Teldat Router

LAN-QLLC and SDLC-QLLC handlers

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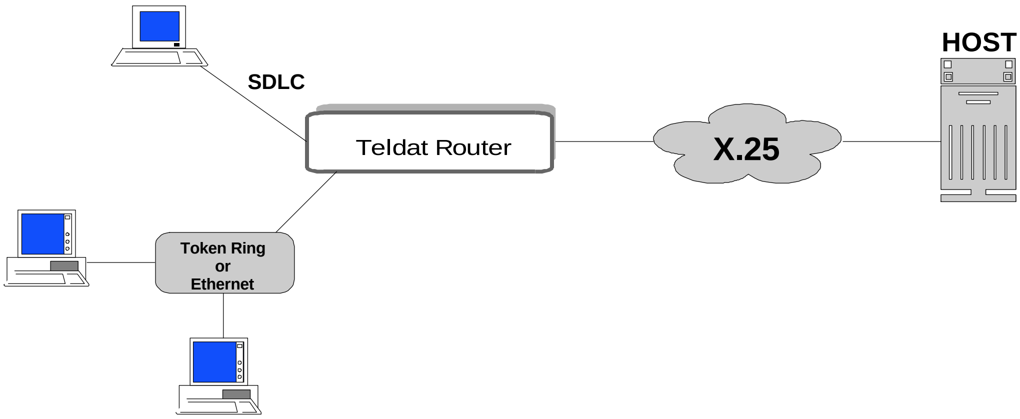
Chapter 1
Introduction

1. LAN-QLLC and SDLC-QLLC Handlers Introduction

This document describes the **Teldat Router** LAN-QLLC and SDLC-QLLC handlers that allow transport of SNA traffic through X.25 networks according to the QLLC protocol.

The **Teldat Router** allows physical units 2.0 or 2.1 connected in Token Ring, Ethernet or SDLC local networks to communicate with the Host entering the FEP* directly through the X.25 network. A LAN-QLLC handler is used for the access to QLLC of traffic coming from Token Ring or Ethernet. A SDLC-QLLC handler is used for the access to QLLC of traffic coming from SDLC lines.

Teldat Router applies the treatment required to match the protocols and norms used in the local network with those expected by FEP in the X.25 network.



Through **Teldat Router** the final workstations operate in the same manner as if they were directly connected to the Host through the Token Ring or Ethernet network. From their point of view the X.25 network is completely transparent.

From the Host point of view, all the traffic coming from the final workstations comes with the same format, thus not requiring any programming in the FEP in order to distinguish between stations connected to Token Ring, Ethernet or SDLC.

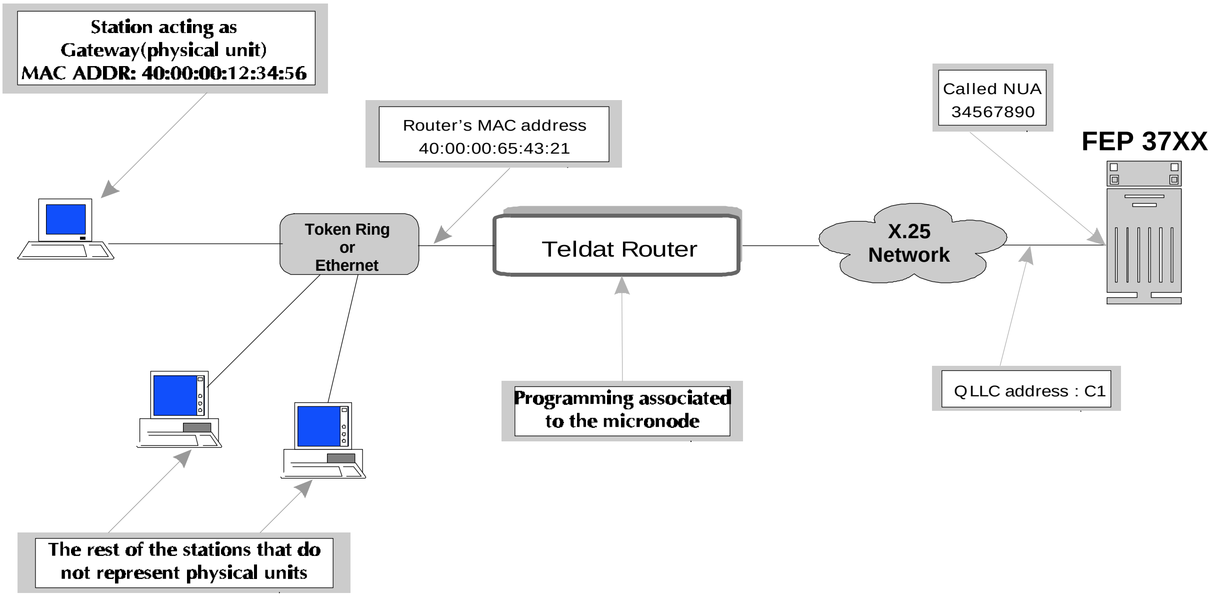
* Front End Processor.

Chapter 2
LAN-QLLC Configuration Example

1. Introduction

A number of parameters must be carefully programmed so that **Teldat Router** can perform the QLLC matching functions properly. Next there is a general explanation of the different elements to be configured and in the following sections there is a specific description of each of the configuration commands.

For this description we shall consider a particular case with specific values and emphasise the key concepts that allow us to perform a correct configuration.



2. Key elements for configuration

PU MAC address

The PU or physical unit is the element that acts as gateway for the rest of the stations. This station's MAC address is the only one that the router has to know, and thus, it is part of its configuration. The MAC addresses of the remaining stations, where only logic units are supported, are of no interest for the router configuration.

In the example this address will be 40:00:00:12:34:56. Notice that the address has been expressed separating the octets by a colon mark. This means that the address has been expressed in Token Ring format (non canonical). Since in the example the LAN is considered to be a Token Ring, all the addresses will be expressed in Token Ring format.

Even though in this example only one physical unit has been considered, it is possible to configure several units, with the restriction that one X.25 logic channel is required in order to channel the traffic coming from each PU. This restriction is not imposed by a **Teldat Router** limitation but by the QLLC protocol itself.

Router MAC address

The traffic coming out from the PU must be directed towards the router's MAC address. For this purpose, it is necessary to configure the appropriate parameter in the operating system in use. For the case of OS/2 Communication Server this parameter is called *"main system destination address"*.

In the example this address will be 40:00:00:65:43:21

If the router's own MAC address is not configured, the router will use, by default, a globally managed address (most significant bit set to zero) this address is based on the device's serial number in order to ensure that two different devices do not have the same address. If you wish to work with locally managed addresses, the required locally managed address (second MSB set to one) will have to be configured in the Token Ring interface. Notice that a locally managed address has been used in the example.

The IEEE distinguishes between globally managed addresses and locally managed addresses or managed addresses.

In a globally managed address:

- The first three octets are managed by the IEEE itself and indicate the device's manufacturer. IEEE ensures that two different manufacturers do not have the same identification. In the case of **Teldat**'s devices the first three octets are always 00-A0-26 in canonical format or if preferred 00:05:64 in Token Ring or IBM format.
- The last three octets are managed by the manufacturer who ensures that two different devices do not have the same address. Usually this part of the MAC address is based on the device's serial number.

In the case of a locally managed address it is the owner of the device who assigns an address and makes sure that it is not repeated within its organisation.

The address type can be distinguished by the value of the second MSB in the first octet:

Byte value	Address type	Example
0	Globally managed	00:05:64:00:00:01
1	Locally managed	40:00:00:00:00:01

The first octet is the one located to the left. In our example the values are 00 and 40, which in binary would be 00000000 and 01000000. In the first case the value of the second most significant byte is 0 (which corresponds to a globally managed type address), whereas in the second is 1 (locally managed address). The byte that will be considered most significant is the one located to the left.

Called NUA associated to the PU

An X.25 connection between the router and the FEP is established for each PU. When configuring the **Teldat Router** to provide service to a PU an associated X.25 network number must be indicated. This allows different PUs to call different FEPs.

Alternative NUA called associated to the PU

This has the same function as the associated NUA (Network User Address) but is used optionally if you can't establish an X.25 connection with the associated NUA (destination out of order, destination busy etc.).

Calling NUA associated to the PU

Sometimes it is necessary to sent the calling device's NUA so it can identify itself to the FEP. As the network might not insert this, you can configure the device to send the calling NUA.

QLLC address

This is the address used as the first octet in all QLLC commands. This address is usually given the value C1.

Programming associated to the micronode

As indicated in the previous section, each PU is assigned the X.25 network number the device has to call. This X.25 call is started in the router and sent to the X.25 node integrated in **Teldat Router**[1].

When the call reaches the node it will be treated as the rest of the other calls. It is necessary therefore to configure all the required parameters in the node so that the call is routed to the appropriate port and comes out with the appropriate values according to the characteristics of the leased X.25 line.

This node configuration involves:

1. Adding the routing input/inputs to route the QLLC call towards the required port.
2. Programming the appropriate C.25 values in the output port.

[1] *For further details on the two virtual devices, router and X.25 node, integrated in the Teldat Router please see the "Teldat Router Configuration" chapter in the Configuration and Monitoring manual.*

3. Required Steps in Configuration

There are two groups of parameters to be configured:

1. LAN-QLLC handler
2. LAN interface general parameters
3. LAN interface LLC parameters
4. Associated programming in the X.25 node.

In the following examples it is assumed that:

- The 0 interface is a LAN Token Ring
- We intend to use the connector indicated as line 2 as the output port in the serigraphy, this interface is defined with number 6 in the internal list of the device's[2] interface.

3.1. LAN-QLLC Handler

Accessing the LAN-QLLC handler configuration from the initial prompt:

```
*PROCESS 4
Config> PROTOCOL LAN-QLLC  or Config> P 22
Configuration SNA LAN-QLLC
LAN-QLLC Cfg>
```

Adding the LAN interface:

```
LAN-QLLC Cfg> ADD INTERFACE
Type local SAP value in hex (range 4 - fc) [4]? 4
LAN-QLLC Cfg>
```

Note.- In systems where both SNA traffic through LAN-FR and LAN-QLLC exists, the LAN interfaces for LAN-QLLC and LAN-FR protocol handlers must not be configured with the same SAP.

Adding the PU:

```
LAN-QLLC Cfg> ADD PU
Type PU MAC address []? 40:00:00:12:34:56
Type remote SAP value in hex (range 4 - fc) [4]?
Type X.25 NUA ? 34567890
Exists alternate NUA (Yes/No)(N)? Y
Type alternate X.25 NUA ? 34567891
Calling NUA X.25?
Type QLLC address in hex (range 0 - ff) [C1]? c1
LAN-QLLC Cfg>
```

[2] *For details on how to find out the internal number that identifies each interface please see the "Teldat Router Configuration" chapter, in the Configuration and Monitoring manual.*

Enabling the protocol:

```
LAN-QLLC Cfg> ENABLE
LAN-QLLC Cfg>
```

The configuration required in the LAN-QLLC handler is now complete in the example case. Next, it is possible to check that the configuration is correct with the **LIST** command:

```
LAN-QLLC Cfg> LIST ALL
Protocol Status : ENABLED
-------------------------
INTERFACE used:  0   Local SAP: 04
----------------------------------
Num. SAP MAC Address                           NUA to connect  Calling NUA  Add
                                               Alternate NUA
1    04  02-00-00-48-2C-6A 40:00:00:12:34:56 34567890                     C1
                                               34567891
LAN-QLLC Cfg>
```

To end, exit the protocol configuration:

```
LAN-QLLC Cfg> EXIT
Config>
```

3.2. LAN Interface

The significant parameters in the example relevant to the LAN interface configuration are explained below:

Accessing the LAN interface configuration:

```
Config> NETWORK 0
-- Config of the Token Ring Interface --
TKR config>
```

The maximum frame size is configured so that it matches the one used in Token Ring:

```
TKR config> PACKET-SIZE
Packet Size (1470,2052,4399,8130,11407,17749)[1470]? 2052
TKR config>
```

As we are operating with managed addresses the router's MAC own address must be configured:

```
TKR config> SET MAC-ADDRESS
MAC address  [00:00:00:00:00:00]? 40:00:00:65:43:21
TKR config>
```

To check the configuration:

```
TKR config> LIST
Packet size:     2052
Speed:           16 Mbps
Media:           UTP media
RIF aging:       120
Source Routing:  DISABLED
MAC address:     40:00:00:65:43:21
TKR config>
```

To end, exit interface configuration:

```
TKR config> EXIT
Config>
```

3.3. LAN interface LLC parameters

The previous section has not dealt with the LLC configuration (Logical Link Control) parameters in the LAN interface. When this parameters are not configured, they are given default values. For most cases it is recommended not to change the default values. If you required to change a parameter, access the configuration through the following command:

```
TKR config> LLC
LLC user configuration
LLC Cfg>
```

To display current values:

```
LLC Cfg> LIST
No LLC configuration record found for this interface.
Default values are used.
Reply Timer(T1):                     1 seconds
Receive ACK Timer(T2):               1 100miliseconds
Inactivity Timer(Ti):                30 seconds
Max Retry value(N2):                 8
Rcvd I-frames before Ack(N3):        1
Transmit Window(Tw):                 2
Receive Window(Rw):                  2
Acks needed to increment Ww(Nw):     1
LLC Cfg>
```

To change the values use the **SET** command.

3.4. Programming associated to the X.25 node

This section gives a brief description of the configuration required in the example case. It also includes some comments about certain aspects that may obstruct a correct configuration. In any case, for a correct node configuration it is always advisable to refer to the corresponding manual.

Accessing node configuration

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

A routing input is added for the X.25 network number indicated when adding the PU:

The correct configuration of the routing table is one of the most important points to ensure that the QLLC call exits through the required port. As previously pointed out, we intended the call to come out through port 6 in the example case. For this purpose it is necessary to analyse the routing table and add, delete or modify the appropriate inputs.

Supposing the table is as follows:

```
X25 Config> LIST ROUTING
Con      Ifc   Type of interface  CSR       CSR2      int
---      4     Router ->Node      0                   0
---      5     Node->Router       0                   0
---      10    XOT                0                   0
ISDN 1   2     ISDN               F001640   F000E00   9C
ISDN 1   3     Channel B: FR      0                   0
ISDN 2   7     ISDN D channel     A000000             1B
ISDN 2   8     ISDN D channel     A200000             1B
ISDN 2   9     ISDN B channel     F001660   F000F00   9B
LAN      0     Ethernet           9000000             1C
WAN1     1     Frame Relay        F001600   F000C00   9E
WAN2     6     X25                F001620   F000D00   9D

Entry    Port     priority    routing   NA                 UD
1        10(XOT)  0           N         234286921
2        8(X25)   2           N         XXXXXXXXXXXXXXX
3        6(X25)   1           N         2323231XXX
X25 Config>
```

The port with highest priority is port 1 (priority 0) and this will be the first that the node will use to try routing. However, as the NA does not coincide with the called NN value in our example, this input will not give rise to any problems.

The following input according to the priority order is input 3 (priority 1). This input routes the traffic towards port 6 which is the actual target in this case. However, the NA still has wildcards that do not coincide with the one in the example. This input will not give any problems but will not solve the routing either.

The next input to be processed by the node is number 2 (priority 2).This input has a universal wildcard in the NA field and therefore coincides with the all the called NAs. Also the port where this input routes the traffic is port 8, not the port required in this example. Therefore the input to be added in this case has to be processed before this one otherwise the traffic from the programmed PU will exit through port 8.

The easiest solution is to add an input with higher priority than input 2 and with the same network number as the example. Since the priority of input 2 is 2, the priority of the new input must be either 0 or 1 (the lower value, the higher the priority):

```
X25 Config> ADD ROUTING

Con      Ifc    Type of interface    CSR       CSR2      int
---      4      Router ->Node        0                   0
---      5      Node->Router         0                   0
---      10     XOT                  0                   0
ISDN 1   2      ISDN                 F001640   F000E00   9C
ISDN 1   3      Channel B: FR        0                   0
ISDN 2   7      ISDN D channel       A000000             1B
ISDN 2   8      ISDN D channel       A200000             1B
ISDN 2   9      ISDN B channel       F001660   F000F00   9B
LAN      0      Ethernet             9000000             1C
WAN1     1      Frame Relay          F001600   F000C00   9E
WAN2     6      X25                  F001620   F000D00   9D

Number of routing port Ports(6-10)   Router(4): 6
Write priority(0-9)[0]? 1
Write routing(S,N,E)[N] N
Value of NA? 34567890
Protocol identifier (hex): [0]?
X25 Config>
```

The X.25 node manual contains further examples of different situations using the re-routing field to have the output through an alternative port when the main port is out of service.

Output port parameter configuration

The default configuration for the X.25 ports is the following:

```
X25 Config> LIST PORT 6
Port Information: 6(X25)
Layer 3 Window: 2
Packet ext mode:  Disabled
Packet Length: 128
NA calling:
NA calling process: Automatic
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: 64000
X25 Config>
```

In the example case, these parameters must be adapted to those of the leased X.25 line. Particularly, level windows 2 and 3 should be checked, whether the extended packet is used or not mode (module 8 or 128), leased X.25 packet size, SVCs, PVCs, speed, etc. With respect to the calling NA, if the X.25 network is public it will not have to be entered as the network will do it unless the Host requires additional sub-addressing in order to identify the line.

Configuring the maximum message size in X.25

The command **SET DATAGRAM-LENGTH** indicates to the **Teldat Router** the maximum message size in X.25, taking for the largest X.25 packet sequence with the M bit set to 1, ending with a packet with the M bit set to 0.

Rounding off for the example case, the following can be programmed:

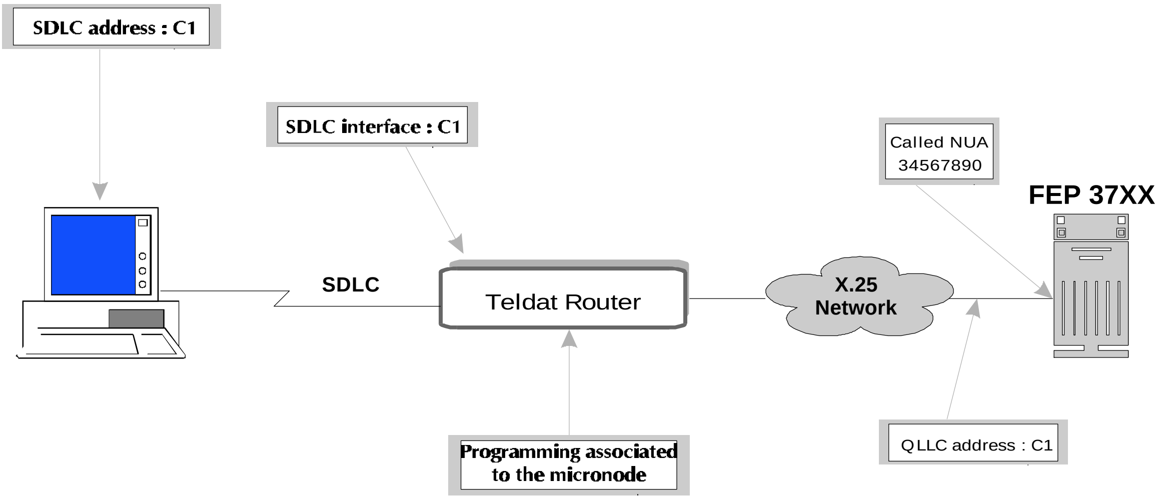
```
X25 Config> SET DATAGRAM-LENGTH
Maximum datagram length[256-18000][128]? 2200
X25 Config>
```

Since the largest frame size used in Token Ring was limited to 2,052.

Chapter 3
SDLC-QLLC Configuration Example

1. Introduction

The following is an explanation of a configuration example very similar to the one analysed in the previous section but this time for SDLC-QLLC. Even in the case that the system should only be SDLC (with no LAN) it is convenient that you read the previous example since many of the concepts in it are also applicable to this case and have been explained here in greater detail.



2. Key elements for configuration

SDLC interface

Corresponds to the **Teldat Router** interface that has been defined as SDLC and to which the PU is connected. Number 1 in the example.

SDLC address

The elements connected to **Teldat Router** through SDLC links must behave as secondary stations. This parameter is the SDLC address of the said secondary stations. Value C1 in the example.

Called NUA associated to the PU

An X.25 connection is established between the router and FEP for each PU. When configuring **Teldat Router** to give service to a PU an associated X.25 network number is given. This allows different PUs to call different FEPs.

Alternative NUA called associated to the PU

This has the same function as the associated NUA (Network User Address) but is used optionally if you can't establish an X.25 connection with the associated NUA (destination out of order, destination busy etc.).

Calling NUA associated to the PU

Sometimes it is necessary to sent the calling device's NUA so it can identify itself to the FEP. As the network might not insert this, you can configure the device to send the calling NUA.

XID support

There exist some outdated devices that operate over SDLC and do not allow XID frame exchange, or whose configuration has this facility disabled. For these devices the router allows programming of '0' XID with 12 hexadecimal characters size. This XID will be the one that transmits the router when the connection is activated, instead of requesting it from the device.

Unsuccessful calls

This facility is not configurable in the router and is performed automatically. The router carries out a call through X.25 to the programmed NN as soon as the PU replies to the XID frames or when the SDLC interface's physical signals are active if the XID has been programmed in the handler. If it is not possible to establish the connection, the router will try again every 10 seconds. Every each 10 unsuccessful calls, the router will automatically increase the interval between calls, thus, the intervals between calls will be 10 seconds, 2 minutes, 4 minutes, 6 minutes, and so forth until an interval of 15 minutes between calls is reached. To initialise the interval at 10 seconds, simply disable the SDLC physical signals or reinitialise the session's statistics in the handler monitoring menu.

Programming associated to the micronode

As indicated in the previous section, each PU is assigned the X.25 network number the device has to call. This X.25 call is started in the router and sent to the X.25 node integrated in **Teldat Router**.

When the call reaches the node it will be treated as the rest of the other calls. It is necessary therefore to configure all the required parameters in the node so that the call is routed to the appropriate port and comes out with the appropriate values according to the characteristics of the leased X.25 line.

This node configuration involves:

1. Adding the routing input/inputs to route the QLLC call towards the required port.
2. Programming the appropriate C.25 values in the output port.

3. Required Steps in Configuration

There are three groups of parameters to be configured:

- The SDLC-QLLC handler
- The SDLC interface
- The X.25 node

In the following examples interface 1 is considered to be an SDLC link

3.1. SDLC-QLLC Handler

Accessing the LAN-QLLC handler configuration from the initial prompt:

```
*PROCESS 4
Config> PROTOCOL SDLC-QLLC
Configuration SNA SDLC-QLLC
SDLC-QLLC Cfg>
```

Note: In systems with simultaneous SNA through FRAME RELAY and QLLC traffic the different traffic handlers cannot share the same SDLC interface.

Adding the PU

```
SDLC-QLLC Cfg> ADD PU
Type the number of interface [2]? 1
Type SDLC Address in hex (range 1 - fe) [1]? C1
Type X.25 NUA? 34567890
Exists alternate NUA (Yes/No)(N)? Y
Type alternate X.25 NUA ? 34567891
Calling NUA X.25?
Confirm if PU supports XID frames (Yes/No)(Y)?N
Type XID (12 hexa digits) []? 020001D04545
SDLC-QLLC Cfg>
```

Enabling the protocol

```
SDLC-QLLC Cfg> ENABLE
SDLC-QLLC Cfg>
```

The configuration needed in the SDLC-QLLC handler for the example case is now complete. You can check that the configuration is correct through the **LIST** command:

```
SDLC-QLLC Cfg> LIST ALL
Protocol Status : ENABLED
-----------------------------------

Num.   SDLC int   SDLC Add   X.25 NUA       Calling NUA   XID Used
                             Alternate NUA
----------------------------------------------------------------------
1      1          C1         34567890       012345678901  020001D04545
                             34567891
SDLC-QLLC Cfg>
```

To end, exit the protocol configuration:

```
SDLC-QLLC Cfg> EXIT
Config>
```

3.2. SDLC Interface

The interface used as SDLC must be configured.

```
Config> SET DATA-LINK SDLC
which port will be changed?[1]? 1
Config>
```

The following is an explanation on the parameters of special significance regarding the SDLC interface in the example:

Accessing SDLC interface configuration

```
Config> NETWORK 1
SDLC user configuration
Creating a default configuration for this link
SDLC 1 Config>
```

Checking SDLC link values

Through the **LIST LINK** command it is possible to see the default configuration values.

```
SDLC 1 Config> LIST LINK
Link configuration for: LINK_1 (ENABLED)

Default role:  PRIMARY    Type:         POINT-TO-POINT
Duplex:        FULL       Modulo:       8
Idle state:    Flag       Encoding:     NRZ
Clocking:      INTERNAL   Frame Size:   2048
Speed:         64000      Cable:        DCE

Timers:     XID/TEST response:    2.0 sec
            SNRM response:        2.0 sec
            Poll response:        0.5 sec
            Inter-poll delay:     0.2 sec
            RTS hold delay:       DISABLED
            Inter-frame delay:    DISABLED

Counters:     XID/TEST retry:    4
              SNRM retry:        6
              Poll retry:        10
SDLC 1 Config>
```

These values must be modified in accordance with the system requirements. For instance, if you are working with a terminal that can only operate at a speed of up to 9,600 you would need to do the following:

```
SDLC 1 Config> SET LINK SPEED
Internal Clock Speed[64000]? 9600
SDLC 1 Config>
SDLC 1 Config>LIST LINK
Link configuration for: LINK_1 (ENABLED)

Default role:   PRIMARY    Type:         POINT-TO-POINT
Duplex:         FULL       Modulo:       8
Idle state:     Flag       Encoding:     NRZ
Clocking:       INTERNAL   Frame Size:   2048
Speed:          64000      Cable:        DCE

Timers:       XID/TEST response:    2.0 sec
              SNRM response:        2.0 sec
              Poll response:        0.5 sec
              Inter-poll delay:     0.2 sec
              RTS hold delay:       DISABLED
              Inter-frame delay:    DISABLED

Counters:     XID/TEST retry:    4
              SNRM retry:        6
              Poll retry:        10
SDLC 1 Config>
```

These values must be modified in accordance with the system requirements. For instance, if you are working with a terminal that can only operate at a speed of up to 9,600 you would need to do the following:

```
SDLC 1 Config> SET LINK SPEED
Internal Clock Speed[64000]? 9600
SDLC 1 Config>
```

3.3. Programming associated to the X.25 node

This section gives a brief description of the configuration required in the case of the example. It also includes some comments about certain aspects that may impede a correct configuration. In any case, for a correct node configuration it is always advisable to refer to the corresponding manual.

Accessing node configuration

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

A routing input is added for the X.25 network number indicated when adding the PU

The correct configuration of the routing table is one of the most important points to ensure that the QLLC call exits through the required port. It was previously pointed out that in the example we intend the call to come out through port 6. For this purpose it is necessary to analyse the routing table and add, delete or modify the appropriate inputs.

Supposing the table is as follows:

```
X25 Config> LIST ROUTING

Con      Ifc   Type of interface   CSR       CSR2      int
---      4     Router ->Node       0                   0
---      5     Node->Router        0                   0
---      10    XOT                 0                   0
ISDN 1   2     ISDN                F001640   F000E00   9C
ISDN 1   3     Channel B: FR       0                   0
ISDN 2   7     ISDN D channel      A000000             1B
ISDN 2   8     ISDN D channel      A200000             1B
ISDN 2   9     ISDN B channel      F001660   F000F00   9B
LAN      0     Ethernet            9000000             1C
WAN1     1     SDLC                F001600   F000C00   9E
WAN2     6     X25                 F001620   F000D00   9D

Entry    Port       priority   routing    NA                  UD
1        10(XOT)    0          N          234286921
2        8(X25)     2          N          XXXXXXXXXXXXXX
3        6(X25)     1          N          2323231XXX
X25 Config>
```

The port with highest priority is port 1 (priority 0) and this will be the first that the node will use to try routing. However, as the NA does not coincide with the called NN value in our example, this input will not give rise to any problems.

The following input according to the priority order is input 3 (priority 1). This input routes the traffic towards port 6 which is the actual target in this case. However, the NA still has wildcards that do not coincide with the one in the example. This input will not give any problems but will not solve the routing either.

The next input to be processed by the node is number 2 (priority 2).This input has a universal wildcard in the NA field and therefore coincides with all the called NAs. Also the port where this input routes the traffic is port 8, not the port required in this example. Therefore the input to be added in this case has to be processed before this one otherwise the traffic from the programmed PU will exit through port 8.

The easiest solution is to add an input with higher priority than input 2 and with the same network number as the example. Since the priority of input 2 is 2, the priority of the new input must be either 0 or 1 (the lower value, the higher the priority):

```
X25 Config> ADD ROUTING

Con      Ifc    Type of interface    CSR       CSR2     int
---      4      Router ->Node        0                   0
---      5      Node->Router         0                   0
---      10     XOT                  0                   0
ISDN 1   2      ISDN                 F001640   F000E00   9C
ISDN 1   3      Channel B: FR        0                   0
ISDN 2   7      ISDN D channel       A000000             1B
ISDN 2   8      ISDN D channel       A200000             1B
ISDN 2   9      ISDN B channel       F001660   F000F00   9B
LAN      0      Ethernet             9000000             1C
WAN1     1      SDLC                 F001600   F000C00   9E
WAN2     6      X25                  F001620   F000D00   9D

Number of routing port Ports(6-10)   Router(4): 6
Write priority(0-9)[0]? 1
Write routing(S,N,E)[N] N
Value of NA? 34567890
Protocol identifier (hex): [0]?
X25 Config>
```

The X.25 node manual contains further examples of different situations using the re-routing field to have the output through an alternative port when the main port is out of service.

Output port parameters configuration

The default configuration for the X.25 ports is the following:

```
X25 Config> LIST PORT 6
Port Information: 6(X25)
Layer 3 Window: 2
Packet ext mode:  Disabled
Packet Length: 128
NA calling:
NA calling process: Automatic
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: 64000
X25 Config>
```

In the example case, these parameters must be adapted to those of the leased X.25 line. Particularly, level windows 2 and 3 should be checked, whether the extended packet is used or not mode (module 8 or 128), leased X.25 packet size, SVCs, PVCs, speed, etc. With respect to the calling NA, if the X.25 network is public it will not have to be entered as the network will do it unless the Host requires additional sub-addressing in order to identify the line.

Configuring the maximum message size in X.25

The command **SET DATAGRAM-LENGTH** indicates to the **Teldat Router** the maximum message size in X.25, taking for the largest X.25 packet sequence with the M bit set to 1, ending with a packet with the M bit set to 0.

Rounding off for the example case, the following can be programmed:

```
Config X25> SET DATAGRAM-LENGTH
Maximum datagram length[256-18000][128]? 2200
X25 Config>
```

As the largest frame size used in Token Ring was limited to 2,052.

Chapter 4
LAN-QLLC Commands

1. LAN-QLLC Configuration Commands

ADD <element> <parameter> <parameter>

This command defines all the elements required for the protocol operation.

```
LAN-QLLC Cfg> ADD ?
INTERFACE
PU
LAN-QLLC Cfg>
```

ADD INTERFACE <Interface #> <Local SAP #>

This command allows the definition of the interface which is usually 0; and the local SAP for the LLC in the LAN side, which must be a multiple of 4.

Type local SAP value in hex	You need to enter the SAP LLC value which opens the interface in order to give service. This must be distinct from 0 and a multiple of 4.

```
LAN-QLLC Cfg> ADD INTERFACE
Type local SAP value in hex (range 4 - fc) [4]? 4
LAN-QLLC Cfg>
```

ADD PU <MAC Addr> <NUA> <Supports Alt> [<Alternate NUA>] [<Calling NUA>]<QLLC Addr>

This command allows the definition of the SNA PUs that can use the router.

Type PU MAC address	The PU's LAN MAC address must be entered.
Type remote SAP value in hex	You need to enter the SAP LLC value to be used in the remote station. This must be distinct from 0 and a multiple of 4.
Type X.25 NUA	NUA is the network X.25 number that must be used.
Exists alternate NUA	This indicates if you need to call an alternate NUA should there be any problems with the main NUA.
Type alternate X.25 NUA	The alternate NUA is the alternative optional X.25 network number which should be used when necessary.
Calling NUA X.25	The calling NUA is the X.25 network number which is sent in the X.25 call packets as source if this is configured.
Type QLLC address in hex	QLLC address is the hexadecimal value used in the QLLC packets.

```
LAN-QLLC Cfg> ADD PU
Type PU MAC address []? 40:00:00:12:34:56
Type remote SAP value in hex (range 4 - fc) [4]?
Type X.25 NUA ? 34567890
Exists alternate NUA (Yes/No)(N)? Y
Type alternate X.25 NUA ? 34567891
Calling NUA X.25?
Type QLLC address in hex (range 0 - ff) [C1]? c1
LAN-QLLC Cfg>
```

You need to take great care when entering the MAC addresses since it will be interpreted in a different way depending on whether:

The octets are separated by a colon mark (Token Ring, IBM or non canonical format)

Example: 00:05:64:00:00:80

The octets are separated by a hyphen mark or no mark (Canonical or Ethernet format)

Example: 00-A0-26-00-00-01 or 00A026000001

The address is the same in the two examples above. Notice that they represent the same octets "the other way round".

DELETE <element> <parameter> <parameter>

This command allows you to delete elements from the protocol configuration.

```
LAN-QLLC Cfg> DELETE ?
ALL
INTERFACE
PU
LAN-QLLC Cfg>
```

DELETE ALL

Deletes all the configuration and disables the protocol.

```
LAN-QLLC Cfg> DELETE ALL
This Process deletes ALL configuration and disable the router SNA
Confirm delete all configuration (Yes/No) (N)?Y
LAN-QLLC Cfg>
```

DELETE INTERFACE

Deletes the defined INTERFACE.

```
LAN-QLLC Cfg> DELETE INTERFACE
Confirm delete INTERFACE (Yes/No) (Y)?
LAN-QLLC Cfg>
```

DELETE PU <#>

Delete the PU defined in the table as Num <#>.

```
LAN-QLLC Cfg> DELETE PU
Type PU table entry number [1]?
Num. SAP MAC Address                           NUA to connect  Calling NUA  Add
                                               Alternate NUA
-----------------------------------------------------------------------------
1    04   02-00-00-48-2C-6A 40:00:00:12:34:56 34567890                     C1
                                               34567891
Confirm delete selected PU (Yes/No) (Y)?Y
LAN-QLLC Cfg>
```

DISABLE

Disables the protocol the next time the device is booted.

```
LAN-QLLC Cfg> DISABLE
LAN-QLLC Cfg>
```

ENABLE

Enables the SNA handler loading on booting.

```
LAN-QLLC Cfg> ENABLE
LAN-QLLC Cfg>
```

LIST <element> <parameter> <parameter>

Lists the corresponding element configuration.

```
LAN-QLLC Cfg> LIST ?
ALL
INTERFACE
PU
LAN-QLLC Cfg>
```

LIST ALL

Displays all the configuration.

```
LAN-QLLC Cfg> LIST ALL
Protocol Status : ENABLED
-------------------------
INTERFACE used:  0   Local SAP: 04
----------------------------------
Num. SAP MAC Address                          NUA to connect  Calling NUA  Add
                                              Alternate NUA
-------------------------------------------------------------------------------
1    04  02-00-00-48-2C-6A 40:00:00:12:34:56 34567890                     C1
                                              34567891
LAN-QLLC Cfg>
```

LIST INTERFACE

Displays the defined INTERFACE.

```
LAN-QLLC Cfg> LIST INTERFACE
INTERFACE used:  0   Local SAP: 04
----------------------------------
LAN-QLLC Cfg>
```

LIST PU

Displays the defined PUs table.

```
LAN-QLLC Cfg> LIST PU
Num. SAP MAC Address                             NUA to connect  Calling NUA  Add
                                                 Alternate NUA
-----------------------------------------------------------------------------
1    04  02-00-00-48-2C-6A 40:00:00:12:34:56 34567890                     C1
                                                 34567891
LAN-QLLC Cfg>
```

The MAC address is displayed in ETH format (octets separated by hyphen marks) and in IBM format (octets separated by colons).

LIST STATUS

Indicates whether the protocol is enabled.

```
LAN-QLLC Cfg> LIST ALL
Protocol Status : ENABLED
-------------------------
LAN-QLLC Cfg>
```

EXIT

Ends the protocol configuration.

```
LAN-QLLC Cfg> EXIT
Config>
```

2. LAN-QLLC Monitoring Commands

CLEAR <#>

Deletes statistics from the PU sessions.

0 = All

```
LAN-QLLC> CLEAR
Select PU Number (0=All) [0]?1
Statistics of PU:1

MAC Address     : 00:00:C9:IE:E9:93
NUA address     :
QLLC address    : C1
Status          : Session inactive


QLLC calls requested    : 0    QLLC Calls connected    : 0
QLLC calls refused      : 0    QLLC link drops         : 0
Tx QXID                 : 0    Rx QXID                 : 0
Rx QSM                  : 0    Rx QDISC                : 0
Tx QUA                  : 0
Tx QLLC INFO            : 0    Rx QLLC INFO            : 0
Tx Bytes INFO LLC->QLLC : 0


LLC Connections requested    : 0   LLC Connections confirm    : 0
LLC Connections refused      : 0   LLC link drops             : 0
Tx LLC XID                   : 0   Rx LLC XID                 : 0
Tx LLC INFO                  : 0   Rx LLC INFO                : 0
Tx Bytes INFO QLLC->LLC      : 0

LAN-QLLC>
```

LIST <#>

Lists the statistics and states of the defined PUs.

0 = All

The access NUA is displayed when the session is active. This is due to the fact that it could be either the principal or the alternative.

```
LAN-QLLC> LIST
Statistics of PU:1

MAC Address     : 00:00:C9:IE:E9:93
NUA address     :
QLLC address    : C1
Status          : Session inactive
```

```
QLLC calls requested    : 0    QLLC Calls connected   : 0
QLLC calls refused      : 0    QLLC link drops        : 0
Tx QXID                 : 0    Rx QXID                : 0
Rx QSM                  : 0    Rx QDISC               : 0
Tx QUA                  : 0
Tx QLLC INFO            : 0    Rx QLLC INFO           : 0
Tx Bytes INFO LLC->QLLC : 0


LLC Connections requested   : 0   LLC Connections confirm   : 0
LLC Connections refused     : 0   LLC link drops            : 0
Tx LLC XID                  : 0   Rx LLC XID                : 0
Tx LLC INFO                 : 0   Rx LLC INFO               : 0
Tx Bytes INFO QLLC->LLC     : 0

LAN-QLLC>
```

EXIT

Exits the screen.

```
LAN-QLLC> EXIT
+>
```

Chapter 5
SDLC-QLLC Commands

1. SDLC-QLLC Configuration Commands

ADD <element> <parameter> <parameter>

This command defines all the elements required for the protocol operation.

```
SDLC-QLLC Cfg> ADD ?
PU
SDLC-QLLC Cfg>
```

ADD PU <Interface #> <QLLC Addr> <NUA> <Exists Alt> [<alternate NUA>] [<Calling NUA>] <Supports XID> [<Optional type 0 XID>]

This command allows the definition of the SNA PUs that can use the router.

Type the number of interface	You need to enter the SDLC interface number where the PU is to be found.
Type SDLC Address in hex	The SDLC address is the hexadecimal value used in the SDLC interface to access the PU. It is also the QLLC addressed used by the protocol.
Type X.25 NUA	NUA is the network X.25 number that must be used.
Exists alternate NUA	This indicates if you need to call an alternative NUA should there be any problems with the main NUA.
Type alternate X.25 NUA	The alternative NUA is the alternative optional X.25 network number which should be used when necessary.
Calling NUA X.25	The calling NUA is the X.25 network number which is sent in the X.25 call packets as source if this is configured.
Confirm if PU supports XID frames	Indicates if the PU supports XID frame exchange.
Type XID	Optional type 0 XID allows you to program a type 0 XID with a 12 hexadecimal characters size when the PU does not support XID frame exchange.

```
SDLC-QLLC Cfg> ADD PU
Type the number of interface [2]? 1
Type SDLC Address in hex (range 1 - fe) [1]? C1
Type X.25 NUA? 34567890
Exists alternate NUA (Yes/No)(N)? Y
Type alternate X.25 NUA ? 34567891
Calling NUA X.25?
Confirm if PU supports XID frames (Yes/No)(Y)?N
Type XID (12 hexa digits) []? 020001D04545
SDLC-QLLC Cfg>
```

DELETE <element> <parameter> <parameter>

This command allows you to delete elements from the protocol configuration.

```
SDLC-QLLC Cfg> DELETE ?
ALL
PU
SDLC-QLLC Cfg>
```

DELETE ALL

Deletes all the configuration and disables the protocol.

```
SDLC-QLLC Cfg> DELETE ALL
This process deletes ALL configuration and disables the forwarder
Confirm delete ALL configuration (Yes/No) (N)?Y
SDLC-QLLC Cfg>
```

DELETE PU <#>

Deletes the PU defined in the table as Num. <#>.

```
SDLC-QLLC Cfg> DELETE PU
Type PU table entry number [1]?
------------------------------
Num.    SDLC int   SDLC Add   X.25 NUA       Calling NUA   XID Used
                              Alternate NUA
----------------------------------------------------------------------
1       1          C1         34567890       012345678901  020001D04545
                              34567891
Confirm delete of selected PU (Yes/No) (Y)?
SDLC-QLLC Cfg>
```

DISABLE

Disables the protocol the next time the device is booted.

```
SDLC-QLLC Cfg> DISABLE
SDLC-QLLC Cfg>
```

ENABLE

Enables the SNA handler loading on booting.

```
SDLC-QLLC Cfg> ENABLE
SDLC-QLLC Cfg>
```

LIST <element> <parameter> <parameter>

Lists the corresponding element configuration.

```
SDLC-QLLC Cfg> LIST ?
ALL
PU
STATUS
SDLC-QLLC Cfg>
```

LIST ALL

Displays all the configuration.

```
SDLC-QLLC Cfg> LIST ALL
Protocol Status : ENABLED
-----------------------------------

Num.   SDLC int   SDLC Add   X.25 NUA       Calling NUA   XID Used
                             Alternate NUA
----------------------------------------------------------------------
1      1          C1         34567890       012345678901  020001D04545
                             34567891
SDLC-QLLC Cfg>
```

LIST PU

Displays the defined PUs table.

```
SDLC-QLLC Cfg> LIST PU

Num.   SDLC int   SDLC Add   X.25 NUA       Calling NUA   XID Used
                             Alternate NUA
----------------------------------------------------------------------
1      1          C1         34567890       012345678901  020001D04545
                             34567891
SDLC-QLLC Cfg>
```

LIST STATUS

Indicates whether the protocol is enabled.

```
SDLC-QLLC Cfg> LIST STATUS
Protocol Status : ENABLED
-----------------------------------
SDLC-QLLC Cfg>
```

EXIT

Ends the protocol configuration.

```
SDLC-QLLC Cfg> EXIT
Config>
```

2. SDLC-QLLC Monitoring Commands

CLEAR <#>

Deletes statistics from the PU sessions and initializes the minimum interval between connections.

0 = All

```
SDLC-QLLC> CLEAR
Select PU Number (0 = All) [0]?1
Statistics of PU:1

SDLC Link       : 1
SDLC Address    : C1
NN X.25 QLLC    :
Status          : Session Inactive

Link SDLC
Connection requests    : 0    Success connections    : 0
Connections refused    : 0    Link drops             : 0
Tx XID Frames          : 0    Rx XID Frames          : 0
Tx INFO Frames         : 0    Rx INFO Frames         : 0
Tx INFO Bytes          : 0

Link QLLC
Connection requests    : 0    Success connections  : 0
Connections refused    : 0    Link drops           : 0
Tx QXID Frames         : 0    Rx QXID Frames       : 0
Tx QUA Frames          : 0    Rx QSM Frames        : 0
                              Rx QDISC Frames      : 0
Tx INFO Frames         : 0    Rx INFO Frames       : 0
Tx INFO Bytes          : 0

SDLC-QLLC>
```

LIST <#>

Lists the statistics and states of the defined PUs.

0 = All

The access NUA is displayed when the session is active. This is due to the fact that it could be either the principal or the alternative.

```
SDLC-QLLC> LIST
Statistics of PU:1

SDLC Link       : 1
SDLC Address    : C1
NN X.25 QLLC    :
Status          : Session Inactive
```

```
Link SDLC
Connection requests   : 0    Success connections   : 0
Connections refused   : 0    Link drops            : 0
Tx XID Frames         : 0    Rx XID Frames         : 0
Tx INFO Frames        : 0    Rx INFO Frames        : 0
Tx INFO Bytes         : 0

Link QLLC
Connection requests   : 0    Success connections  : 0
Connections refused   : 0    Link drops           : 0
Tx QXID Frames        : 0    Rx QXID Frames       : 0
Tx QUA Frames         : 0    Rx QSM Frames        : 0
                             Rx QDISC Frames      : 0
Tx INFO Frames        : 0    Rx INFO Frames       : 0
Tx INFO Bytes         : 0

SDLC-QLLC>
```

EXIT

Exit the screen.

```
SDLC-QLLC> EXIT
+
```