Norsk Data

COSMOS X.25 Option
Operator's Guide

ND—30.034.01

COSMOS X.25 Option
Operator's Guide

ND—30.034.01

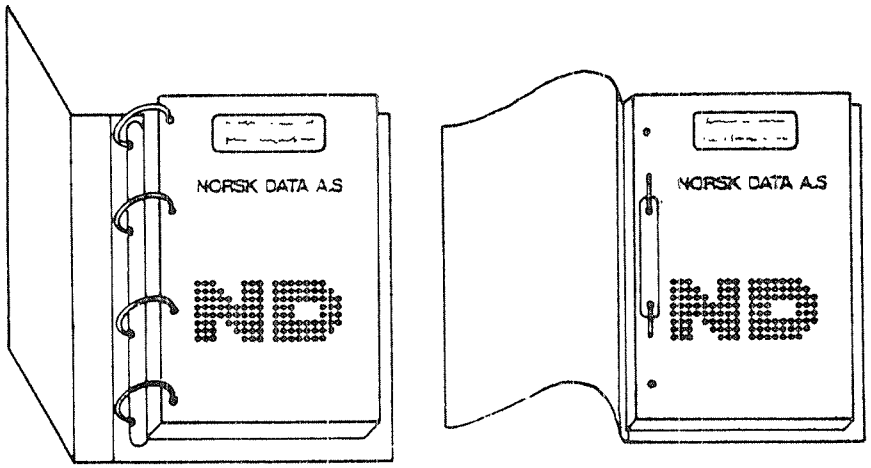
NOTICE

The information in this document is subject to change without notice. Norsk Data A.S assumes no responsibility for any errors that may appear in this document. Norsk Data A.S assumes no responsibility for the use or reliability of its software on equipment that is not furnished or supported by Norsk Data A.S.

This manual is in loose leaf form for ease of updating. Old pages may be removed and new pages easily inserted if the manual is revised.

The loose leaf form also allows you to place the manual in a ring binder (A) for greater protection and convenience of use. Ring binders with 4 rings corresponding to the holes in the manual may be ordered in two widths, 30 mm and 40 mm. Use the order form below.

The manual may also be placed in a plastic cover (B). This cover is more suitable for manuals of less than 100 pages than for large manuals. Plastic covers may also be ordered below.



A Ring Binder B Plastic Cover

Please send your order to the local ND office or (in Norway) to:

Documentation Department
Norsk Data A.S
P.O. Box 4, Lindeberg gård
Oslo 10

ORDER FORM

I would like to order

..... Ring Binders, 30 mm, at nkr 20,- per binder

..... Ring Binders, 40 mm, at nkr 25,- per binder

..... Plastic Covers at nkr 10,- per cover

Name .....
Company .....
Address .....
.....
City .....

PRINTING RECORD

Printing	Notes
01/84	Version 01

ND- 30.034.01
COSMOS X.25 Option Operator's Guide
January 1984

NORSK DATA A.S
P.O. Box 4, Lindeberg gård
Oslo 10, Norway

Manuals can be updated in two ways, new versions and revisions. New versions consist of a complete new manual which replaces the old manual. New versions incorporate all revisions since the previous version. Revisions consist of one or more single pages to be merged into the manual by the user, each revised page being listed on the new printing record sent out with the revision. The old printing record should be replaced by the new one.

New versions and revisions are announced in the ND Bulletin and can be ordered as described below.

The reader's comments form at the back of this manual can be used both to report errors in the manual and to give an evaluation of the manual. Both detailed and general comments are welcome.

These forms, together with all types of inquiry and requests for documentation should be sent to the local ND office or (in Norway) to:

Documentation Department
Norsk Data A.S
P.O. Box 4, Lindeberg gård
Oslo 10

Preface:

THE PRODUCT

This Operators Guide describes the product:

COSMOS X.25 Option ND 10573 A

THE READER

This manual should be read by all system operators (or supervisors) in charge of installing, loading, testing and maintaining the product COSMOS X.25 Option.

PREREQUISITE KNOWLEDGE

Detailed knowledge of the operating procedures of SINTRAN III (version H or later) and the COSMOS Basic Module with Inter System XMeSsage (IS XMSG) is assumed.

Familiarity with the basic requirements in the CCITT X.25 recommendation is helpful, but not essential.

For detailed descriptions of the products listed above, see the next paragraph.

THE MANUAL

This manual is not meant to be read from cover to cover.

The first chapter gives an introduction to the X.25 network system, with reference to the CCITT recommendation. This chapter may be skipped by experienced data communication operators.

Chapters 2, 3, 4 and 5 must be read sequentually by anyone not familiar with the COSMOS X.25 Option.

Chapters 6 and 7, describing how to test and log a COSMOS X.25 Option installation may be skipped by the reader if they are not of particular interest.

The appendices A to D provides alphabetically organised reference documentation of the functions described in the chapters 2 to 7.

Appendix E gives an explanation of the most common error messages and some troubleshooting hints.

Preface continued

RELATED MANUALS

The following manuals suply additional information about products closely related to COSMOS X.25 Option:

SINTRAN III System Supervisor Manual	ND-30.003
COSMOS Operators Guide	ND-30.025
Introduction to ND Data Communication Products	ND-60.181

Included in the Introduction to ND Data Communication Products Manual, is a glossary on data communication terms which might prove helpful for the reader. This glossary lists both general terms and special ND data communication terms.

Further, this manual gives an introduction to the ND data communication environment, and it includes a sketch of the CCITT X.25 recommendations.

CHANGES FROM PREVIOUS VERSION

This manual replaces the old X.25 Supervisors Guide ND-30.023.

The manual documents not only X.25 but also the COSMOS X.25 network server which is included in the product COSMOS X.25 Option.

TABLE OF CONTENTS

Section Page

Section Page

List Of Figures.

1 Introduction

1.1 Synopsis

This chapter is a brief introduction to the CCITT network protocol X.25 in general, and a short outline of the COSMOS X.25 Option in particular.

1.2 What is an X.25 Network?

The COSMOS X.25 Option is a subsystem used to interconnect COSMOS Local Area Networks (LANs) through an X.25 packet switched network, normally provided by a common carrier (US) or by a governmental agency. The 'carriers' are generally called PTT (Postal Telephone and Telegraph).

The acronym for the actual network is PDN, Public Data Network.

The X.25 protocol is an internationally accepted recommendation by the CCITT, the International Telegraph and Telephone Consultative Committee. As pointed out earlier, it would be desirable if you look at this recommendation.

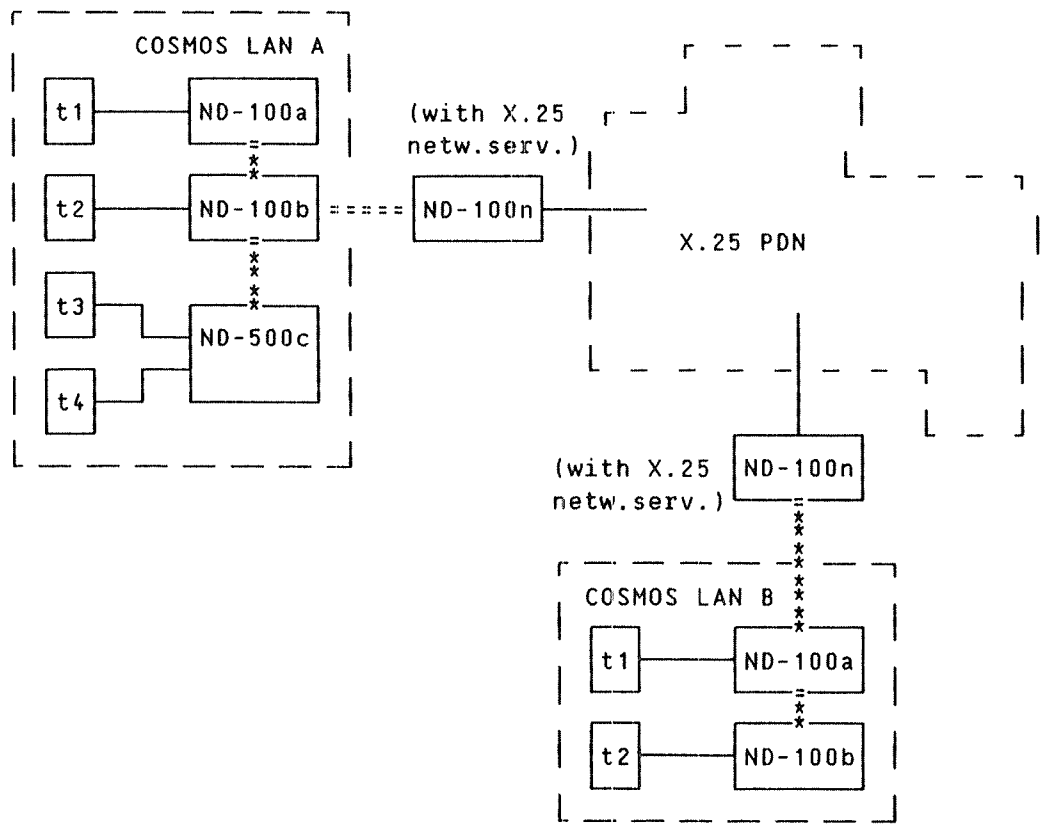


Figure 1. A typical ND X.25 network configuration.

In the network sketched above, a user sitting on terminal t2 in LAN A may access services provided by systems in LAN B, as if they were provided inside LAN A.

The following list gives examples of functions providing total user transparency:

- Remote Terminal Access (RTA) to systems in LAN B (or vice versa)
- Remote file access to information stored in LAN B systems (or vice versa)
- Append remote batch facility, making it possible to start a batch job on a system in LAN B from a system in LAN A (or vice versa).

Thus the functions above appear to the applications user as if they were done inside a LAN. Of course the user must allow for a certain general reduction in throughput, system response etc. This is due to the greater distance between the user and the remote system, and peaks in traffic on the PDN.

Further, data transmissions through a PDN involve a complex apparatus and there may be a significant overhead if the traffic on the PDN is high. If the traffic reaches its maximum capacity, jamming may occur.

1.3 The Parts of the COSMOS X.25 Option

The module COSMOS X.25 Option consists of two main parts:

- X.25 Network Server
- X.25

1.3.1 X.25 Network Server

This part forms an interface between Inter System (IS) XMSG and X.25 packet level.

1.3.2 The X.25 Recommendation

X.25 is a communication protocol that provides the user with a virtual connection through a packet switched PDN. The implemented version conforms to the CCITT X.25 provisional recommendation from 1976, amended in 1977.

The X.25 may be looked upon as levels 1 to 3 in a layered communication system model.

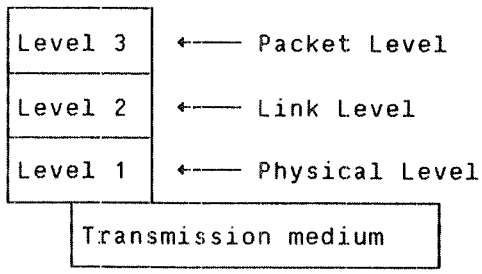


Figure 2. The three X.25 levels (layers)

These three lower levels are specified in the X.25 recommandation, and an abstract of this is listed below:

Level 3 - is often called the Packet Level (PL). It defines the packet format and control procedures for exchange of packets containing control information and/or user data. This level makes it possible to establish one or more logical connections using one physical link.

Level 2 - is often called the Link Level (LL), and it defines the link access procedure for data interchange across the physical link. The purpose of the access procedure is to offer a reliable transmission medium through such functions as error checking and sequence control.

Level 1 - defines the physical, electrical, functional and procedural characteristics to establish, maintain and disconnect the physical link.

The electrical characteristics currently in use are given in the V.24 (X.21 bis or RS 232C) standard.

1.3.3 The Different X.25 Processes

Here is a complete list of the main processes in X.25:

Process	Name
X.25 Network Server	X25NS
X.25 Packet Level	X2530
X.25 Link Level	X2520
X.25 Time Process	X25TM
X.25 Log Process	X25LG
X.25 Power failure process	X25PF
X.25 Supervisor (RT part)	X25SUPV
X.25 Startup process	X25STRT
X.25 Stop process	X25STOP

Figure 3. The main processes of X.25

The process name of X.25 is X2530, where 30 designates level 3 and PL process number 0.

The same syntax is used on the Link Level.

The figure below indicates the relationship between the different X.25 processes:

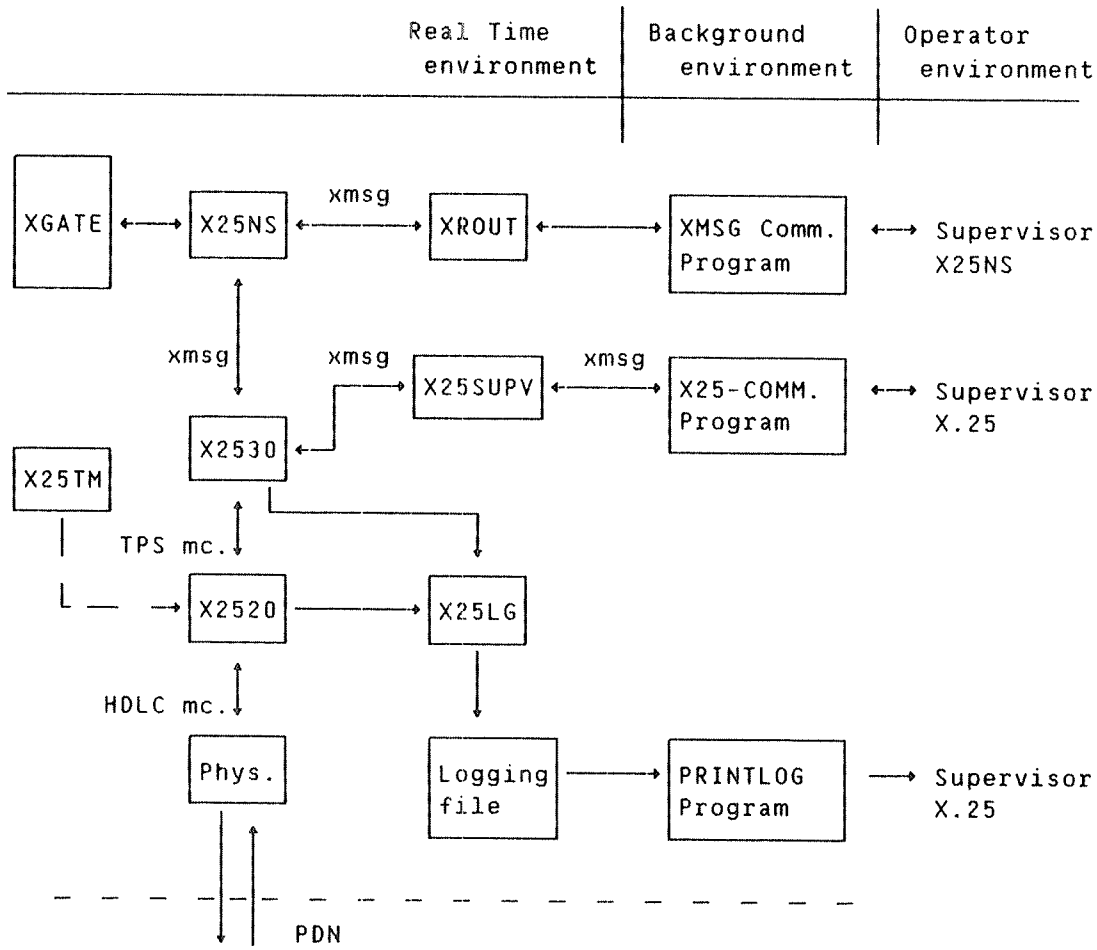


Figure 4. The relationship between the different X.25 processes.

The abbreviation mc. means monitor call(s). TPS mc., Transaction Processing System monitor calls, are buffer pool monitor calls.

As you can see in the figure, the XMSG-COMMAND program is used to control the X.25 Network Server. X.25 itself is controlled by the X25-COMMAND program.

The X25-PRINTLOG program is used to format the logging file, which does not contain readable information.

These three programs are the primary tools for the system operator to control and maintain the COSMOS X.25 Option. In the following chapters they will all be explained.

But for a more thorough description of the XMSG-COMMAND program, see:

COSMOS Operator's Guide ND-30.025

1.4 Some Basic Definitions

The main glossary on data communication terms are included in the manual:

Introduction to ND
Data Communication Products ND-60.181

Thus, for your convienence, a list of basic terms related to X.25 are included below:

DCE - Data Circuit-terminating Equipment.

DTE - Data Terminal Equipment.

Frame - data unit exchanged between two link levels (two LLs).

LL - Link Level (Layer)

Packet - data unit exchanged between two packet levels.

PL - Packet Level (Layer)

PVC - Permanent Virtual Circuit.

VC - Virtual Call.

LCI - Logical Channel Identifier.

2 System Prerequisites

2.1 Synopsis

This chapter lists the different system prerequisites necessary for the operation of the COSMOS X.25 Option. Both hardware and software requirements are listed.

2.2 Hardware and Software Requirements

The following are prerequisites for installation of the COSMOS X.25 Option:

HARDWARE:

- HDLC DMA interface card.

SOFTWARE:

- Operating System: SINTRAN III version H or later, generated for IS XMSG and HDLC DMA.

  SINTRAN must be configured with buffer pool monitor calls (TPS).

  SINTRAN must also be configured with internal devices if X.25 test programs are to be used. Internal device 200B must be reserved with a minimum size of 64 words.

- IS XMSG version H or later, generated with gateway software and a minimum of 12 XMSG ports.

- The PERFORM subsystem.

- The library XMSG-LIBRARY:BRF must exist under user UTILITY.

2.3 Initial installment procedures

The initial installment procedures, such as copying the files on the COSMOS X.25 Option floppies and how to load the system is explained in detail on the Program Description Sheet which comes with the system floppies.

Follow these instructions carefully and make certain that external conflicts, such as insufficient space under the specified user area etc., do not arise.

3 Starting and Stopping X.25

3.1 Synopsis

This chapter describes the different procedures involved in starting and stopping the X.25 part of the COSMOS X.25 Option.

It also explains the commands necessary to control the underlying X.25 network system.

How to start and stop the X.25 Network Server is explained in the next chapter. However, before you can start the network server, the underlying X.25 network system must be running.

3.2 The Supervisory Programs

The system operator, or supervisor, has three different tools to maintain an X.25 network system:

- XMSG-COMMAND program.
- X25-PRINTLOG program.
- X25-COMMAND program.

They are all standard background programs, thus you have to be user SYSTEM to utilize all the features.

3.2.1 XMSG-COMMAND Program

XMSG-COMMAND program is documented in the manual COSMOS Operators Guide, ND-30.025. In this guide we will only look upon the specific commands affecting COSMOS X.25 Option.

XMSG has to be started before X.25 or the X.25 Network Server can be started.

The XMSG commands affecting the operation of COSMOS X.25 Option are explained in the next chapter.

3.2.2 X25-PRINTLOG Program

This program converts the output of a log initiated in the X25-COMMAND program to a readable format.

It is used by the system operator or the system programmer for debugging purposes.

X25-PRINTLOG and the logging facility of X.25 are explained in chapter 6 of this manual.

3.2.3 X25-COMMAND Program

The X25-COMMAND program enables the system supervisor/operator to start/stop and configure an X.25 module.

The X25-COMMAND program reference documentation is provided in appendix A in the back of this manual.

The X25-COMMAND program is a background program which is used to control the X.25 part of the COSMOS X.25 Option. To be able to recover this program, XMSG has to be running and you **must** be logged in as user SYSTEM. This is because X25-COMMAND uses priveleged instructions, such as manipulating RT programs.

The X25-COMMAND program is command-driven in the same way as the XMSG-COMMAND program, with which you should be familiar.

X25-COMMAND communicates with the process X25SUPV. This is a Real-Time (RT) program which acts as a server to the supervisory program.

The X25-COMMAND program may be copied from the X.25 system diskettes into user SYSTEM's area. Set public (and friend) access to NONE to prevent unauthorised use.

The X25-COMMAND program is activated as a normal program by typing X25-COMMAND and **not** X.25-COMMAND. SINTRAN III does not accept "." (decimal point, full stop) in a file name. If COSMOS Basic Module is installed, the decimal point serves as a delimeter.

3.3 Starting the X.25 System

In this chapter we assume that XMSG already has been started successfully and that X.25 has been loaded correctly.

Further we assume that both SINTRAN III and XMSG is configured for X.25 and that the X.25 (HDLC DMA) link(s) is present and not reserved by any other system, eg., XMSG.

Check this by the following SINTRAN III command:

@LIST-DEVICE <LUN>,0

The parameter <LUN> means Logical Unit Number, and is 13608 if HDLC DMA link no. 1 is used. If link no. 2 is used, the <LUN> is 1362B. You must check this!

3.3.1 Starting the X25-COMMAND program

The first time the X25-COMMAND program is started, it will activate the RT process X25SUPV. If X25SUPV was inactive, ie., not in RTWAIT, X25SUPV will go through a test procedure to see if the configuration of SINTRAN III, XMSG and X.25 is sufficient.

After this test X25SUPV will send back a status report to the X25-COMMAND program.

3.3.1.1 Startup Error Returns

The error returns are divided into two main parts:

1) Errors (fatal)

2) Warnings

If a vital part of the system, hardware or software, is missing or if the operating system is configured incorrectly, an error message is returned and the X.25 system is stopped. All error messages are fatal; they stop the X.25 network system.

For example, an error message is returned if the HDLC (DMA) driver is missing, or if one of the initial processes, eg., X25TM, is missing. An error message is also returned if the buffer pool monitor calls is missing.

All warnings are non-fatal error messages, indicating a faulty condition which does not directly prevent the operation and running of the X.25 system.

An example of a warning is if the test system for the packet level or the link level is missing.

A warning will also be issued if the X25-PRINTLOG program is missing.

3.3.1.2 Startup OK

If no errors are found - the X25SUPV will start the RT program X25STRT process which will create queues and a buffer pool and start the timer X25TM.

No messages will be displayed on the terminal if everything is OK. A listing of a typical startup is shown below:

Example:

```
@(X25-NET)X25-COMMAND

ND X.25 command program  -  ND 10573
Version A of 83.10.01  -  Revision 0

Trying to connect to the supervisor.
X25-C:_
```

If the X25-COMMAND program has been run successfully before, the message 'Trying to connect to the supervisor.' will normally not be displayed.

3.3.2 X25-COMMAND Program Commands

Complete reference documentation of the X25-COMMAND program is provided in appendix A in the back of this manual.

In this section we will only give a quick introduction to the program. We assume that X25-COMMAND has been started successfully.

The first command you should try is the HELP command, which lists all available commands:

Example:

```
@(X25-NET)X25-COMMAND

ND X.25 command program  -  ND 10573
Version A of 83.10.01  -  Revision 0

X25-C:HELP

START-MODULE
STOP-MODULE
OPEN-MODULE
CLOSE-MODULE
RESTART-MODULE
CHANGE-LOG-STATUS
MODULE-STATUS
CHANGE-PROFILE
LIST-PROFILE
LIST-MODULE
STOP-COMMUNICATION
HELP
EXIT

X25-C:_
```

Note that the EXIT command terminates the dialogue, but does not stop the X.25 system.

If you want to close the whole system down, you can use the command STOP-COMMUNICATION, which will close and stop all modules. You can also use this command if you lose control over what is going on.

So remember:

STOP-COMMUNICATION closes down the whole X.25 system.

You should also note that this command does **not** stop the network server X25NS. This must be done from XMSG.

In the rest of this chapter we will give a sequential introduction to the different phases of starting up the system. The different commands will be presented accordingly.

3.4 How to Start a Module

Provided the startup sequence was successful, you can now start a module (line) by executing the following command in the sequence shown below:

- START-MODULE
- LIST-PROFILE
- CHANGE-PROFILE
- OPEN-MODULE
- MODULE-STATUS

In the following sections we will demonstrate this.

3.4.1 START-MODULE

Example:

```
X25-C:START-MODULE ↵
Module number (0): ↵
From X.25 module number 0. START-MODULE ok.

X25-C:_
```

You have to execute this command to be able to check whether the profile and configuration of the specified X.25 module suits your system and communication requirements.

3.4.2 LIST-PROFILE

When executing this command, the module must be started.

The purpose of the command is to list the current profile of the specified X.25 module. The default profile for a new system will normally suit your configuration and connection to the PDN or the common carrier.

In the next section it is explained how to change the profile of a module.

The following example illustrates the output from a typical X.25 profile:

```
Example:

X25-C:LIST-PROFILE
Module number (0): ↵

Current profile for X.25 module number 0
Packet level:
  Network type: NDstd. Local DTE number: 1234567
  Max. simultaneously active channels: 50
  Channel range (low,high):
    PVC: 0,0. Oneway incoming: 0,0. Twoway:1,32. Oneway outg:0,0
  User data packet size: 128 octets. Packet level window size: 2
  Timeout data:
  Packet type          Timeout (Sec.)     Retries
  RESTART REQUEST         180                5
  CALL REQUEST            200                0
  RESET REQUEST           180                5
  CLEAR REQUEST           180                5
  INTERUPT REQUEST        180                5
Link level:
  Link access procedure: LAP-B. Window size: 7
  Timeout: 2 (sec.). Retries: 5
  Logical unit: HDLC1 (1360B)
Operation:
  Operational mode: Normal
  Communicating in DTE address mode.
  The link level connection is permanent, ie., connected
    when the packet level is active.
X25-C:_
```

3.4.3 CHANGE-PROFILE

This command allows you to change the current profile of a module.

The module must be started, but **not** opened.

It is advisable that you supply the parameters as the parameter prompts are displayed.

The default profile parameters (or the existing parameters) are listed in double quotes. If you do not want to change it, just type Carriage Return (↵).

In the following example, on the next page, only the DTE number is changed.

Example:

```
X25-C:CHANGE-PROFILE ↵
Module number (0): ↵
Fetching the profile
Specify parameters for the packet level:
  Network type (NDstd/PSS/Datex-P/Transpac): "NDstd" ↵
  DTE number : "" 99999 ↵
  Specify channel ranges, in form LOW/HIGH
  PVC       (default 0,0 implies none) : "0,0" ↵
  VC one-way incoming (       "       ) : "0,0" ↵
  VC two-way          (       "       ) : "1,32" ↵
  VC one-way outgoing (       "       ) : "0,0" ↵
User data packet size in octets (16-1024) : "128" ↵
Window size (1-7) : "2" ↵
Specify timeout values in seconds and max retries as follows:
  Timeout for RESTART packets : "180" ↵
  Max retries : "5" ↵
  Timeout for CALL REQUEST packets : "200" ↵
  Max retries : "0" ↵
  Timeout for RESET REQUEST packets : "180" ↵
  Max retries : "5" ↵
  Timeout for CLEAR REQUEST packets : "180" ↵
  Max retries : "5" ↵
  Timeout for DTE INTERUPT packets : "180" ↵
  Max retries : "5" ↵
Specify parameters for the link level:
  Balanced or Unbalanced link access procedure (B/U) : "B" ↵
  Window size (1-7) : "7" ↵
  Timeout (sec.) : "2" ↵
  Retries        : "5" ↵
  Logical unit (as HDLC"x") : HDLC"1" ↵
Specify operation:
  Operational mode
    (Normal/packet level loopback/Link level Loopback) : "N" ↵
  Communication mode (DTE/DCE/adaptive/symmetric) : "DTE" ↵
  Link level connection type (permanent/non-permanent) : "P" ↵

From X.25 module number 0. CHANGE-PROFILE ok.
X25-C:_
```

In the previous example, all but the following parameters may use the supplied default values without checking.:

- Network type
- DTE number
- What type of Virtual Circuit
- Balanced or Unbalanced link level access procedure

Thus, before you make the X.25 network system operational, check all profile parameters with the PDN or common carrier. This is to maximize the effiency of the network system.

In appendix C, a more thorough explanation of the CHANGE-PROFILE parameters is included.

To verify that the changes you have made are included in the current module profile, check with the command LIST-PROFILE which was explained in the previous section.

3.4.4 OPEN-MODULE

This command will open the specified module and the communication line, and it will try to establish a link level connection request to the remote DCE.

Provided everything above has been done successfully, and the DCE on the other side is ready to accept the packet level connection request, the following response will be displayed:

Example:

```
X25-C:OPEN-MODULE ↵
Module number (0): ↵
From X.25 module number 0. OPEN-MODULE ok.
```

If, for example, the DCE is not ready, the following will be displayed:

Example:

```
X25-C:OPEN-MODULE ↵
Module number (0): ↵
Error return from X.25 module number 0
in the command OPEN-MODULE
Return status : No answer from the remote link level.
The local part will proceed with its connect attempts until
a close is sent.
```

In the example above, the error condition is probably that the remote system, normally the DCE, has experienced a fatal error.

In the next section, we will explain how to list the status of an X.25 module. Whether a virtual call is established or not is not important; the specified module just has to be started.

3.4.5 MODULE-STATUS

This command is used to list the current status of a module.

Remember that the module has to be started.

Example:

```
X25-C:MODULE-STATUS ↵
Module number (0): ↵

Status for X.25 module number 0.
Packet level status:
  State: Not active
  Log state: Log file closed
Link level status:
  State: Not initialized.
  Log state: Log file closed
Buffer pool:
  Buffer size: 148 (octets)
  Free buffers: 128

X25-C:_
```

The listing above was obtained when the module was started, but not opened.

3.5 Summary

If all the steps above have been done successfully, your X.25 network system should be running.

The next step will be to start the network server X25NS and define the network connections. This is explained in the following chapter.

4 How to Start the X.25 Network Server

4.1 Synopsis

This chapter explains how to start and operate the network server part of the COSMOS X.25 Option.

A detailed reference section on the different XMSG commands necessary to operate an X.25 network server is listed in appendix B.

4.2 Prerequisites

Provided that the X.25 network system is running, we can now start the network server, which links the COSMOS Basic Module with the underlying X.25 network system.

We assume that the underlying X.25 network system has been successfully installed, loaded and started.

The packet level status should read 'Active' before trying to start the network server X25NS.

In the following section we will have a brief look at the XMSG-COMMAND program.

4.3 The XMSG-COMMAND Program

The XMSG-COMMAND program is a background program that is used to control and supervise the XMSG system and products using XMSG, like the COSMOS X.25 Option.

XMSG-COMMAND accepts commands in the usual SINTRAN way, with abbreviations being allowed, and XMSG-COMMAND prompts for parameters that are not specified on the command line.

Any command line preceded by the @ sign will be handed over to the SINTRAN III background command processor for execution.

Many of the commands in the background program use privileged XMSG functions.

XMSG-COMMAND will automatically use the XFPRV function to make itself privileged when most of these functions are invoked, but this will be refused if the user is not logged in as 'SYSTEM.'

In the following sections in this chapter, only the commands necessary to operate the X25NS will be discussed.

4.4 Modifying the XMSG Routing Tables

In a X.25/XMSG configuration, we need to be able to build tables that specify where XMSG should send messages destined within an X.25 system. This information lies in the XMSG routing tables.

Since the X25NS uses XMSG for internal communication we have to update XMSG tables accordingly.

The first thing to do is to identify to XMSG the X.25 system. This is done as follows:

Log in as user SYSTEM and start the XMSG-COMMAND program.

Example:

```
@(UTILITY)XMSG-COMMAND ↵

XMSG command program (ND-10130/10373H) of 83.07.21 12.31
Compiled for version 1983.07.13 (Release H)
XMSG kernel version 1983.07.13 (Release H)
Options:
   ND-100 only. Trace.
   Inter System: File server.

X-C:_
```

4.4.1 Defining *X25GATE

Then, you define a 'remote name' which identifies the underlying X.25 Network System to XMSG.

```
Example:

 X-C:DEFINE-REMOTE-NAME ↵
 XROUT system? ↵
 Port or system name: *X25GATE ↵
 Remote system or Port no: <your own system number> ↵
 OK

 X-C:_
```

The name *X25GATE identifies to the COSMOS system where the X.25 system exists. The last parameter, <your own system number>, is the SINTRAN III system number of your local system (ie., 888, 10666, 5655).

4.4.2 Starting X25NS

The next step is to start the network server. This is done as follows:

```
Example:

 X-C:START-NETWORK-SERVER ↵
 Server name? X25NS ↵
 Server system ? ↵
 Server not started - will try to start it now
 Window size? ↵
 Wide Area Network (Y/N)? ↵
```

In the last parameter, the first option Y(es) listed in the parenthesis is the default value.

This command will start the X.25 network server on your local system. The message on the fourth line, "Server not started - will try to start it now", indicates that everything is OK. If something goes wrong, another or additional error messages will be returned.

You will normally use the default values of the parameter Window size.

4.4.3 Defining a Remote System Name

Now, provided that everything is OK, your COSMOS X.25 Option is ready to accept routing information.

This is not done in the same way as for local area network systems, such as the COSMOS point-to-point HDLC network, since the actual routing is done in the PDN.

What you have to do is to define which remote system(s), DTE's, included in the PDN network, you want to have access to, or vice versa.

The following example illustrates how to define such a remote system.

First, you have to define the remote name to XMSG. This is done with the same command as when you defined the local *X25GATE.

```
Example:

 X-C:DEFINE-REMOTE-NAME ↵
 XROUT system? ↵
 Port or system name: ND-BOSTON ↵
 Remote system or Port no? 5467 ↵
 OK

 X-C:_
```

4.4.4 Defining a Network Connection

```
Example:

 X-C:DEFINE-NETWORK-CONNECTION ↵
 Remote system? ND-BOSTON ↵
 Server name? X25NS ↵
 Server system ? ↵
 Remote DTE adress? 11234567894561237 ↵
 Dial-up cost? 10 ↵
 Connect cost/minute? 2 ↵
 Data cost/ksegment? 1 ↵
 OK

 X-C:_
```

The first parameter, ND-BOSTON, is the remote system name.

The second parameter is the name of the local network server to be used. Normally you will only have one, and its name is X25NS.

The third parameter is the server system. You normally give the default value, which is your own system.

The fourth parameter is the remote DTE adress. This number is given to you by the PDN authority.

The three last parameters, (dial-up cost, connect cost/minute and data cost/ksegment) are all parameters which may vary from PDN to PDN. Check with the local PDN authority. The values supplied in the example above may be used for testing purposes. See next section.

4.4.5 Some Comments on Costs

The decision on when to close down a connection is based on Dial up cost, Connect cost/minute and traffic load.

Dial up cost - the cost of establishing a logical connection

Connect cost/minute - the cost of keeping a logical connection per minute.

Data cost/ksegment - This parameter is not used internally in the COSMOS X.25 Option.

If the ratio between Dial-up cost and the Connect cost is high, the X.25 system will increase the time interval and the number of expensive Dial-up calls will be reduced.

If this ratio is low, long connections without traffic are allowed. This will reduce time overhead beacuse of connection request exchanges.

If the traffic load is high, a longer timespan without traffic is allowed before a disconnect.

4.5 Checking a Remote Connection

Provided the different commands above have been executed successfully, the complete COSMOS X.25 Option is operational. This means that you can start using all the different application programs/subsystems included in - or supporting the COSMOS Basic Module, provided that the remote system is an ND system.

But, before you start using any of these subsystems, you should check whether the connection you want is OK, with the XMSG command:

X-C: LIST-ROUTING-INFO,,,,, ↵

When this command checks a connection through a WAN, there may be a considerable time delay.

```
Example:

   X-C:LIST-ROUTING-INFO ↵
   From system? ↵
   To system? TEOBALD ↵
        To      Route
      10667   T: *->WAN->10699
              L: *->WAN->10699
              A: *->10699
   Abbreviations:
   *: - here
   L: - path according to local tables
   P: - path according to tables
   A: - actual path
   WAN- using Wide Area Network (PDN)

   X-C:_
```

If a negative response is returned, ie., NO ACCESS TO REMOTE SYSTEM, you are advised to check whether the remote system has defined you as a 'remote system'. This has to be done locally at the other system.

To verify that a connection is OK, you may also use any of the COSMOS subsystems, such as the File Transfer subsystem or the CONNECT-TO program. But this requires, of course, that the remote system is an ND computer.

4.6 Redefining a Remote Connection

The easiest procedure to redefine or change your network configuration is to update the X.25 start-up mode file, which is explained in the next chapter.

However, it is possible to use the commands described earlier in this chapter to define a new remote system while the COSMOS X.25 Option is running. The procedure for this is the same as in the examples given earlier.

If you update the routing information while X.25 is running, make sure that you also update the mode files described in the next chapter if you want the routing information to be 'permanent'.

5 X.25 Procedures after SINTRAN Cold and Warm Starts

5.1 Synopsis

This chapter gives an outline of how to create load and start-up mode files, which should be used to restart the COSMOS X.25 Option after a cold or warm start.

5.2 The X.25 START MODE file

It is recommended that you modify the start-up mode file for your COSMOS X.25 Option. The file exists on one of the X.25 system floppies and should be copied to user X25 Network, as described in the Program Description (PD) sheet.

Example:

```
@cc
@cc     Startup file for COSMOS X.25 Option
@cc
@cc
@(X25-NETWORK)X25-COMMAND
START-MODULE,,,,
OPEN-MODULE,,,,,
EXIT
@(UTILITY)XMSG-COMMAND
help hh
help hh Before you can start X.25 Network Server you HAVE TO
help hh define your own system with the name  *X25GATE, as
help hh in the example below.
help hh
help hh DEFINE-REMOTE-NAME,,*X25GATE,<your own system number>
help hh
help hh
DEFINE-REMOTE-NAME,,*X25GATE,10060
START-NETWORK-SERVER X25NS,,,,,,
help hh
help hh
help hh It is recommended that you put in your own version
help hh of the command DEFINE-NETWORK-CONNECTION, otherwise
help hh you have todo this every time the X25 Network Server
help hh is started and one time for every connection you have.
help hh (This is similar to the commands DEF-REMOTE and
help hh DEF-SYS in XMSG-START:MODE)
help hh
help hh Example:
help hh DEF-NETW-CONNECT ODIN,X25NS,,26245612140212,10,1,1
help hh
DEF-NETWORK-CONNECTION ODIN,X25NS,,26245612141232,10,1,1
DEF-NETWORK-CONNECTION TORE,X25NS,,234565456440,10,1,1
DEF-NETWORK-CONNECTION ND-5003,X25NS,,208123121231,10,1,1
EXIT
```

The X25-SYS-START:MODE should be started from the SINTRAN III LOAD-MODE file. This is explained in the next section.

5.3 How to Start the X.25 System from the SINTRAN LOAD-MODE file

In the SINTRAN LOAD-MODE file, which is executed after a warmstart, you should start the mode file after XMSG has been started.

Be sure to follow the procedures given on the Program Description sheet as well.

The lines where X.25 mode files are started are underlined. Below is an example of how this may be done:

Example:

```
@ENTER SYS,xxxxxx,yyyyy,1
@SET-UNAVAILABLE $SYSTEM ON ND Sat.999 IS LOADING!$$
@MODE (UTILITY)XMSG-START:MODE,,,
@MODE (X25-NETWORK)X25-SYS-START:MODE,,,,,
@START-TADADM
@BATCH
@SET-AVAILABLE
@MAIL
@RUN-MAIL
@DIRECT-BROADCAST
 ***      ND Sat.999 IS UP AND RUNNING    $$

@EX
```

5.4 How to Load the X.25 System from SINTRAN HENT-MODE file

The example below illustrates how, and where in, a SINTRAN HENT-MODE file (performed after a cold start) you should load the COSMOS X.25 Option. The lines where X.25 mode files are started are underlined.

Example:

```
@SET-UNAVAILABLE $SYSTEMET ER UNDER OPPSTART!$
@SINTRAN-SERVICE
@DEFINE-SEGMENT-FILE Y Y 0 SEGFIL0:DATA
@EXIT
@RT-LOADER
Y
EX
@SET-ERROR-DEVICE 1
@INITITIALIZE-BACKGROUND-PROGRAMS
@RTENTER
@INITIAL-COMMAND ENTER-DIRECTORY PACK-ONE D-21-1
@NEXT-INITIAL-COMMAND SET-ERR-D 1
@NEXT-INITIAL-COMMAND DELETE-FILE SYSTEM-OUTPUT-1:SYMB
@NEXT-INITIAL-COMMAND CREATE-FILE SYSTEM-OUTPUT-1:SYMB,0
@NEXT-INITIAL-COMMAND BATCH
@NEXT-INITIAL-COMMAND APP-B 1 (SYS)LOAD-MODE SYS-OUTPUT-1
@RT-LOADER
Y
READ-BINARY DMAC 7
YES
END
EXIT
@CC   LOAD THE TADS
@RT-LOADER
READ-BINARY COS-TADADM  16
YES
EXIT
@SET-AVAVAILABLE
@BATCH
@MAIL
@RUN-MAIL
@EXIT
@MODE (UTILITY)XMSG-LOAD:MODE SYS-OUT-1
@MODE (X25-NETWORK)X25-SYS-LOAD:MODE SYS-OUT-1
@MODE (X25-NETWORK)X25-TEST-LOAD:MODE SYS-OUT-1
@MODE (X25-NETWORK)X25-PROFILE:MODE SYS-OUT-1
@APPEND-BATCH 1 DUMP-REENTRANT SYS-OUT-1
@APPEND-BATCH 1 LOAD-MODE SYS-OUT-1
```

6 The COSMOS X.25 Option Logging Facilities

6.1 Synopsis

In this chapter a short description of the logging facility of COSMOS X.25 Option is included. Illustrative examples are given together with som precautions to take.

6.2 The Logging Facility

The X.25 packet and link level are equipped with a logging option to assist in system debugging by noting details of packets and frames transmitted. The log is controlled by commands to the X.25-COMMAND program, in the format:

```
X25-C:CHANGE-LOG-STATUS <module no.>,
                        <P/L>,              Packet or Link level
                        <OFF/ON/CLOSE>      Log state
```

As with all other commands in X25-COMMAND program, the default value of a parameter is the value listed first in the angular brackets. In other words, if you reply to the parameter <P/L> with a carriage return (↵), the log will be on the packet level.

The resulting data is logged on the file COS-X25-PL-LL:LOGD under user RT. The file may be printed by means of the program X25-PRINTLOG:PROG, after the LOG has been closed on both the packet and the link level.

All X.25 user errors automatically open the log and the error is logged. The log file must be closed manually before X25-PRINTLOG can be used.

If repetitive errors prevent the COS-X25-PL-LL:LOGD from staying closed, then the X25-C:STOP-MODULE command must be used on the appropriate modules.

6.3 The two Log File Formats

Note that there are two different types of log files being used by the COSMOS X.25 Option:

:LOGD - This is the LOGData file where the logged information is on a special format. An examples of such a file is the COS-X25-PL-LL:LOGD, where the program X25-PRINTLOG program is needed to 'translate' the coded information.

:LOGS - This logtype, LOGSymbolic, is readable in any of the standard editors supported by ND. An example of such a file is COS-X25NS:LOGS, the logfile used by the X.25 Network Server.

6.4 The X25-PRINTLOG Program

6.4.1 The X25-PRINTLOG Parameters

Output on TERM/<filename>- Default value is terminal.

Print format <C>/<D> - In the converted format <C>, which is default, each logged record is analysed as to type etc. The octal format <D> might prove useful only if some records cannot be interpreted correctly.

Complete file <y>/<n> - If answering <N>, the part of the file to be analysed can be specified between two times, or as the final log records.
Within the given area of the file, the user specifies which protocols, links and datatypes are to be printed (see below).

Protocol <X25PL>/<X25LL> - Link level <X25PL> only or <X25LL> may be specified.

Module (link) No. - Only records with this link number will be printed.

Comm. mode <DTE>/<DCE> - The <DCE> mode only applies when one end simulates a DCE.

<Symm.>/<Adapt.> - These additional parameters to the Comm. mode parameter above apply only to link level logging.

Datatypes

IN-LO	- input from lower layer
OUT-LO	- output to lower layer
IN-HI	- input from higher layer
OUT-HI	- output to higher layer
INTERN	- internal messages for the module
IN-SUP	- input from the supervisor
OUT-SUP	- output from the supervisor
ERR	- errors detected by the module
INT-LOG	- internal log, normally dumped with ERR
SPEC	- module dependent data types
LO	- LO = IN-LO + OUT-LO
HI	- HI = IN-HI + OUT-HI
SUP	- SUP = IN-SUP + OUT-SUP
IN	- IN = IN-LO + IN-HI + IN-SUP
OUT	- OUT = OUT-LO + OUT-HI + OUT-SUP
MSG	- MSG = IN + HI + INTERN (This is the default value)
ALL	- all data types
FIN	- finish specifications of data types

Several responses may be given in sequence. The sequence is terminated by FIN - unless ALL is specified.

Examples of log outputs is not included in this manual. In case of trouble, take contact with your local ND service representative.

6.5 The X25NS Log facility

6.5.1 How to Switch the X25NS Log on

To turn the X25NS log on you have to 'patch' the segment where the X25NS was loaded.

This is done as follows:

To find the segment number and the right adress, you must use the RT-LOADER.

The location we must patch is called LGPRF. The initial value of this location after loading is 0.

- To switch the reduced log on, patch the value -1 into the location.
- To switch the full log on, patch the value 177737B into the location.
- To switch the log off, patch the value 0 into the location.

We recommend that you only use the reduced log facility, because this log type, gives you the essential information. The full log will normally 'drown' the interesting information.

6.5.1.1 Example of patching the X25NS segment

```
Example:

  @RT-LOADER ↵

  REAL TIME LOADER,          SINTRAN III - H

  *WHAT-IS ↵
  SYMBOL NAME: LGPRF ↵

     LBPRF  5753   156       DEFINED SYMBOL

  *EXIT ↵

  @LOOK-AT ↵
  MEMORY,ALT-MEM.,SEGM.,IMAGE,RES.,RTCOM.,REGIST.: SEGM ↵
  NUMBER: 156 ↵
  READY:
  5753/      0  -1 ↵
             0  +
  -END

  @_
```

The result of the X25NS logging can be examined using any of the ND editors. The file name is (RT)COS-X25NS:LOGS.

7 The X.25 Test System

7.1 Synopsis

This chapter describes the two test systems included in COSMOS X.25 Option. The two, the Packet Level Test System and the Link Level Test System, are explained separately.

Examples of output from the different test facilities is not included in this manual. Listing-files (examples) of the different test functions is included, on the COMSOS X.25 Option system floppies.

7.2 The X.25 Packet Level Test System

To perform a packet level test it is necessary to use two different terminals. It is advantageous if they are situated in the same room.

For ease of reference, we call the terminals A and B.

On the next page an illustration of a loopback situation is sketched.

The sketch below illustrates what takes place. We assume that terminal A sends some data to terminal B.

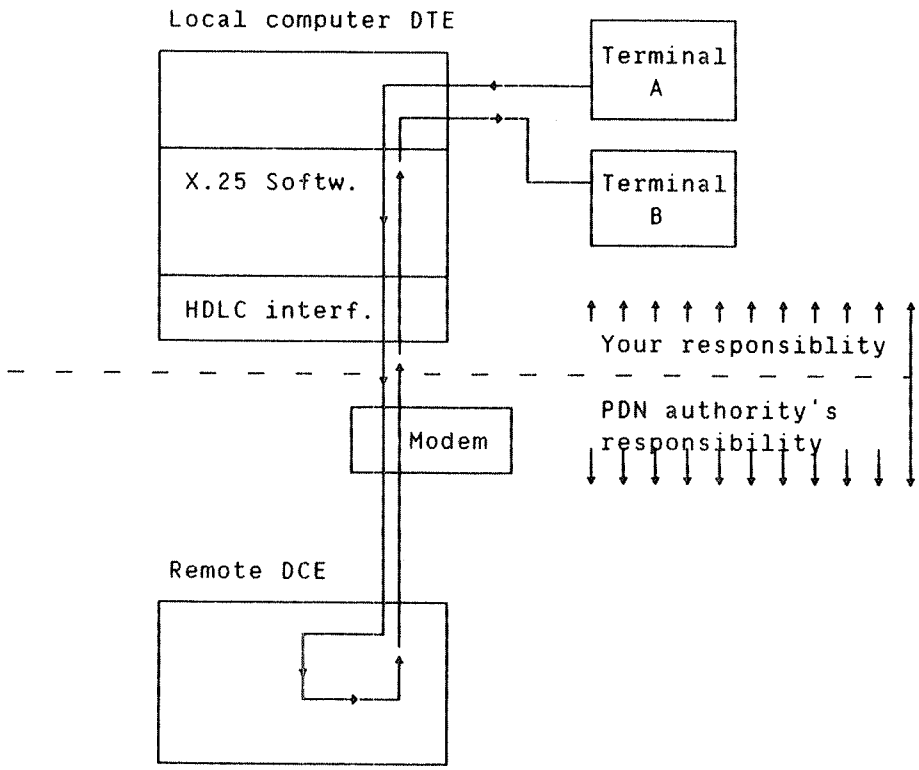


Figure 5. A sketch of a packet level test with loopback at DCE.

As you can see in the sketch above, the principle of loopback testing is very simple.

The information sent from terminal A is sent back to terminal B via the X.25 network.

Included in the description below is also a description of how to make use of the log facilty of the COSMOS X.25 Option.

7.3 How to Perform a Packet Level Test

As explained above, there are different ways of testing an X.25 network system. In this chapter we will only look upon the packet level test system, because this is the first test system to use if anything goes wrong.

The packet level test system will tell you whether something is wrong with your part of the network, the DTE side, or if something is wrong with the DCE part.

To be able to perform a packet level test, you must stop the X.25 network server (X25NS). This is of course only neccessary if it has been started and is done from the XMSG-COMMAND program and is explained in an earlier chapter.

The next step is to switch the log ON, which is done as described below:

```
X25-C:CHANGE-LOG-STATUS ↵
Module number (0): ↵
Log type (ON/OFF/CLOSE) : ↵
From x.25 module no. 0. CHANGE-LOG-STATUS on (Pack.Lev.) ok.

X25-C:EXIT ↵
Dialogue terminated.
@_
```

Default input parameter on the parameter Log type is the first one listed inside the paranthesis, ie., ON. Carriage return (↵) is in other words sufficient.

When you want to switch the log OFF, or CLOSE it, you have to specify the parameter.

On the COSMOS X.25 Option system floppies, an example of a packet level test is included. The file name is:

X25-PTEST-EX:LIST

7.4 How to Perform a Link Level Test

An example of link level test is included as file on the COSMOS X.25 Option floppies. The file name is:

X25-LTEST-EX:LIST

Read this file into any of the ND editors and have a look at it.

A P P E N D I X A

The X.25-COMMAND Program

1 Abstracts

This appendix provides reference documentation for all the supervisory commands necessary to start, operate and maintain the underlying X.25 network system.

All the different commands of the X25-COMMAND programs are listed alphabetically in the first section.

The two following appendices contains reference documentation about the XMSG-COMMAND program and the X25-PRINTLOG program.

If the reader has no previous knowledge of network supervision, s/he is advised to read through at least the three first chapters of this manual befor s/he starts using this appendix directly.

2 X25-COMMAND Program Overview

Here are the different X25-COMMAND programs listed alphabetically.

```
CHANGE-LOG-STATUS
CHANGE-PROFILE
CLOSE-MODULE
EXIT
HELP
LIST-MODULE
LIST-PROFILE
MODULE-STATUS
OPEN-MODULE
RESTART-MODULE
START-MODULE
STOP-COMMUNICATION
STOP-MODULE
```

3 How to start the X25-COMMAND program

The X25-COMMAND program is activated as a normal program by typing its name. Remember that the name is X25-COMMAND and **not** X.25-COMMAND. SINTRAN III does not accept "." (decimal point, full stop) in a file name.

If everything is OK, the X25-COMMAND will respond by displaying a heading, then try to initialize and connect with its RT program (X25SUPV) and then display the prompt X25-C:

```
@(X25-NET)X25-COMMAND ↵

ND X.25 command program  -  ND 10573
Version A of 83.10.01  -  Revision 0

Trying to connect to the supervisor.
X25-C:_
```

If it is impossible for the X25-COMMAND program to connect to X25SUPV, an error message will be returned after a few seconds delay.

On the other hand, if the X25-COMMAND program has been run successfully before, the message 'Trying to connect to the supervisor.' may be displayed.

Further, you should note that only one can use the X25-COMMAND program at a time.

In the following sections we will give a detailed description of each command and their use together with illustrative examples.

The <module no.> is the subsystem consisting of the packet level and link level RT programs for the control of one physical line.

The default value of the <module no.> parameter is 0 the first time it is used after a X25-COMMAND activation. If a different <module no.> is used, this will be the default <module no.> for the rest of the session.

This conforms to the standard configuration of the COSMOS network server, and is subsequently a standard within the COSMOS X.25 Option.

The command program accepts both upper and lower case letters. In this manual however, all user input is in upper case letters and is underlined.

Further, all parameters may be given on one line, but in this manual they will be given as a response to the parameter prompts.

Remember that all commands and parameters must be followed by Carriage Return (CR).

3.1 CHANGE-LOG-STATUS

Input parameter.....: <level>

Default input parameter..: PL

Output parameter / Action: Activates a log on specified level(s).

```
Example:

   X25-C:CHANGE-LOG-STATUS ↵
   Module number (0): ↵
   Level (P/L): ↵
   Log type (ON/OFF/CLOSE) : ↵
   From X.25 module number 0. CHANGE-LOG-STATUS on (Pack.Lev.) ok.

   X25-C:_
```

In the example above only default parameters were given. But in this command this does not mean that no changes have been made.

The default input parameter is the first parameter listed in the parentheses, which in our example mean that a log on packet level was switched on.

See also the chapter about logging.

3.2 CHANGE-PROFILE

Input parameter.....: <module no.>

Default input parameter..: 0

Output parameter / Action: Changes the characteristics of a module.

The X25-COMMAND will simulate a LIST-PROFILE and the message 'Fetching the profile' is written on the terminal. The existing profile is then listed on the terminal in double quotes ("), while changing the profile. The existing profile is the default one.

Then the profile is sent to the PL which will update the profile residing on the PL segment on the disk.

Hence the profile is saved even if the X.25 system should crash afterwards.

On the next page an example is included. Hovewer, in appendix D, a thorough explanation of the CHANGE-PROFILE command is included, together with an explanation of the profile concept.

```
Example:

X25-C:CHANGE-PROFILE ↵
Module number (0): ↵
Fetching the profile
Specify parameters for the packet level:
  Network type (NDstd/PSS/Datex-P/Transpac): "NDstd" ↵
  DTE number : "" nnn ↵
  Specify channel ranges, in form LOW/HIGH
  PVC       (default 0,0 implies none) : "0,0" ↵
  VC one-way incoming (       "      ) : "0,0" ↵
  VC two-way          (       "      ) : "1,32" ↵
  VC one-way outgoing (       "      ) : "0,0" ↵
User data packet size in octets (16-1024) : "128" ↵
Window size (1-7) : "2" ↵
Specify timeout values in seconds and max retries as follows:
  Timeout for RESTART packets : "180" ↵
  Max retries : "5" ↵
  Timeout for CALL REQUEST packets : "200" ↵
  Max retries : "0" ↵
  Timeout for RESET REQUEST packets : "180" ↵
  Max retries : "5" ↵
  Timeout for CLEAR REQUEST packets : "180" ↵
  Max retries : "5" ↵
  Timeout for DTE INTERUPT packets : "180" ↵
  Max retries : "5" ↵
Specify parameters for the link level:
  Balanced or Unbalanced link access procedure (B/U) : "B" ↵
  Window size (1-7) : "7" ↵
  Timeout (sec.) : "2" ↵
  Retries        : "5" ↵
  Logical unit (as HDLC"x") : HDLC"1" ↵
Specify operation:
  Operational mode
    (Normal/packet level loopback/Link level Loopback) : "N" ↵
  Communication mode (DTE/DCE/adaptive/symmetric) : "DTE" ↵
  Link level connection type (permanent/non-permanent) : "P" ↵

From X.25 module number 0. CHANGE-PROFILE ok.

X25-C:_
```

For detailed description, see appendix B.

3.3 CLOSE-MODULE

Input parameter.....: <module no.>

Default input parameter..: 0

Output parameter / Action: Closes the specified module (line).

This command sends a RESTART REQUEST to the remote PL, and waits for the RESTART CONFIRMATION. Then it disconnects the LL.

Example:

```
X25-C:CLOSE-MODULE ↵
Module number (0): ↵

From X.25 module number 0. CLOSE-MODULE ok.

X25-C:_
```

3.4 EXIT

Input parameter.....: none

Default input parameter..: none

Output parameter / Action: Terminates the X25-COMMAND program.

Example:

```
X25-C:EXIT ↵
Dialogue terminated.
@_
```

The EXIT command only terminates the X25-COMMAND program, not the complete X.25 system. To shut the system completely down, see the command STOP-COMMUNICATION.

3.5 HELP

Input parameter.....: none

Default input parameter..: none

Output parameter / Action: Lists all commands in the X25-COMMAND program.

Example:

```
X25-C:HELP ↵

START-MODULE
STOP-MODULE
OPEN-MODULE
CLOSE-MODULE
RESTART-MODULE
CHANGE-LOG-STATUS
MODULE-STATUS
CHANGE-PROFILE
LIST-PROFILE
LIST-MODULE
STOP-COMMUNICATION
HELP
EXIT

X25-C:_
```

3.6 LIST-MODULE

Input parameter.....: none

Default input parameter..: none

Output parameter / Action: Lists current configuration.

Example:

```
X25-C:LIST-MODULE ↵

Configuration:
X.25 Module number 0. State : Active
X.25 Module number 1. State : Active

X25-C:_
```

In the example above, two modules are shown to illustrate that the command LIST-MODULE lists all modules running. But in a 'standard' configuration there is only one module.

3.7 LIST-PROFILE

Input parameter.....: <module no.>

Default input parameter..: 0

Output parameter / Action: Lists the characteristics of a module.

```
Example:

X25-C:LIST-PROFILE ↵
Module number (0): ↵

Current profile for X.25 module number 0
Packet level:
  Network type: NDstd. Local DTE number: nnnnnnn
  Max. simultaneously active channels: 50
  Channel range (low,high):
    PVC: 0,0. Oneway incoming:0,0. Twoway:1,32. Oneway outg: 0,0
  User data packet size: 128 octets. Packet level window size: 2
  Timeout data:
  Packet type          Timeout (Sec.)     Retries
  RESTART REQUEST         180                5
  CALL REQUEST            200                0
  RESET REQUEST           180                5
  CLEAR REQUEST           180                5
  INTERUPT REQUEST        180                5
Link level:
  Link access procedure: LAP-B. Window size: 7
  Timeout: 2 (sec.). Retries: 5
  Logical unit: HDLC1 (1360B)
Operation:
  Operational mode: Normal
  Communicating in DTE address mode.
  The link level connection is permanent, ie., connected
    when the packet level is active.

X25-C:_
```

3.8 MODULE-STATUS

Input parameter.....: <module no.>

Default input parameter..: 0

Output parameter / Action: Lists the current status of the module.

The PL will return a STATUS response together with what it sees of the LL status.

Example:

```
X25-C:MODULE-STATUS ↵
Module number (0): ↵

Packet level status:
  State: Active
  Restart state: No RESTART in progress
  Channels in use (incl. PVC): 0. Path conditions in use: 0
  Log state: Log file closed
Link level status:
  State: Connected
  Log state: Log file closed
Buffer pool:
  Buffer size: 148 (octets)
  Free buffers: 128

X25-C:_
```

On the next page there is an explanation of the output from the MODULE-STATUS command:

Packet level status

State

Start in progress

Not active
is the state after a START-MODULE command or after a CLOSE-MODULE command.

Open in progress

Active
is the state after a successful OPEN-MODULE command.

'Active, but the link level is (temporarily?) broken'
is used when a disconnect is received from the remote part. The local part is trying to establish the link again. It will not give up before a CLOSE-MODULE is sent to the PL.

Network congestion
is the state when the network has sent a restart indicating that it is congested and temporarily out of use.

CLOSE in progress

RESTART in progress

STOP in progress

Restart state

Possible values:

- No RESTART in progress.
- RESTART request sent.
- RESTART indication received. No confirmation sent.
- RESTART requested, but the request is not yet sent.

Channels in use

This figure reflects the number of channel datafields used. This is the sum of PVC's used, VC's used and pending start-listens.

Path conditions in use

The sum of pending path-opens and start-listens.

Log state

This is the log state of the packet level. Possible states are:

- On
- Off
- Closed
- Log locked, ie., turned off due to logging error.

If a logging error occurs, the log is locked, ie., it is impossible to turn it on even if internal errors are detected. The reason is to prevent the SINTRAN III error device from being jammed by printing logging errors.

Link level status

State

Possible values:

- Not initialized
- Initialized (Disconnected)
- Connect in progress
- Connected
- Disconnect in progress

The state is 'Not initialized' before an INIT to the LL. It is 'Initialized' after a successful INIT. The response is 'Connected' after a successful CONNECT.

Log state

This is the log state of the link level. The possible states are as for the packet level.

Buffer pool status

This is the buffer pool used by both the packet level and the link level.

Buffer size

This figure indicates the maximum size of a frame.
It is possible to change this by patching before the X.25 system is activated. The default size is 148.

Free buffers

This figure indicates the number of free buffers in the buffer pool. If the buffer size is the default size (148), the initial number of free buffers is 128.

3.9 OPEN-MODULE

Input parameter.....: <module no.>

Default input parameter..: 0

Output parameter / Action: Opens specified module (line).

This command connects the local and the remote Link Levels and sends a RESTART REQUEST to the remote Packet Level. The system will then wait for a RESTART CONFIRMATION.

If successful the system responds with OK.

If not successful, you may get the following warnings:

1) No response from remote LL.
   The local PL will then send 'connects' to the local LL until successful or until the CLOSE-MODULE command is given.

2) No response from remote PL.
   The communication link is running, ie., local and remote LL is running, but the remote PL does not respond. The PL will use the timeout strategy defined in the CHANGE-PROFILE command. If timeout occurs, the PL will execute a CLOSE-MODULE.

Example:

```
X25-C:OPEN-MODULE ↵
Module number (0): ↵

From X.25 module number 0. OPEN-MODULE ok.

X25-C:_
```

3.10 RESTART-MODULE

Input parameter.....: <module no.>

Default input parameter..: 0

Output parameter / Action: Sends a RESTART REQUEST.

When the RESTART REQUEST is sent, wait for RESTART CONFIRMATION. Returns a restart message.

Example:

```
X25-C:RESTART-MODULE ↵
Module number (0): ↵

From X.25 module number 0. RESTART-MODULE ok.

X25-C:_
```

3.11 START-MODULE

Input parameter.....: <module no.>

Default input parameter..: 0

Output parameter / Action: Starts specified module (line).

The RT part of the X25-COMMAND program, the X25SUPV, starts the packet level (PL). The PL will again activate the LL. The HDLC driver is initialized, and a START message is returned.

NB! If START is done after the first activation nothing will happen, ie., no message is returned. This is because the X25SUPV activates the PL RT program and the START message is returned in the startup sequence of the PL.

Example:

```
X25-C:START-MODULE ↵
Module number (0): ↵

From X.25 module number 0. START-MODULE ok.

X25-C:_
```

3.12 STOP-COMMUNICATION

Input parameter.....: none

Default input parameter..: none

Output parameter / Action: Stops the complete X.25 system.

Controlled shutdown of the complete X.25 system, ie., the command will send STOP only, or CLOSE and STOP, depending on the state, for all modules (lines) in use (normally only one).

When the modules are stopped, X25STOP is activated. X25STOP 'destroys' the buffer pool (ie., makes it impossible to use), stops the timer (X25TM), and closes the log-file (if open).

Example:

```
X25-C:STOP-COMMUNICATION ↵

From X.25 module number 0. Close module ok.
From X.25 module number 0. Stop module ok.
Dialogue terminated.

@_
```

As you can see, the command STOP-COMMUNICATION executes both a CLOSE and a STOP command. Finally the control is returned to SINTRAN III.

3.13 STOP-MODULE

Input parameter.....: <module no.>

Default input parameter..: 0

Output parameter / Action: Stops specified module (line).

This command disconnects the LL (if connected) and aborts the LL. Further it sends a STOP OK to X25SUPV and RTEXIT of the PL. If the log of PL/LL is open, this command will close it.

Example:

```
X25-C:STOP-MODULE ↵
Module number (0): ↵

From X.25 module number 0. STOP-MODULE ok.

X25-C:_
```

To shut the system completely down, see the command STOP-COMMUNICATION.

A P P E N D I X B

The X.25 Related XMSG Commands

1 Abstracts

This appendix provides reference documentation for all the supervisory commands necessary to start, operate and maintain the X.25 network server.

All the X.25 related commands of the XMSG-COMMAND program are listed alphabetically in this appendix.

The previous and the following appendices contain reference documentation about the X25-COMMAND program and the X25-PRINTLOG program.

If the reader has no previous knowledge of network supervision, s/he is advised to read through at least the four first chapters of this manual befor s/he starts using this appendix directly.

2 XMSG-COMMAND Program

This section lists the different XMSG commands necessary to start, operate and run the X.25 network server, and other useful XMSG commands not directly connected to X.25.

2.1 How to start XMSG-COMMAND Program

Normally, the XMSG-COMMAND Program lies under user UTILITY, but it might be copied into user SYSTEM's area. To start the program, just type:

@(UTILITY)XMSG-COMMAND ↵ or only @XMSG-COMMAND ↵

You have to be logged on as user system to use the commands of the XMSG-COMMAND program to manipulate with the X25NS.

3 DEFINE-NETWORK-CONNECTION

Input parameter.....: <Remote system>,<Server name>,
<Server system>,<Remote DTE address>,
<Dial-up cost>,<Connect cost/minute>,
<Data cost/ksegment>

Default input parameter..: See below

Output parameter / Action: Defines the name and connection parameters of a remote system included in a WAN.

Note: The parameter <Data cost/ksegment> should always be set to 1.

Example:

```
X-C:DEFINE-NETWORK-CONNECTION ↵
Remote system? ND-BOSTON ↵
Server name? X25NS ↵
Server system ? ↵
Remote DTE adress? 34554368259874 ↵
Dial-up cost? 10 ↵
Connect cost/minute? 70 ↵
Data cost/ksegment? 1 ↵
OK

X-C:_
```

4 DEFINE-REMOTE-NAME

Input parameter.....: <XROUT system>,<Port or system name>,
<Remote system or Port no>

Default input parameter..:
Output parameter / Action: Defines the name of a remote system on specified XROUT system.

Example:

```
X-C:DEFINE-REMOTE-NAME ↵
XROUT system? ↵
Port or system name: ND-BOSTON ↵
Remote system or Port no? 5467 ↵
OK

X-C:_
```

5 X-C:LIST-LINKS

Input parameter.....: <Record adress>

Default input parameter..: all links

Output parameter / Action: Lists status of a link.

This command is used to list the current status of all links being used by XMSG (i.e. those that have been started by the START-LINK or START-NETWORK-SERVER commands.

The information listed for each link is:

No	- link index in XMSG
Addr.	- of link block (XL-block)
State	- of connection to adjacent system. Values are: DEAD - crashed (fatal timeout or hardware error) INIT - being initialised (purely internal) CALL - trying to make contact with neighbour CONN - contact made. RUN - data phase.
Sysid	- of neighbour (CONN and RUN states only!)
Rcv	- last HDLC A/C bytes received
Xmit	- last HDLC A/C bytes transmitted
Lun	- SINTRAN Logical Unit No (Octal)
Timeout	- Timeout value in XTU's and counter value
Soft-stat	- HDLC software status (should be zero)
-hard	- HDLC Hardware status (should be zero)
TXData	- Number of DATA frames transmitted since last startlink
Retry	- Number of retransmits
RXBad	- Number of bad frames received (CRC error, etc.)

Example:

```
X-C:LIST-LINKS ↵
*- WARNING: You can now bypass system protection mechanism -*
POF table area initialized. POF start address: 156000
Local buffers for tables: 67125 to 71400
Record adress? ↵

Link table status: 2 entries. 2 in use. Max 2 used.

No Addr. State Sysid Rcv Xmit  Lun Timeout  Soft-stat-hard....
1 171351  Run  9800  0   0    1360  10/OFF       0    0   ....

X-C:_
```

6 LIST-NAMES

Input parameter.....: <XROUT system>

Default input parameter..: local system

Output parameter / Action: Lists XROUT's name table

This command asks an XROUT to dump out its name table, listing the system, port number and number of free service points for each name in XROUT's tables.

In a inter-system configuration, the command allows access to any XROUT, so the first prompt asks for the system number where the XROUT program is to be found. (Default is local.)

Example:

```
X-C:LIST-NAMES ↵
XROUT system? ↵
System   Port  Free SPs   Name
5777     0                ND-5777
5777     0                MARILYN
10666    0                ND-10666
10666    0                JAMES-DEAN
.....
...etc...
.....
X-C:_
```

7 LIST-ROUTING-INFO

Input parameter.....: <Record adress>

Default input parameter..: 'all links'

Output parameter / Action: Lists status of a link.

This command will list the route followed by data sent from the system specified in the first parameter (default: local) to the system specified by the second parameter (default: all systems known by system defined in parameter 1).

The command lists two paths for each route. The first is preceded by "T:" and lists the route as defined by the routing tables in each system, whereas the second (introduced by "A:") list the route actually followed. This command leads to messages being sent to all the XROUTs listed and therefore is a simple way of checking the network status.

Example:

```
X-C:LIST-ROUTING ↵
From system? TEOBALD ↵
To system? ND-10699 ↵
     To      Route
   10699   T: *->WAN->10699
           L: *->WAN->10699
           A: *->10699
Abbreviations:
*: - here
L: - path according to local tables
P: - path according to tables
A: - actual path
WAN- using Wide Area Network (PDN)

X-C:_
```

8 START-NETWORK-SERVER

Input parameter.....: <Server name>,<Server system>
<Window size>,
<Wide Area Network (Y/N)>

Default input parameter..: See below

Output parameter / Action: Starts a network server (ie., X25NS).

Example:

```
X-C:START-NETWORK-SERVER ↵
Server name? X25NS ↵
Server system ? ↵
Server not started - will try to start it now
Window size? ↵
Wide Area Network (Y/N)? ↵

X-C:_
```

A P P E N D I X C

The X25-PRINTLOG Program

1 X25-PRINTLOG Program

This section of this appendix list the parameters of the X25-PRINTLOG program.

It is assumed that the reader knows how to start a log from the X25-COMMAND program.

The X25-PRINTLOG program is started as a normal :PROG file program. You are advised to put the X25-PRINTLOG program under user SYSTEM, for ease of use.

The X25-PRINTLOG program prompt driven, which means that the program will ask for all the neccessary parameters.

1.1 X25-PRINTLOG Parameters

Output on TERM/<filename>- Default value is terminal.

Print format <C>/<D> - In the converted format <C>, which is default, each logged record is analysed as to type etc. The octal format <D> might prove useful only if some records cannot be interpreted correctly.

Complete file <y>/<n> - If answering <N>, the part of the file to be analysed can be specified between two times, or as the final log records.
Within the given area of the file, the user specifies which protocols, links and datatypes are to be printed (see below).

Protocol <X25PL>/<X25LL> - Link level <X25PL> only or <X25LL> may be specified.

Module (link) No. - Only records with this link number will be printed.

Comm. mode <DTE>/<DCE> - The <DCE> mode only applies when one end simulates a DCE.

<Symm.>/<Adapt.> - These additional parameters to the Comm. mode parameter above apply only to link level logging.

Datatypes

IN-LO	- input from lower layer
OUT-LO	- output to lower layer
IN-HI	- input from higher layer
OUT-HI	- output to higher layer
INTERN	- internal messages for the module
IN-SUP	- input from the supervisor
OUT-SUP	- output from the supervisor
ERR	- errors detected by the module
INT-LOG	- internal log, normally dumped with ERR
SPEC	- module dependent data types
LO	- LO = IN-LO + OUT-LO
HI	- HI = IN-HI + OUT-HI
SUP	- SUP = IN-SUP + OUT-SUP
IN	- IN = IN-LO + IN-HI + IN-SUP
OUT	- OUT = OUT-LO + OUT-HI + OUT-SUP
MSG	- MSG = IN + HI + INTERN (This is the default value)
ALL	- all data types
FIN	- finish specifications of data types

Several responses may be given in sequence. The sequence is terminated by FIN - unless ALL is specified.

Examples of log outputs will not be included in this manual. In case of troubles, take contact with your local ND service representative.

A P P E N D I X D

The CHANGE-PROFILE parameters

1 Abstracts

This appendix takes a closer look at the purpose of the profile of the X.25 network system.

The main part of the appendix explains the different parameters of the CHANGE-PROFILE command in the X25-COMMAND program.

It is assumed that the reader has read the main part of the three first chapters.

2 Short Introduction to the X.25 Profile

The profile of the X.25 system has initial values, which are generation time defaults. They may of course change, and some of the parameters **must** be updated.

But before we show how to change the profile, try the command LIST-PROFILE which is explained in chapter 3.

Almost every installation would have to tailor the X.25 network system to its needs, as the specific environment varies.

Hence the CHANGE-PROFILE command must be used at the first activation after the loading of the system. This applies also to reloading.

One change has to be done. The default value of the DTE number is displayed as "", which means that it is 'empty'.

The default (or the existing) profile parameters is displayed to the right of the colon, enclosed in double quotes.

3 The CHANGE-PROFILE Command

```
Example:

 X25-C:CHANGE-PROFILE ↵
 Module number (0): ↵
 Fetching the profile
 Specify parameters for the packet level:
   Network type (NDstd/PSS/Datex-P/Transpac): "NDstd" ↵
   DTE number : "" nnn ↵
   Specify channel ranges, in form LOW/HIGH
   PVC       (default 0,0 implies none) : "0,0" ↵
   VC one-way incoming (       "       ) : "0,0" ↵
   VC two-way          (       "       ) : "1,32" ↵
   VC one-way outgoing (       "       ) : "0,0" ↵
 User data packet size in octets (16-1024) : "128" ↵
 Window size (1-7) : "2" ↵
 Specify timeout values in seconds and max retries as follows:
   Timeout for RESTART packets : "180" ↵
   Max retries : "5" ↵
   Timeout for CALL REQUEST packets : "200" ↵
   Max retries : "0" ↵
   Timeout for RESET REQUEST packets : "180" ↵
   Max retries : "5" ↵
   Timeout for CLEAR REQUEST packets : "180" ↵
   Max retries : "5" ↵
   Timeout for DTE INTERUPT packets : "180" ↵
   Max retries : "5" ↵
 Specify parameters for the link level:
   Balanced or Unbalanced link access procedure (B/U) : "B" ↵
   Window size (1-7) : "7" ↵
   Timeout (sec.) : "2" ↵
   Retries        : "5" ↵
   Logical unit (as HDLC"x") : HDLC"1" ↵
 Specify operation:
   Operational mode
     (Normal/packet level loopback/Link level Loopback) : "N" ↵
   Communication mode (DTE/DCE/adaptive/symmetric) : "DTE" ↵
   Link level connection type (permanent/non-permanent) : "P" ↵

 From X.25 module number 0. CHANGE-PROFILE ok.
 X25-C:_
```

In this example, only the DTE number of the current profile was changed.

In the following section we will have a closer look at the different parameters of this command.

The first parameter, the module number, we assume to be 0. It may, of course, be any value between 0 and 7, which is the maximum value.

4 Packet Level Parameters

4.1 Network type

```
Network type (NDstd/PSS/Datex-P/Transpac): "NDstd" ↵
```

Even if X.25 is a standard protocol, different computer vendors and different PDNs use slightly different 'versions' of the X.25 protocol.

NDstd - which means ND standard, should be used for ND computers in point to point connections, ie., connections with no public network in between.

PSS - (Packet Switched Stream) is the X.25 network version in Great Britain.

DATEX-P - is the German X.25 network version.

TRANSPAC - is the French X.25 network version.

Other networks may be similar to one of the above mentioned. Eg., TELEPAC (Switzerland) is identical to DATEX-P.

DATAPAK, in Norway, will be similar to the PSS version.

4.2 DTE Number

```
DTE number : "" nnn ↵
```

This is the number identifying your computer in a X.25 network system.

It may have different names and acronyms, eg., NUA - Network User Address in PSS.

This is information given by the PTT, or common carrier, when connected to a public network.

The DTE (NUA) number can be empty for private point to point connections.

The maximum number of digits in the DTE number is 15. Thus the different network versions mentioned above may accept fewer digits.

4.3 Channel Ranges

```
Specify channel ranges, in form LOW/HIGH
PVC       (default 0,0 implies none) : "0,0" ↵
VC one-way incoming (       "      ) : "0,0" ↵
VC two-way          (       "      ) : "1,32" ↵
VC one-way outgoing (       "      ) : "0,0" ↵
```

The details about the channel specification can be found in the CCITT X.25 specifications. However a short description is given below.

Generally, the range is from 1 to 4095. Channel 0 is used by the RESTART PACKETS.

The channels are grouped into four main categories:

1) PVC (Permanent Virtual Circuit)

2) VC (Virtual Circuit) oneway incoming

3) VC (Virtual Circuit) twoway

4) VC (Virtual Circuit) oneway outgoing

They must be allocated in the following way:

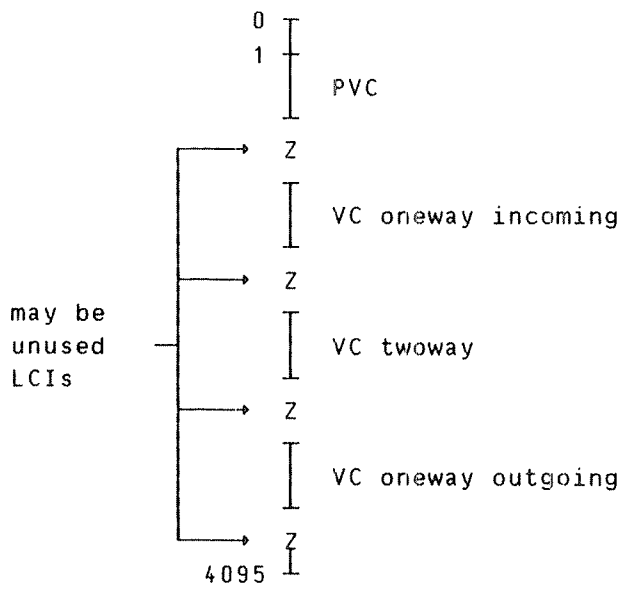


Figure 6. Allocation of LICs

Each LCI (Logical Channel Identifier) in the PVC range denotes a fixed endpoint (destination computer), ie., no connect procedures are necessary.

For the VC's a connect procedure is necessary to establish contact with the given destination (the destination DTE number is a part of the connect packet).

The DTE will start the channel allocation, ie., it establishes a new connection and transmits a connect packet, from the bottom, eg., with the highest number in the VC oneway outgoing range.

The DCE will allocate from the top of the VC oneway incoming call, eg., lowest possible number.

Both DTE and DCE can use the VC two way channels. The DTE will allocate starting at the bottom, and the DCE will allocate starting from the top of the VC twoway range.

This is done to avoid collisions. The DTE and DCE will try not to use the same LCI for two different connect packets at the same time.

Details in the channel allocation will differ from network to network. (See the specifications of the implemented X.25 software and specifications on the channel allocation supplied by the PTT).

The system is configured with a maximum number of connections at the same time. It is important to remember that 'a PVC is always connected'. Hence you cannot have more PVCs than this maximum.

4.4 User Data Packet Size

```
User data packet size in octets (16-1024) : "128" ↵
```

This parameter limits the maximum number of octets of user data that can be sent in a data packet to the X.25 network. The default is 128 octets.

The maximum size may vary, but the COSMOS X.25 Option supports sizes of up to 1024 octets.

4.5 Window Size

```
Window size (1-7) : "2" ↵
```

This parameter limits the number of data packets that can be sent without the reception of an ACK, acknowledgement, from the remote computer. The default is two for most networks.

4.6 Timout Values and Max Retries

```
Specify timeout values in seconds and max retries as follows:
  Timeout for RESTART packets : "180" ↵
  Max retries : "5" ↵
  Timeout for CALL REQUEST packets : "200" ↵
  Max retries : "0" ↵
  Timeout for RESET REQUEST packets : "180" ↵
  Max retries : "5" ↵
  Timeout for CLEAR REQUEST packets : "180" ↵
  Max retries : "5" ↵
  Timeout for DTE INTERUPT packets : "180" ↵
  Max retries : "5" ↵
Status OK. CP-signal received : 48 ↵
```

Some of the packet types request a response within a given time limit. If no answer (ACK) is received, the packet may be retransmitted (depending on the retry variable).

If the maximum number of retries is reached, a recovery action takes place. The order of action taken is as follows:

- No answer to the interrupt packets → send reset
- No answer to the reset packets → send disconnect
- No answer to the disconnect packets → declare connection out of order (ie., not used)

For the RESTART REQUEST packet the PL will simulate the X25-COMMAND program command CLOSE-MODULE.

The default time limits are taken from the 1980 version of the CCITT X.25 Specifications.

The number of retries is arbitrary. These figures may vary. Some networks do not even use the timeout mechanism.

NB! Number of retries of a connect must be zero to avoid duplicate connections.

5 Link Level Parameters

The following sections explain the different link level parameters. For a complete specification see the CCITT X.25 Specifications.

5.1 Link Access Procedure

```
Balanced or Unbalanced link access procedure (B/U) : "B" ↵
```

X.25 specifies two different LAPs, Link Access Procedures. The unbalanced called LAP (from 1976) and the balanced called LAP-B (from 1977). Normally LAP-B is the preferred one.

5.2 Window Size

```
Window size (1-7) : "7" ↵
```

This is the same type of parameter as the window size of the packet level, but this is one protocol level further down. The default size is 7.

5.3 Timeout and Retries

```
Timeout (sec.) : "2" ↵
Retries        : "5" ↵
```

For the link level all command frames are supervised. If no response is received within the given time, the frame is retransmitted.

If it is retransmitted 'retries number of times', a recovery action takes place.

The figures here are determined by the public network.

5.4 HDLC Logical Unit

```
Logical unit (as HDLC"x") : HDLC"1" ↵
```

Each X.25 module, identified by the module number, uses one HDLC logical unit each. Normally only one module is used.

The HDLC is a device which controls the physical line.

The device is accessed via the HDLC driver. The HDLC numbers and their corresponding Logical Unit Numbers (LUN) are listed below:

HDLCno	input/output	LUN
HDLC1	input part	1360
	output part	1361
HDLC2	input part	1362
	output part	1363
etc..		
HDLC5	input part	1370
	output part	1371
HDLC6	input part	700
	output part	701

5.5 Operation - Normal or Loopback

```
Specify operation:
  Operational mode
    (Normal/Packet level loopback/Link level Loopback) : "N" ↵
```

This parameter is used if a software loopback is needed for testing the system.

Possible values are:

Normal - Everything is sent out to the physical line.

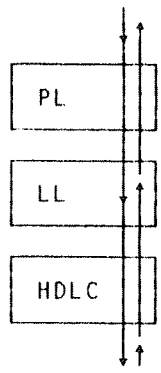


Figure 7. Normal operational mode

PL loopback - Everything sent out by the bottom part of the packet level is 'sent' to the receiver bottom part of the packet level. The link level is not used.

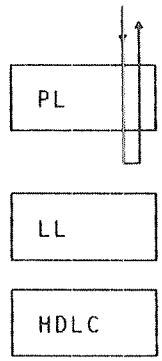


Figure 8. Packet level loopback operational mode

LL loopback - Everything sent by the driver is received by the input part of the driver, ie., the HDLC driver and parts of the hardware interface are used.

NB! If you want loopback, the packet level will automatically change the LCIs of the incoming packets. To avoid being changed to an unassigned channel, the uppermost LCI must be odd. This is done by the X25SUPV and a message is sent to the system console.

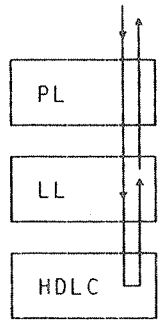


Figure 9. Link level loopback operational mode

5.6 Communication Mode

```
Communication mode (DTE/DCE/adaptive/symmetric) : "DTE" ↵
```

This setting determines the value of the address fields of the HDLC frame and where the packet level should start its allocation of LCI's.

DTE - must be used if the connection is to a public network.

DCE - can be used in point to point connection when the other computer is a DTE.

Adaptive - must be used if it is impossible to find out beforehand what the remote part is. The local part will try to adapt if the remote part initiates a connection. If the local part takes the initiative, it will first try as a DTE, then as a DCE, then as a DTE symmetric and then start all over again.

Symmetric - must be used for loopback modes. The link level commands have the same address (which is not the case otherwise).

Commands for a DTE have different addresses to a DCE. This implies that if a DTE is set in loopback mode, nothing will be received, ie., the link level will discard everything received because of illegal addresses.

5.7 Connection Type

```
Link level connection type (permanent/non-permanent) : "P" ↵
```

For the permanent type, the link level will be set up permanently between an OPEN-MODULE and a CLOSE-MODULE.

For the non-permanent type, the link level will be connected as soon as you try to send a connect, ie., as soon as a channel is in use.

When no channel is in use, the link level will be disconnected again.

For point to point connection and connection to a network, one should use the permanent type.

This parameter is applicable only in the normal operational mode.

A P P E N D I X E

X.25 Error Messages

1 Errors from the X25-COMMAND Program

Experience has shown that errors are most likely to occur during the startup of the X.25 system.

Below is a list of the most important error messages which may occur during the startup sequence.

1.1 Error Messages from the Packet Level

1) "No answer from the remote packet level"
   See chapter about how to start X.25.

2) "No answer from the remote link level"
   See chapter about how to start X.25.

3) "The link level is being used by another process"
   This situation is likely to occur if the link level test system is using the link level.
   Action: Exit the link level test system and try the X25-COMMAND command once more.

4) "Module congestion (no buffer available)"
   This situation could occur if a log change of the link level is ordered and the state of the pool is critical, ie., the number of free buffers is below a predefined level. The reason for this will normally be large activity on the network system.
   Action: Wait to the level of activity has dropped.
   If some kind of hangup is suspected, stop the network system. This situation may be due to a serious error condition either in the local or the remote machine, and your local ND service representative should be contacted.

1.2 Errors from the link level

The error returns are:

1) "Input device already reserved"

2) "Output device already reserved"

3) "SINTRAN is not configured with the specified HDLC logical unit number(s)"

4) "HDLC buffer pool (input) too small"
   See next section.

5) "HDLC buffer pool (output) too small"
This error message (and the one above) will occur if it is impossible to fit IHBUF (OHBUF) times max buffer size into the pool. The size is given to the link level from the driver. IHBUF and OHBUF indicates the minimum number of buffers in these HDLC driver buffer pools.

6) "HDLC receive list too small"
The driver can keep a queue of empty buffers. If the maximum of this queue (ie., the receiver list) is less than IHBUF error 6 would be returned.

7) "Mon HDLC error"
This error message is returned if the link level receives an error from the HDLC monitor call.
For this error message more information is provided, ie., the error type and the hardware status. The most frequent of these messages are:

- *** Fatal error. Inconsistent table ***
  plus a SINTRAN HDLC error message.
  This situation is due to the fact that no space has been provided for the HDLC buffer pool.
  Action: Provide space for the HDLC buffer pool and try again. (This is necessary for the H version (or earlier) of SINTRAN III).

8) "HDLC driver error"
For this error message more information is provided, ie., the error type and the hardware status. The most frequent of these messages are:

- Timeout (No output interrupt)
  When communication with a network (or a modem) is established, the external equipment is responsible for the bit timing determining the line speed. If the interface does not detect this bit timing, this error occurs.
  Action: Find out if the all cables are connected to the right sockets. If they seem OK, the cable or the modem may be damaged.

- Command timeout. (Hardware error?).
  If this happens together with the SINTRAN III error message FALSE INTERUPT (on the SINTRAN error device), then the switch setting of the HDLC interface is wrong, ie., it defines another device.

  If the SINTRAN error message FALSE INTERUPT is not displayed together with the X.25 error message COMMAND TIMEOUT, then the situation is most likely to be a hardware error.

2 Errors from SINTRAN III

All SINTRAN III error messages are displayed on the error device, normally the console.

If the PL/LL detects internal errors, these are printed on the SINTRAN error device. If a SINTRAN III G-version or older is used, the ERMON monitor call is used and the error numbers are printed. If the H-version, or a newer version, is used, an error message is printed.

2.1 Errors from the Link Level

1) Log on failed

2) Log off failed

3) Log close failed

4) Log data failed

5) Buffer already in queue

6) Error from MON 170 (GETF)

7) Error from MON 171 (PUTF)

8) Error from MON 172 (GETQ)

9) Error from MON 173 (PUTQ)

10) Link level inconsistency

A number is printed in parenthesis after the error message. This indicates where the error occurred. For some of the errors an additional sub-error message is printed.

For the errors 1 to 4 in the previous list, the additional sub-error messages are:

1) Emergency close of the log file

2) Log is not turned on

3) Illegal protocol/module specification

For the monitor call error messages (6-9) the error sub messages are:

- Illegal parameter value

- Packet not owned by program

- Too long chain. Disorder?

- Pool destroyed

These are all error returns from the monitor calls.

Actions taken by the LL:

If a logging error occurs, the log is turned OFF and closed to avoid an endless printing of error messages.

If a monitor call error occurs, the LL is halted, because it is then impossible to communicate with the link level.

Errors 5 & 10 will be printed if the LL detects an internal inconsistency. The LL will proceed.

Actions to be taken by the user:

For the log or monitor call error messages, the X.25 system should be restarted. If the error occurs again, try a reload of the X.25 system. If the same error occurs again, contact ND service.

Error 5 & 10 should always be reported to ND service.

When reporting such error messages as the ones described above, try to obtain a log of what has happened and give it to your ND service contact.

2.2 Errors from the Packet Level

Main errors:

1) Log error

2) X.25 PL internal error

3) Error from MON 170

4) Error from MON 171

5) Error from MON 172

6) Error from MON 173

7) XMSG error (suberror range 0-255)

8) XROUT error (suberror ≥ 256)

After the main error the error origin number is printed.

The suberror for the log error is the same as for the LL.

The suberrors for the X.25 PL internal error are:

- LCB already in timer queue
- LCB not in timer queue
- LCB not in XMSG port queue
- Illegal LCI in rtn. RSERVLCI
- Illegal LCI in rtn. RELLCI
- Illegal LCI in rtn. OUTLCILCB
- LCB not found in rtn. OUTLCILCB
- Not enough LCB's for PVC's (rtn. PVC_INIT)
- No LCB found for PVC (rtn. PVC_REL)
- No buffer available (rtn. INITLL)
- No buffer available (rtn. RESTARTPL/1)
- No buffer available (rtn. RESTARTPL/2)

The suberrors for the monitor call errors are the same as for the LL.

The suberrors from the XMSG/XROUT error messages are read from the XMSG-LIBRARY part.

Actions taken by the PL:

PL will do the same as the LL when a log error or monitor call error occurs.

If the XMSG error is printed on the SINTRAN error device, the system is halted. PL internal errors will be printed and, if possible, logged. The PL will then continue the processing.

Index

********** **SEND US YOUR COMMENTS!!!** **********

Are you frustrated because of unclear information in this manual? Do you have trouble finding things? Why don't you join the Reader's Club and send us a note? You will receive a membership card — and an answer to your comments.

Please let us know if you
- find errors
- cannot understand information
- cannot find information
- find needless information

Do you think we could improve the manual by rearranging the contents? You could also tell us if you like the manual!

********** **HELP YOURSELF BY HELPING US!!** **********

Manual name: COSMOS X.25 Option Operator's Guide Manual number: ND--30.034.01

What problems do you have? (use extra pages if needed) _____

_____

_____

_____

_____

Do you have suggestions for improving this manual ? _____

_____

_____

_____

_____

_____

Your name: _____ Date: _____

Company: _____ Position: _____

Address: _____

_____

What are you using this manual for ? _____

_____

NOTE!
This form is primarily for documentation errors. Software and system errors should be reported on Customer System Reports.

Send to:
Norsk Data A.S
Documentation Department
P.O. Box 25, Bogerud
Oslo 6, Norway

Norsk Data's answer will be found on reverse side

Answer from Norsk Data _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

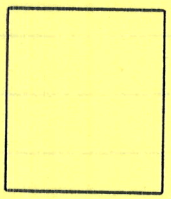
_____

_____

_____

_____

Answered by _____ Date _____



Norsk Data A.S
Documentation Department
P.O. Box 25, Bogerud
0621 Oslo6, Norway

Systems that put people first

NORSK DATA A.S OLAF HELSETS VEI 5 P.O. BOX 25 BOGERUD 0621 OSLO 6 NORWAY
TEL.: 02 - 29 54 00 - TELEX: 18284 NDN