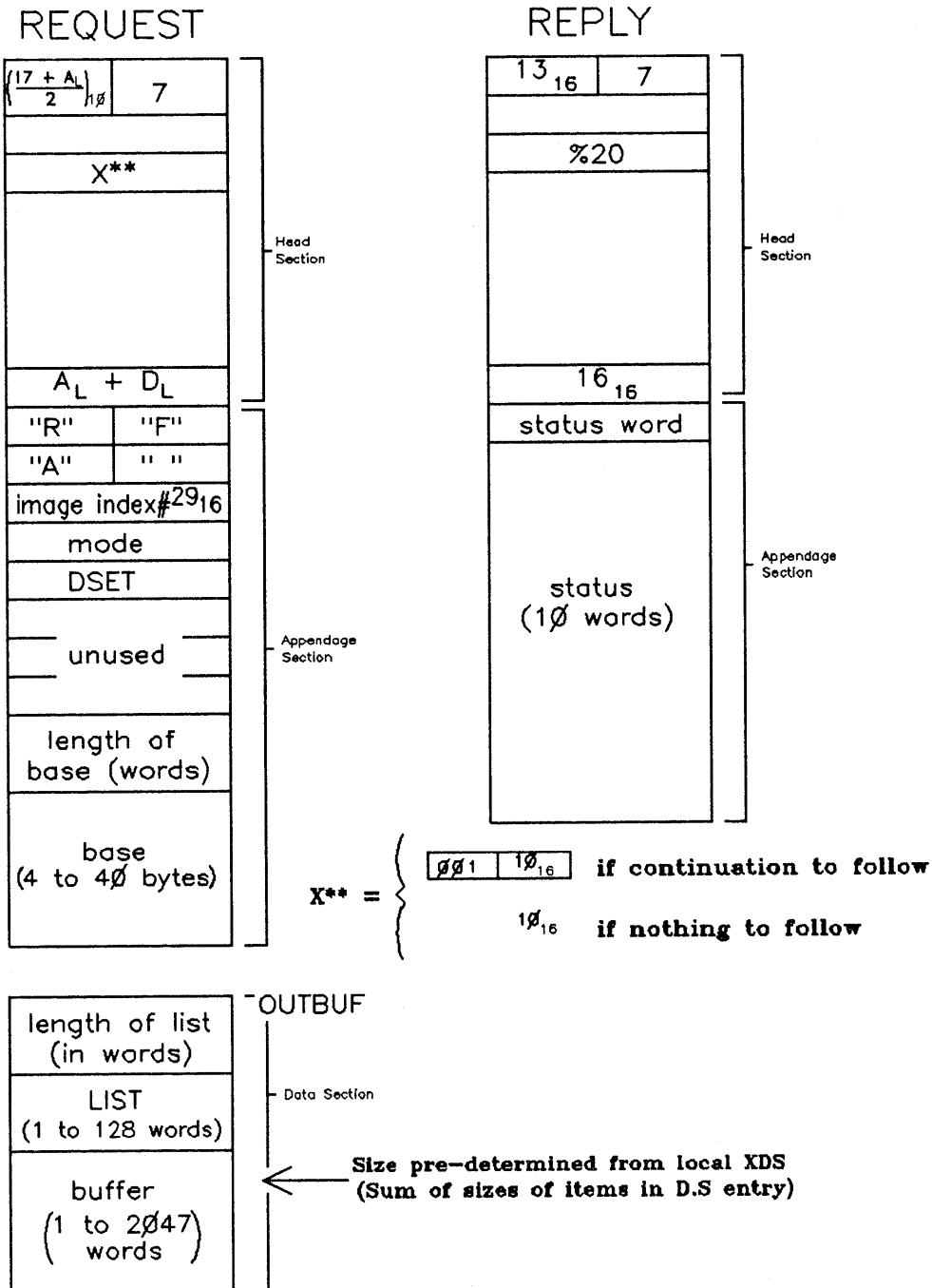


NOTE: Local DBGET will convert DSET and LIST to numeric form if necessary.

$$X^* = \begin{cases} \left[ \begin{array}{|c|c|} \hline 1\emptyset1 & 1\emptyset_{16} \\ \hline \end{array} \right] & \text{if continuation to follow} \\ \left[ \begin{array}{|c|c|} \hline 1 & 1\emptyset_{16} \\ \hline \end{array} \right] & \text{if nothing to follow} \end{cases}$$

## DBUPDATE

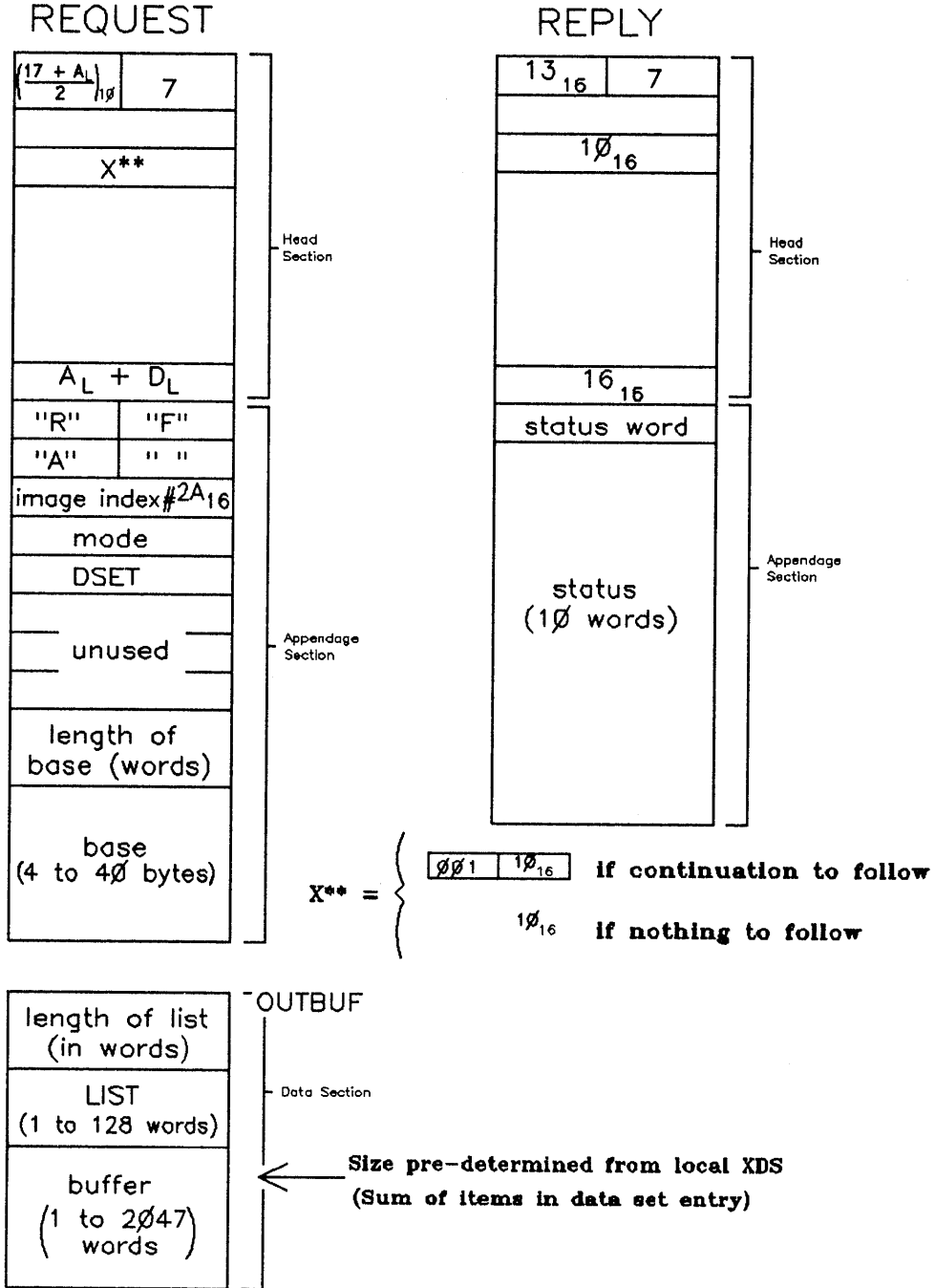
Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %51(#29, 41)



**NOTE:** Local DBUPDATE will convert DSET and LIST to numeric form if necessary.

DBPUT

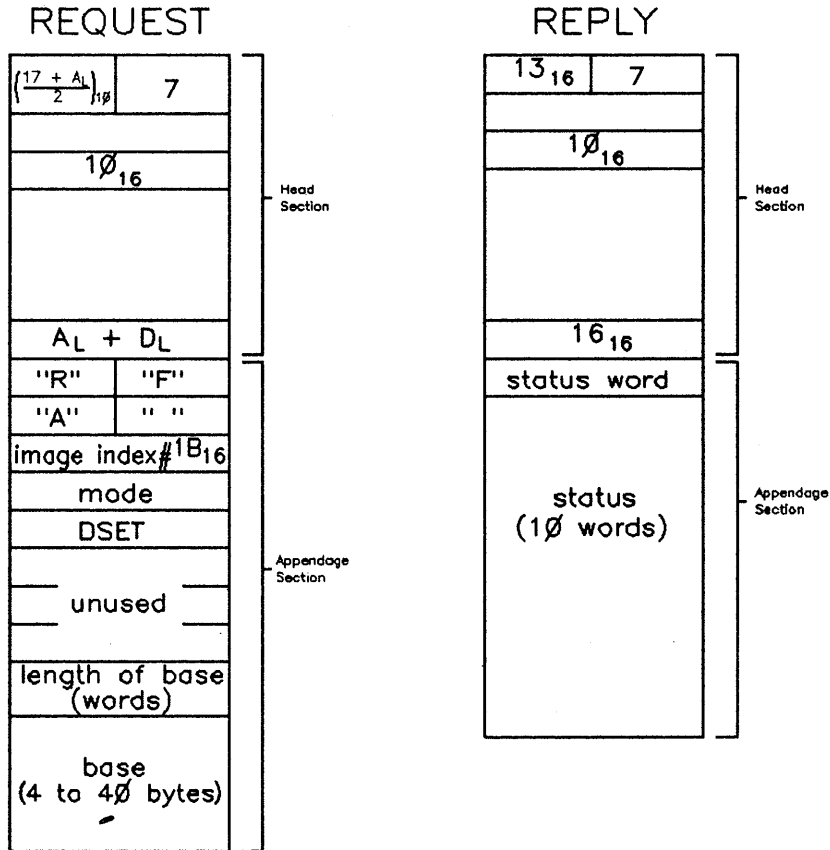
Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %52(#2A, 42)



NOTE: Local DBPUT will convert DSET and LIST to numeric form if necessary.

## DBDELETE

Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %53(#2B, 43)

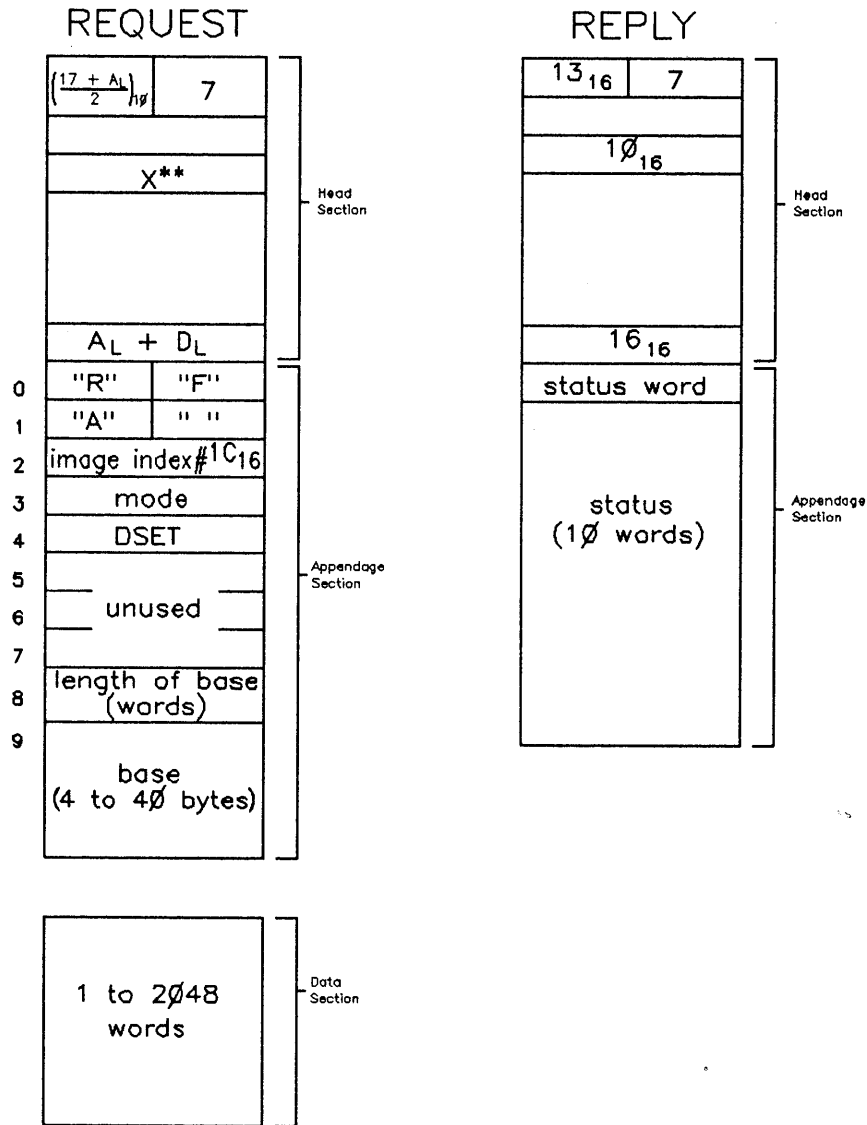


**NOTE:** Local DBDELETE will convert DSET to numeric form if necessary.

Message Formats

DBLOCK

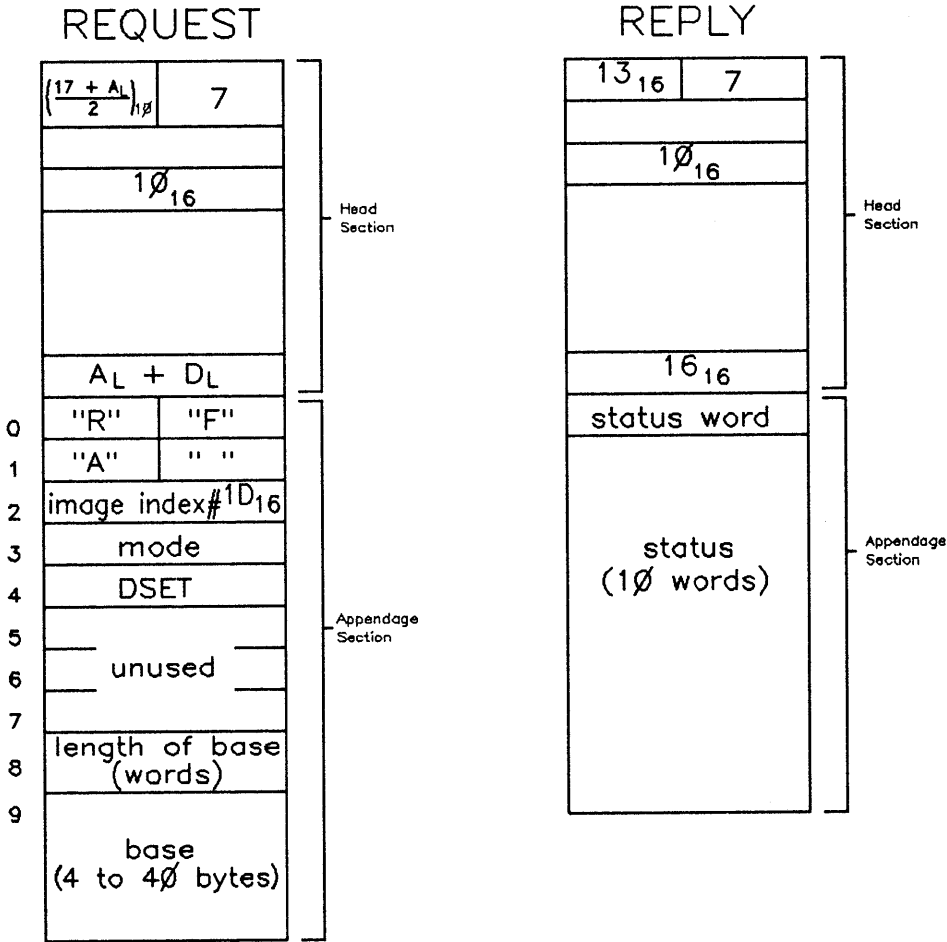
Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %54(#2C, 44)



X\*\* = {  $\begin{matrix} 00_1 & 10_{16} & \text{if continuation to follow} \\ 10_{16} & & \text{if nothing to follow} \end{matrix}$

DBUNLOCK

Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %55(#2D, 45)

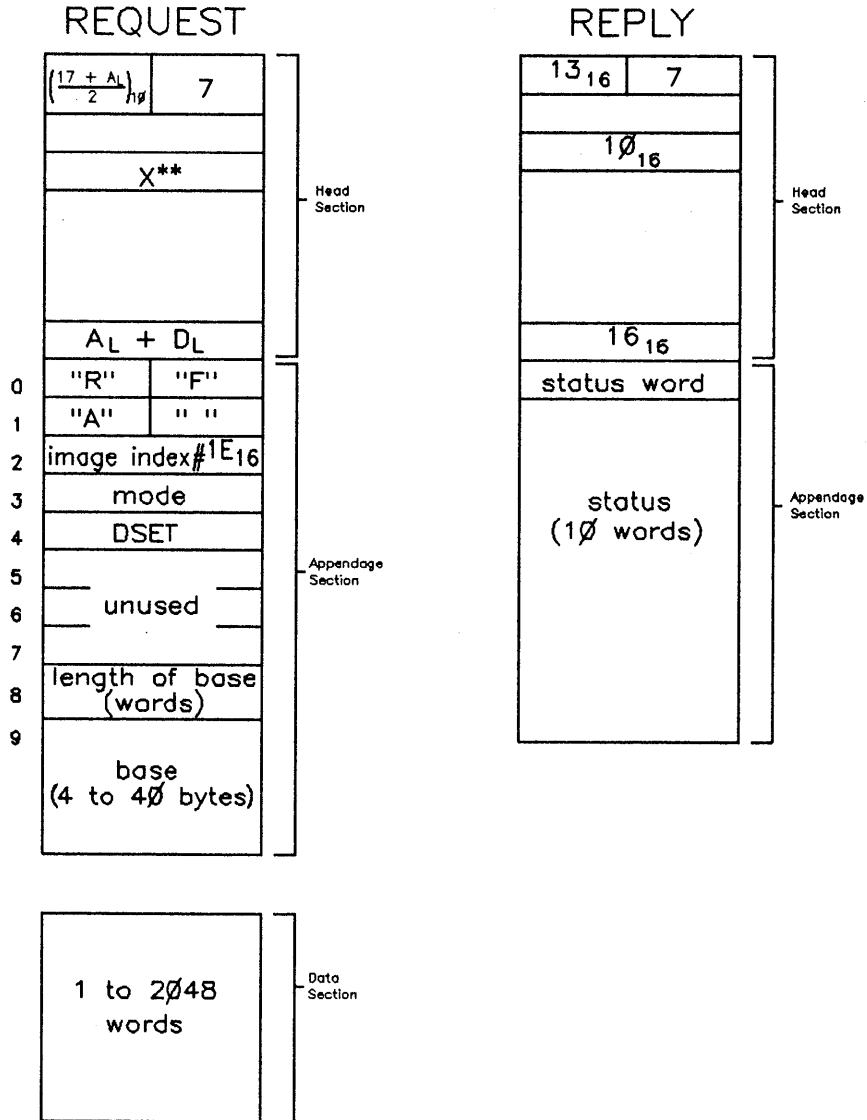




Message Formats

DBCCONTROL

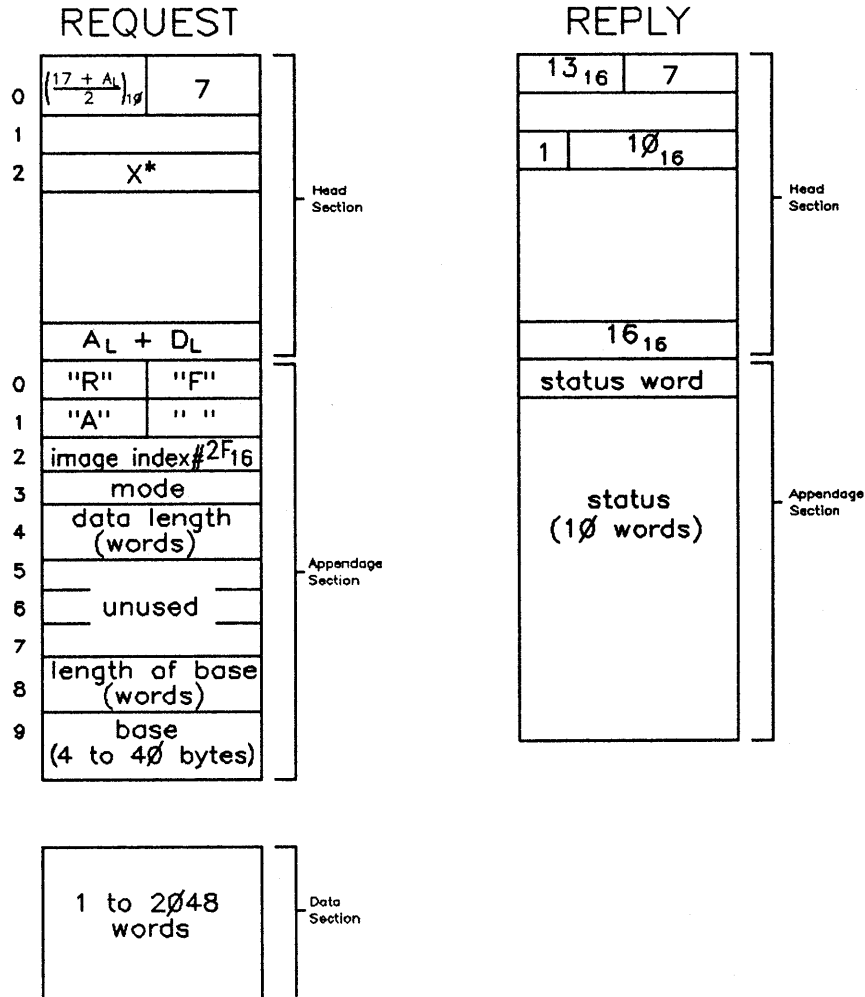
Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %56(#2E, 46)



$$X^{**} = \begin{cases} \begin{matrix} 001 & 10_{16} \end{matrix} & \text{if continuation to follow} \\ 10_{16} & \text{if nothing to follow} \end{cases}$$

DBBEGIN

Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %57(#2F, 47)

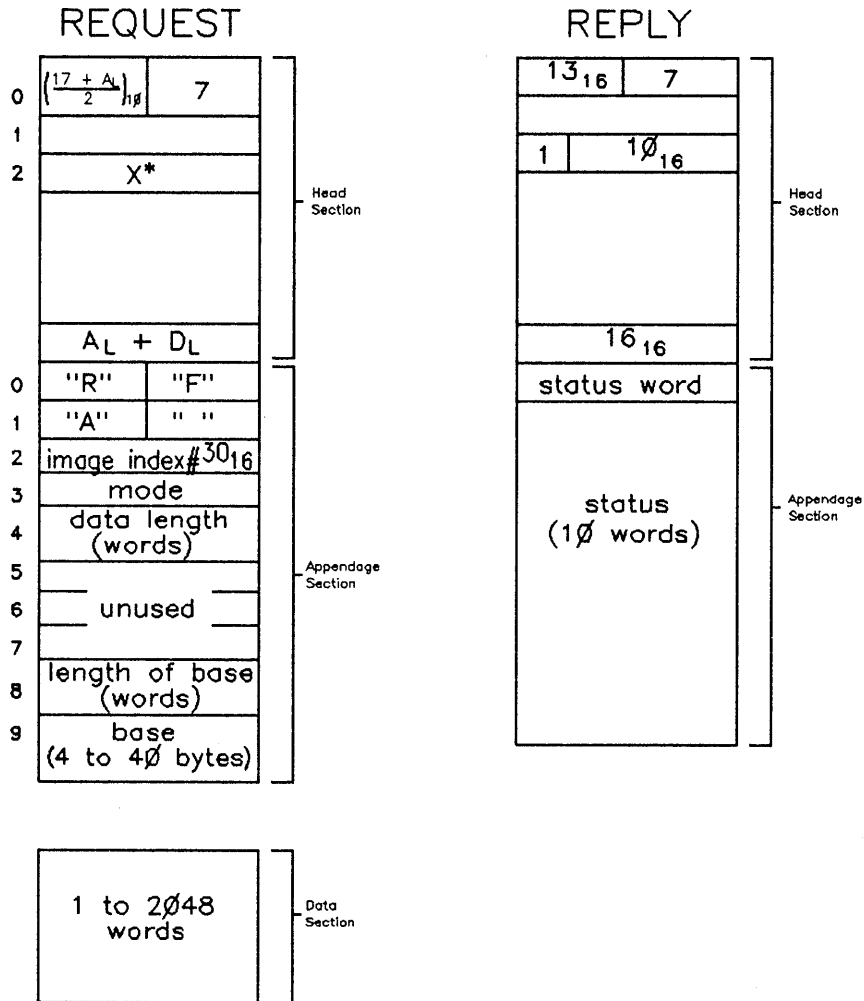


$$X^* = \begin{cases} \boxed{101} \boxed{10_{16}} & \text{if continuation to follow} \\ \boxed{1} \boxed{10_{16}} & \text{if nothing to follow} \end{cases}$$

Message Formats

DBEND

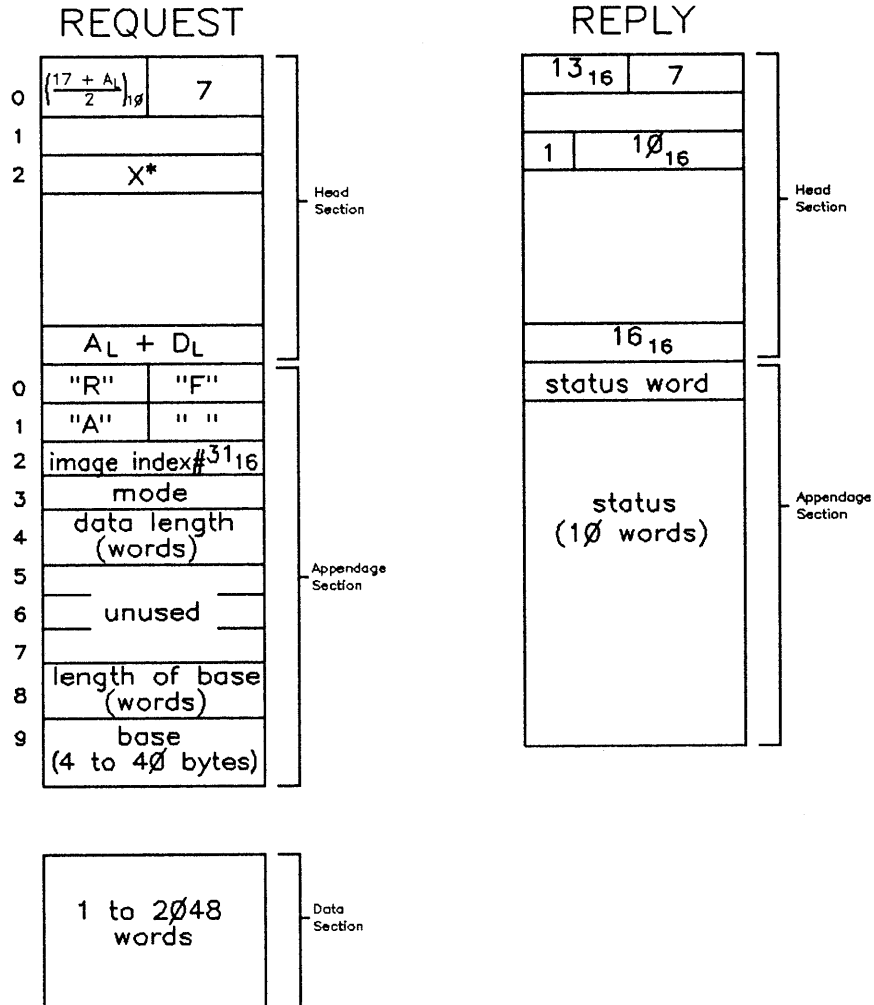
Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %60(#30, 48)



$$X^{**} = \begin{cases} \begin{matrix} 00_1 & 10_{16} \end{matrix} & \text{if continuation to follow} \\ 10_{16} & \text{if nothing to follow} \end{cases}$$

DBMEMO

Message Class = 7  
 Stream Type = %20(#10, 16)  
 Image Index = %61(#31, 49)



$X^* = \begin{cases} \begin{matrix} 001 & 10_{16} \end{matrix} & \text{if continuation to follow} \\ 10_{16} & \text{if nothing to follow} \end{cases}$

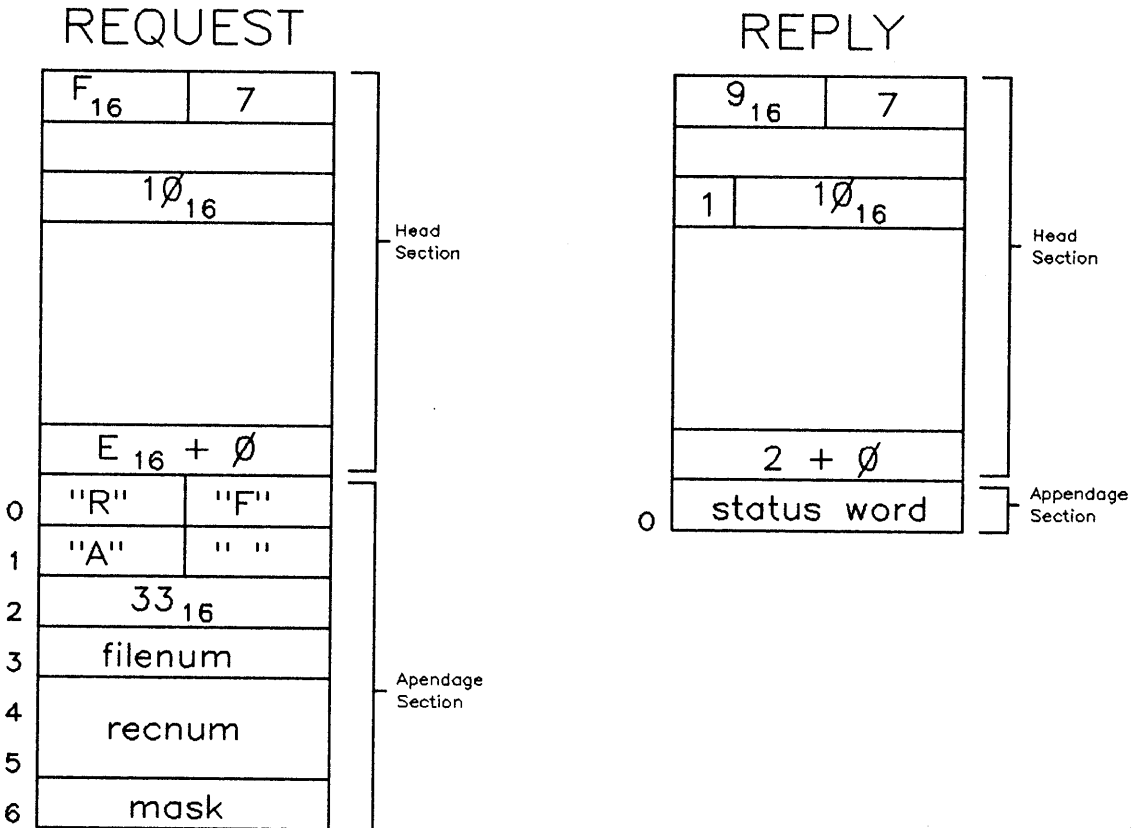
Message Formats

FDELETE

Message Class = 7

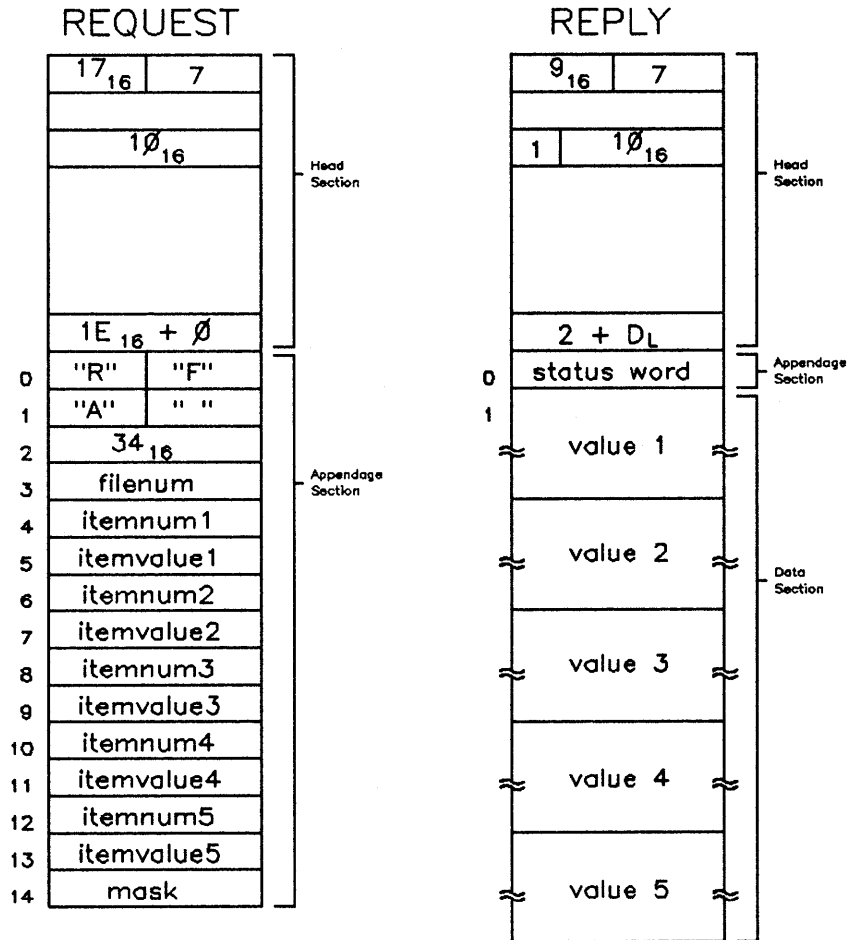
Stream Type = %20 (#10, 16)

F.S. Intrinsic Number = %63 (#33, 51)



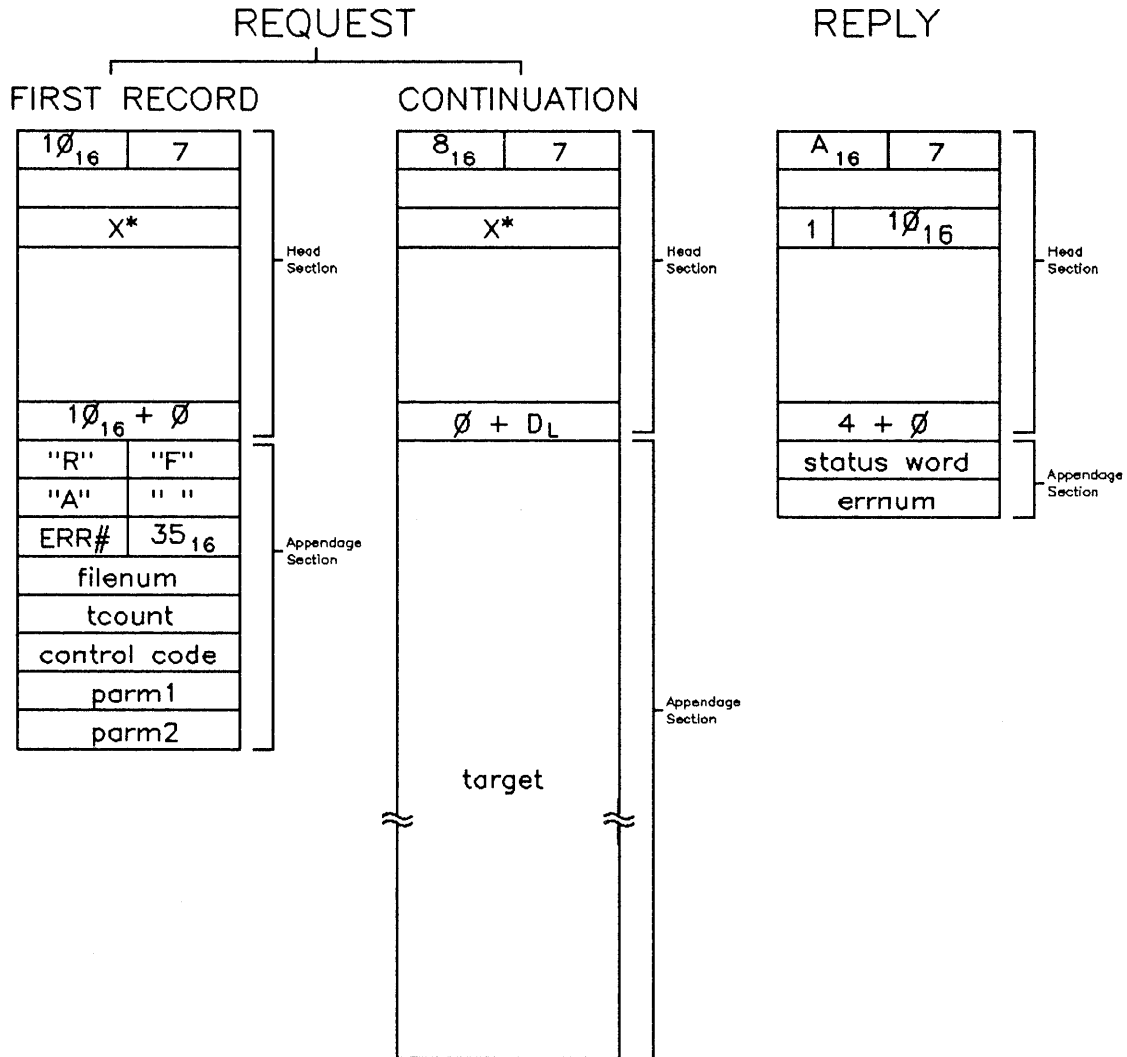
### FFILEINFO

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %64 (#34, 52)



## FDEVICECONTROL

Message Class = 7  
 Stream Type = %20 (#10, 16)  
 F.S. Intrinsic Number = %65 (#35, 53)



**ERR#** - used when local system finds an error in a file. ERR# passed to remote system to be placed in ACB so FCHECK will return correct error.

$$X^* = \begin{cases} \begin{matrix} \emptyset\emptyset 1 & 1\emptyset_{16} \end{matrix} & \text{if continuation to follow} \\ 1\emptyset_{16} & \text{if nothing to follow} \end{cases}$$

## POPEN

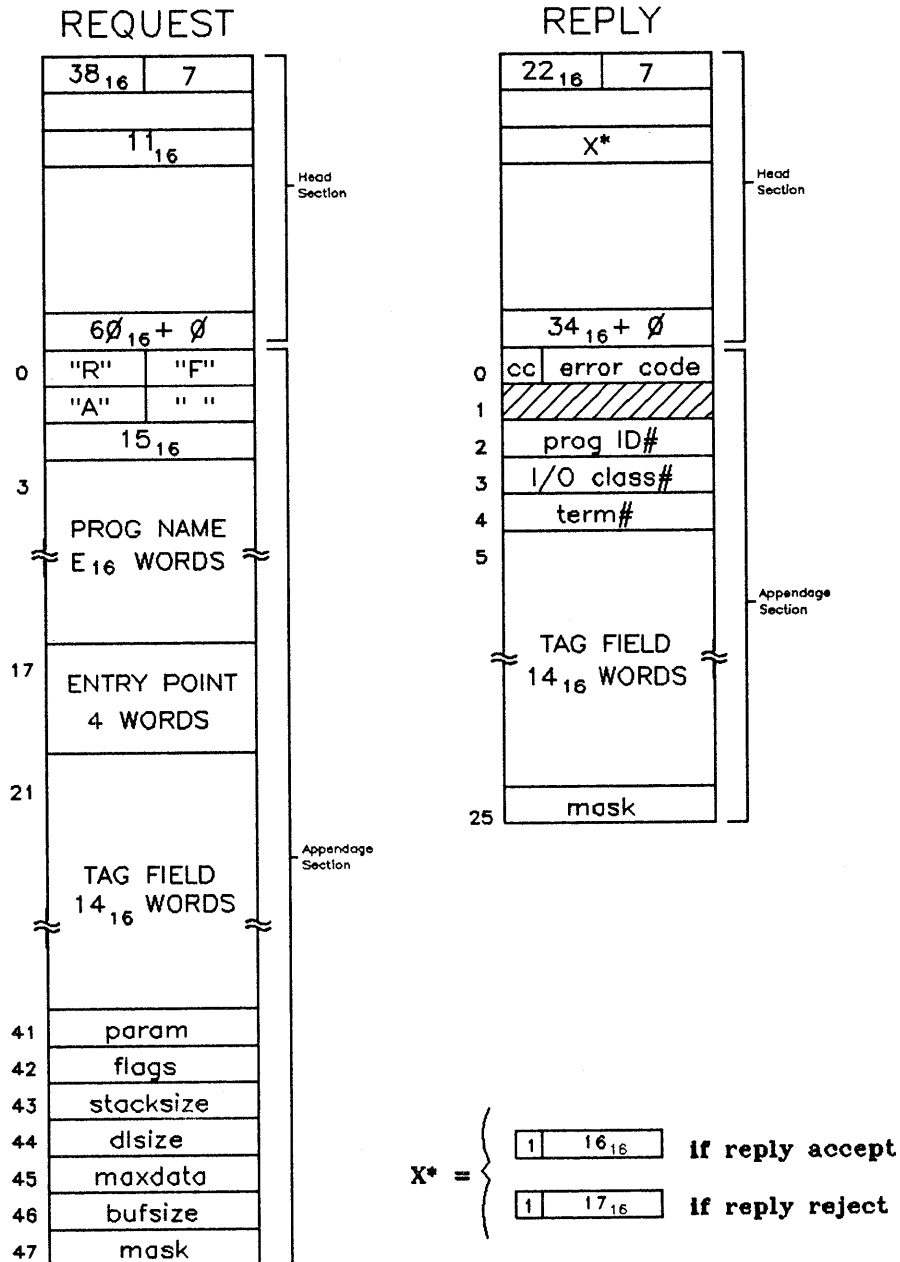
Message Class = 7

Stream Type = %21 (#11, 17) Request = %21 (#11, 17) Request

= %26 (#16, 22) Reply -- ACCEPT

= %27 (#17, 23) Reply -- REJCT

F.S. Intrinsic Number = %25 (#15, 21)





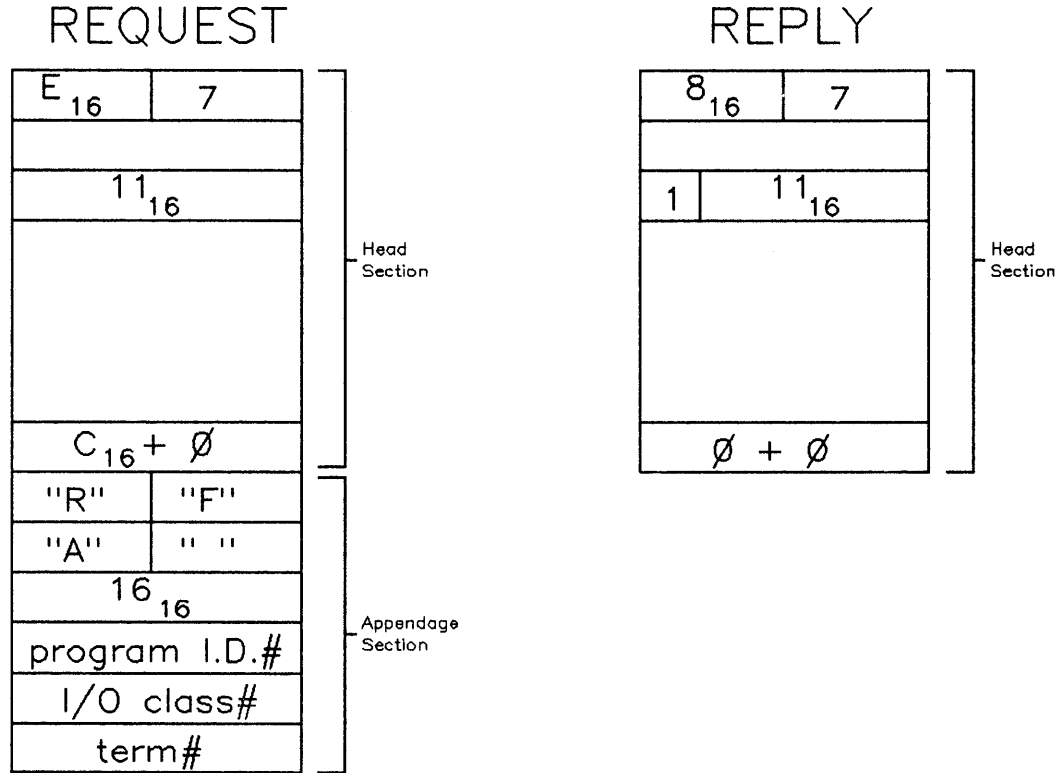
Message Formats

PCLOSE

Message Class = 7

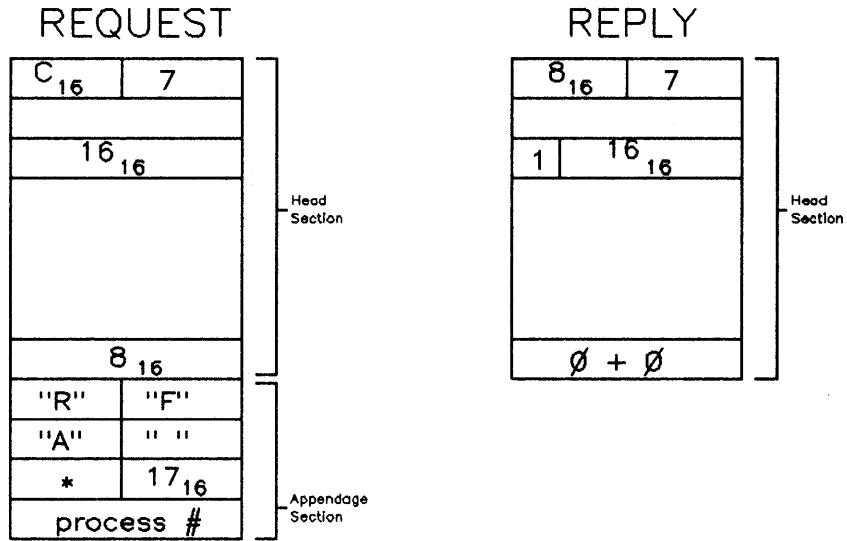
Stream Type = %21 (#11, 17)

F.S. Intrinsic Number = %26 (#16, 22)



### RFA Request (Remote Hello on Slave) (Initial DSOPEN)

Message Class = 7  
Stream Type = %22 (#12, 18)



**NOTE: Performs a DSOPEN.**

- \* ∅ = Master is not compressing on this line, slave will not compress either.
- 1 = Master is compressing on this line and knows that the slave can compress also, so slave will compress.

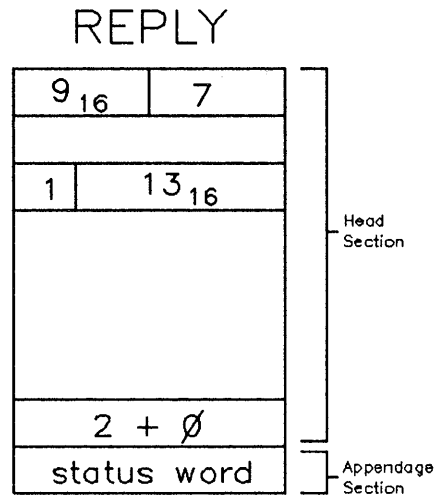
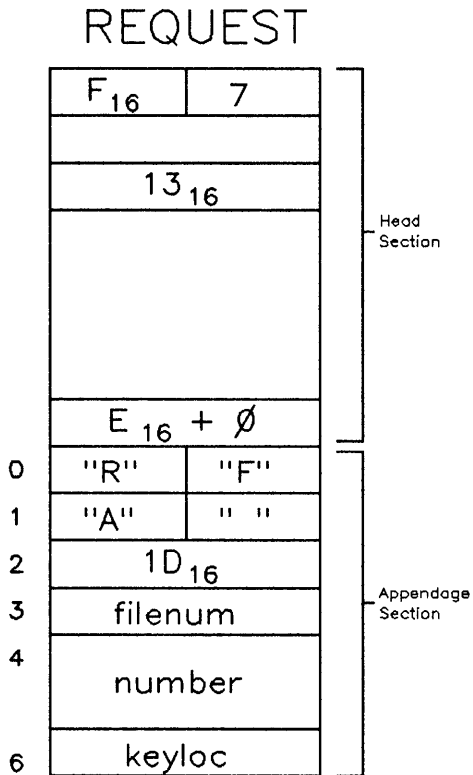
Message Formats

KSAM FFINDN

Message Class = 7

Stream Class = %23 (#13, 19)

F.S. Intrinsic Number = %35 (#1D, 29)

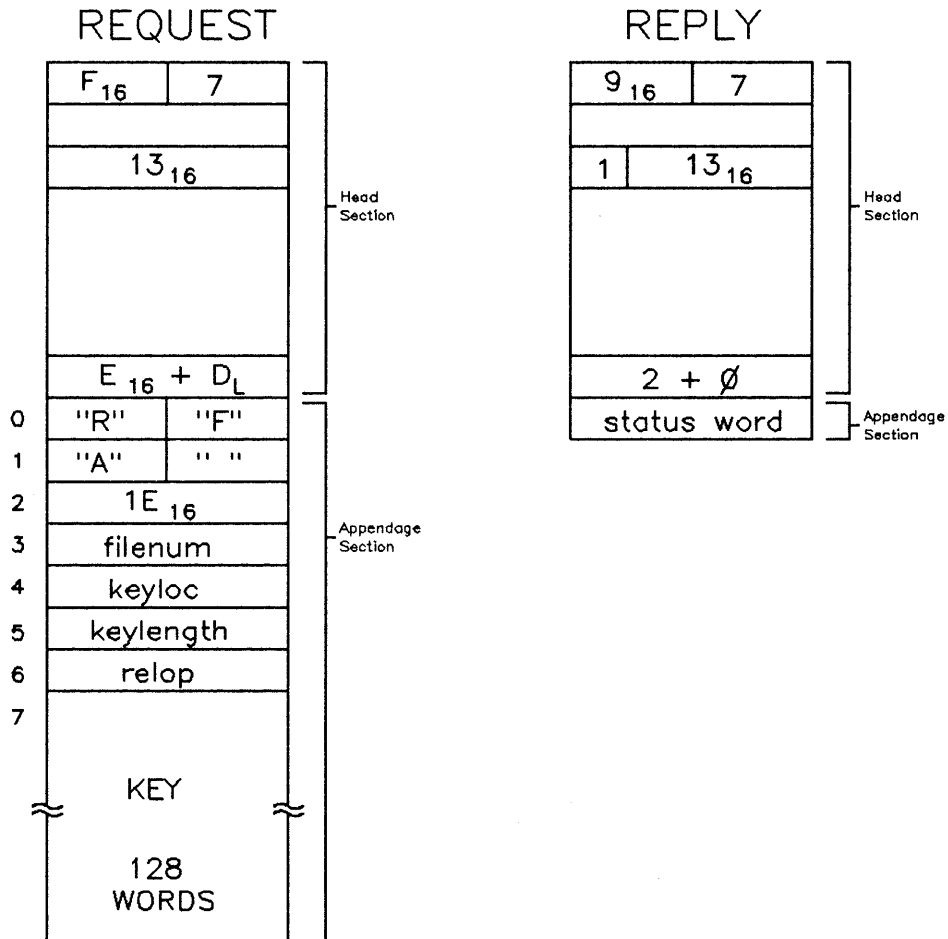


### KSAM FFINDBYKEY

Message Class = 7

Stream Class = %23 (#13, 19)

F.S. Intrinsic Number = %36 (#1E, 30)



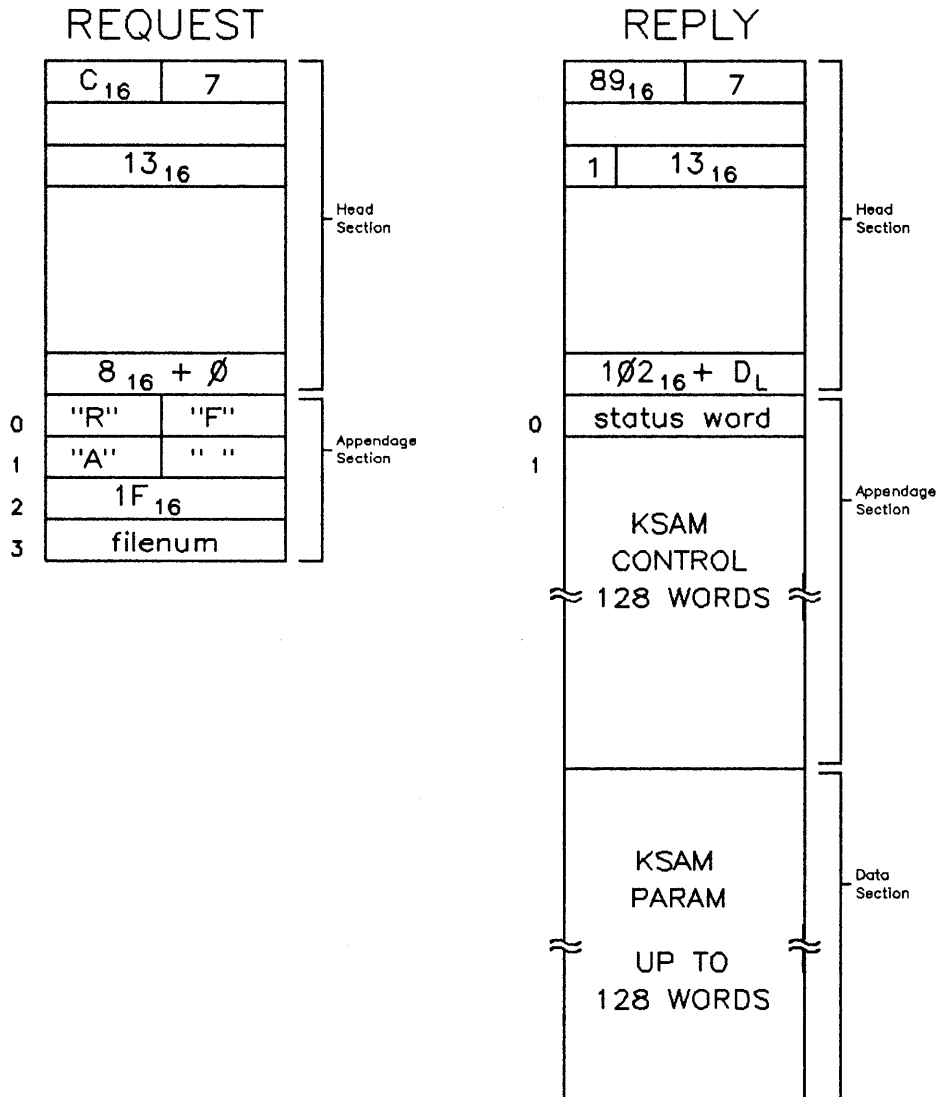
Message Formats

**KSAM FGETKEYINFO**

Message Class = 7

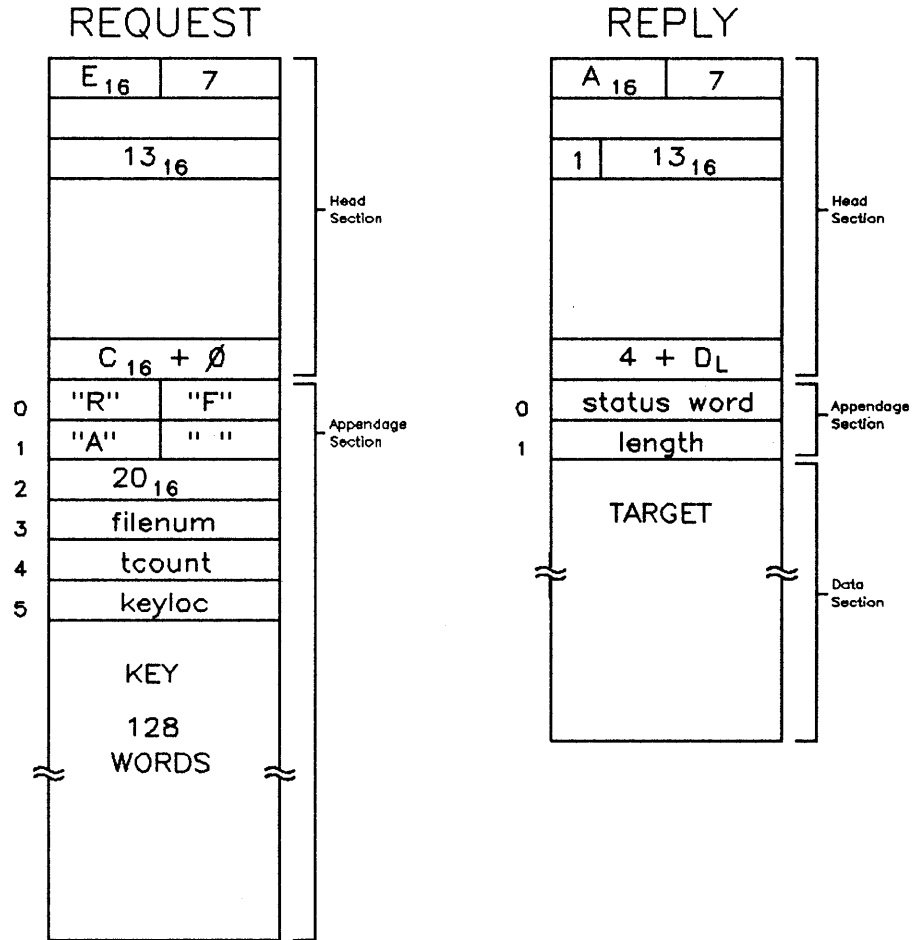
Stream Type = %23 (#13, 19)

F.S. Intrinsic Number = %37 (#1F, 31)



KSAM FREADBYKEY

Message Class = 7  
 Stream Type = %23 (#13, 19)  
 F.S. Intrinsic Number = %40 (#20, 32)



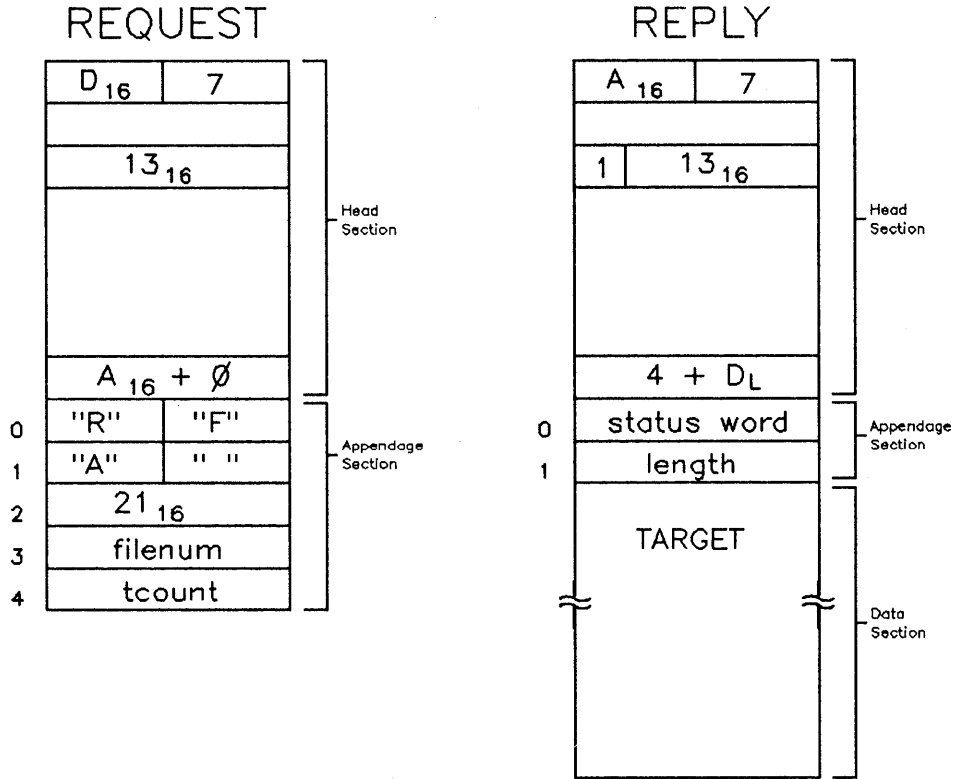
Message Formats

KSAM FREADC

Message Class = 7

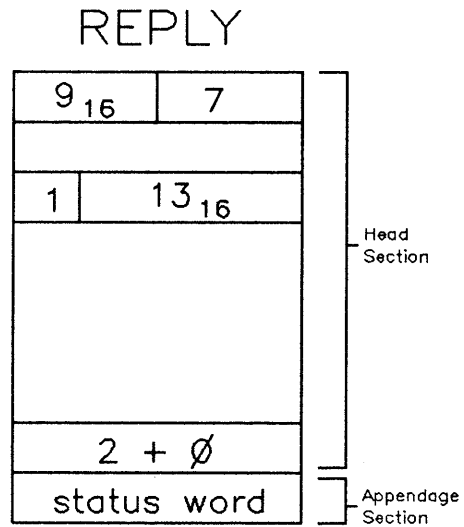
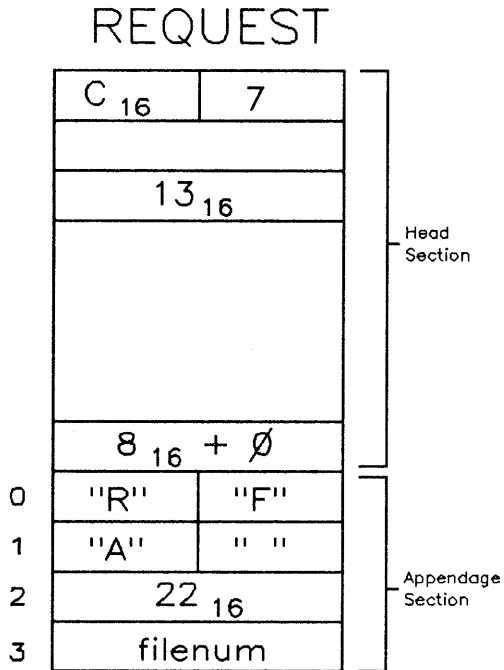
Stream Type = %23 (#13, 19)

F.S. Intrinsic Number = %41 (#21, 33)



### KSAM FREMOVE

Message Class = 7  
 Stream Type = %23 (#13, 19)  
 F.S. Intrinsic Number = %42 (#22, 34)

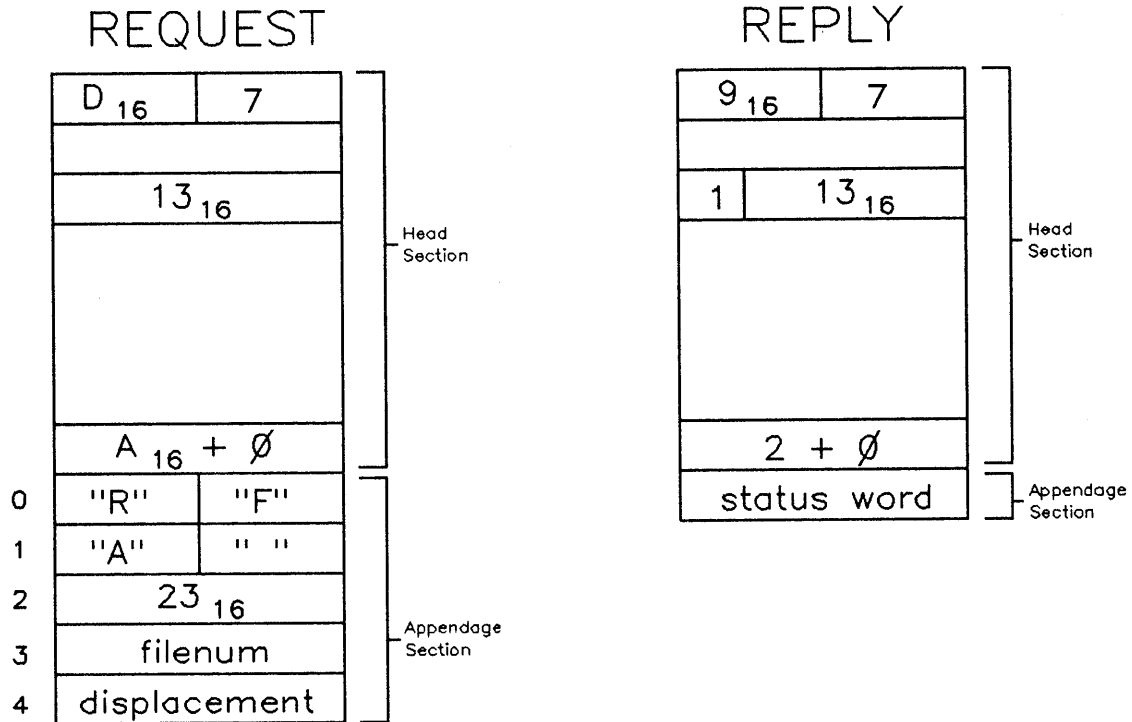




Message Formats

KSAM KSPACE

Message Class = 7  
 Stream Type = %23 (#13, 19)  
 F.S. Intrinsic Number = %43 (#23, 35)

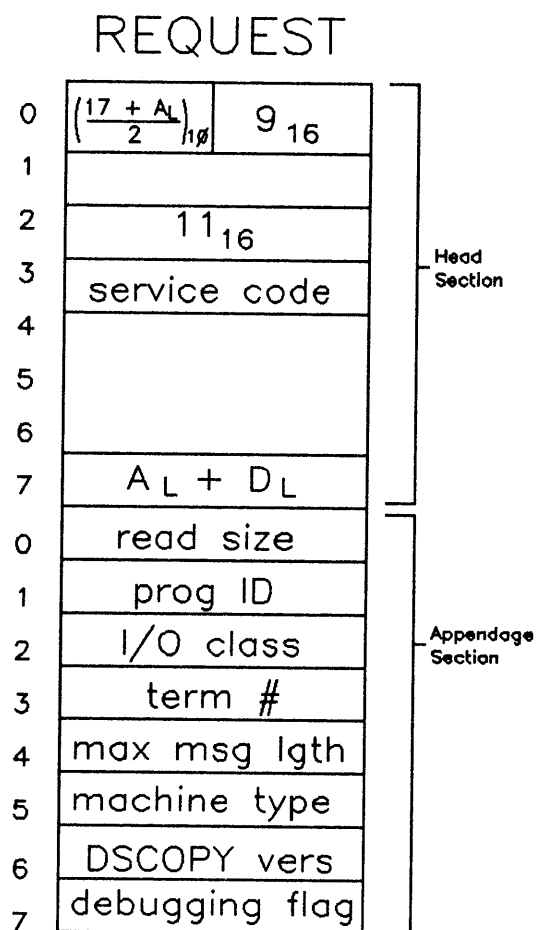


## Message Class 11

### QOPEN (Master to Slave)

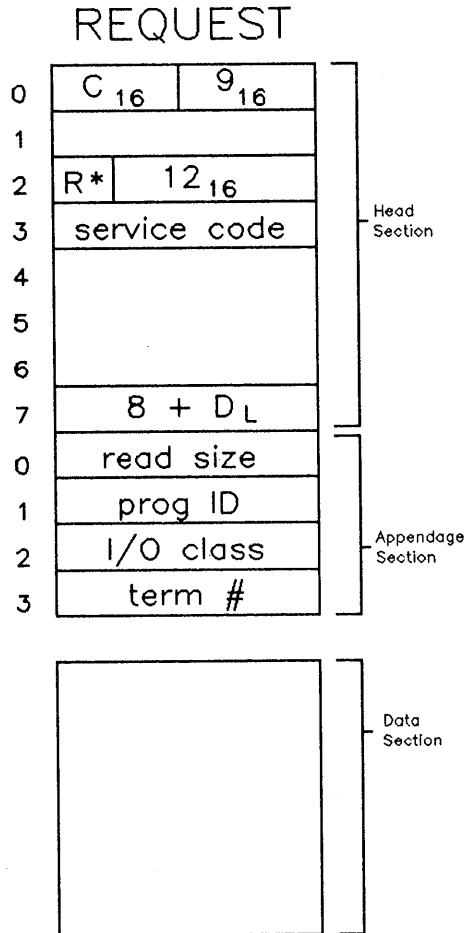
Message Class = %11 (#9, 9)

Stream Class = %21 (#11, 17) Request = %21 (#11, 17) Request  
 = %22 (#12, 18) Accept Reply -- QWRITEREAD  
 = %23 (#13, 19) Reject Reply -- QCLOSE



## QWRITEREAD (Master to Slave or Slave to Master)

Message Class = %11 (#9, 9)  
 Stream Class = %22 (#12, 18)



R\*

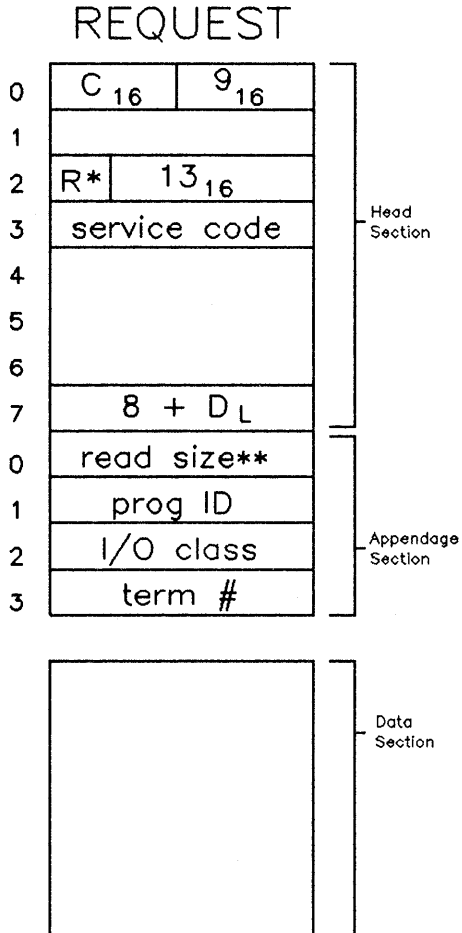
R = ∅    Master to Slave

R = 1    Slave to Master

Expected reply is  
 QWRITEREAD OR QCLOSE

## QCLOSE (Master to Slave or Slave to Master)

Message Class = %11 (#9, 9)  
Stream Class = %23 (#13, 19)



**R\***

**R = ∅    Master to Slave  
Expected reply is  
QCLOSE.**

**R = 1    Slave to Master  
No reply is expected.**

**\*\* read size = -1**

## X.25 PACKET FORMATS

### PACKET LEVEL PROTOCOL

#### Packet Formats

##### DATA

Q	D	0	1	L	C	G	N
LCN							
P(R)	M	P(S)	0				
USER DATA							

or

Q	D	1	0	L	C	G	N
LCN							
P(S)				0			
P(R)				M			
USER DATA							

##### CALL CONFIRMATION

0	D	S	N	L	C	G	N
LCN							
0 0 0 0 1 1 1 1							
Calling				Called			
Addresses							

Address Lengths

##### RR (Receiver Ready)

0	0	0	1	L	C	G	N
LCN							
P(R) 0 0 0 0 1							

or

0	0	1	0	L	C	G	N
LCN							
0 0 0 0 0 0 0 1							
P(R)				0			

##### CLEAR REQUEST

0	0	S	N	L	C	G	N
LCN							
0 0 0 1 0 0 1 1							
Clearing Cause							
Diagnostic Code							

##### CLEAR CONFIRMATION

0	0	S	N	L	C	G	N
LCN							
0 0 0 1 0 1 1 1							

##### RNR (Receiver Not Ready)

0	0	0	1	L	C	G	N
LCN							
P(R) 0 0 1 0 1							

or

0	0	1	0	L	C	G	N
LCN							
0 0 0 0 0 1 0 1							
P(R)				0			

##### RESET REQUEST

0	0	S	N	L	C	G	N
LCN							
0 0 0 1 1 0 1 1							
Resetting Cause							
Diagnostic Code							

##### RESET CONFIRMATION

0	0	S	N	L	C	G	N
LCN							
0 0 0 1 1 1 1 1							

##### REJ (Reject)

0	0	0	1	L	C	G	N
LCN							
P(R) 0 1 0 0 1							

or

0	0	1	0	L	C	G	N
LCN							
0 0 0 0 1 0 0 1							
P(R)				0			

##### RESTART REQUEST

0	0	S	N	0	0	0	0
LCN							
0 0 0 0 0 0 0 0							
1 1 1 1 1 0 1 1							
Restarting Cause							
Diagnostic Code							

##### RESTART CONFIRMATION

0	0	S	N	0	0	0	0
LCN							
0 0 0 0 0 0 0 0							
1 1 1 1 1 1 1 1							

##### INT. (Interrupt)

0	0	S	N	L	C	G	N
LCN							
0 0 1 0 0 0 1 1							
USER DATA							

##### INT. CONF (Interrupt Confirmation)

0	0	S	N	L	C	G	N
LCN							
0 0 1 0 0 1 1 1							

##### CALL REQUEST

0	D	S	N	L	C	G	N
LCN							
0 0 0 0 1 0 1 1							
Calling				Called			
Addresses							

Address Lengths

##### INCOMING CALL FROM PAD

0	D	S	N	L	C	G	N
LCN							
0 0 0 0 1 0 1 1							
Calling				Called			
Addresses							
0 0 0 0 0 0 0 0							
0 0 0 0 0 0 0 1							

Address Lengths

# COMPARISON TO CCITT X.25

SECTION

6

The HP 3000 implementation of X.25 level 3 follows closely the CCITT 1980 X.25 recommendation. Specific choices however have been made about particular features and facilities.

We shall indicate here all the modifications or choices we have made in our implementation. Only chapters describing the X.25 level 3 will be considered.

Preliminary notes:

WE in this appendix refers to the HP DSN/X.25 subsystem on the HP 3000.

- We do not support DATAGRAMS.
- We do not support PERMANENT virtual circuits.
- We may act as DCE (when connected to a private network) and as DTE (when connected to a public or a private network).

## NOTE

CHAPTER and PARAGRAPH numbers indicated are those of the CCITT 1980 X.25 recommendation. Paragraphs not listed here are implemented without any change.

## Chapter 3

### THE PACKET LEVEL DTE/DCE INTERFACE.

## NOTE

We require the data fields of packets to contain an integral number of octets.

#### 3.1 Logical Channels.

We refer to logical channels as virtual circuits. A virtual circuit number in our terminology is really the concatenation of the Logical Channel Group Number (most significant) and the Logical Channel number (least significant). We thus support VC numbers from 0 to 4095. However only 255 consecutive VC numbers may be used at any given time on any one physical X.25 line from a HP 3000.

Comparison to CCITT X.25

### **3.2 Basic Structure of Packets.**

We support all packet types in table 3.1 except DCE/DTE DATAGRAM and DATAGRAM SERVICE SIGNAL packets.

#### **3.4.1 Diagnostic Packet.**

We do not support the DIAGNOSTIC packet and incoming DIAGNOSTIC packets are ignored.

## **Chapter 4**

### **PROCEDURES FOR VIRTUAL CIRCUIT SERVICES.**

#### **4.2.1 Call Request Packet.**

We always send the calling (if configured by NETCONF) and the called DTE address in our CALL REQUEST packets.

#### **4.1.11 Call Progress Signals.**

We do not use or issue any Call Progress Signals.

#### **4.3.2 User Data Field Length of Data Packets.**

We support maximum User Data field lengths of 32,64,256,512 and 1024 octets. We can also support any maximum User Data field lengths in the range 32 octets to 1024 octets if required by any public or private network. We do not support negotiation of the maximum User Data field on a per call basis.

<b>NOTE</b>
-------------

The User Data field must contain an integral number of octets.

#### **4.3.3 Delivery Confirmation Bit.**

We do not make any use of the D-bit in the General Format Identifier. We accept DATA packets with any D-bit setting but do not respond to any other packets with the D-bit set. We always set the D-bit to zero in any outgoing packets.

#### **4.3.4 More Data Mark.**

For outgoing packets we set the M bit to 1 only in full data packets and always set the M bit to zero in the last data packet of a packet sequence.

For incoming packets we send a RESET packet if the M-bit is set to one in a partially full DATA packet. The last packet of a packet sequence should have the M bit equal to zero.

We do not do any splitting or recombination of packets when acting as DCE.

#### **4.3.6 Qualifier Bit.**

The Q bit is used by us only for purposes of the X.29 PAD support. Any incoming data packet with Q bit equal to one is assumed to be a PAD control packet (as defined in X.29). We send data packets with Q bit equal to one only for X.29 PAD control packets.

#### **4.4.1.1 Numbering of Data Packets.**

We support both modulo 8 and the extended packet numbering scheme with modulo 128.

#### **4.4.1.2 Window Description.**

Negotiation of window sizes on a per call basis is not supported.

#### **4.4.1.3 Flow Control Principles.**

A P(S) sequence error is regarded as a local procedure error only if it is not the first duplicate packet. An exception is the DATEX-P network where even the first duplicate packet is a local procedure error. The above local procedure error causes a RESET packet with diagnostic 1 to be sent out.

A P(R) sequence error causes a RESET packet with diagnostic 2 to be sent out.

#### **4.4.1.4 Delivery Confirmation.**

We send an RR packet for a data packet received after one second or after receiving half of the window whichever is earlier. The above is true only if we do not have a data packet waiting to be sent on the same virtual circuit. If we do have a data packet waiting to be sent on the same virtual circuit then we send this data packet with the appropriate value of P(R) as an acknowledgement.

The D-bit is NOT used by us for end to end acknowledgement.

#### **4.4.1.6 DTE and DCE Receive Not Ready (RNR) Packets.**

We never send RNR packets.



#### **4.4.2 Throughput Characteristics and Throughput Classes.**

We do not support throughput class negotiation on a per call basis.

## **Chapter 5**

### **PROCEDURES FOR DATAGRAM SERVICE.**

We do not support Datagram Service.

## **Chapter 6**

### **PACKET FORMATS.**

#### **6.2.1 Call Request and Incoming Call Packets.**

The called and calling addresses (configured by NETCONF) are always inserted in a CALL REQUEST packet. The calling address is expected in all INCOMING CALL packets except for a PAD call. This calling address is verified by finding a matching remote address in the NETCON database in the Remote Node Table. If the calling address is not found in the Remote Node Table then a CLEAR packet with diagnostic 68 (decimal) is sent out. If there are several nodes with the same remote address configured then the calling address is matched to the first such node accessed from the NETCON database. All addresses sent and received can be up to 15 decimal digits.

The Facility Length Field, Facility Field and the Call User Data Field are not used in any way in the CALL REQUEST packet. For the INCOMING CALL packet all facilities information is ignored. The only use made of the Call User Data field in INCOMING CALL packets is to recognize PAD calls when the first byte of the Call User Data Field is one (0000 0001). The INCOMING CALL packet can be up to 99 bytes in length for proper recognition.

#### **6.2.2 Call Accepted and Call Connected Packets.**

The address fields and the facilities fields are not put to any use when sending or receiving CALL CONNECTED or CALL ACCEPTED packets. The above packets are recognized while receiving only if they are up to 99 bytes in length.

#### **6.2.3 Clear Request and Clear Indication Packets.**

We always send CLEAR REQUEST or CLEAR INDICATION packets as five byte packets, including the packet header, and cause and diagnostic code fields. When receiving the above packets they can have a length of up to 40 bytes for proper recognition.

#### **6.2.4 DTE and DCE Clear Confirmation Packets.**

The CLEAR CONFIRMATION packets are recognized when receiving them when they have a length of up to 40 bytes.

#### **6.4 Datagram and Datagram Service Signal Packets.**

Not supported.

#### **6.5.2 DTE and DCE Receive Not Ready (RNR) Packets.**

We do not issue RNR packets but accept them.

#### **6.5.3 Reset Request and Reset Indication Packets.**

When we send a RESET REQUEST or a RESET INDICATION packet the cause and the diagnostic code are always inserted. The cause is always 0.

When receiving RESET packets, special action is taken if the remote node is a HP3000 (as opposed to a PAD or HP1000). If a diagnostic of 002 is received then all packets in the current read (if we are reading at a high level) are discarded and the read is restarted. If a diagnostic of 001 is received then all packets in the current write (if we are writing at a high level) are discarded and the write is restarted.

If the remote node is not a HP3000 then no use is made of the cause and diagnostic codes except to record them for trace purposes.

#### **6.6.1 Restart Request and Restart Indication Packets.**

When sending a RESTART REQUEST or RESTART INDICATION packet we always set the cause to 0.

When receiving a RESTART REQUEST or RESTART INDICATION packet we do not use the cause and diagnostic codes in any way except to record them for a trace.

#### **6.7 Diagnostic Packets.**

We do not issue DIAGNOSTIC packets and ignore them if received.

#### **6.8.2 Fast Select Facility.**

We do not support the fast select facility.

## **Chapter 7**

### **OPTIONAL USER FACILITIES.**

#### **7.1 Procedures for Optional User Facilities.**

We do not support any facility negotiation on a per call basis.

## Comparison to CCITT X.25

### **7.1.1 Extended Packet Sequence Numbering.**

We support modulo 128 numbering as an optional configurable facility.

### **7.1.2 Nonstandard Default Window Sizes.**

We support window sizes of 1 to 7 for modulo 8 numbering and 1 to 15 for modulo 128 numbering of data packets.

### **7.1.3 Default Throughput Classes Assignment.**

We support this facility and different values may be selected by the user.

### **7.1.4 Packet Retransmission.**

We will send REJECT packets only to directly connected computers and not to PDN's. If we receive a REJECT packet, we will retransmit up to 3 packets (for each REJECT).

### **7.1.5 Incoming Calls Barred.**

The user can set up this facility with the administration, and its presence will be transparent to DSN/X.25. The user can also open the line with the MASTER option (using DSCONTROL) set to bar INCOMING CALLS and thereby have control from the HP3000 end. When the MASTER option is set on a line all INCOMING CALLS get cleared with diagnostic code 34 (decimal).

### **7.1.6 Outgoing Calls Barred.**

The user can set up this facility with the administration, and its presence will be transparent to DSN/X.25. The user can also open the line with the SLAVE option (using DSCONTROL) set to bar OUTGOING CALLS and thereby have control from the HP3000 end. When the SLAVE option is set on a line the user will get a DSERROR when trying to send a CALL REQUEST packet (by using the DSLINE command with DSN/DS or FOPENing a device connected to the HP2334A with DSN/X.25).

### **7.1.7 One-way Logical Channel Outgoing.**

We do not support this facility.

### **7.1.8 One-way Logical Channel Incoming.**

We do not support this facility.

### **7.1.9 Closed User Group.**

This facility is supported only for one closed user group and has to be agreed upon with the administration.

**7.1.10 Closed User Group with Outgoing Access.**

We do not support this facility.

**7.1.11 Closed User Group with Incoming Access.**

We do not support this facility.

**7.1.12 Incoming Calls Barred Within a Closed User Group.**

We support this if agreed to by the administration. The user has to configure the appropriate virtual circuit values.

**7.1.13 Outgoing Calls Barred Within a Closed User Group.**

We support this if agreed to by the administration. The user has to configure the appropriate virtual circuit values.

**7.1.14 Bilateral Closed User Group.**

We do not support this facility.

**7.1.15 Bilateral Closed User Group with Outgoing Access.**

We do not support this facility.

**7.1.16 Reverse Charging.**

We will accept reverse-charge calls only from PADs and will reject any other reverse charge calls.

**7.1.17 Reverse Charging Acceptance.**

The user can use this facility upon agreement with the administration.

**7.1.18 RPOA Selection.**

We do not support this facility.

**7.2.1 Nonstandard Default Packet Sizes.**

We support this facility.

Comparison to CCITT X.25

**7.2.2 Flow Control Parameter Negotiation.**

We do not support this facility.

**7.2.3 Throughput Class Negotiation.**

We do not support this facility.

**7.2.4 Fast Select.**

We do not support this facility.

**7.2.5 Fast Select Acceptance.**

We do not support this facility.

**7.2.6 D Bit Modification.**

We do not support this facility.

**7.3 Datagram Facilities.**

We do not support any DATAGRAM facilities.

**7.4 Formats for Optional User Facilities.**

We do not support any of the formats described in this section since we do not support any facilities on a per call basis.

**ANNEX A: RANGE OF LOGICAL CHANNELS.**

We support up to 255 consecutive logical channels in the range 0-4095. Our configuration can only recognize a low virtual circuit number and a high virtual circuit number. It is up to the user and the administration to decide how the above numbers are chosen.

As a DCE we choose the lowest virtual circuit number available for an incoming call and as a DTE we choose the highest virtual circuit number available for an outgoing call.

**ANNEX D.**

We always implement the DTE timeouts whether acting as DCE or DTE.

**ANNEX E.**

The codes in Table 6-1 are generated by DSN/X.25/3000. Most of the codes are CCITT standards and are used as such. Some CCITT codes have further qualified meanings on the HP3000 and are mentioned below. Some codes are special to the HP3000.

Table 6-1. DSN/X.25/3000 codes.

Sent on packet	Diagnostic code	Standards Reference	Meaning
Reset	001	CCITT	Invalid P(S)
	002	CCITT	Invalid P(R)
	003	HP	Invalid P(S) in unanticipated data
	005	HP	Looping detected in reset error recovery
	027	CCITT	Packet type invalid for state d1.
	032	HP	Outgoing reset request
	038	CCITT/HP	Invalid packet length (long/short) CCITT: Packet too short
	045	HP	Invalid DS message
Clear	020	CCTT	Packet type invalid for state p1
	021	CCITT	Packet type invalid for state p2
	023	CCITT	Packet type invalid for state p3
	024	CCITT	Packet type invalid for state p4
	032	HP	Packet type invalid for state p6
	038	CCITT/HP	Invalid packet length on call request. CCITT: Packet too short
	039	HP	Unanticipated data packet(s) too long. CCITT: Packet too long
	049	CCITT	Timer expired on call request
	050	CCITT	Clear retry -- timer expired
	064	CCITT	Call setup problem
	068	CCITT	Invalid calling address
Restart	052	CCITT	Restart retry -- timer expired
	250	HP	Link status change, i.e., down -> up or up -> down

# DSLISIT AND DSTEST

SECTION

7

## DSLISIT

The DSLISIT program provides a list of the software module version numbers for the DSN/DS, DSN/X.25, and CS modules installed on your system. This list must be available for all troubleshooting activities, and it must accompany each Service Request (SR) that you submit to your HP Systems Engineer (SE).

In order to obtain the list, you must have READ access to the DSN/DS program files in PUB.SYS. The command syntax is:

```
:RUN DSLISIT.PUB.SYS
```

## Version Report Examples

### DSN/DS WITH DSN/X.25

```
:RUN DSLISIT.PUB.SYS
```

```
HEWLETT PACKARD 30131A.00.00 DSLISIT/3000 WED, APR 7,1982, 1:18 PM
```

#### DSN/DS HP32189A:

MODULE	VERSION	
SL DSSEGS	A.00.00,	INTERNAL FIX 000
SL DSRTECALL	A.00.00,	INTERNAL FIX 000
DSMON	A.00.00,	INTERNAL FIX 000
DSTEST	A.00.00,	INTERNAL FIX 000
DS2026	A.00.00,	INTERNAL FIX 000
DS2026CN	A.00.00,	INTERNAL FIX 000
DSCOPY	A.00.00,	INTERNAL FIX 000
IODSO	A.00.00,	INTERNAL FIX 000
IODSTRM0	A.00.00,	INTERNAL FIX 000
IODSTRMX	A.00.00,	INTERNAL FIX 000

#### DSN/X.25 HP32191A:

MODULE	VERSION	
DSMONX	A.00.00,	INTERNAL FIX 000
IODSX	A.00.00,	INTERNAL FIX 000
IOPADO	A.00.00,	INTERNAL FIX 000

#### CS SUBSYSTEM HP30131 :

MODULE	VERSION	
SL COMSYS	A.05.09,	INTERNAL FIX 000
SL DSIOM	A.00.00,	INTERNAL FIX 000
DSDUMP	A.00.00,	INTERNAL FIX 000
NETCONF	A.05.09,	INTERNAL FIX 000



DSLISL and DSTEST

END OF PROGRAM  
:

DSN/DS WITHOUT DSN/X.25

:RUN DSLISL.PUB.SYS  
HEWLETT PACKARD 30131A.00.00 DSLISL/3000 WED, APR 7,1982, 1:18 PM

DSN/DS HP32189A:

	MODULE	VERSION			
SL	DSSEGS	A.00.00,	INTERNAL	FIX	000
SL	DSRTECALL	A.00.00,	INTERNAL	FIX	000
	DSMON	A.00.00,	INTERNAL	FIX	000
	DSTEST	A.00.00,	INTERNAL	FIX	000
	DS2026	A.00.00,	INTERNAL	FIX	000
	DS2026CN	A.00.00,	INTERNAL	FIX	000
	DSCOPY	A.00.00,	INTERNAL	FIX	000
	IODSO	A.00.00,	INTERNAL	FIX	000
	IODSTRM0	A.00.00,	INTERNAL	FIX	000
	IODSTRMX	A.00.00,	INTERNAL	FIX	000

DSN/X.25 HP32191A:  
NOT INSTALLED

CS SUBSYSTEM HP30131 :

	MODULE	VERSION			
SL	COMSYS	A.05.09,	INTERNAL	FIX	000
SL	DSIOM	A.00.00,	INTERNAL	FIX	000
	DSDUMP	A.00.00,	INTERNAL	FIX	000
	NETCONF	A.05.09,	INTERNAL	FIX	000

END OF PROGRAM  
:

## DSTEST

DSTEST checks your DS line by transmitting and receiving data. You can specify how many times to check your line, and other parameters, by running DSTEST in Diagnostic Mode. Or, you can simply run DSTEST, and it will use default values. Before running DSTEST, you must have opened the DS line using the :DSLIN command, and established a remote session.

### Normal Mode

Normal mode is often run by users when problems are suspected. When calling for HP Support, the results of running Normal Mode should be included.

To run the normal mode, perform the following steps:

1. Enter the following line to initiate DSTEST:

:RUN DSTEST.PUB.SYS

In the normal mode, you are not required to select options; the default values are automatically used.

2. Answer the following question:

:DSLIN?

Enter the device class or logical device number for IODS0, or node name for an X.25 configuration.

<b>NOTE</b>
-------------

The normal mode default is a 512-word program-to-program transfer with all words containing %177777.

## Diagnostic Mode

To run the diagnostic mode, perform the following steps:

1. If you are testing RFA, a :FILE command is required before initiating DSTEST to direct the data to the desired file to and DS line. (This file does not have to exist.) The file equation is:

:FILE REMOTE;DEV=dsdevice#DISC

Enter the following line to initiate the line test:

:RUN DSTEST.PUB.SYS,DIAG

2. Answer the following questions:

.RFA or PTOP?

Enter RFA for Remote File Access or enter PTOP for Program-to-Program testing.

.REMOTE COMPUTER? (This question is only asked for RFA.)

Enter 3000 or 1000.

.DSLIN? (This question is not asked for RFA if Step 1 was followed.)

Enter the device class or logical device number for IODS0, or node name for an X.25 configuration.

.NUMBER OF PASSES?

Enter the number of actual transmissions desired, up to a maximum of 32767 (decimal). Entering 0 or RETURN causes the test pattern to be transmitted once. A pass is one transmit and one receive transaction pair.

.PATTERN?

Enter an octal word to be transferred (the % sign must be entered).

<b>NOTE</b>
-------------

Illegal input causes the message

INPUT ERROR

to be printed. Enter a correct value, or enter RETURN to specify the default value %177777.

.BLOCKSIZE?

Enter the desired blocksize of the transfer (<4096). If a value equal to or greater than 4096 is entered, an error message will be printed.

.CONTINUE (Y/N)?

Enter Y to return to the beginning of the option selection phase if you wish to repeat the cycle, or enter N to terminate the test.

## DSTEST,CONFIG

DSTEST has an alternate entry point, CONFIG, that provides a list of the DS devices configured through SYSDUMP. The program also provides a rudimentary check of the configuration, looking for obvious errors. It does not recognize the PAD terminal drivers IOPAD0 or IOPAD1.

DSTEST,CONFIG is especially useful for picking out the DS devices from a large configuration.

A sample run of DSTEST,CONFIG follows.

```
:RUN DSTEST.PUB.SYS,CONFIG
```

LDEV	DEVICE	DEVICE TYPE	LINK	SUBTYP	MODE	WIDTH	DRIVER
13	CS	INP		3		0	IOINPO
15	CS	INP		3		0	IOINPO
16	CS	INP		3		0	IOINPO
17	CS	INP		3		0	IOINPO
18	CS	INP		3		0	IOINPO
19	CS	INP		3		0	IOINPO
120	DS	CONTROLLER	17	0		128	IODSO
121	DS	PSEUDOTERM	120	0	J ID	40	IODSTRM0
122	DS	PSEUDOTERM	120	0	J ID	40	IODSTRM0
123	DS	PSEUDOTERM	120	0	J ID	40	IODSTRM0
124	DS	PSEUDOTERM	120	0	J ID	40	IODSTRM0
125	DS	PSEUDOTERM	120	0	J ID	40	IODSTRM0
126	DS	PSEUDOTERM	120	0	J ID	40	IODSTRM0
127	DS	PSEUDOTERM	120	0	J ID	40	IODSTRM0
128	DS	PSEUDOTERM	120	0	J ID	40	IODSTRM0
129	DS	PSEUDOTERM	120	0	J ID	40	IODSTRM0
140	DS	CONTROLLER	15	0		128	IODSX
141	DS	PSEUDOTERM	140	0	J ID	40	IODSTRMX
142	DS	PSEUDOTERM	140	0	J ID	40	IODSTRMX
143	DS	PSEUDOTERM	140	0	J ID	40	IODSTRMX
144	DS	PSEUDOTERM	140	0	J ID	40	IODSTRMX
145	DS	PSEUDOTERM	140	0	J ID	40	IODSTRMX
146	DS	PSEUDOTERM	140	0	J ID	40	IODSTRMX
147	DS	PSEUDOTERM	140	0	J ID	40	IODSTRMX
148	DS	PSEUDOTERM	140	0	J ID	40	IODSTRMX
149	DS	PSEUDOTERM	140	0	J ID	40	IODSTRMX
150	DS	CONTROLLER	16	0		128	IODSO
151	DS	PSEUDOTERM	150	0	J ID	40	IODSTRM0
152	DS	PSEUDOTERM	150	0	J ID	40	IODSTRM0
153	DS	PSEUDOTERM	150	0	J ID	40	IODSTRM0
154	DS	PSEUDOTERM	150	0	J ID	40	IODSTRM0
155	DS	PSEUDOTERM	150	0	J ID	40	IODSTRM0
156	DS	PSEUDOTERM	150	0	J ID	40	IODSTRM0
157	DS	PSEUDOTERM	150	0	J ID	40	IODSTRM0
158	DS	PSEUDOTERM	150	0	J ID	40	IODSTRM0
159	DS	PSEUDOTERM	150	0	J ID	40	IODSTRM0
160	DS	CONTROLLER	18	0		128	IODSO
161	DS	PSEUDOTERM	160	0	J ID	40	IODSTRM0
162	DS	PSEUDOTERM	160	0	J ID	40	IODSTRM0
163	DS	PSEUDOTERM	160	0	J ID	40	IODSTRM0
164	DS	PSEUDOTERM	160	0	J ID	40	IODSTRM0

DSLISL and DSTEST

165	DS	PSEUDOTERM	160	0	J ID	40	IODSTRM0
166	DS	PSEUDOTERM	160	0	J ID	40	IODSTRM0
167	DS	PSEUDOTERM	160	0	J ID	40	IODSTRM0
168	DS	PSEUDOTERM	160	0	J ID	40	IODSTRM0
171	DS	CONTROLLER	19	0		128	IODS0
172	DS	PSEUDOTERM	171	0	J ID	40	IODSTRM0
173	DS	PSEUDOTERM	171	0	J ID	40	IODSTRM0
174	DS	PSEUDOTERM	171	0	J ID	40	IODSTRM0
175	DS	CONTROLLER	13	0		128	IODS0
176	DS	PSEUDOTERM	175	8	J ID	40	IODSTRM0
177	DS	PSEUDOTERM	175	8	J ID	40	IODSTRM0
178	DS	PSEUDOTERM	175	8	J ID	40	IODSTRM0
179	DS	PSEUDOTERM	175	8	J ID	40	IODSTRM0
180	DS	PSEUDOTERM	175	8	J ID	40	IODSTRM0
181	DS	PSEUDOTERM	175	8	J ID	40	IODSTRM0
182	DS	PSEUDOTERM	175	8	J ID	40	IODSTRM0
183	DS	PSEUDOTERM	175	8	J ID	40	IODSTRM0

END OF PROGRAM

:

If the person configuring the system had answered any of the SYSDUMP questions incorrectly, an error message (such as LDEV nnn: Device mode may be erroneous.) would be printed.



**A**

ADD 2-3, 2-44  
Adding a communications driver 1-5  
Adding a device 1-5  
Adding a virtual terminal 1-5  
Adding devices, and maximum number of devices 1-5  
Adding to the LC table 2-9  
Adding to the Line Characteristics table 2-9  
Adding to the Remote Node table 2-5  
Adding to the RN table 2-5

**B**

Begin Tracing message 3-21, 4-15, 4-44

**C**

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San Pedro de Montes de Oca  
Apartado 10159  
SAN JOSE  
Tel: 24-38-20, 24-08-19  
Telex: 2367 GALGUR CR  
CM,E,M

## CYPRUS

Telerexa Ltd.  
P.O. Box 4809  
14C Stassinou Avenue  
NICOSIA  
Tel: 62698  
Telex: 2894 LEVIDO CY  
E,M,P

## DENMARK

Hewlett-Packard A/S  
Datavej 52  
DK-3460 BIRKEROD  
Tel: (02) 81-66-40  
Telex: 37409 hpas dk  
A,CH,CM,CS,E,MS,P

Hewlett-Packard A/S  
Rolighedsvej 32  
DK-8240 RISSKOV, Aarhus  
Tel: (06) 17-60-00  
Telex: 37409 hpas dk  
CH,E

## DOMINICAN REPUBLIC

Microprog S.A.  
Juan Tomás Mejía y Cotes No. 60  
Arroyo Hondo  
SANTO DOMINGO  
Tel: 565-6268  
Telex: 45 10 ARENTA DR (RCA) P

## ECUADOR

CYEDE Cia. Ltda.  
Avenida Eloy Alfaro 1749  
Casilla 6423 CCI  
QUITO  
Tel: 450-975, 243-052  
Telex: 2548 CYEDE ED  
CM,E,P

Hospitalar S.A.  
Robles 625  
Casilla 3590  
QUITO  
Tel: 545-250, 545-122  
Telex: 2485 HOSPTEL ED  
Cable: HOSPITALAR-Quito  
M

## EGYPT

International Engineering Associates  
24 Hussein Hegazi Street  
Kasr-el-Aini  
CAIRO  
Tel: 23829, 21641  
Telex: IEA UN 93830  
CH,CS,E,M

EGYPOR  
P.O.Box 2558  
42 El Zahraa Street  
CAIRO, Egypt  
Tel: 65 00 21  
Telex: 93 337  
P

## EL SALVADOR

IPESA de El Salvador S.A.  
29 Avenida Norte 1216  
SAN SALVADOR  
Tel: 26-6858, 26-6868  
Telex: 20539 IPESASAL  
A,CH,CM,CS,E,P

## FINLAND

Hewlett-Packard Oy  
Revontulentie 7  
PL 24  
SF-02101 ESPOO 10  
Tel: (90) 4550211  
Telex: 121563 hewpa sf  
CH,CM,CS,P

Hewlett-Packard Oy  
(Olarinluoma 7)  
PL 24  
02101 ESPOO 10  
Tel: (90) 4521022  
A,E,MS

Hewlett-Packard Oy  
Aatoksenkatu 10-C  
SF-40720-72 JYVASKYLA  
Tel: (941) 216318  
CH

Hewlett-Packard Oy  
Kainuntie 1-C  
SF-90140-14 OULU  
Tel: (981) 338785  
CH

## FRANCE

Hewlett-Packard France  
Z.I. Mercure B  
Rue Berthelot  
F-13763 Les Milles Cedex  
AIX-EN-PROVENCE  
Tel: 16 (42) 59-41-02  
Telex: 410770F  
A,CH,E,MS,P\*

Hewlett-Packard France  
64, rue Marchand Saillant  
F-61000 ALENCON  
Tel: 16 (33) 29 04 42

Hewlett-Packard France  
Boite Postale 503  
F-25026 BESANCON  
28 rue de la Republique  
F-25000 BESANCON  
Tel: 16 (81) 83-16-22  
CH,M

Hewlett-Packard France  
13, Place Napoleon III  
F-29000 BREST  
Tel: 16 (98) 03-38-35

Hewlett-Packard France  
Chemin des Mouilles  
Boite Postale 162  
F-69130 ECULLY Cedex (Lyon)  
Tel: 16 (78) 833-81-25  
Telex: 310617F  
A,CH,CS,E,MP

Hewlett-Packard France  
Tour Lorraine  
Boulevard de France  
F-91035 EVRY Cedex  
Tel: 16 6 077-96-60  
Telex: 692315F  
E

Hewlett-Packard France  
Parc d'Activite du Bois Briard  
Ave. du Lac  
F-91040 EVRY Cedex  
Tel: 16 6 077-8383  
Telex: 692315F  
E

Hewlett-Packard France  
5, avenue Raymond Chanas  
F-38320 EYBENS (Grenoble)  
Tel: 16 (76) 25-81-41  
Telex: 980124 HP GRENOB EYBE  
CH

Hewlett-Packard France  
Centre d'Affaire Paris-Nord  
Bâtiment Ampère 5 étage  
Rue de la Commune de Paris  
Boite Postale 300  
F-93153 LE BLANC MESNIL  
Tel: 16 (1) 865-44-52  
Telex: 211032F  
CH,CS,E,MS

Hewlett-Packard France  
Parc d'Activités Cadera  
Quartier Jean Mermoz  
Avenue du Président JF Kennedy  
F-33700 MERIGNAC (Bordeaux)  
Tel: 16 (56) 34-00-84  
Telex: 550105F  
CH,E,MS

Hewlett-Packard France  
Immueble "Les 3 B"  
Nouveau Chemin de la Garde  
ZAC de Bois Briand  
F-44085 NANTES Cedex  
Tel: 16 (40) 50-32-22  
CH\*\*

# SALES & SUPPORT OFFICES

Arranged alphabetically by country

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## FRANCE (Cont'd)

Hewlett-Packard France  
125, rue du Faubourg Bannier  
F-45000 ORLEANS  
Tel: 16 (38) 68 01 63

Hewlett-Packard France  
Zone Industrielle de Courtaboeuf  
Avenue des Tropiques  
F-91947 Les Ulis Cedex ORSAY  
Tel: (6) 907-78-25  
Telex: 600048F  
A,CH,CM,CS,E,MP,P

Hewlett-Packard France  
Paris Porte-Maillet  
15, Avenue de L'Amiral Bruix  
F-75782 PARIS CEDEX 16  
Tel: 16 (1) 502-12-20  
Telex: 613663F  
CH,MS,P

Hewlett-Packard France  
124, Boulevard Tourasse  
F-64000 PAU  
Tel: 16 (59) 80 38 02

Hewlett-Packard France  
2 Allée de la Bourgonnette  
F-35100 RENNES  
Tel: 16 (99) 51-42-44  
Telex: 740912F  
CH,CM,E,MS,P\*

Hewlett-Packard France  
98 Avenue de Bretagne  
F-76100 ROUEN  
Tel: 16 (35) 63-57-66  
CH\*\*CS

Hewlett-Packard France  
4 Rue Thomas Mann  
Boite Postale 56  
F-67033 STRASBOURG Cedex  
Tel: 16 (88) 28-56-46  
Telex: 890141F  
CH,E,MS,P\*

Hewlett-Packard France  
Le Péripole  
20, Chemin du Pigeonnier de la Céprière  
F-31083 TOULOUSE Cedex  
Tel: 16 (61) 40-11-12  
Telex: 531639F  
A,CH,CS,E,P\*

Hewlett-Packard France  
9, rue Baudin  
F-26000 VALENCE  
Tel: 16 (75) 42 76 16

Hewlett-Packard France  
Carolor  
ZAC de Bois Briand  
F-57640 VIGY (Metz)  
Tel: 16 (8) 771 20 22  
CH

Hewlett-Packard France  
mmeuble Péricentre  
F-59658 VILLENEUVE D'ASCQ Cedex  
Tel: 16 (20) 91-41-25  
Telex: 160124F  
CH,E,MS,P\*

**GERMAN FEDERAL REPUBLIC**

Hewlett-Packard GmbH  
Geschäftsstelle  
Leithstrasse 2-4  
D-1000 BERLIN 30  
Tel: (030) 24-90-86  
Telex: 018 3405 hpbln d  
A,CH,E,M,P

Hewlett-Packard GmbH  
Geschäftsstelle  
Herrenberger Strasse 130  
D-7030 BOBLINGEN  
Tel: (7031) 14-0  
Telex:

A,CH,CM,CS,E,MP,P

Hewlett-Packard GmbH  
Geschäftsstelle  
Emanuel-Leutze-Strasse 1  
D-4000 DUSSELDORF  
Tel: (0211) 5971-1  
Telex: 085/86 533 hpdd d  
A,CH,CS,E,MS,P

Hewlett-Packard GmbH  
Geschäftsstelle  
Schleefstr. 28a  
D-4600 DORTMUND-Aplerbeck  
Tel: (0231) 45001

Hewlett-Packard GmbH  
Vertriebszentrale Frankfurt  
Berner Strasse 117  
Postfach 560 140  
D-6000 FRANKFURT 56  
Tel: (0611) 50-04-1  
Telex: 04 13249 hpffm d  
A,CH,CM,CS,E,MP,P

Hewlett-Packard GmbH  
Geschäftsstelle  
Aussenstelle Bad Homburg  
Louisenstrasse 115  
D-6380 BAD HOMBURG  
Tel: (06172) 109-0

Hewlett-Packard GmbH  
Geschäftsstelle  
Kapstadtring 5  
D-2000 HAMBURG 60  
Tel: (040) 63804-1  
Telex: 021 63 032 hphh d  
A,CH,CS,E,MS,P

Hewlett-Packard GmbH  
Geschäftsstelle  
Heidering 37-39  
D-3000 HANNOVER 61  
Tel: (0511) 5706-0  
Telex: 092 3259  
A,CH,CM,E,MS,P

Hewlett-Packard GmbH  
Geschäftsstelle  
Rosslauer Weg 2-4  
D-6800 MANNHEIM  
Tel: (0621) 70050  
Telex: 0462105  
A,C,E

Hewlett-Packard GmbH  
Geschäftsstelle  
Messerschmittstrasse 7  
D-7910 NEU ULM  
Tel: 0731-70241  
Telex: 0712816 HP ULM-D  
A,C,E\*

Hewlett-Packard GmbH  
Geschäftsstelle  
Ehlicherstr. 13  
D-8500 NÜRNBERG 10  
Tel: (0911) 5205-0  
Telex: 0623 860  
CH,CM,E,MS,P

Hewlett-Packard GmbH  
Geschäftsstelle  
Eschenstrasse 5  
D-8028 TAUFKIRCHEN  
Tel: (089) 6117-1  
Telex: 0524985  
A,CH,CM,E,MS,P

## GREAT BRITAIN

See United Kingdom

## GREECE

Kostas Karayannis S.A.  
8 Omirou Street  
ATHENS 133  
Tel: 32 30 303, 32 37 371  
Telex: 215962 RKAR GR  
A,CH,CM,CS,E,M,P

PLAISIO S.A.  
G. Gerardos  
24 Stourara Street  
ATHENS  
Tel: 36-11-160  
Telex: 221871  
P

## GUATEMALA

IPESA  
Avenida Reforma 3-48, Zona 9  
GUATEMALA CITY  
Tel: 316627, 314786  
Telex: 4192 TELTRO GU  
A,CH,CM,CS,E,M,P

## HONG KONG

Hewlett-Packard Hong Kong, Ltd.  
G.P.O. Box 795  
5th Floor, Sun Hung Kai Centre  
30 Harbour Road  
HONG KONG  
Tel: 5-8323211  
Telex: 66678 HEWPA HX  
Cable: HEWPACK HONG KONG  
E,CH,CS,P

## CET Ltd.

1402 Tung Wah Mansion  
199-203 Hennessy Rd.  
Wanchia, HONG KONG  
Tel: 5-729376  
Telex: 85148 CET HX  
CM  
Schmidt & Co. (Hong Kong) Ltd.  
Wing On Centre, 28th Floor  
Connaught Road, C.  
HONG KONG  
Tel: 5-455644  
Telex: 74766 SCHMX HX  
A,M

## ICELAND

Elding Trading Company Inc.  
Hafnarnvöll-Tryggvagotu  
P.O. Box 895  
IS-REYKJAVIK  
Tel: 1-58-20, 1-63-03  
M

## INDIA

Computer products are sold through Blue Star Ltd. All computer repairs and maintenance service is done through Computer Maintenance Corp.

Blue Star Ltd.  
Sabri Complex II Floor  
24 Residency Rd.  
BANGALORE 560 025  
Tel: 55660  
Telex: 0845-430  
Cable: BLUESTAR  
A,CH\*,CM,CS\*,E

Blue Star Ltd.  
Band Box House  
Prabhadevi  
BOMBAY 400 025  
Tel: 422-3101  
Telex: 011-3751  
Cable: BLUESTAR  
A,M

Blue Star Ltd.  
Sahas  
414/2 Vir Savarkar Marg  
Prabhadevi  
BOMBAY 400 025  
Tel: 422-6155  
Telex: 011-4093  
Cable: FROSTBLUE  
A,CH\*,CM,CS\*,E,M

Blue Star Ltd.  
Kalyan, 19 Vishwas Colony  
Alkapuri, BORDA, 390 005  
Tel: 65235  
Cable: BLUE STAR  
A

Blue Star Ltd.  
7 Hare Street  
CALCUTTA 700 001  
Tel: 12-01-31  
Telex: 021-7655  
Cable: BLUESTAR  
A,M

Blue Star Ltd.  
133 Kodambakkam High Road  
MADRAS 600 034  
Tel: 82057  
Telex: 041-379  
Cable: BLUESTAR  
A,M

Blue Star Ltd.  
Bhandari House, 7th/8th Floors  
91 Nehru Place  
NEW DELHI 110 024  
Tel: 682547  
Telex: 031-2463  
Cable: BLUESTAR  
A,CH\*,CM,CS\*,E,M

Blue Star Ltd.  
15/16-C Wellesley Rd.  
PUNE 411 011  
Tel: 22775  
Cable: BLUE STAR  
A

Blue Star Ltd.  
2-2-47/1108 Bolarum Rd.  
SECUNDERABAD 500 003  
Tel: 72057  
Telex: 0155-459  
Cable: BLUEFROST  
A,E

Blue Star Ltd.  
T.C. 7/603 Poornima  
Maruthankuzhi  
TRIVANDRUM 695 013  
Tel: 65799  
Telex: 0884-259  
Cable: BLUESTAR  
E  
Computer Maintenance Corporation  
Ltd.  
115, Sarojini Devi Road  
SECUNDERABAD 500 003  
Tel: 310-184, 345-774  
Telex: 031-2960  
CH\*\*



# SALES & SUPPORT OFFICES

Arranged alphabetically by country

## INDONESIA

**BERCA Indonesia P.T.**  
P.O.Box 496/Jkt.  
Jl. Abdul Muis 62  
**JAKARTA**  
Tel: 21-373009  
Telex: 46748 BERSAL IA  
Cable: BERSAL JAKARTA  
P

**BERCA Indonesia P.T.**  
P.O.Box 2497/Jkt  
Antara Bldg., 17th Floor  
Jl. Medan Merdeka Selatan 17  
**JAKARTA-PUSAT**  
Tel: 21-344-181  
Telex: BERSAL IA  
A,CS,E,M

**BERCA Indonesia P.T.**  
P.O. Box 174/SBY.  
Jl. Kutei No. 11  
**SURABAYA**  
Tel: 68172  
Telex: 31146 BERSAL SB  
Cable: BERSAL-SURABAYA  
A\*,E,M,P

## IRAQ

Hewlett-Packard Trading S.A.  
Service Operation  
Al Mansoor City 9B/3/7  
**BAGHDAD**  
Tel: 551-49-73  
Telex: 212-455 HEPAIRAQ IK  
CH,CS

## IRELAND

Hewlett-Packard Ireland Ltd.  
82/83 Lower Leeson Street  
**DUBLIN 2**  
Tel: 0001 608800  
Telex: 30439  
A,CH,CM,CS,E,M,P  
Cardiac Services Ltd.  
Kilmore Road  
Artane  
**DUBLIN 5**  
Tel: (01) 351820  
Telex: 30439  
M

## ISRAEL

Eldan Electronic Instrument Ltd.  
P.O.Box 1270  
**JERUSALEM 91000**  
16, Ohaliav St.  
**JERUSALEM 94467**  
Tel: 533 221, 553 242  
Telex: 25231 AB/PAKRD IL  
A  
Electronics Engineering Division  
Motorola Israel Ltd.  
16 Kremenetski Street  
P.O. Box 25016  
**TEL-AVIV 67899**  
Tel: 3 88 388  
Telex: 33569 Motil IL  
Cable: BASTEL Tel-Aviv  
CH,CM,CS,E,M,P

## ITALY

Hewlett-Packard Italiana S.p.A.  
Traversa 99C  
Via Giulio Petroni, 19  
I-70124 **BARI**  
Tel: (080) 41-07-44  
M

Hewlett-Packard Italiana S.p.A.  
Via Martin Luther King, 38/III  
I-40132 **BOLOGNA**  
Tel: (051) 402394  
Telex: 511630  
CH,E,MS

Hewlett-Packard Italiana S.p.A.  
Via Principe Nicola 43G/C  
I-95126 **CATANIA**  
Tel: (095) 37-10-87  
Telex: 970291  
C,P

Hewlett-Packard Italiana S.p.A.  
Via G. Di Vittorio 9  
I-20063 **CERNUSCO SUL NAVIGLIO**  
(Milano)  
Tel: (02) 923691  
Telex: 334632  
A,CH,CM,CS,E,MP,P  
Hewlett-Packard Italiana S.p.A.  
Via C. Colombo 49  
I-20090 **TREZZANO SUL NAVIGLIO**  
(Milano)  
Tel: (02) 4459041  
Telex: 322116  
C,M

Hewlett-Packard Italiana S.p.A.  
Via Nuova San Rocco a  
Capodimonte, 62/A  
I-80131 **NAPOLI**  
Tel: (081) 7413544  
Telex: 710698  
A,CH,E

Hewlett-Packard Italiana S.p.A.  
Viale G. Modugno 33  
I-16156 **GENOVA PEGLI**  
Tel: (010) 68-37-07  
Telex: 215238  
E,C

Hewlett-Packard Italiana S.p.A.  
Via Pellizzo 15  
I-35128 **PADOVA**  
Tel: (049) 664888  
Telex: 430315  
A,CH,E,MS

Hewlett-Packard Italiana S.p.A.  
Viale C. Pavese 340  
I-00144 **ROMA EUR**  
Tel: (06) 54831  
Telex: 610514  
A,CH,CM,CS,E,MS,P\*  
Hewlett-Packard Italiana S.p.A.  
Via di Casellina 57/C  
I-50018 **SCANDICCI-FIRENZE**  
Tel: (055) 753863  
Hewlett-Packard Italiana S.p.A.  
Corso Svizzera, 185  
I-10144 **TORINO**  
Tel: (011) 74 4044  
Telex: 221079  
CH,E

## JAPAN

Yokogawa-Hewlett-Packard Ltd.  
152-1, Onna  
**ATSUGI**, Kanagawa, 243  
Tel: (0462) 28-0451  
CM,C\*,E  
Yokogawa-Helwett-Packard Ltd.  
Meiji-Seimei Bldg. 6F  
3-1 Hon Chiba-Cho  
**CHIBA**, 280  
Tel: 472 25 7701  
E,CH,CS

Yokogawa-Hewlett-Packard Ltd.  
Yasuda-Seimei Hiroshima Bldg.  
6-11, Hon-dori, Naka-ku  
**HIROSHIMA**, 730  
Tel: 82-241-0611

Yokogawa-Hewlett-Packard Ltd.  
Towa Building  
2-3, Kaigan-dori, 2 Chome Chuo-ku  
**KOBE**, 650  
Tel: (078) 392-4791  
C,E

Yokogawa-Hewlett-Packard Ltd.  
Kumagaya Asahi 82 Bldg  
3-4 Tsukuba  
**KUMAGAYA**, Saitama 360  
Tel: (0485) 24-6563  
CH,CM,E

Yokogawa-Hewlett-Packard Ltd.  
Asahi Shinbun Daiichi Seimei Bldg.  
4-7, Hanabata-cho  
**KUMAMOTO**, 860  
Tel: (0963) 54-7311  
CH,E

Yokogawa-Hewlett-Packard Ltd.  
Shin-Kyoto Center Bldg.  
614, Higashi-Shiokoji-cho  
Karasuma-Nishiiru  
Shiokoji-dori, Shimogyo-ku  
**KYOTO**, 600  
Tel: 075-343-0921  
CH,E

Yokogawa-Hewlett-Packard Ltd.  
Mito Mitsui Bldg  
4-73, Sanno-maru, 1 Chome  
**MITO**, Ibaraki 310  
Tel: (0292) 25-7470  
CH,CM,E

Yokogawa-Hewlett-Packard Ltd.  
Sumitomo Seimei 14-9 Bldg.  
Meieki-Minami, 2 Chome  
Nakamura-ku  
**NAGOYA**, 450  
Tel: (052) 571-5171  
CH,CM,CS,E,MS

Yokogawa-Hewlett-Packard Ltd.  
Chuo Bldg.,  
4-20 Nishinakajima, 5 Chome  
Yodogawa-ku  
**OSAKA**, 532  
Tel: (06) 304-6021  
Telex: YHPOSA 523-3624  
A,CH,CM,CS,E,MP,P\*

Yokogawa-Hewlett-Packard Ltd.  
27-15, Yabe, 1 Chome  
**SAGAMIHARA** Kanagawa, 229  
Tel: 0427 59-1311

Yokogawa-Hewlett-Packard Ltd.  
Daiichi Seimei Bldg.  
7-1, Nishi Shinjuku, 2 Chome  
Shinjuku-ku, **TOKYO** 160  
Tel: 03-348-4611  
CH,E

Yokogawa-Hewlett-Packard Ltd.  
29-21 Takaido-Higashi, 3 Chome  
Suginami-ku **TOKYO** 168  
Tel: (03) 331-6111  
Telex: 232-2024 YHPTOK  
A,CH,CM,CS,E,MP,P\*

Yokogawa-Hewlett-Packard Ltd.  
Daiichi Asano Building  
2-8, Odori, 5 Chome  
**UTSUNOMIYA**, Tochigi 320  
Tel: (0286) 25-7155  
CH,CS,E

Yokogawa-Hewlett-Packard Ltd.  
Yasuda Seimei Nishiguchi Bldg.  
30-4 Tsuruya-cho, 3 Chome  
**YOKOHAMA** 221  
Tel: (045) 312-1252  
CH,CM,E

## JORDAN

Mouasher Cousins Company  
P.O. Box 1387  
**AMMAN**  
Tel: 24907, 39907  
Telex: 21456 SABCO JO  
CH,E,M,P

## KENYA

ADCOM Ltd., Inc., Kenya  
P.O.Box 30070  
**NAIROBI**  
Tel: 331955  
Telex: 22639  
E,M

## KOREA

Samsung Electronics HP Division  
12 Fl. Kinam Bldg.  
San 75-31, Yeoksam-Dong  
Kangnam-Ku  
Yeongdong P.O. Box 72  
**SEOUL**  
Tel: 555-7555, 555-5447  
Telex: K27364 SAMSAN  
A,CH,CM,CS,E,M,P

## KUWAIT

Al-Khaldiya Trading & Contracting  
P.O. Box 830 Safat  
**KUWAIT**  
Tel: 42-4910, 41-1726  
Telex: 22481 Areeg kt  
CH,E,M

Photo & Cine Equipment  
P.O. Box 270 Safat  
**KUWAIT**  
Tel: 42-2846, 42-3801  
Telex: 22247 Matin kt  
P

## LEBANON

G.M. Dolmadjian  
Achrafieh  
P.O. Box 165.167  
**BEIRUT**  
Tel: 290293  
MP\*\*  
Computer Information Systems  
P.O. Box 11-6274  
**BEIRUT**  
Tel: 89 40 73  
Telex: 22259  
C

## LUXEMBOURG

Hewlett-Packard Belgium S.A./N.V.  
Blvd de la Woluwe, 100  
Woluwedal  
B-1200 **BRUSSELS**  
Tel: (02) 762-32-00  
Telex: 23-494 paloben bru  
A,CH,CM,CS,E,MP,P

## MALAYSIA

Hewlett-Packard Sales (Malaysia)  
Sdn. Bhd.  
1st Floor, Bangunan British  
American  
Jalan Semantan, Damansara Heights  
**KUALA LUMPUR** 23-03  
Tel: 943022  
Telex: MA31011  
A,CH,E,M,P\*

# SALES & SUPPORT OFFICES

Arranged alphabetically by country

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## MAYLAISIA (Cont'd)

Protel Engineering  
P.O.Box 1917  
Lot 6624, Section 64  
23/4 Pending Road  
Kuching, SARAWAK  
Tel: 36299  
Telex: MA 70904 PROMAL  
Cable: PROTELENG  
A,E,M

## MALTA

Philip Toledo Ltd.  
Notabile Rd.  
MRIEHEL  
Tel: 447 47, 455 66  
Telex: Media MW 649  
E,P

## MEXICO

Hewlett-Packard Mexicana, S.A.  
de C.V.  
Av. Periferico Sur No. 6501  
Tepepan, Xochimilco  
16020 MEXICO D.F.  
Tel: 6-76-46-00  
Telex: 17-74-507 HEWPACK MEX  
A,CH,CS,E,MS,P  
Hewlett-Packard Mexicana, S.A.  
de C.V.  
Ave. Colonia del Valle 409  
Col. del Valle  
Municipio de Garza Garcia  
MONTERREY, Nuevo Leon  
Tel: 78 42 41  
Telex: 038 410  
CH  
ECISA  
José Vasconcelos No. 218  
Col. Condesa Deleg. Cuauhtémoc  
MEXICO D.F. 06140  
Tel: 553-1206  
Telex: 17-72755 ECE ME  
M

## MOROCCO

Dolbeau  
81 rue Karatchi  
CASABLANCA  
Tel: 3041-82, 3068-38  
Telex: 23051, 22822  
E

## Gerep

2 rue d'Agadir  
Boite Postale 156  
CASABLANCA  
Tel: 272093, 272095  
Telex: 23 739  
P

## NETHERLANDS

Hewlett-Packard Nederland B.V.  
Van Heuven Goedhartlaan 121  
NL 1181KK AMSTELVEEN  
P.O. Box 667  
NL 1180 AR AMSTELVEEN  
Tel: (020) 47-20-21  
Telex: 13 216 HEPA NL  
A,CH,CM,CS,E,MP,P  
Hewlett-Packard Nederland B.V.  
Bongerd 2  
NL 2906VK CAPELLE A/D IJSSEL  
P.O. Box 41  
NL 2900AA CAPELLE A/D IJSSEL  
Tel: (10) 51-64-44  
Telex: 21261 HEPAC NL  
A,CH,CS,E

Hewlett-Packard Nederland B.V.  
Pastoor Petersstraat 134-136  
NL 5612 LV EINDHOVEN  
P.O. Box 2342  
NL 5600 CH EINDHOVEN  
Tel: (040) 326911  
Telex: 51484 hepae nl  
A,CH\*,E,M

## NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.  
5 Owens Road  
P.O. Box 26-189  
Epsom, AUCKLAND  
Tel: 687-159  
Cable: HEWPACK Auckland  
CH,CM,E,P\*

Hewlett-Packard (N.Z.) Ltd.  
4-12 Cruickshank Street  
Kilbirnie, WELLINGTON 3  
P.O. Box 9443  
Courtenay Place, WELLINGTON 3  
Tel: 877-199  
Cable: HEWPACK Wellington  
CH,CM,E,P

Northrop Instruments & Systems Ltd.  
369 Khyber Pass Road  
P.O. Box 8602

## AUCKLAND

Tel: 794-091  
Telex: 60605  
A,M

Northrop Instruments & Systems Ltd.  
110 Mandeville St.

## P.O. Box 8388

## CHRISTCHURCH

Tel: 486-928  
Telex: 4203  
A,M

Northrop Instruments & Systems Ltd.  
Sturdee House

85-87 Ghuznee Street

P.O. Box 2406

## WELLINGTON

Tel: 850-091  
Telex: NZ 3380  
A,M

## NORTHERN IRELAND

See United Kingdom

## NORWAY

Hewlett-Packard Norge A/S  
Folke Bernadottes vei 50  
P.O. Box 3558  
N-5033 FYLLINGSDALEN (Bergen)  
Tel: 0047/5/16 55 40  
Telex: 16621 hpnas n  
CH,CS,E,MS

Hewlett-Packard Norge A/S

Österndalen 16-18

P.O. Box 34

N-1345 ÖSTERÅS

Tel: 0047/2/17 11 80

Telex: 16621 hpnas n

A,CH,CM,CS,E,M,P

## OMAN

Khimjil Ramdas

P.O. Box 19

## MUSCAT

Tel: 722225, 745601

Telex: 3289 BROKER MB MUSCAT

P

Suhail & Saud Bahwan

P.O. Box 169

## MUSCAT

Tel: 734 201-3

Telex: 3274 BAHWAN MB

## PAKISTAN

Mushko & Company Ltd.  
1-B, Street 43  
Sector F-8/1  
ISLAMABAD  
Tel: 51071  
Cable: FEMUS Rawalpindi  
A,E,M

Mushko & Company Ltd.

Oosman Chambers

Abdullah Haroon Road

KARACHI 0302

Tel: 524131, 524132

Telex: 2894 MUSKO PK

Cable: COOPERATOR Karachi

A,E,M,P\*

## PANAMA

Electrónico Balboa, S.A.  
Calle Samuel Lewis, Ed. Alfa  
Apartado 4929  
PANAMA 5  
Tel: 63-6613, 63-6748  
Telex: 3483 ELECTRON PG  
A,CM,E,M,P

## PERU

Cía Electro Médica S.A.  
Los Flamencos 145, San Isidro  
Casilla 1030  
LIMA 1  
Tel: 41-4325, 41-3703  
Telex: Pub. Booth 25306  
CM,E,M,P

## PHILIPPINES

The Online Advanced Systems  
Corporation  
Rico House, Amorsolo Cor. Herrera  
Street  
Legaspi Village, Makati  
P.O. Box 1510  
Metro MANILA  
Tel: 85-35-81, 85-34-91, 85-32-21  
Telex: 3274 ONLINE  
A,CH,CS,E,M  
Electronic Specialists and Proponents  
Inc.  
690-B Epifanio de los Santos Avenue  
Cubao, QUEZON CITY  
P.O. Box 2649 Manila  
Tel: 98-96-81, 98-96-82, 98-96-83  
Telex: 40018, 42000 ITT GLOBE  
MACKAY BOOTH  
P

## PORTUGAL

Mundinter  
Intercambio Mundial de Comércio  
S.A.R.L.  
P.O. Box 2761  
Av. Antonio Augusto de Aguiar 138  
P-LISBON  
Tel: (19) 53-21-31, 53-21-37  
Telex: 16691 munter p  
M  
Soquímica  
Av. da Liberdade, 220-2  
1298 LISBOA Codex  
Tel: 56 21 81/2/3  
Telex: 13316 SABASA  
P

Telectra-Empresa Técnica de  
Equipamentos Eléctricos S.A.R.L.  
Rua Rodrigo da Fonseca 103  
P.O. Box 2531  
P-LISBON 1  
Tel: (19) 68-60-72  
Telex: 12598  
CH,CS,E,P

## PUERTO RICO

Hewlett-Packard Puerto Rico  
Ave. Muñoz Rivera #101  
Esq. Calle Ochoa  
HATO REY, Puerto Rico 00918  
Tel: (809) 754-7800  
Hewlett-Packard Puerto Rico  
Calle 272 Edificio 203  
Urb. Country Club  
RIO PIEDRAS, Puerto Rico  
P.O. Box 4407  
CAROLINA, Puerto Rico 00628  
Tel: (809) 762-7255  
A,CH,CS

## QATAR

Compute Arabia  
P.O. Box 2750  
DOHA  
Tel: 883555  
Telex: 4806 CHPARB  
P  
Eastern Technical Services  
P.O. Box 4747  
DOHA  
Tel: 329 993  
Telex: 4156 EASTEC DH  
Nasser Trading & Contracting  
P.O. Box 1563  
DOHA  
Tel: 22170, 23539  
Telex: 4439 NASSER DH  
M

## SAUDI ARABIA

Modern Electronic Establishment  
Hewlett-Packard Division  
P.O. Box 22015  
Thuobah  
AL-KHOBAR  
Tel: 895-1760, 895-1764  
Telex: 671 106 HPMEEK SJ  
Cable: ELECTA AL-KHOBAR  
CH,CS,E,M  
Modern Electronic Establishment  
Hewlett-Packard Division  
P.O. Box 1228  
Redec Plaza, 6th Floor  
JEDDAH  
Tel: 644 38 48  
Telex: 4027 12 FARNAS SJ  
Cable: ELECTA JEDDAH  
CH,CS,E,M  
Modern Electronic Establishment  
Hewlett-Packard Division  
P.O. Box 22015  
RIYADH  
Tel: 491-97 15, 491-63 87  
Telex: 202049 MEERYD SJ  
CH,CS,E,M  
Abdul Ghani El Ajou  
P.O. Box 78  
RIYADH  
Tel: 40 41 717  
Telex: 200 932 EL AJOU  
P

## SCOTLAND

See United Kingdom

## SINGAPORE

Hewlett-Packard Singapore (Sales)  
Pte. Ltd.  
#08-00 Inchcape House  
450-2 Alexandra Road  
P.O. Box 58 Alexandra Rd. Post Office  
SINGAPORE, 9115  
Tel: 631788  
Telex: HPSGSO RS 34209  
Cable: HEWPACK, Singapore  
A,CH,CS,E,MS,P





# SALES & SUPPORT OFFICES

Arranged alphabetically by country

## SINGAPORE (Cont'd)

*Dynamar International Ltd.*  
Unit 05-11 Block 6  
Kolam Ayer Industrial Estate  
**SINGAPORE 1334**  
Tel: 747-6188  
Telex: RS 26283  
CM

## SOUTH AFRICA

Hewlett-Packard So Africa (Pty.) Ltd.  
P.O. Box 120  
Howard Place **CAPE PROVINCE 7450**  
Pine Park Center, Forest Drive,  
Pinelands  
**CAPE PROVINCE 7405**  
Tel: 53-7954  
Telex: 57-20006  
A,CH,CM,E,MS,P  
Hewlett-Packard So Africa (Pty.) Ltd.  
P.O. Box 37099  
92 Overport Drive  
**DURBAN 4067**  
Tel: 28-4178, 28-4179, 28-4110  
Telex: 6-22954  
CH,CM

Hewlett-Packard So Africa (Pty.) Ltd.  
6 Linton Arcade  
511 Cape Road  
Linton Grange  
**PORT ELIZABETH 6000**  
Tel: 041-302148  
CH

Hewlett-Packard So Africa (Pty.) Ltd.  
P.O.Box 33345  
Glenstantia 0010 **TRANSVAAL**  
1st Floor East  
Constantia Park Ridge Shopping  
Centre  
Constantia Park  
**PRETORIA**  
Tel: 982043  
Telex: 32163  
CH,E

Hewlett-Packard So Africa (Pty.) Ltd.  
Private Bag Wendywood  
**SANDTON 2144**  
Tel: 802-5111, 802-5125  
Telex: 4-20877  
Cable: HEWPACK Johannesburg  
A,CH,CM,CS,E,MS,P

## SPAIN

Hewlett-Packard Española S.A.  
Calle Entenza, 321  
**E-BARCELONA 29**  
Tel: 322.24.51, 321.73.54  
Telex: 52603 hpbee  
A,CH,CS,E,MS,P  
Hewlett-Packard Española S.A.  
Calle San Vicente S/No  
Edificio Albia II  
**E-BILBAO 1**  
Tel: 423.83.06  
A,CH,E,MS

Hewlett-Packard Española S.A.  
Ctra. de la Coruña, Km. 16, 400  
Las Rozas  
**E-MADRID**  
Tel: (1) 637.00.11  
CH,CS,M

Hewlett-Packard Española S.A.  
Avda. S. Francisco Javier, S/no  
Planta 10. Edificio Sevilla 2,  
**E-SEVILLA 5**  
Tel: 64.44.54  
Telex: 72933  
A,CS,MS,P

Hewlett-Packard Española S.A.  
Calle Ramon Gordillo, 1 (Entlo.3)  
**E-VALENCIA 10**  
Tel: 361-1354  
CH,P

## SWEDEN

Hewlett-Packard Sverige AB  
Sunnanvagen 14K  
S-22226 **LUND**  
Tel: (046) 13-69-79  
Telex: (854) 17886 (via Spånga  
office)  
CH

Hewlett-Packard Sverige AB  
Östra Tullgatan 3  
S-21128 **MALMÖ**  
Tel: (040) 70270  
Telex: (854) 17886 (via Spånga  
office)

Hewlett-Packard Sverige AB  
Västra Vintergatan 9  
S-70344 **ÖREBRO**  
Tel: (19) 10-48-80  
Telex: (854) 17886 (via Spånga  
office)  
CH

Hewlett-Packard Sverige AB  
Skalholtsgatan 9, Kista  
Box 19  
S-16393 **SPÅNGA**  
Tel: (08) 750-2000  
Telex: (854) 17886

Telefax: (08) 7527781  
A,CH,CM,CS,E,MS,P  
Hewlett-Packard Sverige AB  
Fröfalligsgatan 30  
S-42132 **VÄSTRA-FRÖLUNDA**  
Tel: (031) 49-09-50  
Telex: (854) 17886 (via Spånga  
office)  
CH,E,P

## SWITZERLAND

Hewlett-Packard (Schweiz) AG  
Clarastrasse 12  
CH-4058 **BASEL**  
Tel: (61) 33-59-20  
A

Hewlett-Packard (Schweiz) AG  
7, rue du Bois-du-Lan  
Case Postale 365  
CH-1217 **MEYRIN 2**  
Tel: (0041) 22-83-11-11  
Telex: 27333 HPAG CH  
CH,CM,CS

Hewlett-Packard (Schweiz) AG  
Allmend 2  
CH-8967 **WIDEN**  
Tel: (0041) 57 31 21 11  
Telex: 53933 hpag ch  
Cable: HPAG CH  
A,CH,CM,CS,E,MS,P

## SYRIA

*General Electronic Inc.*  
Nuri Basha Ahnaf Ebn Kays Street  
P.O. Box 5781  
**DAMASCUS**  
Tel: 33-24-87  
Telex: 411 215  
Cable: ELECTROBOR DAMASCUS  
E

*Middle East Electronics*  
P.O.Box 2308  
Abu Rummaneh  
**DAMASCUS**  
Tel: 33 4 5 92  
Telex: 411 304  
M

## TAIWAN

Hewlett-Packard Far East Ltd.  
Kaohsiung Office  
2/F 68-2, Chung Cheng 3rd Road  
**KAOHSIUNG**  
Tel: (07) 241-2318  
CH,CS,E

Hewlett-Packard Far East Ltd.  
Taiwan Branch  
8th Floor  
337 Fu Hsing North Road  
**TAIPEI**

Tel: (02) 712-0404  
Telex: 24439 HEWPACK  
Cable: HEWPACK Taipei  
A,CH,CM,CS,E,M,P  
*Ing Lih Trading Co.*  
3rd Floor, 7 Jen-Ai Road, Sec. 2  
**TAIPEI 100**  
Tel: (02) 3948191  
Cable: INGLIH TAIPEI  
A

## THAILAND

*Unimesa*  
30 Patpong Ave., Suriwong  
**BANGKOK 5**  
Tel: 235-5727  
Telex: 84439 Simonco TH  
Cable: UNIMESA Bangkok  
A,CH,CS,E,M  
*Bangkok Business Equipment Ltd.*  
5/5-6 Dejo Road  
**BANGKOK**  
Tel: 234-8670, 234-8671  
Telex: 87669-BEQUIPT TH  
Cable: BUSIQUIPT Bangkok  
P

## TRINIDAD & TOBAGO

*Caribbean Telecoms Ltd.*  
50/A Jerningham Avenue  
P.O. Box 732  
**PORT-OF-SPAIN**  
Tel: 62-44213, 62-44214  
Telex: 235,272 HUGCO WG  
C,M,E,M,P

## TUNISIA

*Tunisie Electronique*  
31 Avenue de la Liberte  
**TUNIS**  
Tel: 280-144  
E,P  
*Corema*  
1 ter. Av. de Carthage  
**TUNIS**  
Tel: 253-821  
Telex: 12319 CABAM TN  
M

## TURKEY

*Teknim Company Ltd.*  
Iran Caddesi No. 7  
Kavaklidere, **ANKARA**  
Tel: 275800  
Telex: 42155 TKNM TR  
E

E.M.A.

*Medina Eldem Sokak No.41/6*  
Yuksel Caddesi  
**ANKARA**  
Tel: 175 622  
Telex: 42 591  
M

## UNITED ARAB EMIRATES

*Emitac Ltd.*  
P.O. Box 2711  
**ABU DHABI**  
Tel: 82 04 19-20  
Cable: EMITAC ABUDHABI  
*Emitac Ltd.*  
P.O. Box 1641  
**SHARJAH**  
Tel: 591 181  
Telex: 68136 Emitac Sh  
CH,CS,E,M,P

## UNITED KINGDOM

**GREAT BRITAIN**  
Hewlett-Packard Ltd.  
Trafalgar House  
Navigation Road  
**ALTRINCHAM**  
Cheshire WA14 1NU  
Tel: 061 928 6422  
Telex: 668068  
A,CH,CS,E,M,MS,P  
Hewlett-Packard Ltd.  
Elstree House, Elstree Way  
**BOREHAMWOOD**, Herts WD6 1SG  
Tel: 01 207 5000  
Telex: 8952716  
E,CH,CS,P

Hewlett-Packard Ltd.  
Oakfield House, Oakfield Grove  
Clifton **BRISTOL**, Avon BS8 2BN  
Tel: 0272 736806  
Telex: 444302  
CH,CS,E,P

Hewlett-Packard Ltd.  
Bridewell House  
Bridewell Place  
**LONDON EC4V 6BS**  
Tel: 01 583 6565  
Telex: 298163  
CH,CS,P

Hewlett-Packard Ltd.  
Fourier House  
257-263 High Street  
**LONDON COLNEY**  
Herts. AL2 1HA, St. Albans  
Tel: 0727 24400  
Telex: 1-8952716  
CH,CS

Hewlett-Packard Ltd.  
Pontefract Road  
**NORMANTON**, West Yorkshire WF6 1RN  
Tel: 0924 895566  
Telex: 557355  
CH,CS,P

Hewlett-Packard Ltd.  
The Quadrangle  
106-118 Station Road  
**REDHILL**, Surrey RH1 1PS  
Tel: 0737 68655  
Telex: 947234  
CH,CS,E,P

# SALES & SUPPORT OFFICES

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## GREAT BRITAIN (Cont'd)

Hewlett-Packard Ltd.  
Avon House  
435 Stratford Road  
Shirley, SOLIHULL, West Midlands  
B90 4BL

Tel: 021 745 8800  
Telex: 339105  
CH,CS,E,P

Hewlett-Packard Ltd.  
West End House  
41 High Street, West End

**SOUTHAMPTON**  
Hampshire SO3 3DQ  
Tel: 042 18 6767  
Telex: 477138  
CH,CS,P

Hewlett-Packard Ltd.  
Eskdale Rd.  
Winnersh, **WOKINGHAM**  
Berkshire RG11 5DZ  
Tel: 0734 696622  
Telex: 848884  
E

Hewlett-Packard Ltd.  
King Street Lane  
Winnersh, **WOKINGHAM**  
Berkshire RG11 5AR  
Tel: 0734 784774  
Telex: 847178  
A,CH,CS,E,M,MP,P

Hewlett-Packard Ltd.  
Nine Mile Ride  
Easthampstead, **WOKINGHAM**  
Berkshire, 3RG11 3LL  
Tel: 0344 773100  
Telex: 848805  
CH,CS,E,P

## IRELAND

### NORTHERN IRELAND

Hewlett-Packard Ltd.  
Cardiac Services Building  
95A Finaghy Road South  
**BELFAST BT10 0BY**  
Tel: 0232 625-566  
Telex: 747626  
CH,CS

### SCOTLAND

Hewlett-Packard Ltd.  
**SOUTH QUEENSFERRY**  
West Lothian, EH30 9TG  
Tel: 031 331 1188  
Telex: 72682  
CH,CM,CS,E,M,P

## UNITED STATES

### Alabama

Hewlett-Packard Co.  
700 Century Park South, Suite 128  
**BIRMINGHAM, AL 35226**  
Tel: (205) 822-6802  
A,CH,M

Hewlett-Packard Co.  
420 Wynn Drive  
**HUNTSVILLE, AL 35805**  
P.O. Box 7700  
**HUNTSVILLE, AL 35807**  
Tel: (205) 830-2000  
CH,CM,CS,E,M\*

### Arizona

Hewlett-Packard Co.  
8080 Pointe Parkway West  
**PHOENIX, AZ 85044**  
Tel: (602) 273-8000  
A,CH,CM,CS,E,MS

Hewlett-Packard Co.  
2424 East Aragon Road  
**TUCSON, AZ 85706**  
Tel: (602) 889-4631  
CH,E,MS\*\*

### California

Hewlett-Packard Co.  
99 South Hill Dr.  
**BRISBANE, CA 94005**  
Tel: (415) 330-2500  
CH,CS

Hewlett-Packard Co.  
P.O. Box 7830 (93747)  
5060 E. Clinton Avenue, Suite 102  
**FRESNO, CA 93727**  
Tel: (209) 252-9652  
CH,CS,MS

Hewlett-Packard Co.  
P.O. Box 4230  
1430 East Orangethorpe  
**FULLERTON, CA 92631**  
Tel: (714) 870-1000  
CH,CM,CS,E,MP

Hewlett-Packard Co.  
320 S. Kellogg, Suite B  
**GOLETA, CA 93117**  
Tel: (805) 967-3405  
CH

Hewlett-Packard Co.  
5400 W. Rosecrans Boulevard  
**LAWDALE, CA 90260**  
P.O. Box 92105  
**LOS ANGELES, CA 90009**

Tel: (213) 970-7500  
Telex: 910-325-6608  
CH,CM,CS,MP

Hewlett-Packard Co.  
3155 Porter Oaks Drive  
**PALO ALTO, CA 94304**  
Tel: (415) 857-8000  
CH,CS,E

Hewlett-Packard Co.  
4244 So. Market Court, Suite A  
P.O. Box 15976  
**SACRAMENTO, CA 95852**  
Tel: (916) 929-7222  
A\*,CH,CS,E,MS

Hewlett-Packard Co.  
9606 Aero Drive  
P.O. Box 23333  
**SAN DIEGO, CA 92139**  
Tel: (619) 279-3200  
CH,CM,CS,E,MP

Hewlett-Packard Co.  
2305 Camino Ramon "C"  
**SAN RAMON, CA 94583**  
Tel: (415) 838-5900  
CH,CS

Hewlett-Packard Co.  
3005 Scott Boulevard  
**SANTA CLARA, CA 95050**  
Tel: (408) 988-7000  
Telex: 910-338-0586  
A,CH,CM,CS,E,MP

Hewlett-Packard Co.  
5703 Corsa Avenue  
**WESTLAKE VILLAGE, CA 91362**  
Tel: (213) 706-6800  
E\*,CH\*,CS\*

### Colorado

Hewlett-Packard Co.  
24 Inverness Place, East  
**ENGLEWOOD, CO 80112**  
Tel: (303) 649-5000  
A,CH,CM,CS,E,MS

### Connecticut

Hewlett-Packard Co.  
47 Barnes Industrial Road South  
P.O. Box 5007  
**WALLINGFORD, CT 06492**  
Tel: (203) 265-7801  
A,CH,CM,CS,E,MS

### Florida

Hewlett-Packard Co.  
2901 N.W. 62nd Street  
P.O. Box 24210  
**FORT LAUDERDALE, FL 33307**  
Tel: (305) 973-2600  
CH,CS,E,MP

Hewlett-Packard Co.  
6177 Lake Ellenor Drive  
P.O. Box 13910  
**ORLANDO, FL 32859**  
Tel: (305) 859-2900  
A,CH,CM,CS,E,MS

Hewlett-Packard Co.  
5750B N. Hoover Blvd., Suite 123  
P.O. Box 15200  
**TAMPA, FL 33614**  
Tel: (813) 884-3282  
A\*,CH,CM,CS,E\*,M\*

### Georgia

Hewlett-Packard Co.  
2000 South Park Place  
P.O. Box 105005  
**ATLANTA, GA 30348**  
Tel: (404) 955-1500  
Telex: 810-766-4890  
A,CH,CM,CS,E,MP

### Hawaii

Hewlett-Packard Co.  
Kawaiahao Plaza, Suite 190  
567 South King Street  
**HONOLULU, HI 96813**  
Tel: (808) 526-1555  
A,CH,E,MS

### Illinois

Hewlett-Packard Co.  
304 Eldorado Road  
P.O. Box 1607  
**BLOOMINGTON, IL 61701**  
Tel: (309) 662-9411  
CH,MS\*\*

Hewlett-Packard Co.  
1100 31st Street, Suite 100  
**DOWNERS GROVE, IL 60515**  
Tel: (312) 960-5760  
CH,CS

Hewlett-Packard Co.  
5201 Tollview Drive  
**ROLLING MEADOWS, IL 60008**  
Tel: (312) 255-9800  
Telex: 910-687-1066  
A,CH,CM,CS,E,MP

### Indiana

Hewlett-Packard Co.  
7301 No. Shadeland Avenue  
P.O. Box 50807  
**INDIANAPOLIS, IN 46250**  
Tel: (317) 842-1000  
A,CH,CM,CS,E,MS

### Iowa

Hewlett-Packard Co.  
1776 22nd Street, Suite 1  
**WEST DES MOINES, IA 50265**  
Tel: (515) 224-1435  
CH,MS\*\*

### Kansas

Hewlett-Packard Co.  
7804 East Funston Road, #203  
**WICHITA, KS 67207**  
Tel: (316) 684-8491  
CH

### Kentucky

Hewlett-Packard Co.  
10300 Linn Station Road, #100  
**LOUISVILLE, KY 40223**  
Tel: (502) 426-0100  
A,CH,CS,MS

### Louisiana

Hewlett-Packard Co.  
160 James Drive East  
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Arranged alphabetically by country

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