



X.25 Protocol

Teldat-Dm 707-I

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I Related Documents

Teldat-Dm702-I TCP-IP

Teldat-Dm772-I Common Configurations for Interfaces

Chapter 1 X.25 Protocol

1.1 Introduction

The idea of network computers emerged at the beginning of the 60s, when more powerful and reliable models began to be produced, it became necessary to interconnect computers located in remote places, with the aim of sharing the hardware and software resources provided by the network.

The interconnection of computers was based initially on the use of existing networks at that time, in other words telephone lines, and the first efforts were centered on achieving reliable transmission through them.

The idea of packet switching came from the defense department ARPA (Advanced Research Projects Agency), working on the basic premise that short messages or packets decrease the storage size and therefore the average delay. This led to the creation of the ARPANET network (Advanced Research Projects Agency NETWORK), at the end of the 60s and beginning of the 70s. With the idea that this was the solution to achieving an international switching and data transportation service in the medium term, they began to make the first packet switching networks, Datapac (first public network), Telenet, Transpac, etc., that gradually moved on to other projects.

In recent decades public and international bodies (CCITT¹, ISO, IEEE, ...) have started to show interest in the structuring and rationalization of the different functions that appear in data communication, and some architectures stratified in levels and layers emerged (SNA, DECNET, DSE, DNA, BNA, etc.).

In 1976, the CCITT developed the X.25 recommendation for public data communication networks with the aim of establishing the international interconnection of national public networks and this is the current tendency in all communication companies.

1.2 Packet switching

The packet switching technique consists of data transmission in groups through the network. Each one of these has a header where the associated virtual circuit is specified and it travels through the network independently from the rest, without the network user really knowing the "itinerary" followed by the packets transmitted.

The huge increase in the use of public switched networks is due to the advantages supplied to the users in contrast to switching circuits for certain types of data transfer.

These advantages include:

Flexibility

A computer system that connects to a packet switching network can access or be accessed by any other system. Connection to the network however can be carried out point-to-point, and the data from several users can be multiplexed in the same line thanks to the use of an address (logical channel) contained in the packets themselves, which allows for great interconnection flexibility between Host, terminals and information systems.

Low Cost

In packet switching you pay per bit of information transmitted plus a specific fixed charge for renting the line. In a leased line, in switching circuits, you pay a fixed amount for renting, independently of the quantity of the data transmitted. The high cost of renting means that leased lines are more cost effective than switching packets when the volume of data transmitted is very high. As usually the applications utilized on a daily basis are transactional, these generate little traffic making it advisable to use packet switching. Furthermore, in packet switching the increase of traffic in international communications is less than in switched circuits.

Alternative Routes

The advantage here is to be found within the basic structure of the network itself and in the standardization of data through frames and packets. A generic network will be composed of data terminal equipment (DTE), data circuit equipment (DCE) and packet switching nodes (PSN). In this way, if a line or switching center breaks down, the packets can be routed through other alternative routes, as they contain the destination address and therefore do not require a physical connection between source and destination.

Easy Access

[1] Now ITU-T

One of the major advantages of the use of packet switching networks is easy access through the Network/User interfaces, well determined and regulated by the CCITT X.25 recommendation. This has allowed the normalization of telematic equipment and of public networks in different countries, hence facilitating access and interconnection.

1.3 The X.25 Recommendation

The first version of the X.25 recommendation appeared in 1976 and was revised several times over the following years. Its objective was to standardize access from the data terminal equipment (DTE) to the services offered by the packet switching public networks.

This recommendation was the first to be structured in accordance with the layer model set up by the ISO (International Standards Organization) to interconnect open systems and establish protocols and interfaces from the first three layers in order to offer to the higher layers (from 4-7) the so-called service network.

For layer 1, X.25 suggests the X.21 recommendation for DTE-DCE interconnections functioning synchronously in public networks, the X.24 recommendation for the definition of link circuits and the X.26 and X.27 ones for electrical characteristics.

For the DTE-DCE interconnections using synchronous modems, X.25 suggests the X.21 bis recommendation and the V.28 and X.26 recommendations for electrical characteristics and the V.24 for link circuits' characteristics. The V.24 and V.28 recommendations are largely equivalent to the RS-232 norm of the EIA (Electronic Industries Association).

On the link layer the access procedure is defined for the exchange of data between the DTE and the DCE. X.25 uses a subset of the HDLC procedure (High-level Data Link Control) specified by ISO, called LAPB (Link Access Procedure Balanced), reached after modifications to the initial proposals.

Layer 3, which in X.25 may be called packet layer, has the setting up, maintenance and disconnection of the virtual circuits functions assigned to it. Here the procedure for the exchange of data packets and control between the DTE and the DCE is defined. This exchange is carried out through the logical channels. Several channels can exist between DTE and DCE.

Chapter 2 X.25 Configuration

2.1 X.25 Global Configuration Commands

To enter in the X.25 Protocol global configuration, access through the main menu in the following way:

- (1) At the (*) prompt, enter **PROCESS 4** (or **P 4**).
- (2) At the configuration prompt (Config>), enter **NODE X25**.
- (3) At the X.25 protocol configuration prompt (X25 Config>), use the configuration commands which are described in this chapter to configure the X.25 Protocol parameters.

There are certain commands which are common for all the device's interfaces. These commands are described in the manual on configuring common interfaces (Teldat- **Dm772-I Common Configurations for Interfaces**).

The X.25 protocol global configuration commands are numerated and described in this section.

Command	Functions
? (HELP)	Lists the available commands or their options.
ADDRESS	Permits you to associate an IP address with X.25 addresses.
APPLY	Allows dynamic updating of the changes introduced in the routing commands.
ASSIGN	Allows you to assign a permanent virtual circuit (PVC) to another PVC or to an IP address.
DISABLE	Allows you to disable some the of X.25 protocol options.
ENABLE	Allows you to enable some the of X.25 protocol options.
FACILITY	Permits you to select distinct options and facilities in the X.25 call packet.
LIST	Lists the configuration parameters.
NO	Allows you to delete some of the X.25 protocol configuration parameters.
RESTORE	Allows you to restore the default X.25 protocol parameter values.
ROUTING	Permits you to associate X.25 addresses with the physical ports.
SET	Permits configuration of the X.25 protocol parameters.
EXIT	Returns to the <i>Config</i> > prompt.

2.1.1 ? (HELP)

Displays the list of available commands or their options.

Syntax:

```
X25 Config>?
```

Example:

```
X25 config>?
address    Associate an IP address with X.25 addresses
apply      Dynamic updating of the routing configuration
assign     Assign a PVC to another PVC or to an IP address
disable    Disable some X.25 protocol configuration parameters
enable     Enable some X.25 protocol configuration parameters
facility    Create or modify a facility entry
list       List configuration
```



```

no          Negate a command or set its defaults
restore    Restore the default configurations
routing    Associate X.25 addresses with the physical ports
set        Configure some X.25 protocol parameters
exit
X25 config>

```

2.1.2 ADDRESS

Allows you to associate an IP address with X.25 addresses. In order to eliminate an association, you need to introduce the command **NO** in front of the command **ADDRESS**. For further information, please see the section which describes the **NO** command functionality.

Syntax:

```

X25 config>ADDRESS <x.x.x.x>
calling-na      calling na for this address
compression    enable compression
encapsulation  encapsulation type (null o IP)
    null
    IP
na-value       na to call for this address
no
    compression Disable compression
release-time   time to release call when no data is transmitted

```

Where each option has the following meaning:

<x.x.x.x>	IP address to which an X.25 address is associated.
calling-na	Calling NA for the indicated IP address (this parameter is mandatory).
compression	Enables the compression.
no compression	Disables the compression.
encapsulation	Permits you to select the encapsulation type: null or IP.
na-value	NA X.25 to call for the indicated IP address.
release-time	Period of time without data exchange in order to release the call.

Example:

You need to configure:

Address	192.100.4.4
calling-na	20003
no compression	encapsulation null
na-value	20001
release-time	120.

```

X25 config>ADDRESS 192.100.4.4 na-calling 20001
X25 config>ADDRESS 192.100.4.4 calling-na 20003
X25 config>ADDRESS 192.100.4.4 no compression
X25 config>ADDRESS 192.100.4.4 encapsulation null
X25 config>ADDRESS 192.100.4.4 release-time 120

```

2.1.3 APPLY

Allows dynamic updating of the changes introduced in the routing commands.

Syntax:

```
X25 Config>APPLY
```

Example:

```
X25 Config>APPLY
X25 Config>
```

2.1.4 ASSIGN

Allows you to assign a PVC to another PVC or to an IP address. In order to eliminate an assignation, you need to introduce the command **NO** in front of the command **ASSIGN**. For further information, please see the section which describes the **NO** command functionality.

Syntax:

```
X25 Config>ASSIGN ?
  address-to-permanent      Associate a PVC to an IP address
  permanent-to-permanent   Associate a PVC to another permanent circuit
```

2.1.4.1 ASSIGN ADDRESS-TO-PERMANENT

Associates a PVC to an IP address so that all the datagrams with this destination address are routed by a specific PVC.

Example:

```
X25 Config>ASSIGN ADDRESS-TO-PERMANENT 192.168.1.1 ip no serial0/0 1
X25 Config>
```

2.1.4.2 ASSIGN PERMANENT-TO-PERMANENT

Assigns a PVC to another permanent circuit of a different port in order to switch packets from one to the other.

Example:

```
X25 Config>ASSIGN PERMANENT-TO-PERMANENT serial0/0 1 serial0/1 2
X25 Config>
```

2.1.5 DISABLE

Permits you to disable some of the X.25 protocol options.

Syntax:

```
X25 Config>DISABLE ?
  check-input-calling      Disable the NA calling check
```

2.1.5.1 DISABLE CHECK-INPUT-CALLING

Disables the NA calling check. This parameter should always be *Enabled* if you are going to route IP over X.25.

Example:

```
X25 Config>DISABLE CHECK-INPUT-CALLING
X25 Config>
```

2.1.6 ENABLE

Allows you to enable certain X.25 protocol configuration parameters.

Syntax:

```
X25 Config>ENABLE ?
  check-input-calling      Enable the NA calling check
```

2.1.6.1 ENABLE CHECK-INPUT-CALLING

Enables the NA calling check: makes the router verify that a specific NA calling is in its tables. This parameter should always be *Enabled* if you are going to route IP over X.25.

Example:

```
X25 Config>ENABLE CHECK-INPUT-CALLING
X25 Config>
```

2.1.7 FACILITY

Permits you to change the called NA, add or change the user data, and add or change the call packets facilities (window negotiation, packet length, reverse charge, closed user group and network user identifier). In order to eliminate a facility entry, you need to introduce the command **NO** in front of the command **FACILITY**. For further information, please see the section which describes the **NO** command functionality.

Syntax:

```
X25 config>FACILITY <id>
called                window and packet length called facilities
  window              window value
  packet-length       packet-length value

caller                window and packet length caller facilities
  window              window value
  packet-length       packet-length value

direction
  output              output packets
  input               input packets
  both                bothway packets

na-value              na value to match (digit or X)
new-na-value          new na value (digit , X or S)
no
  reverse-charge      Disable reverse charge facility option
  packet-length-negotiation Disable packet-length negotiation facility
  window-negotiation Disable window-negotiation facility
  user-group          Disable user-group facility

packet-length-negotiation packet-length negotiation facility
interface             interface to match
priority              priority of this entry
reverse-charge        reverse charge facility option
user                  several user facilities
  bilateral-group     bilateral group type
  normal-group        normal group type
  outgoing-group      outgoing group type
  id                  user id
  data                user data

window-negotiation    window-negotiation facility
```

Where each option has the following meaning:

<i><id></i>	Facility entry number (item).
<i>called</i>	Window size and packet length facilities for the called.
<i>-window</i>	Window size (1 – 128), default value 7.
<i>-packet-length</i>	Packet length (1- 4096) default value 256.
<i>caller</i>	Window size and packet length facilities for the caller.
<i>-window</i>	Window size (1-128), default value 7.
<i>-packet-length</i>	Packet length (1-4096) default value 256.
<i>direction</i>	When the facilities change is executed.
<i>-output</i>	When the packet exits through the interface (after routing).

<i>-input</i>	When the packet enters through the interface (before routing).
<i>-both</i>	The rule is always applied if the conditions are fulfilled.
<i>na-value</i>	NA Value (digits or X).
<i>new-na-value</i>	New NA value (digit, X or S). S suppresses the digit appearing in this position. X does not change it.
<i>no</i>	Disables the reverse charge facility option.
<i>-reverse-charge</i>	Disables the packet length negotiation facility option.
<i>-packet-length-negotiation</i>	Disables the window size negotiation facility option.
<i>-window-negotiation</i>	Disables the user group facility option.
<i>-user-group</i>	
<i>packet-length-negotiation</i>	Enables the packet length negotiation facility option.
<i>interface</i>	Assigns an interface to which the outgoing calls facility is applied. In cases where this is not configured, the facility is applied to all the device's outgoing calls.
<i>priority</i>	Permits you to configure priority for this entry (0 a 9).
<i>reverse-charge</i>	Enables the reverse charge facility option.
<i>user</i>	Permits you to configure various user facilities.
<i>bilateral-group</i>	Configures the bilateral group type user.
<i><num></i>	Group number (4 Hexadecimal digits from 0 to F)
<i>normal-group</i>	Configures the normal group type user.
<i><num></i>	Group number (2 Hexadecimal digits from 0 to F).
<i>outgoing-group</i>	Configures the closed user group type user with outgoing access.
<i><num></i>	Group number (2 Hexadecimal digits from 0 to F).
<i>id</i>	User identifier (ASCII Characters).
<i>data</i>	User data. (Hexadecimal characters without the 0x in front of it).
<i>window-negotiation</i>	Enables the window size negotiation facility option.

Example:

```
X25 Config> facility 1 na-value 232x2x3
X25 Config> facility 1 reverse-charge
X25 Config> facility 1 called window 4
X25 Config> facility 1 called packet-length 128
X25 Config> facility 1 caller window 4
X25 Config> facility 1 caller packet-length 128
X25 Config>
```

2.1.8 LIST

Allows you to list the configuration parameter values.

Syntax:

```
X25 Config>LIST ?
  address      List the IP addresses associated to the X.25 addresses
  assign       List the PVC configured associations
  encryption   List the encryption configuration
  facility     List the X.25 configured facilities
  global       List the global parameters
```

port	List the X.25 port's specific parameters
routing	List the configured routing table of the X.25 node

2.1.8.1 LIST ADDRESS

Lists the IP addresses associated to the X.25 addresses.

Example:

```
X25 Config>LIST ADDRESS
IP Address      X25 clld Address  X25 clng Address Idle Time Encapsulation
192.100.3.1    345820
192.100.4.4    20004             20001      60      IP
X25 Config>
```

2.1.8.2 LIST ASSIGN

Lists the PVC configured associations.

Syntax:

```
X25 Config>LIST ASSIGN ?
address      List the PVC associations and the IP addresses
permanent   List the associations between the PVCs
```

LIST ASSIGN ADDRESS

Lists the PVC associations and the IP addresses.

Example:

```
X25 Config>LIST ASSIGN ADDRESS
Nentry  IP address      Port      PVC Encapsulation
1       192.100.4.69    serial0/0  1    IP
X25 Config>
```

LIST ASSIGN PERMANENT

Lists the associations between the permanent virtual circuits.

Example:

```
X25 Config> LIST ASSIGN PERMANENT
Entry      Port      PVC      Port      PVC
1          serial0/0  1        serial0/2  1
X25 Config>
```

2.1.8.3 LIST ENCRYPTION

This option is only significant in devices that have the specific encryption hardware installed (Encryption daughter Card). The information on all the configuration parameters and encryption handling can be found in document Teldat-DM726-I. Should you have any queries or doubts about encryption, please see the said document.

2.1.8.4 LIST FACILITY

Lists the configured facilities.

Example:

```
X25 Config>LIST FACILITY
Packet facilities:
num P D  Port      NA          NNA          Wcd Wcr Led  Lcr  RC CUG  NUI/UD
1   0 0  serial0/0  123456     999SXX      7   7   256  256  Y B/0021 rftx/C0
2   0 0  I serial0/1  323323     3232XXXX    -   -   -    -    N -/----
X25 config>
```

2.1.8.5 LIST GLOBAL

Lists the global parameters, i.e. the parameters common to all the ports supporting X.25.

Example:

```
X25 Config>LIST GLOBAL
X.25 global data:
Max. datagram length: 1500
Backup recover attempt time: 0
Max dynamically added addresses: 10
Check input call: Enabled
X25 Config>
```

The *Max. datagram length* field represents the maximum length of the data unit, i.e. for a chain of packets with M bit.

The *Check input call* field makes the router verify that a determined calling NA is in its tables. This parameter must always be *Enabled* if IP is going to be routed over X.25.

The *Max dynamically added addresses* field permits you to configure how many IP addresses can be dynamically added i.e. without having to reboot the device so they activate.

In the *Backup recover attempt time* field, you configure the period of time where calls are attempted over the main route to see if it has re-established. (please see manual Teldat-Dm702-I "TCP-IP Configuration" for further details on static routes).

2.1.8.6 LIST PORT

Lists the X.25 port's specific parameters.

Example:

```
X25 Config>LIST PORT serial0/0
Port information: serial0/0(X25)
Layer 3 Window: 2
Packet ext mode: EnabledPacket length: 256
NA Calling:
NA calling process: Outgoing calls
PVC low: 0
PVC high: 0
SVC low: 100
SVC high: 100
Channels direction: DEC
Interface address: DTE
Layer 2 Window: 7
Frames ext mode: Enabled
T1: 10
T3: 60
N1: 263
N2: 10
SABM: Enabled
Answer SABM to DMs and DISCs: Disabled
Speed: 9600
Invert TxClock : Disabled
X25 Config>
```

2.1.8.7 LIST ROUTING

Lists the table containing all routes configured for the ports supporting X.25.

Example:

```
X25 Config>LIST ROUTING
```

Interface	Connector	Type of interface
ethernet0/0	LAN1	Fast Ethernet interface
serial0/0	SERIAL0/WAN1	Frame Relay
serial0/1	SERIAL1/WAN2	X25
serial0/2	SERIAL2/WAN3	X25
bri0/0	BRI/ISDN1	ISDN Basic Rate Int

```

x25-node      ---          Router->Node
ip-router     ---          Node->Router

Entry      Port      priority  routing      NA      UD
  1      serial0/0      0          N      XXXXXXXXXXXXXXXX  22
  2      ip-router      1          N          123456
X25 Config>

```

2.1.9 NO

Permits you to delete some of the X.25 protocol configuration parameters.

Syntax:

```

X25 config>NO ?
address      Associate an IP address with X.25 addresses
assign       Assign a PVC to another PVC or to an IP address
facility     Create or modify a facility entry
routing      Eliminate a route

```

2.1.9.1 NO ADDRESS

Eliminates the association of an IP address with X.25 addresses from the configuration.

Example:

```

X25 Config>NO ADDRESS 192.100.4.4
X25 Config>

```

2.1.9.2 NO ASSIGN

Eliminates PVC assignment entries to another PVC or an IP address from the configuration.

Syntax:

```

X25 config>NO ASSIGN ?
address-to-permanent      Associate a PVC to an IP address
permanent-to-permanent   Associate a PVC to another permanent circuit

```

NO ASSIGN ADDRESS-TO-PERMANENT

Permits you to eliminate the assignment of a PVC to an IP address.

Example:

```

X25 config>NO ASSIGN ADDRESS-TO-PERMANENT 192.3.45.66
IP Address [0.186.250.240]? 192.3.45.66
X25 Config>

```

NO ASSIGN PERMANENT-TO-PERMANENT

Permits you to eliminate the assignment between two PVCs.

Example:

```

X25 Config>NO ASSIGN PERMANENT-TO-PERMANENT 1
X25 Config>

```

2.1.9.3 NO FACILITY

Eliminates a facility configuration entry.

Example:

```

X25 Config>NO FACILITY 1
X25 Config>

```

2.1.9.4 NO ROUTING

Eliminates a routing, i.e. the association between an X.25 address and a port.

Example:

```
X25 Config>NO ROUTING 1
X25 Config>
```

2.1.10 RESTORE

Allows you to restore the default configurations.

Syntax:

```
X25 Config>RESTORE ?
all      Restore the configuration default values
```

2.1.10.1 RESTORE ALL

Restores the configuration default values for the X.25 ports, the routing and the global parameters.

Example:

```
X25 Config>RESTORE ALL
Restored default values for all ports
Restored default values for routing
Restored default global values
X25 Config>
```

2.1.11 ROUTING

Permits you to associate X.25 addresses with the physical ports. In order to eliminate a route, you need to introduce the command **NO** in front of the command **ROUTING**. For further information, please see the section which describes the **NO** command functionality.

Syntax:

```
X25 config>ROUTING <id>
na-value      na value to match this entry
no
  reroute     disable re-route
port          port to route this na
protocol      protocol
priority      priority of this route
reroute       enable re-route
  exclusive   enable re-route excluding the incoming call port
  all         enable re-route for all ports
```

Where each option has the following meaning:

<i><id></i>	ROUTING entry number (item).
<i>na-value</i>	NA value to match in order to activate this route. (digits or X).
<i>port</i>	Port to route this NA. (serialx/x or ip-router).
<i>protocol</i>	Protocol identifier. This value must be introduced in hexadecimal.
<i>priority</i>	Priority for this route. The highest routing priority corresponds to the lowest number. (0-9).
<i>reroute</i>	Enable rerouting.
- <i>exclusive</i>	Enable rerouting, excluding the incoming call port.
- <i>all</i>	Enable rerouting for all the ports.
<i>no reroute</i>	Disable rerouting.

(*) The rerouting option allows you to carry out rerouting if the routing or route with the highest priority is unavailable or all their logical channels are busy. The possible values are:

Y: Yes, carries out rerouting.

N: No, does not carry out rerouting.

E: Exclusively rerouting: This option prevents an X.25 call being routed towards the same port that it entered by, i.e. if the highest priority routing routes the call towards an SVC from the same port which it entered by, a search to see if there are other routes towards other ports is carried out.

(**) The Protocol identifier field allows you to carry out routing depending on the first octet of the user data field which identifies the protocol. If this field is not programmed, it is ignored.

Example:

Configure:

```
<id>                3
na-value            32323XXXX
port               serial0/1
priority           1
reroute            Enable normal rerouting.
```

```
X25 config>routing 3 port serial0/1 na-value 32323XXXX
X25 config>routing 3 priority 1 reroute all
X25 config>
```

The first time you introduce the command you need to enter, in this order, a minimum of *<id>*, *port* and *na-value*. Subsequently in order to change any of the parameters, you will need to introduce the *<id>*, and the parameters that you wish to modify

2.1.12 SET

Allows you to configure the following parameters.

Syntax:

```
X25 Config>SET ?
  bkup-rcv-time      Retry time between calls
  datagram-length    Maximum datagram length
  encryption         Set encryption parameters
  max-add-dir        Maximum number of dynamically added IP addresses
```

2.1.12.1 SET BKUP-RCV-TIME

Allows you to configure the retry time between calls in order to activate the inactive NUA (provided that the X.25 call is established) and the IP static routes associated to them. If 0 is configured, this prevents call retries meaning the static routes configured for X.25 are always active. This is a global parameter for all the X.25 ports.

For further information please consult the IP manual and the chapter on static routes.

Example:

```
X25 Config>SET BKUP-RCV-TIME 0
X25 Config>
```

2.1.12.2 SET DATAGRAM-LENGTH

Configures the maximum length of the datagram, i.e. the maximum length of the data unit (a string of packets with M bit).

Example:

```
X25 Config>SET DATAGRAM-LENGTH 1400
X25 Config>
```

2.1.12.3 SET ENCRYPTION

This option is only significant for devices that have the specific encryption hardware installed (Encryption daughter Card). The information on all the configuration parameters and encryption handling can be found in document Teldat-DM726-I. Should you have any queries or doubts about encryption, please see the said document.

2.1.12.4 SET MAX-ADD-DIR

Configures the maximum number of IP address that can be dynamically aggregated. The values range between 0 and 500.

Example:

```
X25 Config>SET MAX-ADD-DIR 20
X25 Config>
```

2.1.13 EXIT

The **EXIT** command is used to return to the previous prompt.

Syntax:

```
X25 Config>EXIT
```

Example:

```
X25 Config>EXIT
Config>
```

2.2 X.25 Interfaces Configuration Commands

If you wish to execute a command over a specific port

- (1) At the (*) prompt, enter **PROCESS 4** (or **P 4**).
- (2) At the configuration prompt (Config>), enter **NET SERIALx/y**, where “x” is the slot where the serial interface is and “y” the instance there. If the serial interface is in the “x” motherboard, it is 0.

The X.25 Interfaces Configuration Commands are numerated and described in this section.

Command	Functions
? (HELP)	Lists the available commands or their options.
DESCRIPTION	Permits you to configure a descriptive text for the interface.
DISABLE	Allows you to disable some the of X.25 protocol options.
ENABLE	Allows you to enable some the of X.25 protocol options.
LIST	Lists the configuration parameters.
NO	Allows you to delete some of the X.25 protocol configuration parameters.
RESTORE	Allows you to restore the default X.25 protocol parameter values.
SET	Permits configuration of the X.25 protocol parameters.
SHUTDOWN	Changes the administrative state to down or out of service.
EXIT	Returns to the <i>Config></i> prompt.

2.2.1 ? (HELP)

Displays the list of available commands or their options.

Syntax:

```
X25 Config>?
```

Example:

```
X25 config>?
  description      Enter interface description
  disable          Disable some X.25 protocol configuration parameters
  enable          Enable some X.25 protocol configuration parameters
  list            List configuration
  no              Negate a command or set its defaults
  restore         Restore the default X.25 values
  set             Configure some X.25 protocol parameters
  shutdown       Change state to administratively down
  exit
X25 config>
```

2.2.2 DESCRIPTION

Permits you to configure a text for information purposes on displaying the configuration. This does not affect interface functionality.

Syntax:

```
X25 config>DESCRIPTION <text>
```

Where each option has the following meaning:

<text> Descriptive text.

Example:

```
X25 config>DESCRIPTION Exit to the public network
```

2.2.3 DISABLE

Permits you to disable some of the X.25 protocol options.

Syntax:

```
X25 Config>DISABLE ?
  answer-sabm-to-dm-disc  Answer SABM to DMs and DISCs
  ext-frame-mode          Set the NS field to 8
  ext-packet-mode         Set the PS field to 8
  invert-txc              Invert TxClock
```

2.2.3.1 DISABLE ANSWER-SABM-TO-DM-DISC

Disables the functionality to respond with SABM/E frames on receiving DM command frames.

Example:

```
X25 Config>DISABLE ANSWER-SABM-TO-DM-DISC
X25 Config>
```

2.2.3.2 DISABLE EXT-FRAME-MODE

Specifies the NS field module of the X.25 link layer, i.e. the module used to consecutively number the transmitted LAPB frames. This can have a value of 8 or 128, corresponding to the Disabled and Enabled values for this parameter. The default value is 8 (Disabled).

Example:

```
X25 Config>DISABLE EXT-FRAME-MODE
X25 Config>
```

2.2.3.3 DISABLE EXT-PACKET-MODE

Specifies the PS field module of the X.25 network layer, i.e. the module used to consecutively number the transmitted X.25 packets. This can have a value of 8 or 128, corresponding to the Disabled and Enabled values for this parameter. The default value is 8 (Disabled).

Example:

```
X25 Config>DISABLE EXT-PACKET-MODE
X25 Config>
```

2.2.3.4 DISABLE INVERT-TXC

On disabling this option, the TxC signal of the associated serial port stops being inverted.

Example:

```
X25 Config>DISABLE INVERT-TXC
X25 Config>
```

2.2.4 ENABLE

Allows you to enable certain X.25 protocol configuration parameters.

Syntax:

```
X25 Config>ENABLE ?
  answer-sabm-to-dm-disc  Answer SABM to DMs and DISCs
  ext-frame-mode          Set the NS field to 128
  ext-packet-mode         Set the PS field to 128
  invert-txc              Invert TxClock
```

2.2.4.1 ENABLE ANSWER-SABM-TO-DM-DISC

Enables the functionality to respond with SABM/E frames on receiving DM command frames. This permits you to activate the link when the remote end sends DM frames as an invitation to initiate link establishment.

Example:

```
X25 Config>ENABLE ANSWER-SABM-TO-DM-DISC
X25 Config>
```

2.2.4.2 ENABLE EXT-FRAME-MODE

Specifies the NS field module of the X.25 link layer, i.e. the module used to consecutively number the sent LAPB frames. This can have a value of 8 or 128, corresponding to the Disabled and Enabled values for this parameter. The default value is 8 (Disabled).

Example:

```
X25 Config>ENABLE EXT-FRAME-MODE
X25 Config>
```

2.2.4.3 ENABLE EXT-PACKET-MODE

Specifies the PS field module of the X.25 network layer, i.e. the module used to consecutively number the sent X.25 packets. This can have a value of 8 or 128, corresponding to the Disabled and Enabled values for this parameter. The default value is 8 (Disabled).

Example:

```
X25 Config>ENABLE EXT-PACKET-MODE
X25 Config>
```

2.2.4.4 ENABLE INVERT-TXC

On enabling this option, when the port is configured as DTE, the data sent by the TxD from the indicated serial port, is synchronized with the TxC signal increasing side. A normal situation, when the TxD side is not inverted, the TxD data is transmitted with the TxC descending side. This function is only active when the physical interface is configured as DTE. This operation permits you to compensate TxD signal delays in high speed connections.

Example:

```
X25 Config>ENABLE INVERT-TXC
X25 Config>
```

2.2.5 LIST

Allows you to list the configuration parameter values.

Syntax:

```
X25 Config>LIST
```

Example:

```
X25 Config>LIST
Port information: serial0/2(X25)
Layer 3 Window: 2
Packet ext mode: Disabled
Packet length: 256
NA Calling:
NA calling process: Outgoing calls
PVC low: 0
PVC high: 0
SVC low: 100
SVC high: 100
Channels direction: DEC
Interface address: DTE
Layer 2 Window: 7
Frames ext mode: Disabled
T1: 10
T3: 60
N1: 263
N2: 10
SABM: Enabled
Answer SABM to DMs and DISCs: Disabled
Speed: 9600
Invert TxClock : Disabled
X25 Config>
```

2.2.6 NO

Eliminates certain X.25 protocol configuration parameters.

Syntax:

```
X25 config>NO ?
description      Enter interface description
na-calling       Eliminate the NA (Network Number)
shutdown         Change state to administratively down
```

2.2.6.1 NO DESCRIPTION

Eliminates the descriptive text configured as interface description.

Example:

```
X25 Config>NO DESCRIPTION
X25 Config>
```

2.2.6.2 NO NA-CALLING

Eliminates the NA (Network Number) configured in one of the X.25 ports.

Example:

```
X25 Config>NO NA-CALLING
X25 Config>
```

2.2.6.3 NO SHUTDOWN

Passes the interface to active.

Example:

```
X25 Config>NO SHUTDOWN
X25 Config>
```

2.2.7 RESTORE

Allows you to restore the default configurations.

Syntax:

```
X25 Config>RESTORE ?
PORT
```

2.2.7.1 RESTORE PORT

Restores the default X.25 port values.

Example:

```
X25 Config>
Restored default values port: serial0/2
X25 Config>
```

2.2.8 SET

Allows you to configure the following parameters.

Syntax:

```
X25 Config>SET ?
 channel-direction      Configure the number order in the logical channel
 frame-window           LAPB frame window size
 interface-direction    Specify behavior as terminal (DTE) or modem (DCE)
 n1                     LAPB maximum frame length
 n2                     LAPB maximum number of retransmissions
 na-calling              Configure the NA
 packet-size            Specify the maximum length of an X.25 packet
 packet-window          Configure the layer 3 window
 process-na-calling     Calling NA process
 pvc                    Configure the PVC numbers
 sabm                   Configure SABM behaviour
 speed                  Configure the binary regime
 svc                    Configure the SVC numbers
 t1                     LAPB max waiting time for frame acknowledgement, i.e.
                       retransmission timer
 t3                     LAPB max allowed inactivity time in seconds. Also
                       known as T4
```

2.2.8.1 SET CHANNEL-DIRECTION

Allows you to configure the numbers in the logical channel in either increasing or decreasing order which correspond to the values DECREASING and INCREASING. DECREASING is configured by default.

Syntax:

```
X25 Config>SET CHANNEL-DIRECTION ?
 decreasing      Decreasing order
 increasing      Increasing order
```

With this value the logical channels use a decreasing order.

Example:

```
X25 Config>SET CHANNEL-DIRECTION DECREASING
X25 Config>
```

2.2.8.2 SET FRAME-WINDOW

Configures the window used by the LAPB layer 2 protocol, under X.25. The default value is 7. The range of values is between 1 and 128.

Syntax:

```
X25 Config>SET FRAME-WINDOW <1..128>
```

Example:

```
X25 Config>SET FRAME-WINDOW 3
X25 Config>
```

2.2.8.3 SET INTERFACE-DIRECTION

The X.25 layer 2 LAPB protocol behavior is specified as terminal (DTE) or modem (DCE). By default, it acts as a terminal (DTE). If the value for this parameter has been incorrectly configured, the Teldat router automatically changes the operation mode adapting the behavior to layer 2 of the device it is connected to.

Syntax:

```
X25 Config>SET INTERFACE-DIRECTION ?
dce    Modem
dte    Terminal
```

Example:

```
X25 Config>SET INTERFACE-DIRECTION DTE
X25 Config>
```

2.2.8.4 SET N1

Configures the maximum frame length permitted at reception of the LAPB information I frames.

Please note that the maximum N1 frame length is imposed by the maximum packet length plus the layer 2 and 3 header length. This is 7 bytes.

This parameter must be configured when you wish the router to accept calls containing features with packet size at reception greater than that configured in the port.

If a call requesting packet size greater than that configured for this port arrives at reception (this is the N1 value less the 7 header bytes), the Teldat router reduces the size value of the requested packet in the response packet features to the maximum value supported by the device for the configured N1.

Syntax:

```
X25 Config>SET N1 <1..4096>
```

Example:

```
X25 Config>SET N1 512
X25 Config>
```

2.2.8.5 SET N2

Configures the maximum number of retransmissions for an unacknowledged LAPB frame. The default value is 10 and the values range between 1 and 100.

Syntax:

```
X25 Config>SET N2 <1..100>
```

Example:

```
X25 Config>SET N2 20
X25 Config>
```

2.2.8.6 SET NA-CALLING

Configures the NA which is the calling X.25 address of the call request packets which exit via the port independently of the NA they have been received with in the Teldat router. This is not programmed by default.

Syntax:

```
X25 Config>SET NA-CALLING <NA>
```

Example:

```
X25 Config>SET NA-CALLING 40004
X25 Config>
```

2.2.8.7 SET PACKET-SIZE

Specifies the maximum length of an X.25 packet. The maximum length is limited to 4.096 octets. The default value is 256 octets.

Syntax:

```
X25 Config>SET PACKET-SIZE <1..4096>
```

Example:

```
X25 Config>SET PACKET-SIZE 512
X25 Config>
```

2.2.8.8 SET PACKET-WINDOW

Configures the layer 3 window, i.e. the maximum number of X.25 packets which can be waiting acknowledgment. The window is contracted through your carrier and can have values between 1 and 128. The default value is 2.

Syntax:

```
X25 Config>SET PACKET-WINDOW <1..128>
```

Example:

```
X25 Config>SET PACKET-WINDOW 7
X25 Config>
```

2.2.8.9 SET PROCESS-NA-CALLING

This option allows you to add or suppress the NA of the calling packets processed by the Teldat router. The values that can be taken are:

<i>two-way</i>	Adds the NA to all the calls.
<i>suppress</i>	Suppress the NA in all the calls which pass through the port.
<i>outgoing</i>	Adds the NA to all the outgoing calls.
<i>incoming</i>	Adds the NA to all the incoming calls.
<i>automatic</i>	Depending on the interface DCE: Adds the NA to incoming calls. DTE: Adds the NA to outgoing calls.

Syntax:

```
X25 Config>SET PROCESS-NA-CALLING ?
two-way      Adds the NA to all the calls
suppress     Suppress the NA in all the calls which pass through the port
outgoing     Adds the NA to all the outgoing calls
incoming     Adds the NA to all the incoming calls
automatic    Automatic depending on the interface
```

Example:

```
X25 Config>SET PROCESS-NA-CALLING TWO-WAY
X25 Config>
```


2.2.8.10 SET PVC

Allows you to configure the PVC numbers used in the X.25 communications. The PVC range used by your device will be negotiated with your carrier. The permitted values range between 0 and 4095.

Syntax:

```
X25 Config>SET PVC ?
  high   Configure the highest PVC number
  low    Configure the lowest PVC number
```

SET PVC LOW

Configures the lowest PVC number that can be used in X.25 communications. The default value is 0.

Example:

```
X25 Config>SET PVC LOW 10
X25 Config>
```

SET PVC HIGH

Configures the highest PVC number that can be used in X.25 communications. The default value is 0.

Example:

```
X25 Config>SET PVC HIGH 10
X25 Config>
```

2.2.8.11 SET SABM

Configures the interface behavior to activate the link.

Syntax:

```
X25 Config>SET SABM ?
  always   Try to establish the link transmitting SABM indefinitely
  n2       Try to establish the link transmitting SABM N2 times
  passive  Wait receiving SABM frames to establish the link
```

always: Continuously tries to establish the link (only if the interface physical level is DCE).

n2: Tries to establish the link by sending up to n2 SABM/E frames (default value).

passive: Does not send SABM/E frames, it waits for the other end to take the initiative.

Example:

Configuring passive behavior to establish the link.

```
X25 Config>SET SABM PASSIVE
X25 Config>
```

2.2.8.12 SET SPEED

You can configure the binary regime through this parameter through which the X.25 interface operates. The possible values are the range of synchronous speeds from 1200 to 2048 Mbps. The speed used by default is 9600 bps.

Syntax:

```
X25 Config>SET SPEED <speed>
```

Example:

```
X25 Config> SET SPEED 19200
X25 Config>
```



Note

In cases where the lines are DTE (at a physical layer) this value is indifferent as the clock is external.

2.2.8.13 SET SVC

Allows you to configure the SVC numbers used in X.25 communications. The SVC range used by your device will be negotiated with your carrier. The permitted values range between 0 and 4095.

Syntax:

```
X25 Config>SET SVC ?
  high   Configure the highest SVC number
  low    Configure the lowest SVC number
```

SET SVC LOW

Configures the lowest SVC number that can be used in X.25 communications. The default value is 100. (0 = deactivated, 1 – 4095).

Example:

```
X25 Config>SET SVC LOW 120
X25 Config>
```

SET SVC HIGH

Configures the highest SVC number that can be used in X.25 communications. The default value is 100. (0 = deactivated, 1 – 4095).

Example:

```
X25 Config>SET SVC HIGH 110
X25 Config>
```

2.2.8.14 SET T1

Configures T1, this is the maximum wait time in tenths of seconds for LAPB frame acknowledgement. Once this has timed out and if no frames have been exchanged, the Teldat router retransmits the frame awaiting acknowledgement. The default value is 10. The permitted range of values is between 1 and 1800 (0.1 – 30 sg.).

Syntax:

```
X25 Config>SET T1 <1..1800>
```

Example:

```
X25 Config>SET T1 2
X25 Config>
```

2.2.8.15 SET T3

Configures T3, this is the maximum time for LAPB inactivity on the line in seconds. Once this has timed out and if no frames have been exchanged, the Teldat router sends an RR with a poll bit. The default value is 60. The permitted range of values is between 1 and 3600 seconds. A 0 value means that RR frames with poll bit are not sent due to inactivity. This parameter is also known as T4.

Syntax:

```
X25 Config>SET T3 <0..3600>
```

Example:

```
X25 Config>SET T3 70
X25 Config>
```

2.2.9 SHUTDOWN

Deactivates the X.25 interface.

Syntax:

```
X25 Config>SHUTDOWN
```

Example:

```
X25 Config>SHUTDOWN
X25 Config>
```

2.2.10 EXIT

The **EXIT** command is used to return to the previous prompt.

Syntax:

```
X25 Config>EXIT
```

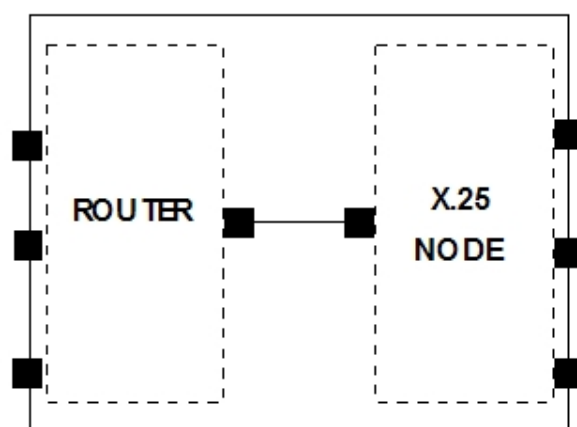
Example:

```
X25 Config>EXIT
Config>
```

2.3 Configuration Example

From a functional point of view, there are two virtual devices integrated in the Teldat router:

- (1) A router which carries out the internetworking functions.
- (2) A packet switch for packets coming from both the router and the X.25 ports.



As can be seen in the figure, each virtual device controls its own set of interfaces. This is necessary in order to precisely identify the distinct interfaces and to know if the interface belongs to the router or the node.

The way to identify the interfaces in the Teldat router configuration is through an identifier.

Through the configuration procedure's **LIST DEVICES** command, you can obtain the interface identification table. Exiting this command in a specific device is shown below:

```
Config>LIST DEVICES

Interface      Connector      Type of interface
-----
ethernet0/0    LAN1           Fast Ethernet interface
serial0/0      SERIAL0/WAN1  Frame Relay
serial0/1      SERIAL1/WAN2  X25
serial0/2      SERIAL2/WAN3  X25
bri0/0        BRI/ISDN1     ISDN Basic Rate Int
x25-node       ---           Router->Node
ip-router      ---           Node->Router
Config>
```

The first column indicates the interface identifier and the second the physical connector the interface corresponds to, the third specifies the programmed interface type.

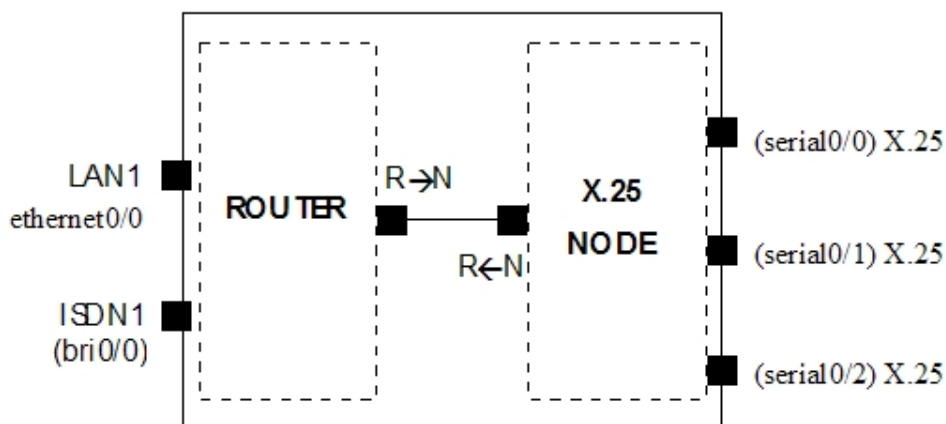
Another important aspect is that there are interfaces which are not associated to a physical connector. This is the case of the *x25-node* interface in the example. This is due to the fact it is the interface which permits you to link the virtual machines and therefore do not have an external connector associated to it.

You must take the following into account with respect to the interface numbers:

- (1) The interfaces controlled by the node are: the Node -> Router and the X.25s. All the other interfaces are controlled by the router. The Node -> Router interface is not displayed on executing a **LIST DEVICES**. It is only dis-

played within the X.25 Node as it has no significance outside of this.

Using this information you can redesign the previous figure for this case:



Suppose you now change the protocol of one of the WAN lines through the **SET DATA-LINK** command and subsequently consult the interface table.

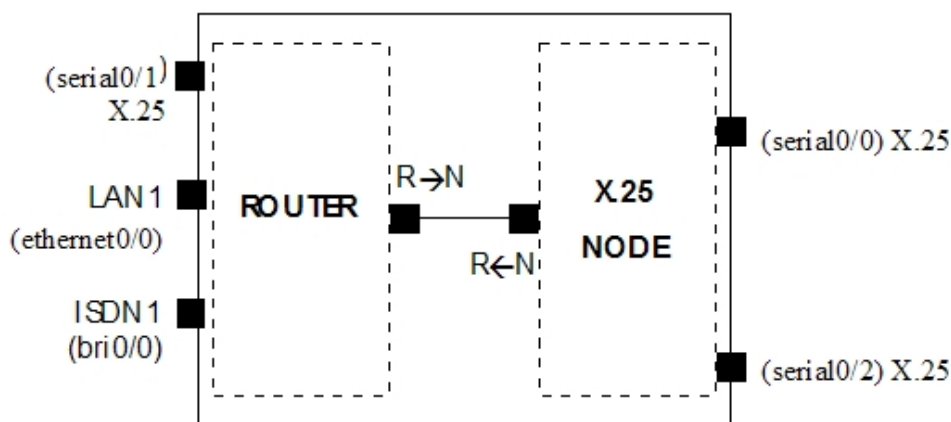
In the following example, Frame Relay protocol is assigned to physical line 2:

```
Config>SET DATA-LINK FRAME-RELAY SERIAL0/1
Config>list dev

Interface      Connector      Type of interface
-----
ethernet0/0    LAN1           Fast Ethernet interface
serial0/0       SERIAL0/WAN1   Frame Relay
serial0/1       SERIAL1/WAN2   Frame Relay
serial0/2       SERIAL2/WAN3   X25
bri0/0         BRI/ISDN1      ISDN Basic Rate Int
x25-node       ---           Router->Node
ip-router      ---           Node->Router
Config>
```

As you can see, there is one more interface controlled by the router and one less by the node.

In this new example, the diagram looks like this:



Note

When you are configuring a device, you must correctly identify the interfaces through the identifier shown in the list interfaces table. The connector number should not be used.

Therefore, the first rule to bear in mind when configuring the interfaces is:

Take no notice of the device connector numbers, only the interface identifier is significant. This is obtained through the **LIST DEVICES** command.

Chapter 3 X.25 Monitoring

3.1 X.25 Global Monitoring Commands

To enter in the X.25 Protocol Global monitoring, access through the main menu in the following way:

- (1) At the (*) prompt, enter **PROCESS 3** (or **P 3**).
- (2) At the monitoring prompt (+), enter **NODE X25**.
- (3) At the X.25 protocol monitoring prompt (X25+), use the monitoring commands which are described in this chapter to monitor the X.25 Protocol parameters.

The X.25 protocol monitoring commands are numerated and described below.

Command	Functions
? (HELP)	Lists the available commands or their options.
CLEAR	Command to release the X.25 calls.
COMPRESSION	Displays the compression statistics.
DELETE	Deletes the traffic and call statistics.
DISPLAY	Allows you to see the release causes and diagnosis associated with each number as well as the status of the X.25 ports.
LIST	Lists a series of calls and traffic statistics.
EXIT	Returns to previous prompt.

3.1.1 ? (HELP)

Displays a list of available commands or their options.

Syntax:

```
X25+?
```

Example:

```
X25+?
clear          Release the X.25 call from the port and logical channel
compression    View the compression statistics
delete         Delete the traffic and released calls statistics
display        Display X25 information
list           List a series of calls and traffic statistics
exit
X25+
```

3.1.2 CLEAR

Releases the X.25 call from the port and logical channel that are entered as parameters.

Syntax:

```
X25+clear <port> <channel>
```

Example:

```
X25+clear serial10/11 100
Call cleared
X25+
```

3.1.3 COMPRESSION

Command to view the compression statistics.

Syntax:

```
X25+compression ?
  restart-statistics  Deletes the compression statistics
  statistics          Lists the compression statistics
  version            Indicates the compression software version
```

3.1.3.1 COMPRESSION RESTART-STATISTICS

Deletes the compression statistics.

Example:

```
X25+compression restart-statistics
X25+
```

3.1.3.2 COMPRESSION STATISTICS

Lists the compression statistics.

Example:

```
X25+compression statistics

FRAMES          COMPRESSION  (bytes      ) DECOMPRESSION (bytes      )
-----
MANAGED         0              (0          ) 0              (0          )
PROCESSED       0              (0          ) 0              (0          )
NOT PROCESSED  0              (0          ) 0              (0          )
ERR_CODE        0              (0          ) 0              (0          )
OUT OF SEQ.    0              (0          ) 0              (0          )
ERR_LEN        0              (0          ) 0              (0          )
=====
STATISTICS BEGINING 04/06/99 00:35:50
SESSIONS PENDING FOR FREE FROM MEMORY          0
X25+
```

3.1.3.3 COMPRESSION VERSION

Indicates the compression software version.

Example:

```
X25+compression version

Revision: 1.1.2.1 $$Name: NPLS_V_7_5_0R $
X25+
```

3.1.4 DELETE

Command to delete the traffic and released calls statistics.

Syntax:

```
X25+delete ?
  calls          Delete the released call information
  frame-errors   Number of detected frame errors
```

3.1.4.1 DELETE CALLS

Deletes the buffer where the released call information is stored.

Example:

```
X25+delete calls
Released calls buffer deleted
X25+
```

3.1.4.2 DELETE FRAME-ERRORS

This command is used to zeroize those counters used to keep the number of detected frame errors: *too short frames, incorrect length, invalid address or whose control field contains a value not associated to any type of frame.*

Example:

```
X25+delete frame-errors
Erroneous Frame counters cleared
X25+
```

3.1.5 DISPLAY

This command displays the release causes and diagnosis as well as the status of the X.25 ports.

Syntax:

```
X25+display ?
causes          Display the interpretation of a cause
diagnostics     Display the diagnosis interpretation
```

3.1.5.1 DISPLAY CAUSES

Displays the interpretation of the cause which is entered as a hexadecimal parameter.

Example:

```
X25+display causes 9
Cause (9): Out of order
X25+
```

3.1.5.2 DISPLAY DIAGNOSTICS

Displays the diagnosis interpretation which is entered as hexadecimal parameter.

Example:

```
X25+display diagnostics 01
Diagnostic (1): Invalid P(S)
X25+
```

3.1.6 LIST

Lists a series of calls and traffic statistics.

Syntax:

```
X25+LIST ?
frame-errors      Number of detected frame errors
monitor-counters released-calls  Provide information on the connections that have already
                    been released
```

3.1.6.1 LIST FRAME-ERRORS

This command offers the number of error frames detected at the LAPB link over which distinct connections are established and classes the errors in: *too short frames, incorrect length, invalid address or whose control field contains a value not associated to any type of frame .*

Example:

```
X25+list frame-errors

Too short frames:           0
Incorrect length frames:    0
Invalid address frames:     0
Undefined control field frames: 0

X25+
```

3.1.6.2 LIST RELEASED-CALLS

Provides information on the connections that have already been released. The relative data on the last 100 released calls is stored together with order in which they were released.

If you wish to have information on a specific number of the most recent calls, enter the number of calls you wish to see after the command.

Example:

```
X25+list released-calls

PORT LCN TYP  PROTOCOL  CALLED AD/ CC DC  DIR  T/START  D/START
      CALLING AD  T/END  D/END
      2028 00 00  REQ  09:29:22 09/06/99
      1028                11:32:57 09/06/99
      2062 00 00  REQ  09:29:22 09/06/99
      1062                11:33:00 09/06/99

X25+
```

The meaning of the fields is:

PORT	Port where the call release has been received.
LCN	Logical channel number.
TYP	Type of channel according to direction. This can be: <i>Incoming (IN)</i> , <i>Outgoing (OUT)</i> or <i>Permanent (PER)</i> .
PROTOCOL	Indicates the protocol used in the communication. This can be: <i>DSA</i> , <i>IP</i> , <i>QLLC</i> , <i>VTX</i> or <i>X.28</i> . In cases where it is none of the above, the called packet's <i>User Data</i> content is printed (in hexadecimal) where the protocol identifier is found.
CALLED AD	Called DTE address.
CALLING AD	Calling DTE address.
CC	Cause of release of call (in hexadecimal).
DC	Diagnosis of release of call (in hexadecimal).
DIR	Indicates who provoked the release. This could be: <i>Internal (INT)</i> , <i>release Indication (IND)</i> : generated by the DCE and <i>release Request (REQ)</i> : generated by the DTE.
T/START	Indicates the call establishment and release time.
T/END	Indicates the call release time.
D/START	Indicates the call establishment and release date.
D/END	Indicates the call release date.

3.1.7 EXIT

The **EXIT** command is used to return to the previous prompt.

Syntax:

```
X25+exit
```

Example:

```
X25+exit
+
```

3.2 X.25 Interfaces Monitoring Commands

To enter in the X.25 Protocol monitoring, access through the main menu in the following way:

- (1) At the (*) prompt, enter **PROCESS 3** (or **P 3**).
- (2) At the monitoring prompt (+), enter **NET** and the X.25 interface name.

The X.25 protocol monitoring commands are numerated and described below.

Command	Functions
? (HELP)	Lists the available commands or their options.
DELETE	Deletes the traffic and call statistics.
DISPLAY	Allows you to see the release causes and diagnosis associated with each number as well as the status of the X.25 ports.
LIST	Lists a series of calls and traffic statistics.
EXIT	Returns to previous prompt.

3.2.1 ? (HELP)

Displays a list of available commands or their options.

Syntax:

```
X25+?
```

Example:

```
X25+?
  delete      Delete the traffic and released calls statistics
  display     Display X25 information
  list        List a series of calls and traffic statistics
  exit
X25+
```

3.2.2 DELETE

Command to delete the traffic and released calls statistics.

Syntax:

```
X25+delete ?
  frames      Number of detected errors
  traffic     Number of transmitted and received packets
X25+
```

3.2.2.1 DELETE FRAMES

This command zeroizes the counters where the number of detected errors in the sequence number (**N(s)**) and the number of the various types of frames are saved: (*I, RR, RNR, REJ, FRMR, UI* (only LAPD)) which are transmitted and received by each port. You need to indicate the port number whose counters are to be returned to zero.

Example:

```
X25+delete frames
Transmitted and received frames counters cleared
X25+
```

3.2.2.2 DELETE TRAFFIC

This command zeroizes those counters where the number of transmitted and received packets is kept for each of the logical channels associated to a port. You need to indicate the number of the port where you wish to return the counters to zero.

Example:

```
X25+delete traffic
Packet counters cleared
X25+
```

3.2.3 DISPLAY

This command displays the release causes and diagnosis as well as the status of the X.25 ports.

Syntax:

```
X25+display ?
  port-status    Display the general state of a port
X25+
```

3.2.3.1 DISPLAY PORT-STATUS

Displays the general state of a port and gives the following information.

Line	Line to which the port number is associated.
Interface type	DCE (modem) or DTE (terminal). This is the type of driver which has been installed for this port.
Status	For lines with serial V interface, this provides the state of the RTS, DTR, CTS, DSR and DCD signals .
Restart Status	Status of the restart component.
LCN	Logical channel.
WINDOW	Layer 3 window for each logical channel.
N(s)	Sequence number of the next data packet to be transmitted.
N(r)	Sequence number of the next data packet to be received.
N(ack)	Sequence number of the last acknowledged data packet.
STATE	Data component state.

Example:

```
X25+display port-status
Line: 1
```

```

Interface type: DCE

Circuit:      105 108 106 107 109
RS232-C:     RTS DTR CTS DSR DCD
Status:      ON  ON  ON  ON  ON
Restart Status: Ready (R1)

LCN   WINDOW  N(s)  N(r)  N(ack)  STATE
100   2        0     0     0       P1 Ready
101   2        0     0     0       P1 Ready

X25+

```

3.2.4 LIST

Lists a series of calls and traffic statistics.

Syntax:

```

X25+list ?
  active-calls  List connections which are established through a specific
                 port
  frames        Number of detected errors
  traffic       Number of transmitted and received packets

X25+

```

3.2.4.1 LIST ACTIVE-CALLS

This provides information on those connections which are currently established through a specific port. You need to specify the number of the port where you wish to access the information on the calls associated to it.

Example 1:

```

X25+list active-calls

No calls at this port

X25+

```

Example 2:

```

X25+list active-calls

LCN      CALLED AD    CALLING AD    PORT    TYPE    PROTOCOL    H/START
158      2074             1074         0       OUT     IP          09:29:23
159      2087             1087         0       OUT     IP          09:29:23

Total active calls: 98

X25+

```

The meaning of each field is:

LCN	Logical channel number.
CALLED AD	Called DTE address.
CALLING AD	Calling DTE address.
PORT	Port associated to the call.
TYPE	Type of channel according to direction. This can be: <i>Incoming (IN)</i> , <i>Outgoing (OUT)</i> or <i>Permanent (PER)</i> .
PROTOCOL	Indicates the protocol used in the communication. This can be: <i>DSA</i> , <i>IP</i> , <i>QLLC</i> , <i>VTX</i> or <i>X.28</i> . In cases where it is none of the above, the content (in hexadecimal) of the first 4 octets from the called packet's User Data field is printed where the protocol identifier is found.

H/START Indicates the time the call was established.

3.2.4.2 LIST FRAMES

This command list the statistics on the number of different types of frames transmitted or received through a port, classing them by type. You need to enter the number of the port where you wish to view these statistics.

Example:

```
X25+list frames

I Frames   : transmitted = 1340312   received = 1527784
RR Frames  : transmitted =    413    received =  700841
RNR Frames : transmitted =     0     received =     0
REJ Frames : transmitted =     0     received =     0
FRMR Frames: transmitted =     0     received =     0

Errors in N(S):      0

Timeout T1:         0

X25+
```

The displayed statistics indicate the number of the following types of frames transmitted and received:

- I** Information frames.
- RR** Supervision frames *Receive Ready*.
- RNR** Supervision frames *Receive Not Ready*.
- REJ** Supervision frames *Reject*.
- FRMR** Unnumbered frames *Frame Reject*.

Lastly, in the **Errors inN(S)** field, the number of frames where errors have been detected in the sequence number are displayed and the T1 Timeouts show the T1 lapsed times.

3.2.4.3 LIST TRAFFIC

Offers information on the number of packets transmitted and received through a port, specifying the logical channel through which they are sent or received. You need to enter the number of the port where you wish to obtain the statistics.

Example:

```
X25+list traffic

LCN      TRANSMITTED    RECEIVED
100             0             0

TOTAL             0             0

X25+
```

3.2.5 EXIT

The **EXIT** command is used to return to the previous prompt.

Syntax:

```
X25+EXIT
```

Example:

```
X25+EXIT
+
```