Teldat Router

X.25 Configuration

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Chapter 1
X.25 Protocol

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 U.S. 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 (CCITT*, 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.

* Now ITU-T

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

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.

* Today ITU-T

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, that 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

1. X.25 Configuration Commands

To enter in the X.25 Protocol 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.

If you wish to execute a command over a specific port, another possibility is:

1. At the (*) prompt, enter **PROCESS 4** (or **P 4**).
2. At the configuration prompt (Config>), enter **NET** and the name of the X25 interface.
3. At the X.25 protocol configuration prompt (X25 Config>), use the configuration commands relative to a specific port which are also described in this chapter.

The X.25 protocol 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 *Config>* prompt.

1.1. ? (HELP)

Displays the list of available commands or their options.

Syntax:

```
X25 Config>?
```

Example:

```
X25 config>?
ADDRESS
APPLY
ASSIGN
DISABLE
ENABLE
FACILITY
LIST
NO
RESTORE
ROUTING
SET
EXIT
X25 config>
```

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
     IP
na-value            na to call for this address
no
     compression    Disable comppression
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 20001 CA 20003 NO CO EN NU RE 120
```

1.3. APPLY

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

Syntax:

```
X25 Config>APPLY
```

Example:

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

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
PERMANENT-TO-PERMANENT
```

a) 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
IP Address [0.0.0.0]? 192.168.1.1
Encapsulation (IP, Null)[IP]? IP
Compression(Yes/No)? Y
Port(serial0/0-serial0/2): serial0/0
Channel: [1]? 1
X25 Config>
```

b) 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
Port(serial0/0-serial0/2): serial0/0
Channel: [1]? 1
Associated with:
Port(serial0/0-serial0/2): serial0/1
Channel: [1]? 2
X25 Config>
```

1.5. DISABLE

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

Syntax:

```
X25 Config>DISABLE ?
CHECK-INPUT-CALLING
EXT-FRAME-MODE
EXT-PACKET-MODE
INVERT-TXC
SABM-ACTIVE
```

a) 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>
```

b) 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
Port(serial0/0-serial0/2): serial0/2
X25 Config>
```

c) 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
Port(serial0/0-serial0/2): serial0/2
X25 Config>
```

d) DISABLE INVERT-TXC

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

Example:

```
X25 Config>DISABLE INVERT-TXC
Port(serial0/0-serial0/2): serial0/2
X25 Config>
```

e) DISABLE SABM-ACTIVE

On disabling this option, the X.25 layer 2 entity waits as it is the remote entity which establishes the link.

Example:

```
X25 Config>DISABLE SABM-ACTIVE
Port(serial0/0-serial0/2): serial0/2
X25 Config>
```

1.6. ENABLE

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

Syntax:

```
X25 Config>ENABLE ?
ALWAYS-SABM-ACTIVE
CHECK-INPUT-CALLING
EXT-FRAME-MODE
EXT-PACKET-MODE
INVERT-TXC
SABM-ACTIVE
```

a) ENABLE ALWAYS-SABM-ACTIVE

On enabling this option, the X.25 layer 2 entity continually tries to establish the link transmitting SABM indefinitely and not just N2 times. This value can only be configured if the port is DCE at a physical level.

Example:

```
X25 Config>ENABLE ALWAYS-SABM-ACTIVE
Port(serial0/0-serial0/2): serial0/2
Parameter only valid if the Interface type is DCE
X25 Config>
```

b) 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>
```

c) 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
Port (serial0/0-serial0/2): serial0/2
X25 Config>
```

d) 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
Port(serial0/0-serial0/2): serial0/2
X25 Config>
```

e) 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
Port(serial0/0-serial0/2): serial0/2
X25 Config>
```

f) ENABLE SABM-ACTIVE

On enabling this option, the X.25 layer 2 entity tries to establish the link transmitting SABM (Enabled) N2 times. The default value is enabled.

Example:

```
X25 Config>ENABLE SABM-ACTIVE
Port(serial0/0-serial0/2): serial0/2
X25 Config>
```

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

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                            serveral 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:

<id> Facility entry number (item).

called	Window size and packet length facilities for the called.
- window	Window size (1 – 128), default value 7.
- packet-length	Packet length (1- 4096) default value 256.
caller	Window size and packet length facilities for the caller.
- window	Window size (1-128), default value 7.
- packet-length	Packet length (1-4096) default value 256.
na-value	NA Value (digits or X).
new-na-value	New NA value (digit, X or S). **S** suppresses the digit appearing in this position. **X** does not change it.
no	
- reverse-charge	Disables the reverse change facility option.
- packet-length-negotiation	Disables the packet length negotiation facility option.
- window-negotiation	Disables the window size negotiation facility option.
- user-group	Disables the user group facility option.
packet-length-negotiation	Enables the packet length negotiation facility option.
interface	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.
priority	Permits you to configure priority for this entry (0 a 9).
reverse-charge	Enables the reverse change facility option.
user	Permits you to configure various user facilities.
bilateral-group	Configures the bilateral group type user.
<num>	Group number (4 Hexadecimal digits from 0 to F)
normal-group	Configures the normal group type user.
<num>	Group number (2 Hexadecimal digits from 0 to F).
outgoing-group	Configures the closed user group type user with outgoing access.
<num>	Group number (2 Hexadecimal digits from 0 to F).
id	User identifier (ASCII Characters).
data	User data. (Hexadecimal characters without the 0x in front of it).
window-negotiation	Enables the window size negotiation facility option.

Example:

```
X25 Config>FACILITY 1 CALLED WINDOW 4 CALLED PACKET-LENGTH 128 NA-VALUE 232X2X3 RE
VERSE-CHARGE
X25 Config>FACILITY 1 CALLER WINDOW 4 CALLER PACKET-LENGTH 128
X25 Config>
```

1.8. LIST

Allows you to list the configuration parameter values.

Syntax:

```
X25 Config>LIST ?
ADDRESS
ALL
ASSIGN
ENCRYPTION
FACILITY
GLOBAL
PORT
ROUTING
```

a) 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                          60        IP
192.100.4.4                  20004             20001      60        IP
X25 Config>
```

b) LIST ALL

Lists all the X.25 ports configuration parameters and the global configuration parameters.

Example:

```
X25 config>LIST ALL
Port information: serial0/0(X25)
Layer 3 Window: 2
Packet ext mode:  Enabled
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: DCE
Layer 2 Window: 7
Frames ext mode:  Enabled
T1: 10
T3: 60
N1: 263
N2: 10
SABM:  Enabled
Speed: 9600
Port information: serial0/1(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
Speed: 9600
Invert TxClock : Disabled

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
Speed: 9600
Invert TxClock : Disabled



 Interface       Con    Type of interface             CSR     CSR2  int
 ethernet0/0     LAN1   Fast Ethernet interface   fa200e00             27
 serial0/0       WAN1   X25                       fa200a00 fa203c00   5e
 serial0/1       WAN2   X25                       fa200a20 fa203d00   5d
 serial0/2       WAN3   X25                       fa200a60 fa203f00   5b
 bri0/0          ISDN1  ISDN Basic Rate Int       fa200a40 fa203e00   5c
 x25-node        ---    Router->Node                     0              0
 ip-router       ---    Node->Router                     0              0

Entry        Port      priority     routing              NA        UD
  4          serial0/0       0           N                898989

IP Address         X25 clld Address   X25 clng Address Idle Time Encapsulation
192.100.3.1                 345820                         60         IP
192.100.4.4                  20004             20001      60         IP

X.25 global data:
Max. datagram length: 1500
Backup recover attempt time: 0
Max dinamically added addresses: 10
Check input call:  Enabled

Facilities not set
X25 config>
```

c) *LIST ASSIGN*

Lists the PVC configured associations.

Syntax:

```
X25 Config>LIST ASSIGN ?
ADDRESS
PERMANENT
```

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>
```

d) 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 DM726-I. Should you have any queries or doubts about encryption, please see the said document.

e) LIST FACILITY

Lists the configured facilities.

Example:

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

f) 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>
```

g) LIST PORT

Lists the X.25 port's specific parameters.

Example:

```
X25 Config>LIST PORT
Port number(serial0/0-serial0/2): serial0/0
Port information: serial0/0(X25)
Layer 3 Window: 2
Packet ext mode:  Enabled
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:  Enabled
T1: 10
T3: 60
N1: 263
N2: 10
SABM:  Enabled
Speed: 9600
X25 Config>
```

h) LIST ROUTING

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

Example:

```
X25 Config>LIST ROUTING

 Interface       Con    Type of interface             CSR     CSR2  int
 ethernet0/0     LAN1   Fast Ethernet interface   fa200e00             27
 serial0/0       WAN1   X25                       fa200a00 fa203c00    5e
 serial0/1       WAN2   X25                       fa200a20 fa203d00    5d
 serial0/2       WAN3   X25                       fa200a60 fa203f00    5b
 bri0/0          ISDN1  ISDN Basic Rate Int       fa200a40 fa203e00    5c
 x25-node        ---    Router->Node                     0              0
 ip-router       ---    Node->Router                     0              0

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

1.9. NO

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

Syntax:

```
X25 config>NO ?
ADDRESS
ASSIGN
FACILITY
NA-CALLING
ROUTING
```

a) NO ADDRESS

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

Example:

```
X25 Config>NO ADDRESS
IP Address [0.0.0.0]? 192.100.4.4
X25 Config>
```

b) NO ASSIGN

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

Syntax:

```
X25 config>NO ASSIGN ?
ADDRESS
PERMANENT
```

NO ASSIGN ADDRESS

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

Example:

```
X25 config>NO ASSIGN ADDRESS
IP Address [0.186.250.240]? 192.3.45.66
X25 Config>
```

NO ASSIGN PERMANENT

Permits you to eliminate the assignment between two PVCs.

Example:

```
X25 Config>NO ASSIGN PERMANENT
Entry number:1
Entry        Port      PVC     Port      PVC
   1       serial0/1    1    serial0/2    2
Delete this entry?(Yes/No)[N]? Y
Routing deleted
X25 Config>
```

c) NO FACILITY

Eliminates a facility configuration entry.

Example:

```
X25 Config>NO FACILITY
facility id[1]? 1
X25 Config>
```

d) NO NA-CALLING

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

Example:

```
X25 Config>NO NA-CALLING
Port(serial0/0-serial0/2): serial0/1
Deleted NA-CALLING port serial0/1
X25 Config>
```

e) NO ROUTING

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

Example:

```
X25 Config>NO ROUTING
Entry number:1
X25 Config>
```

1.10. RESTORE

Allows you to restore the default configurations.

Syntax:

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

a) 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>
```

b) RESTORE PORT

Restores the default X.25 port values which pass as a parameter.

Example:

```
X25 Config>RESTORE PORT
Port(serial0/0-serial0/2): serial0/2
Restored default values port: serial0/2
X25 Config>
```

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
  re-route    disable re-route
port          port to route this na
protocol      protocol
priority      priority of this route
re-route      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:

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

```
X25 config>ROUTING 3 PO serial0/1 NA 32323XXXX PRI 1 RE AL
```

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

1.12. SET

Allows you to configure the following parameters.

Syntax:

```
X25 Config>SET ?
BKUP-RCV-TIME
CHANNEL-DIRECTION
DATAGRAM-LENGTH
ENCRYPTION
FRAME-WINDOW
INTERFACE-DIRECTION
MAX-ADD-DIR
N1
N2
NA-CALLING
PACKET-WINDOW
PACKET-SIZE
PROCESS-NA-CALLING
PVC
SPEED
SVC
T1
T3
```

a) 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
Back up recover time(0-65000)[0]?
X25 Config>
```

b) 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
INCREASING
```

SET CHANNEL-DIRECTION DECREASING

With this value the logical channels use a decreasing order.

Example:

```
X25 Config>SET CHANNEL-DIRECTION DECREASING
Port(serial0/0-serial0/2): SERIAL0/1
X25 Config>
```

SET CHANNEL-DIRECTION INCREASING

With this value the logical channels use an increasing order.

Example:

```
X25 Config>SET CHANNEL-DIRECTION INCREASING
Port(serial0/0-serial0/2): SERIAL0/1
X25 Config>
```

c) 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
Maximum datagram length(256-18000)[1500]? 1400
X25 Config>
```

d) 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 DM726-I. Should you have any queries or doubts about encryption, please see the said document.

e) 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.

Example:

```
X25 Config>SET FRAME-WINDOW
Port(serial0/0-serial0/2): serial0/0
Frame window size(1-128)[7]? 3
X25 Config>
```

f) 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.

Example:

```
X25 Config>SET INTERFACE-DIRECTION
Port number(serial0/0-serial0/2): S0
Interface address(DTE o DCE) [DCE]? DTE
X25 Config>
```

g) 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
Max dynamically added addresses(0-500)[10]? 20
X25 Config>
```

h) SET N1

Configures the maximum frame length permitted at reception of the 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.

Example:

```
X25 Config>SET N1
Port(serial0/0-serial0/2): serial0/0
Frame length(1-4096)[263]? 512
X25 Config>
```

i) SET N2

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

Example:

```
X25 Config>SET N2
Port(serial0/0-serial0/2): serial0/0
Maximum number of transmt.(1-100)[10]? 20
X25 Config>
```

j) 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.

Example:

```
X25 Config>SET NA-CALLING
Port(serial0/0-serial0/2): serial0/0
NA calling? 40004
X25 Config>
```

k) 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.

Example:

```
X25 Config>SET PACKET-WINDOW
Port(serial0/0-serial0/2): serial0/0
Packet window(1-128)[2]? 7
X25 Config>
```

l) 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.

Example:

```
X25 Config>SET PACKET-SIZE
Port(serial0/0-serial0/2): serial0/0
Packet size(1-4096)[256]? 512
X25 Config>
```

m) 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:

T (Two-way calls): Adds the NA to all the calls.

S (Suppress): Suppress the NA in all the calls which pass through the port.

O (Outgoing Calls): Adds the NA to all the outgoing calls.

I (Incoming Calls): Adds the NA to all the incoming calls.

A (Automatic): Depending on the interface, if it is a DCE the NA is added to all the calls entering through the port, if it is a DTE, the NA is added to all the outgoing calls.

The default value is "O".

Example:

```
X25 Config>SET PROCESS-NA-CALLING
Port(serial0/0-serial0/2): serial0/0
Calling NA process (T,S,I,O,A) [O]? T
X25 Config>
```

n) 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 4.096.

Syntax:

```
X25 Config>SET PVC ?
LOW
HIGH
```

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
Port(serial0/0-serial0/2): serial0/0
PVC low(0-4096)[0]? 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
Port(serial0/0-serial0/2): serial0/0
PVC high(0-4096)[0]? 10
X25 Config>
```

o) 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.

Example:

```
X25 Config>SET SPEED
Port(serial0/0-serial0/2): serial0/0
Port speed rate[9600]? 19200
X25 Config>
```

Note: In cases where the lines are DTE (at a physical layer) this value is indifferent as the clock is external except where you are using line 2. Here the exact external clock value must be configured.

p) 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 4.096.

Syntax:

```
X25 Config>SET SVC ?
LOW
HIGH
```

SET SVC LOW

Configures the lowest SVC number that can be used in X.25 communications. The default value is 100.

Example:

```
X25 Config>SET SVC LOW
Port(serial0/0-serial0/2): serial0/0
SVC low(0-4096)[100]? 120
X25 Config>
```

SET SVC HIGH

Configures the highest SVC number that can be used in X.25 communications. The default value is 100.

Example:

```
X25 Config>SET SVC HIGH
Port(serial0/0-serial0/2): serial0/0
SVC high(0-4096)[100]? 110
X25 Config>
```

q) SET T1

Configures T1, this is the maximum wait time in tenths of seconds for 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 100.

Example:

```
X25 Config>SET T1
Port(serial0/0-serial0/2): serial0/0
Timer T1(1-100)[10]? 2
X25 Config>
```

r) SET T3

Configures T3, this is the maximum time for inactivity on the line in tenths of 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 100.

Example:

```
X25 Config>SET T3
Port(serial0/0-serial0/2): serial0/0
Timer T3(1-100)[60]? 70
X25 Config>
```

1.13. EXIT

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

Syntax:

```
X25 Config>EXIT
```

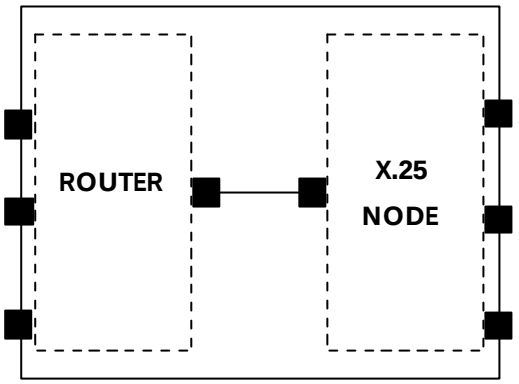
Example:

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

2. 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       Con    Type of interface             CSR     CSR2  int
 ethernet0/0     LAN1   Fast Ethernet interface   fa200e00            27
 serial0/0       WAN1   X25                       fa200a00 fa203c00   5e
 serial0/1       WAN2   X25                       fa200a20 fa203d00   5d
 serial0/2       WAN3   X25                       fa200a60 fa203f00   5b
 bri0/0          ISDN1  ISDN Basic Rate Int       fa200a40 fa203e00   5c
 x25-node        ---    Router->Node                     0             0
Config>
```

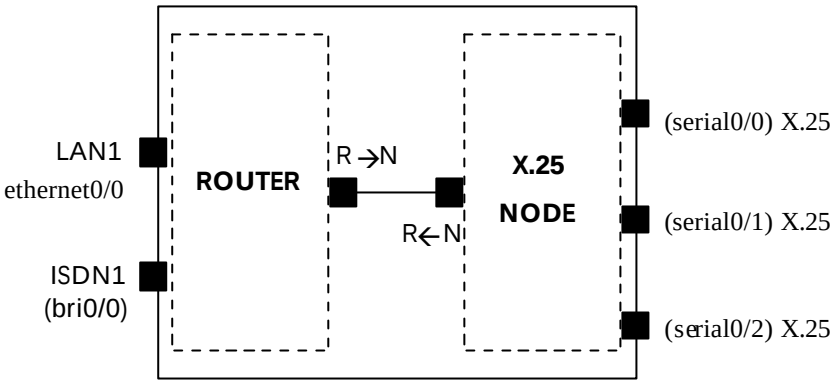
The first column indicates the interface identifier and the second the physical connector the interface corresponds to, the third specifies the programmed interface type, the CSR, CSR2 and int columns refer to the memory positions within the device and the interruption addresses.

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:

- 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 displayed 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.

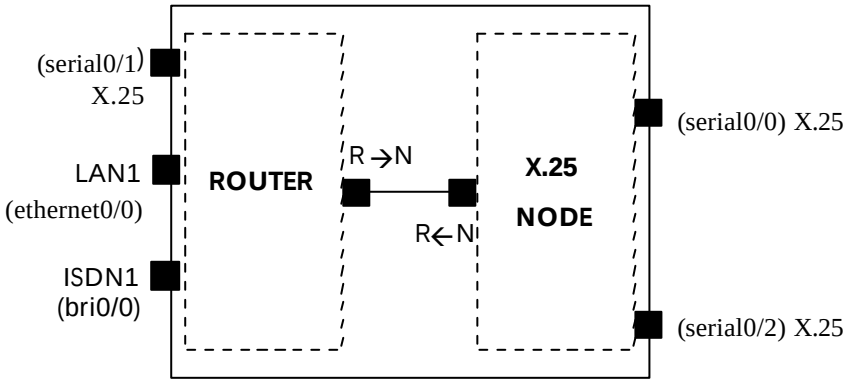
In the following example, Frame Relay protocol is assigned to physical line 2:

```
Config>SET DATA-LINK FRAME-RELAY
Interface name [serial0/0]? serial0/1
Config>list dev

 Interface       Con    Type of interface            CSR     CSR2  int
 ethernet0/0     LAN1   Fast Ethernet interface   fa200e00             27
 serial0/0       WAN1   X25                       fa200a00 fa203c00   5e
 serial0/1       WAN2   Frame Relay               fa200a20 fa203d00   5d
 serial0/2       WAN3   X25                       fa200a60 fa203f00   5b
 bri0/0          ISDN1  ISDN Basic Rate Int       fa200a40 fa203e00   5c
 x25-node        ---    Router->Node                     0              0
Config>
```

As you can see, there is one more interface controlled by the router and one less by the node. You can also see that the interface corresponding to line 2 is number 1 while the interface corresponding to line 1 is number 4.

In this new example, the diagram looks like this:



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.

3. Configuring Global Parameters

The switch system global parameters allow you to define certain parameters common to all ports that support X.25.

The **LIST GLOBAL** command permits you to view these parameters:

```
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. a string of packets with M bit.

The *Check input call* field ensures that the router verifies that a determine NA calling is in its tables. This parameter should always be *Enabled* if you are going to route IP over X.25.

The *Max dynamically added addresses* command permits you to configure how many IP address can be dynamically added, i.e. without having to restart the device in order to activate them.

The *Backup recover attempt time* field permits you to configure a time interval where the calls are tried over the main route to see if this has been reestablished (see document Dm702-I "TCP-IP Configuration" for more information on static routes).

4. Configuring X.25 Parameters

In order to configure the X.25 protocol, carry out the following steps:

From the system console, enter P4 to access the configuration process.

```
*
*P4
Config>
```

- Accessing the X.25 prompt

Enter **NODE X25** to access the X.25 port configuration. A list of the interfaces configured in the **Teldat Router** can be examined by entering **LIST DEVICES** at the user configuration *Config>* prompt.

```
Config>NODE X25
X25 Config>
```

If you wish to configure parameters that affect a single port, another possibility is to enter **NET** and the number of the X.25 interface you wish to configure.

```
Config>NET 1
X25 Config>
```

- The currently configured values of the port you wish to use, viewed on-screen

To do this, enter the **LIST PORT** [serial port identifier] command at the *X25 Config>* prompt; the port identifier is obtained as indicated in the paragraph above, using the command **LIST DEVICES** at the user configuration *Config>* prompt.

```
X25 Config>LIST PORT serial0/0
Port information: serial0/0(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
Speed: 9600
Invert TxClock : Disabled

X25 config>
```

- Configuring X.25 parameters

The meaning of the parameters and commands that modify them are as follows:

4.1. Layer 3 Window

Specifies the maximum number of X.25 packets that can be waiting for acknowledgment. The window is negotiated with your carrier, and can have values which range between 1 and 128. The default value is 2.

Example:

```
X25 Config>SET PACKET-WINDOW
Port(serial0/0-serial0/2): serial0/1
Packet window(1-128)[2]? 3
X25 Config>
```

4.2. Extended Frame Mode

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

Example:

```
X25 Config>ENABLE EXT-FRAME-MODE
Port(serial0/0-serial0/2): serial0/1
X25 Config>
```

Or:

```
X25 Config>DISABLE EXT-FRAME-MODE
Port(serial0/0-serial0/2): serial0/1
X25 Config>
```

4.3. Packet Size

Specifies the maximum size of a X.25 packet. The maximum size is restricted to 4096 octets. The default value is 256 octets.

Example:

```
X25 Config>SET PACKET-SIZE
Port(serial0/0-serial0/2): serial0/1
Packet size(1-4096)[256]? 256
X25 Config>
```

4.4. NA Calling

The NA (Network Address) is the X.25 calling address of the call request packets that exit through the port, independently of the NA with which they was received in the **Teldat Router**. By default this is not programmed.

Example:

```
X25 Config> SET NA-CALLING
Port(serial0/0-serial0/2): serial0/1
NA calling? 40004
X25 Config>
```

The number can consist of a maximum of 15 ASCII characters. In order to delete this, use the **DELETE NA-CALLING** command.

4.5. NR calling process

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

T (Two-way calls): Adds the NA to all calls.

S (Suppress): Suppresses the NA in all calls that pass through the port.

O (Outgoing Calls): Adds the NA to all outgoing calls.

I (Incoming Calls): Adds the NA to incoming calls.

A (Automatic): Depends on the interface, if it is a DCE, NA is added to all calls that enter through the port. If it is a DTE, NA is added to all outgoing calls.

The default value is "O".

Example:

```
X25 Config> SET PROCESS-NA-CALLING
Port(serial0/0-serial0/2): serial0/1
Calling NA process (T,S,I,O,A) [O]? T
X25 Config>
```

In cases where the calling packet already contains an NA, if the length is greater than the programmed NA, only the first digits will be changed. This permits the sub-addressing contained in the calling packet to be conserved.

4.6. PVC low

Indicates the lowest PVC number that can be used in X.25 communications. The range of PVC's your equipment uses will be negotiated with your carrier. The range of values permitted is from 0 to 4.096. The default value is 0.

Example:

```
X25 Config>SET PVC LOW
Port(serial0/0-serial0/2): serial0/1
PVC low(0-4096)[0]? 100
X25 Config>
```

4.7. PVC high

Indicates the highest PVC number that can be used in X.25 communications. The range of PVC's your equipment uses will be negotiated with your carrier. The range of values permitted is from 0 to 4096. The default value is 0.

Example:

```
X25 Config>SET PVC HIGH
Port(serial0/0-serial0/2): serial0/1
PVC high(0-4096)[0]? 200
X25 Config>
```

4.8. SVC low

Indicates the lowest SVC that can be used in X.25 communications. The range of SVCs your equipment uses will be negotiated with your carrier. The range of values permitted is from 0 to 4.096. The default value is 100.

Example:

```
X25 Config>SET SVC LOW
Port(serial0/0-serial0/2): serial0/1
SVC low(0-4096)[100]? 200
X25 Config>
```

4.9. SVC high

Indicates the highest SVC number that can be used in X.25 communications. The range of SVCs your equipment uses will be negotiated with your carrier. The range of values permitted is from 0 to 4.096. The default value is 100.

Example:

```
X25 Config>SET SVC HIGH
Port(serial0/0-serial0/2): serial0/1
SVC high(0-4096)[100]? 300
X25 Config>
```

4.10. Channel Direction

Specifies the logical channel numbers which will be used in order from the lowest to the highest or vice versa. The possible values are DECREASING and INCREASING. The default configuration is DECREASING.

Example:

```
X25 Config>SET CHANNEL-DIRECTION DECREASING
Port(serial0/0-serial0/2): serial0/1
X25 Config>
```

4.11. Interface Direction

The X.25 LAPB layer 2 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.

Example:

```
X25 Config>SET INTERFACE-DIRECTION
Port(serial0/0-serial0/2): serial0/1
Interface address(DTE o DCE) [DCE]? DTE
X25 Config>
```

4.12. Layer 2 Window

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

Example:

```
X25 Config>SET FRAME-WINDOW
Port(serial0/0-serial0/2): serial0/1
Frame window size(1-128) [7]? 8
X25 Config>
```

4.13. Extended Frame Mode

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

Example:

```
X25 Config>ENABLE EXT-FRAME-MODE
Port(serial0/0-serial0/2): serial0/1
X25 Config>
```

4.14. T1

T1 is the maximum wait time in tenths of seconds for frame acknowledgement. Once this has timed out and if no frames have been exchanged, the **Teldat Router** retransmits the frames waiting acknowledgement. The default value is 10. The range of permitted values is between 1 and 100.

Example:

```
X25 Config>SET T1
Port(serial0/0-serial0/2): serial0/1
Timer T1(1-100)[10]? 20
X25 Config>
```

4.15. T3

This is the maximum time for inactivity on the line in tenths of seconds. Once this has timed out and if no frames have been exchanged, the **Teldat Router** sends a RR with poll bit. The default value is 60, and the range of values permitted is between 1 and 100.

Example:

```
X25 Config>SET T3
Port(serial0/0-serial0/2): serial0/1
Timer T3(1-100)[60]? 70
X25 Config>
```

4.16. N1

This is the maximum frame length permitted at reception including the headers and flags. The default value is 263 corresponding to the 256 packet length and the range of values is between 1 and 4096.

Should you wish to modify this enter:

Example:

```
X25 Config>SET N1
Port(serial0/0-serial0/2): serial0/1
Frame length(1-4096)[263]? 264
X25 Config>
```

4.17. N2

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

If you wish to modify the value, enter:

Example:

```
X25 Config>SET N2
Port(serial0/0-serial0/2): serial0/1
Maximum number of transmt.(1-100)[10]? 20
X25 Config>
```

4.18. SABM

Determines if the X.25 layer 2 entity tries to establish continually the link transmitting SABM (Enabled) or waits for the remote entity to establish the link (Disabled). The default value is enabled.

Example:

```
X25 Config>ENABLE SABM-ACTIVE
Port(serial0/0-serial0/2): serial0/1
X25 Config>
```

Or:

```
X25 Config>DISABLE SABM-ACTIVE
Port(serial0/0-serial0/2): serial0/1
X25 Config>
```

4.19. Speed

The bit rate at which the X.25 interface operates is configured through this parameter. The possible values are the range of synchronous speeds from 1.200 bps to 2,048 Mbps. The default is 64 Kbps.

Example:

```
X25 Config>SET SPEED
Port(serial0/0-serial0/2): serial0/1
Port speed rate[9600]? 64000
X25 Config>
```

Chapter 3
X.25 Monitoring

1. X.25 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 **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.

If you wish to execute a command over a specific port, another possibility is:

1. At the (*) prompt, enter **PROCESS 3** (or **P 3**).
2. At the monitoring prompt (+), enter **NET** and the X.25 interface name.
3. At the X.25 protocol monitoring prompt (X25>), use the monitoring commands relative to a specific port.

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

Command	Functions
? (HELP)	Lists the available commands or their options.
CLEAR port channel	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.

1.1. ? (HELP)

Displays a list of available commands or their options.

Syntax:

```
X25>?
```

Example:

```
X25>?
CLEAR port channel
COMPRESSION
DELETE
DISPLAY
LIST
EXIT
X25>
```

1.2. CLEAR port channel

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

Syntax:

```
X25>CLEAR port channel
```

Example:

```
X25>CLEAR
Port(serial0/0-serial0/1): serial0/1
[100]?

Call cleared
X25>
```

1.3. COMPRESSION

Command to view the compression statistics.

Syntax:

```
X25>COMPRESSION ?
RESTART-STATISTICS
STATISTICS
VERSION
```

a) COMPRESSION RESTART-STATISTICS

Deletes the compression statistics.

Example:

```
X25>COMPRESSION RESTART-STATISTICS
X25>
```

b) 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
OUT OF SEQ.   0                                  0
ERR_LEN       0                                  0
================================================================================
STATISTICS BEGINING 04/06/99 00:35:50
SESSIONS PENDING FOR FREE FROM MEMORY            0
X25>
```

c) COMPRESSION VERSION

Indicates the compression software version.

Example:

```
X25>COMPRESSION VERSION

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

1.4. DELETE

Command to delete the traffic and released calls statistics.

Syntax:

```
X25>DELETE ?
CALLS
FRAMES
FRAME-ERRORS
TRAFFIC
```

a) DELETE CALLS

Deletes the buffer where the released call information is stored.

Example:

```
X25>DELETE CALLS

Released calls buffer deleted

X25>
```

b) 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
Port(serial0/0-serial0/1): serial0/0

Transmitted and received frames counters cleared

X25>
```

c) 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>
```

d) 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
Port(serial0/0-serial0/1):

Packet counters cleared

X25>
```

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
DIAGNOSTICS
PORT-STATUS
```

a) DISPLAY CAUSES

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

Example:

```
X25>DISPLAY CAUSES

Cause Code (in hex)(0-FF): 9

Cause (9):  Out of order

X25>
```

b) DISPLAY DIAGNOSTICS

Displays the diagnosis interpretation which is entered as hexadecimal parameter.

Example:

```
X25>DISPLAY DIAGNOSTICS

Diagnostic Code (in hex)(0-FF): 01

Diagnostic (1):  Invalid P(S)

X25>
```

c) 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
Port(serial0/0-serial0/1): serial0/0
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>
```

1.6. LIST

Lists a series of calls and traffic statistics.

Syntax:

```
X25>LIST ?
ACTIVE-CALLS
FRAMES
FRAME-ERRORS
RELEASED-CALLS
TRAFFIC
```

a) 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:

```
X25>LIST ACTIVE-CALLS
Port(serial0/0-serial0/1): serial0/0

No calls at this port

X25>
```

```
X25>LIST ACTIVE-CALLS
Port(serial0/0-serial0/1): serial0/2

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: *Incoming* ***(IN),*** *Outgoing* ***(OUT)*** or *Permanent* ***(PER).***
PROTOCOL	Indicates the protocol used in the communication. This can be: ***DSA, IP, QLLC, VTX*** *or* ***X.28***. 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.

b) 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
Port(serial0/0-serial0/2): serial0/1

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.*
UI	Unnumbered information frames (Only in LAPD links).

Lastly, in the **Errors in N(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.

c) 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>
```

d) 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
  3  244 OUT        IP            2028 00 00  REQ  09:29:22  09/06/99
                                  1028             11:32:57  09/06/99
  3  240 OUT        IP            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: *Incoming* ***(IN),*** *Outgoing* ***(OUT)*** or *Permanent* ***(PER).***
PROTOCOL	Indicates the protocol used in the communication. This can be: ***DSA, IP, QLLC, VTX*** *or* ***X.28***. In cases where it is none of the above, the called packet's *User Data* 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: Internal (INT), release Indication (IND): generated by the DCE and release Request (REQ): 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.

e) 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
Port(serial0/0-serial0/2): serial0/1
LCN       TRANSMITTED     RECEIVED
100                0            0

TOTAL              0            0

X25>
```

1.7. EXIT

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

Syntax:

```
X25>EXIT
```

Example:

```
X25>EXIT
+
```