Teldat Router

LAN-FR and SDLC-FR Handlers in SNA environment

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INDEX

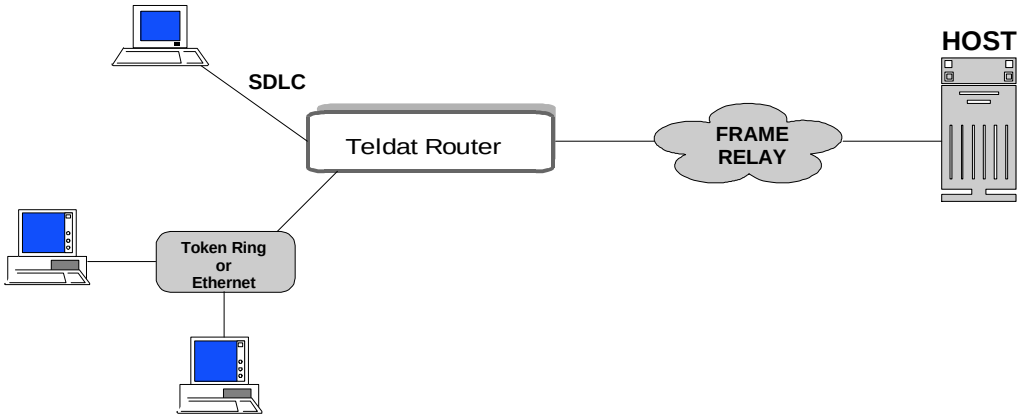
Chapter 1
Introduction

1. Introduction

This document describes the LAN-FR and SDLC-FR handlers of the **Teldat Router,** which permit SNA traffic to be transported through Frame Relay networks, according to IBM´s *Boundary Access Node*[1] (BAN) specification.

The BAN establishes the method for 2.0 or 2.1 Physical Units (PUs) connected in Token Ring or Ethernet local networks to communicate with the Host, entering the FEP[2] directly through the Frame Relay network. The procedures required, when physical units are connected at source to SDLC lines, are also described in the BAN.

The **Teldat Router** carries out the necessary tasks to adapt the local network protocols and norms used, to the ones expected by the FEP in the Frame Relay network. It permits SNA traffic multiplexing of different physical units and the IP protocol traffic through a single Frame Relay permanent circuit.



Through the **Teldat Router,** the end stations work in the same way they would if they were directly connected to the Host through the Token Ring network, Ethernet network, or through SDLC links. The Frame Relay network from this point of view, is totally transparent.

From the Host point of view, all the traffic coming from the end stations arrives with the same format so programming in the FEP is unnecessary to distinguish between stations connected to Token Ring, Ethernet or SDLC. This format is indicated in the BAN, and consists of Token Ring frames encapsulated in Frame Relay frames, according to the RFC 1490 recommendation.

Two detailed examples of device configuration are shown below. The first for LAN environment cases and the second for SDLC environments. As can be observed, both are very similar.

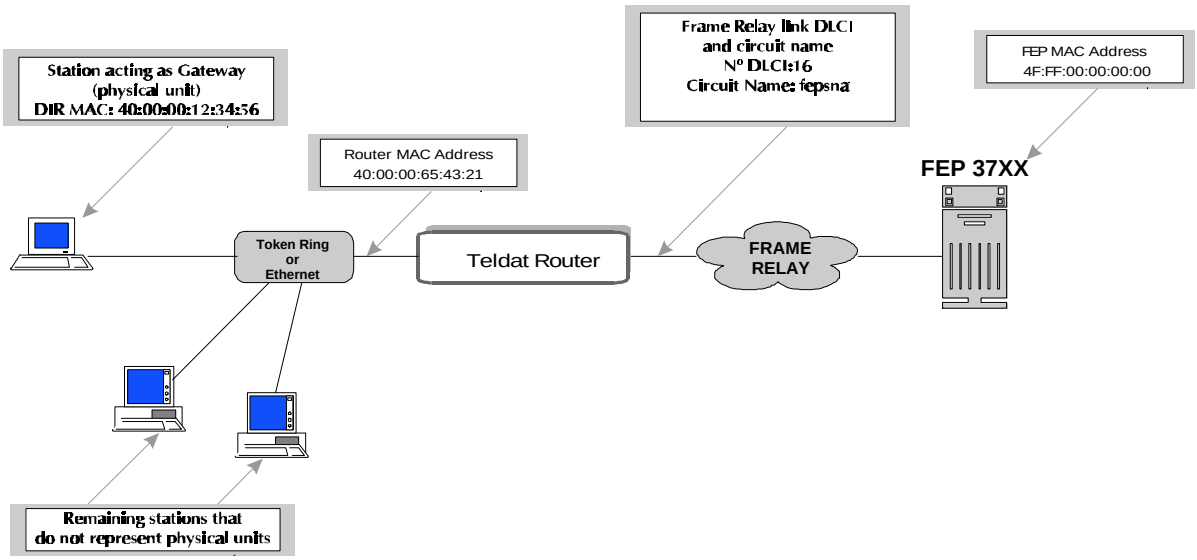
[1] *IBM is a "International Business Corporation" Registered Mark*

[2] Front End Processor

2. Example of LAN-FR environment configuration

For the **Teldat Router** to carry out Boundary Access Node (BAN) adaptation functions properly, it is necessary to carefully program a series of parameters. A general explanation of the different elements that need to be configured is given below, and a specific description of each configuration command is given in further sections.

In this description, a specific case with set values will be considered, with the emphasis on key concepts in order to carry out an accurate configuration.



2.1. Key elements for configuration

PU MAC Address

The Physical Unit (PU) functions as the gateway for the rest of the stations. This station's MAC address is the only one the router needs to know and is part of the configuration. The rest of the stations MAC addresses, where only logic units are supported, are unnecessary for router configuration.

In the example, this address is going to be 40:00:00:12:34:56. As can be observed, the octets in the address have been separated using a colon. This means that the address is shown in Token Ring format (non-canonical format). As the LAN is considered to be a Token Ring, all addresses will be expressed in Token Ring format.

Although in the current example only one physical unit is considered, several can be configured.

Router MAC Address

The PU's outgoing traffic must go to the router MAC address. To do so, the appropriate parameter in the operating system in use needs to be configured. In the OS/2 Communication Server case, this parameter is called *"main system destination address"*.

In the example, this address is 40:00:00:65:43:21

If your own MAC address is not configured, the router will take a globally managed address by default (second bit more significant at zero). This is calculated from the device serial number to ensure that no two devices have the same address. If the managed addresses option is chosen, it will be necessary to configure the required locally managed address (second bit more significant at one) in the Token Ring interface. As can be observed in the example, a managed address is being used.

> ***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 indicates the manufacturer of the device. The IEEE ensures that two different manufacturers do not have the same identification. In **Teldat´s Routers**, the first three octets are always 00-A0-26 in canonical format or 00:05:64 in Token Ring or IBM format.
- The three last octets are managed by the manufacturer, who ensures that there are no two devices with the same address. This part of the MAC address is usually calculated from the device serial number.

In a locally managed address, the proprietor is the person in charge of assigning an address and ensures that, within his organisation, no address will be repeated.

The value of the most significant second bit of the first octet is the digit used to distinguish the type of address:

Bit 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 located to the far left. In our example, the values are 00 and 40, in binary 00000000 and 01000000. In the first case, the value of the most significant second bit is 0 (corresponding to a globally-managed type of address), whereas in the second case it is 1 (locally-managed address). We consider the most significant bit to be the one located on the left.

Frame Relay link DLCI

Several parameters must be configured in order to set the Frame Relay interface. This section will only deal with the ones that are particularly relevant to the LAN-FR handler. When this handler is configured, a link between each PU and the DLCI (Data Link Connection Identifier), through which its traffic exits, is established. This is one of the aspects that demands the most attention. When a PU is added to the handler configuration, the Frame Relay circuit through which the traffic exits is indicated. This circuit must be created as a permanent circuit in the Frame Relay interface configuration, and must match the circuit indicated by the service supplier. When the PU is added, the associated DLCI's name, not number, is indicated. This name consists of an ASCII string with a maximum of eight characters and must match the name given to the created circuit in the Frame Relay interface.

In the example, the circuit is number 16, and is called *"fepsna"*

FEP MAC Address

A LLC 2 connection for each PU is established between the router and the FEP. To do so, each end must have its own MAC address:

- The router's matches the PU MAC address and it is not necessary to program it.

- The FEP has the address indicated in the NCP definition which corresponds to the interface used.

> ***This last parameter is configured in the FEP. Consult your IBM representative for further details. The address usually has a value of 4F:FF:00:00:00:00 and is programmed in the "LINE statement LOCADD" code that defines the Frame Relay Front End Processor (FEP) physical connection.***

In the example, the FEP MAC address is 4F:FF:00:00:00:00

2.2. Steps needed for configuration

The are four groups of parameters to be configured:

- The LAN-FR handler
- The LAN interface general parameters
- The LAN interface LLC parameters
- The Frame Relay interface

In the following examples, the following points will be taken into account:

- The zero interface is a LAN Token Ring
- The Frame Relay interface is the first in the list of interfaces[3]

a) LAN-FR Handler

To access the LAN-FR handler configuration from the starting prompt:

```
*PROCESS 4
User configuration
Config> PROTOCOL LAN-FR
Configuration SNA LAN-FR
LAN-FR Cfg>
```

The LAN interface is added:

```
LAN-FR Cfg> ADD INTERFACE LAN
Type interface number [0]?0
Type local SAP value in hex (range 4 - fc) [4]?4
LAN-FR Cfg>
```

The Frame Relay interface is added:

[3] *Check the Configuration and Monitoring Manual for the **Teldat Router** (Document Dm504-I) for an explanation about the way to find out the internal identification number for each interface.*

```
LAN-FR Cfg> ADD INTERFACE FRAME-RELAY
Type interface number [1]?1
LAN-FR Cfg>
```

The PU is added:

```
LAN-FR Cfg> ADD PU
Type MAC Address of PU (LAN)  []? 40:00:00:12:34:56
Type remote SAP value (LAN) in hex (range 4 - fc) [4]? 4
Type MAC Address of FEP (FR)  []? 4F:FF:00:00:00:00
Type remote SAP value (FR) in hex (range 4 - fc) [4]? 4
Type FR DLCI name (max 8 characters) []? fepsna
LAN-FR Cfg>
```

The protocol is enabled:

```
LAN-FR Cfg> ENABLE
LAN-FR Cfg>
```

This concludes the necessary configuration for the LAN-FR handler for the example given. The configuration can be checked for accuracy through the **LIST** command:

```
LAN-FR Cfg> LIST ALL
Protocol Status : ENABLED
-----------------------------------------
LAN INTERFACE
Interface :   0     SAP Used : 04
-----------------------------------------
FRAME-RELAY INTERFACE
Interface :   1
-----------------------------------------

Num.  LAN MAC Address    SAP LAN  FR MAC Address    SAP FR  DLCI
-------------------------------------------------------------------
1     02-00-00-48-2C-6A  04       F2-FF-00-00-00-00  04      fepsna
      40:00:00:12:34:56           4F:FF:00:00:00:00
LAN-FR Cfg>
```

In order to finish, exit the protocol configuration:

```
LAN-FR Cfg> EXIT
Config>
```

b) LAN Interface

Referring to the LAN interface configuration, the following information is on the parameters in the example which have particular significance.

Access the LAN interface configuration:

```
Config> NET 0

-- Token Ring Config --
TKR config>
```

Configure the maximum frame length so it matches the frame being used in Token Ring:

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

As we are working with management commands it is necessary to configure the router's MAC address:

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

In order to check the configuration, use the **LIST** command:

```
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>
```

In order to finish, exit the interface configuration:

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

c) LAN Interface LLC parameters

In the previous paragraph the LAN interface LLC (Logical Link Control) parameter configurations have not been entered. If these are not configured, the values are achieved by default. In most cases it is recommended that the default values are not changed. Should it be necessary to change a parameter configuration, access is achieved with the following command:

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

To see the 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>
```

In order to change the values use the **SET** command.

d) Frame Relay Interface

For general Frame Relay parameters such as: Committed Information Rate, Committed Burst Size, Excess Burst Size, LMI type, CIR monitoring, congestion monitoring, maximum frame length, type of encryption, line speed, etc.; please consult the Frame Relay manual (Document Dm503-I).

The parameters directly related to the BAN and value examples are shown here.

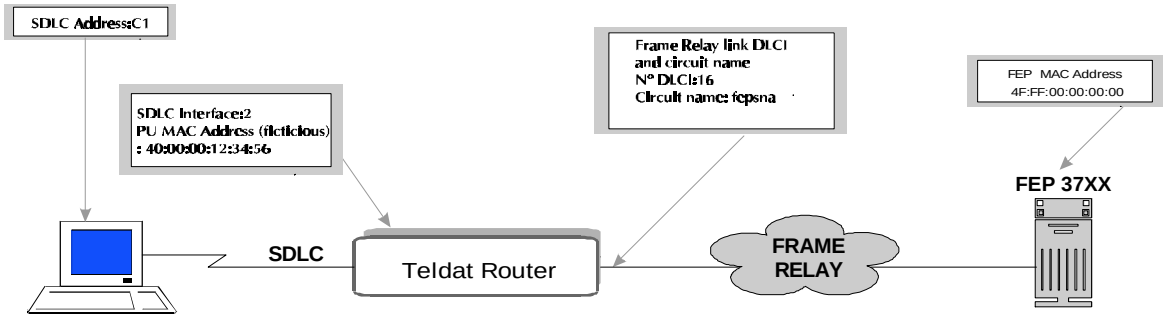
The circuit name must be correctly indicated when adding the circuit in order to establish a link with the previously identified PU:

```
FR config> ADD PVC-PERMANENT-CIRCUIT
Circuit number [16]?16
Outgoing Committed Information Rate (CIR) in bps [16000]?16000
Outgoing Committed Burst Size (Bc) in bits [16000]?5000
Outgoing Excess Burst Size (Be) in bits [0]?0
Encrypt information? [No]: (Yes/No)?No
Assign circuit name []?fepsna
FR config>
```

DLCI 16 is used here and needs to match the Frame Relay service company's DLCI.

3. Example of SDLC-FR environment configuration

This configuration example described below is similar to the one seen in the previous section but in this case applied to the SDLC-FR. It is highly recommended that the previous example is read, even if the installation concerned is SDLC (without LAN), as many of the concepts are applicable to this case and are found in greater detail than in this example.



3.1. Key elements for configuration

SDLC Interface

This is the **Teldat Router** interface, defined as SDLC, to which the PU is connected. In the example, the number 2 is used.

SDLC Address

The elements connected to the **Teldat Router** through SDLC links must act as secondary stations. This parameter is the secondary station's SDLC address. In the example, the value C1 is used.

PU MAC Address

As in the LAN-FR environment, the PU MAC address appears here as well. Initially, it seems surprising that a MAC address should appear here, where there is no local network. The reasons for this are as follows:

In the BAN, the packets arrive at the FEP in Token Ring frame format, encapsulated in Frame Relay according to RFC 1490 recommendation. As in the aforementioned Token Ring frames, each one will have the source station MAC address. This permits the traffic coming from multiple stations to be multiplexed in a single Frame Relay circuit. As the source station can be connected to different mediums, the **Teldat Router** must carry out the appropriate processes for each case:

- When the source station is in a Token Ring network, the **Teldat Router** only has to encapsulate the frames in Frame Relay, according to the recommendation.
- When the source station is in an Ethernet network, the **Teldat Router** transforms the MAC Ethernet header into a Token Ring header.
- When the source station is connected through a SDLC link, the **Teldat Router** must create the Token Ring header; but in this case a MAC address will not arrive from the station.

What the **Teldat Router** does is to put a value stored in the device's configuration as the station MAC address.

The PU MAC address therefore is fictitious. It is necessary because the FEP needs to see all the stations as if they were connected to the Token Ring networks.

The indications above refer to the processing of the frames going from the stations to the FEP. The processing in the opposite direction is the reverse. Moreover, these indications only refer to the processes concerning the frame formats. Apart from this processing, the **Teldat Router** must carry out address changes between the router MAC address and the FEP MAC address. In LAN, it must keep LLC sessions separated for both ends and for LLC and SDLC sessions in the case of stations connected through this type of link.

For this parameter, it is recommended that a locally-managed address is configured containing some useful information for the network manager, i.e. a code indicating the location of the station (office number, etc.)

In our example, the value used is the following:

40:00:00:12:34:56

Frame Relay link DLCI

Several parameters must be configured in order to set the Frame Relay interface. This section will only deal with the ones that are particularly relevant to the LAN-FR handler. When this handler is configured, a link between each PU and the DLCI (Data Link Connection Identifier) through which its traffic exits is established. This is one of the aspects that demands the most attention. When a PU is added to the handler configuration, the Frame Relay circuit through which the traffic exits is indicated. This circuit must be created as a permanent circuit in the Frame Relay interface configuration, and must match the circuit indicated by the service supplier. When the PU is added, the associated DLCI's name, not number, is indicated. This name consists of an ASCII string with a maximum of eight characters and must match the name given to the created circuit in the Frame Relay interface.

In the example, the circuit is number 16, and is called *"fepsna"*

FEP MAC Address

A LLC 2 connection for each PU is established between the router and the FEP. To do so, each end must have its own MAC address:

- The router's matches the PU MAC address. In the SDLC-FR case, it is a fictitious address as seen above.
- The FEP has the address indicated in the NCP definition corresponding to the interface used.

> ***This last parameter is configured in the FEP. Consult your IBM representative for further details. The address usually has a value of 4F:FF:00:00:00:00 and is programmed in the "LINE statement LOCADD" code that defines the Frame Relay Front End Processor (FEP) physical connection.***

In the example, the FEP MAC address is 4F:FF:00:00:00:00

XID support

There are still some old devices working over SDLC that do not permit the exchange of XID frames or have this facility disabled in their configuration. For these devices, the router permits XID programming type "0" of 12 hexadecimal characters long. The router will transmit the XID when the connection is activated, instead of requesting it from the device.

Fallen connections

This facility is not configurable in the router and it is carried out automatically. The router tries, through Frame Relay, to connect with the programmed address as soon as the PU answers the XID frames. Or when the physical signals of the SDLC interface are active and if the XID has been programmed in the handler. If the connection can not be established, the router will retry it again every 10 seconds. Every 10 failed consecutive connections, the router will automatically increase the time interval between connections. The time interval between them will be 10 seconds, 2 minutes, 4 minutes, 6 minutes, increasing to an interval of 15 minutes between connections. To set the time interval at 10 seconds, the physical signals of the SDLC interface must be disabled, or the session statistics in the handler monitoring menu must be reset.

3.2. Steps needed for configuration

There are three groups of parameters to be configured:

- The SDLC-FR handler
- The SDLC interface
- The Frame Relay interface

In the following example, the below must be taken into account:

- The interface 2 is a SDLC link
- The Frame Relay interface is the first on the list of interfaces[4]

a) SDLC-FR Handler

To access the LAN-FR handler configuration from the starting prompt:

```
*PROCESS 4
User configuration
Config> PROTOCOL SDLC-FR
Configuration SNA SDLC-FR
SDLC-FR Cfg>
```

The SDLC interface is added:

N.B.: Only in 5.3 software and previous versions. It is unnecessary in subsequent versions.

[4] *Check the Configuration and Monitoring Manual for the **Teldat Router** (Document Dm504-I) for an explanation about the way to find out the internal identification number for each interface.*

```
SDLC-FR Cfg> ADD INTERFACE SDLC
Type interface number [2]?2
SDLC-FR Cfg>
```

N.B.: In installations where there is both Frame Relay SNA traffic and QLLC traffic, the individual handlers for them cannot share the same SDLC interface.

The Frame Relay interface is added:

```
SDLC-FR Cfg> ADD INTERFACE FRAME-RELAY
Type interface number [1]?1
SDLC-FR Cfg>
```

The PU is added:

```
SDLC-FR Cfg> ADD PU
Type interface number [2] ?2
Type SDLC Address in hex (range 1 - fe) [1]? C1
Type MAC Address associated to PU (SDLC)  []? 40:00:00:12:34:56
Type associated SAP value (SDLC) in hex (range 4 - fc) [8]?8
Type MAC Address of FEP (FR)  []? 4F:FF:00:00:00:00
Type remote SAP value (FR) in hex (range 4 - fc) [4]?4
Type FR DLCI name (8 characters max) []?fepsna
Confirm if PU supports XID frames (Yes/No) [Y]?No
Type XID (12 hexa digits) []? 012345678901
SDLC-FR Cfg>
```

N.B.: In installations where there is SNA traffic via LAN and SDLC, the same SAP must not be configured for both the LAN and SDLC interfaces.

The protocol is enabled:

```
SDLC-FR Cfg> ENABLE
SDLC-FR Cfg>
```

The necessary configuration in the SDLC-FR handler is finished in this example. The configuration can be checked for accuracy by using the **LIST** command:

```
SDLC-FR Cfg> LIST ALL
Protocol Status: ENABLED
-----------------------------------
FRAME-RELAY INTERFACE
Interface :   1
-----------------------------------
Num.  Ifc  Addr   MAC Addr. Asoc.    SAP   FR MAC Addr.   SAP FR   DLCI
                  (Fmt. TKR)              (Fmt. TKR)              XID Used
-------------------------------------------------------------------------------
1     2    01     02-00-00-48-2C-6A  08    F2-FF-00-00-00-00  04   fepsna
                  40:00:00:12:34:56        4F:FF:00:00:00:00       020012345678
SDLC-FR Cfg>
```

In order to finish, exit the protocol configuration:

```
SDLC-FR Cfg> EXIT
Config>
```

b) SDLC Interface

The interface used should be configured as SDLC.

```
Config> SET DATA-LINK SDLC
which port will be changed [0]? 2
Config>
```

Referring the SDLC interface configuration, the following information is on the parameters in the example which have particular significance.

Access the SDLC interface configuration:

```
Config> NETWORK 2
SDLC user configuration
Creating a default configuration for this link
SDLC 2 Config>
```

Check the SDLC link values:

The configuration values by default can be seen through the **LIST LINK** command.

```
SDLC 2 Config> LIST LINK
Link configuration for:  LINK_2  (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 2 Config>
```

These values must be modified according to installation needs. E.g. If we have a terminal which can only work up to a speed of 9600 then the following command is used:

```
SDLC 2 Config> SET LINK SPEED
Internal Clock Speed [64000]? 9600
SDLC 2 Config>
```

Normally the values by configuration default are similar to most installation needs.

The **Teldat Router** always acts as the first station so connected SDLC terminals should act as secondary stations:

The remote station is added:

```
SDLC 2 Config> ADD REMOTE
Enter station address (in hex)[C1]? C1
Enter remote station name[SDLC_c1]?
Enter max packet size[2048]? 2048
Enter receive window[7]? No
Enter transmit window[7]? No
Enable negotiable mode (Yes/No)? No
SDLC 2 Config>
```

In order to see the station configuration do the following:

```
SDLC 2 Config> LIST REMOTE C1
Address Name     Status   Max BTU  Rx Window  Tx Window  Role
------- -------  ------   -------  ---------  ---------  ---------
C1      SDLC_C1  ENABLED  2048     7          7          SECONDARY
SDLC 2 Config>
```

In order to finish, exit the interface configuration:

```
SDLC 2 Config> EXIT
Config>
```

c) *Frame Relay Interface*

For general Frame Relay parameters such as: Committed Information Rate, Committed Burst Size, Excess Burst Size, LMI type, CIR monitoring, congestion monitoring, maximum frame length, type of encryption, line speed, etc.; please consult the Frame Relay manual (Document Dm503-I).

The parameters directly related to the BAN and value examples are shown here.

The circuit name must be correctly indicated when adding the circuit in order to establish a link with the previously identified PU:

```
FR config> ADD PVC-PERMANENT-CIRCUIT
Circuit number[16]? 16
Outgoing Committed Information Rate (CIR) in bps[16000]? 16000
Outgoing Committed Burst Size (Bc) in bits[16000]? 5000
Outgoing Excess Burst Size (Be) in bits[0]? 0
Encrypt information? [No]:(Yes/No)? No
Assign circuit name[]? fepsna
FR config>
```

DLCI 16 is used here and needs to match the Frame Relay service company's DLCI.

Chapter 2
LAN-FR Commands

1. LAN-FR Configuration Commands

The LAN-FR configuration commands are introduced in the LAN-FR Cfg> prompt.

Command	Function
? (HELP)	Lists available commands or lists the command ‘s options.
ADD	Allows necessary elements for protocol performance to be added.
DELETE	Eliminates protocol configuration elements.
DISABLE	Disables the protocol.
ENABLE	Enables the protocol.
LIST	Lists the corresponding element configuration.
EXIT	Finalizes the protocol configuration.

The letters typed in **bold** are the minimum number of characters which need to be keyed in order to activate the command.

1.1. ? (HELP)

Lists available commands or lists the command ‘s options.

Syntax:

```
LAN-FR Cfg> ?
```

Example:

```
LAN-FR Cfg> ?
ADD
DELETE
DISABLE
ENABLE
LIST
EXIT
```

1.2. ADD

This command defines how many elements are necessary for the protocol performance.

Syntax:

```
LAN-FR Cfg> ADD <element> <parameter> <parameter> ?
INTERFACE
PU
```

a) ADD INTERFACE

This command permits the definition of the type of interface to be used. The two possibilities are LAN and FRAME-RELAY.

Syntax:

```
LAN-FR Cfg> ADD INTERFACE ?
FRAME-RELAY
LAN
```

ADD INTERFACE FRAME-RELAY

Syntax:

```
LAN-FR Cfg> ADD INTERFACE FRAME-RELAY < Interface # >
```

This command permits the definition of the Frame Relay interface to be used, number 1 by default.

Example:

```
LAN-FR Cfg> ADD INTERFACE FRAME-RELAY
Type interface number [1]?
LAN-FR Cfg>
```

ADD INTERFACE LAN

Syntax:

```
LAN-FR Cfg> ADD INTERFACE LAN < Interface # > < Local SAP # >
```

This command permits the definition of the LAN interface which is usually 0; and on the LAN side the local SAP which must be a multiple of 4.

Example:

```
LAN-FR Cfg> ADD INTERFACE LAN
Type interface number [0]?
Type local SAP value in hex (range 4 - fc) [4]?
LAN-FR Cfg>
```

b) ADD PU

Syntax:

```
LAN-FR Cfg> ADD PU < PU type >
```

This command permits the definition of the physical units (PU's) that can use the router. The possible types are <MAC PU Add> <SAP PU> <MAC FEP Add> <SAP FEP> <DLCI>, and their meanings are as follows:

MAC PU Add is the PU address in the local network. **SAP PU** is the SAP that uses the PU. **MAC FEP Add** is the FEP MAC address on the Frame Relay side. **SAP FEP** is the SAP which uses the FEP. **DLCI** is the name assigned to the DLCI in the Frame Relay configuration.

Example:

```
LAN-FR Cfg> ADD PU 00:05:64:00:00:80
LAN-FR Cfg>
```

Great care must be taken when introducing the MAC addresses as these can be interpreted in different ways as follows:

The octets are separated by a two dot symbol (Token Ring, IBM or non canonical format)

For example: 00:05:64:00:00:80

The octets are separated by a dash symbol or not separated (canonical or Ethernet format)

For example: 00-A0-26-00-00-01 or 00A026000001

In the two examples above, the address is the same. Please note that they represent the same octets "reversed".

1.3. DELETE

This command permits the deleting of protocol configuration elements.

Syntax:

```
LAN-FR Cfg> DELETE <element> <parameter> <parameter> ?
ALL
INTERFACE
PU
```

a) DELETE ALL

Delete all configuration and disable the protocol.

Example:

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

b) DELETE INTERFACE

Syntax:

```
LAN-FR Cfg> DELETE INTERFACE ?
FRAME-RELAY
LAN
```

DELETE INTERFACE FRAME-RELAY

Deletes the defined Frame Relay interface.

Example:

```
LAN-FR Cfg> DELETE INTERFACE FRAME-RELAY
LAN-FR Cfg>
```

DELETE INTERFACE LAN

Deletes the defined LAN interface.

Example:

```
LAN-FR Cfg> DELETE INTERFACE LAN
LAN-FR Cfg>
```

c) DELETE PU

Syntax:

```
LAN-FR Cfg> DELETE PU < # >
```

Deletes the physical unit (PU) defined in the table with the number <#>.

Example:

```
LAN-FR Cfg> DELETE PU 1
Num    LAN MAC Address      SAP LAN      FR MAC Address      SAP FR     DLCI
       Idem (Fmt. TKR)                   Idem (Fmt. TKR)
-------------------------------------------------------------------------------
1      00-00-93-78-97-C9    4            F2-FF-00-00-00-80   4          fepsna
       00:00:C9:IE:E9:93                 4F:FF:00:00:00:01
Confirm delete of selected PU(Yes/No) (Y)?
LAN-FR Cfg>
```

1.4. DISABLE

Disable the protocol. This only takes effect after re starting the device.

Syntax:

```
LAN-FR Cfg> DISABLE
```

Example:

```
LAN-FR Cfg> DISABLE
LAN-FR Cfg>
```

1.5. ENABLE

Enable the protocol. This only takes effect after re starting the device.

Syntax:

```
LAN-FR Cfg> ENABLE
```

Example:

```
LAN-FR Cfg> ENABLE
LAN-FR Cfg>
```

1.6. LIST

Displays all the protocol configuration.

Syntax:

```
LAN-FR Cfg> LIST <element> <parameter> <parameter> ?
ALL
INTERFACE
PU
STATUS
```

a) LIST ALL

Indicates which interface is used in the Frame Relay side protocol.

Example:

```
LAN-FR Cfg> LIST ALL
Protocol Status : ENABLED
---------------------------------------
LAN INTERFACE
Interface :   0     SAP Used : 04
---------------------------------------
FRAME-RELAY INTERFACE
Interface :   1
---------------------------------------
Num.    LAN MAC Address     SAP LAN    FR MAC Address     SAP FR    DLCI
        Idem (Fmt. TKR)                Idem (Fmt. TKR)
-------------------------------------------------------------------------------
1       00-00-93-78-97-C9   04         F2-FF-00-00-00-80   04       fepsna
        00:00:C9:IE:E9:93             4F:FF:00:00:00:01
LAN-FR Cfg>
```

b) LIST INTERFACE

Syntax:

```
LAN-FR Cfr> LIST INTERFACE ?
FRAME-RELAY
LAN
```

LIST INTERFACE FRAME RELAY

Indicates which interface is used in the Frame Relay side protocol.

Example:

```
LAN-FR Cfg> LIST INTERFACE FRAME-RELAY
FRAME-RELAY INTERFACE
Interface: 1
LAN-FR Cfg>
```

LIST INTERFACE LAN

Indicates which interface is used in the LAN side protocol and the SAP used.

Example:

```
LAN-FR Cfg> LIST INTERFACE LAN
LAN INTERFACE
Interface: 0   SAP used: 4
LAN-FR Cfg>
```

c) LIST PU

To see the defined physical units (PU's) table.

Example:

```
LAN-FR Cfg> LIST PU
Num.   LAN MAC Address    SAP LAN   FR MAC Address     SAP FR  DLCI
       Idem (Fmt. TKR)              Idem (Fmt. TKR)
-------------------------------------------------------------------------------
1      00-00-93-78-97-C9  04        F2-FF-00-00-00-80  04      fepsna
       00:00:C9:IE:E9:93            4F:FF:00:00:00:01
LAN-FR Cfg>
```

La dirección MAC se visualiza en formato Ethernet (octetos separados por guiones) y en formato IBM (octetos separados por dos puntos).

d) LIST STATUS

Indicates if the protocol is enabled or not.

Example:

```
LAN-FR Cfg> LIST STATUS
Protocol Status: ENABLED
LAN-FR Cfg>
```

1.7. EXIT

Ends the LAN-FR protocol configuration.

Syntax:

```
LAN-FR Cfg> EXIT
```

Example:

```
LAN-FR Cfg> EXIT
Config>
```

2. LAN-FR Monitoring Commands

The LAN-FR monitoring commands are introduced in the LAN-FR> prompt.

Command	Function
? (HELP)	Lists available commands or lists the command ‘s options.
CLEAR	Initializes the session statistics.
LIST	Lists the statistics and the defined physical units (PU’s) status.
EXIT	Finish protocol monitoring.

The letters typed in **bold** are the minimum number of characters which need to be keyed in order to activate the command.

2.1. ? (HELP)

Lists available commands or lists the command ‘s options.

Syntax:

```
LAN-FR> ?
```

Example:

```
LAN-FR> ?
CLEAR
LIST
EXIT
```

2.2. CLEAR

Clear the PU session statistics. # = 0 (meaning all).

Syntax:

```
LAN FR> CLEAR < # >
```

Example:

```
LAN-FR> CLEAR 1
LAN-FR>
```

2.3. LIST

List the statistics and the defined physical units status. # = 0 (meaning all).

Syntax:

```
LAN-FR> LIST < # >
```

Example:

```
LAN-FR> LIST 1
Statistics of PU:1
-------------------------------------------------------------------------------
MAC Address LAN:  00:00:C9:IE:E9:93   SAP:   04
MAC Address FR:   4F:FF:00:00:00:01   SAP:   04
DLCI FR Name:     fepsna
Status:           Session Inactive
-------------------------------------------------------------------------------
Link LAN
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 FR
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
-------------------------------------------------------------------------------
LAN-FR>
```

2.4. EXIT

Exit permitted from LAN-FR protocol monitoring process.

Syntax:

```
LAN-FR> EXIT
```

Example:

```
LAN-FR> EXIT
+
```

Chapter 3
SDLC-FR Commands

1. SDLC-FR Configuration Commands

The SDLC-FR configuration commands are introduced in the SDLC-FR Cfg> prompt.

Command	Function
? (HELP)	Lists available commands or lists the command ‘s options.
ADD	Allows necessary elements for protocol performance to be added.
DELETE	Eliminates protocol configuration elements.
DISABLE	Disables the protocol.
ENABLE	Enables the protocol.
LIST	Lists the corresponding element configuration.
EXIT	Finalizes the protocol configuration.

The letters typed in **bold** are the minimum number of characters which need to be keyed in order to activate the command.

1.1. ? (HELP)

Lists available commands or lists the command ‘s options.

Syntax:

```
SDLC-FR Cfg> ?
```

Example:

```
SDLC-FR Cfg> ?
ADD
DELETE
DISABLE
ENABLE
LIST
EXIT
```

1.2. ADD

This command defines how many elements are necessary for the protocol performance.

Syntax:

```
SDLC-FR Cfg> ADD <element> <parameter> <parameter> ?
INTERFACE
PU
```

a) ADD INTERFACE

This command permits the definition of the type of interface to be used. The two possibilities are SDLC and FRAME-RELAY.

Syntax:

```
SDLC-FR Cfg> ADD INTERFACE ?
FRAME-RELAY
SDLC
```

ADD INTERFACE FRAME-RELAY

Syntax:

```
SDLC-FR Cfg> ADD INTERFACE FRAME-RELAY < Interface #>
```

This command permits the definition of the Frame Relay interface to be used which is usually 1 by default.

Example:

```
SDLC-FR Cfg> ADD INTERFACE FRAME-RELAY
Type interface number [1]?
SDLC-FR Cfg>
```

ADD INTERFACE SDLC

Syntax:

```
SDLC-FR Cfg> ADD INTERFACE SDLC < Interface #>
```

This command permits the definition of the SDLC interface which is usually 2 by default.

Example:

```
SDLC-FR Cfg> ADD INTERFACE SDLC
Type interface number [2]?
SDLC-FR Cfg>
```

N.B.: Only in 5.3 software and previous versions. It is unnecessary in subsequent versions.

1.3. ADD PU

Syntax:

```
SDLC-FR Cfg> ADD PU < PU type >
```

This command permits the definition of the physical units (PU's) that can use the router. The possible types are <SDLC Add> <MAC PU Add> <SAP PU> <MAC FEP Add> <SAP FEP> <DLCI> <XID Support> [<Optional XID type 0>], and their meanings are as follows:

SDLC Add is the secondary station address in the SDLC link. **MAC PU Add** is the associated PU fictitious MAC for use in the FRAME-RELAY link. **SAP PU** is the local SAP associated with the PU. **MAC FEP Add** is the FEP MAC address on the Frame Relay side. **SAP FEP** is the SAP which uses the FEP. **DLCI** is the name assigned to the DLCI in the Frame Relay configuration. **XID Support** indicates if the PU can exchange XID frames. **Optional XID type 0** allows XID programming type 0 of 12 characters hexadecimal length in case the PU cannot support XID frames

Example:

```
SDLC-FR Cfg> ADD PU 00:05:64:00:00:80
SDLC-FR Cfg>
```

Great care must be taken when introducing the MAC addresses as these can be interpreted in different ways as follows:

The octets are separated by a two dot symbol (Token Ring, IBM or non canonical format)

For example: 00:05:64:00:00:80

The octets are separated by a dash symbol or not separated (canonical or Ethernet format)

For example: 00-A0-26-00-00-01 or 00A026000001

In the two examples above, the address is the same. Please note that they represent the same octets "reversed".

1.4. DELETE

This command permits the deleting of protocol configuration elements.

Syntax:

```
SDLC-FR Cfg> DELETE <element> <parameter> <parameter> ?
ALL
INTERFACE
PU
```

a) DELETE ALL

Delete all the configuration and disable the protocol.

Example:

```
SDLC-FR Cfg> DELETE ALL
Confirm delete ALL configuration (Yes/No)?
SDLC-FR Cfg>
```

b) DELETE INTERFACE

Syntax:

```
SDLC-FR Cfg> DELETE INTERFACE ?
FRAME-RELAY
SDLC
```

DELETE INTERFACE FRAME-RELAY

Delete defined Frame Relay interface.

Example:

```
SDLC-FR Cfg> DELETE INTERFACE FRAME-RELAY
Type interface number [2]?
Confirm delete local INTERFACE (Yes/No)?
SDLC-FR Cfg>
```

DELETE INTERFACE SDLC

Delete SDLC defined interface.

Example:

```
SDLC-FR Cfg> DELETE INTERFACE SDLC
Type interface number [2]?
Confirm delete local INTERFACE (Yes/No)?
SDLC-FR Cfg>
```

N.B.: Only in 5.3 software and previous versions. It is unnecessary in subsequent versions.

c) DELETE PU

Syntax:

```
SDLC-FR Cfg> DELETE PU < # >
```

Deletes the physical unit (PU) defined in the table with the number <#>.

Example:

```
SDLC-FR Cfg> DELETE PU 1
Num.  Ifc.  Addr.  MAC Addr. Asoc.    SAP   FR MAC Addr.        SAP FR     DLCI
                  (Fmt. TKR)              (Fmt. TKR)                      XID Used

-------------------------------------------------------------------------------
1     2     C1     00-00-93-78-97-C9  08    F2-FF-00-00-00-80   04         ERERERER
                   00:00:C9:1E:E9:93        4F:FF:00:00:00:00          020012121212
Confirm delete of selected PU (Yes/No)?
SDLC-FR Cfg>
```

1.5. DISABLE

Disable the protocol. This only takes effect after re starting the device.

Syntax:

```
SDLC-FR Cfg> DISABLE
```

Example:

```
SDLC-FR Cfg> DISABLE
SDLC-FR Cfg>
```

1.6. ENABLE

Enable the protocol. This only takes effect after re starting the device.

Syntax:

```
SDLC-FR Cfg> ENABLE
```

Example:

```
SDLC-FR Cfg> ENABLE
SDLC-FR Cfg>
```

1.7. LIST

List corresponding element configuration.

Syntax:

```
SDLC-FR Cfg> LISTAR <element> <parameter> <parameter> ?
ALL
INTERFACE
PU
STATUS
```

a) LIST ALL

Displays all the protocol configuration.

Example:

```
SDLC-FR Cfg> LIST ALL
Protocol Status: ENABLED
-----------------------------------
FRAME-RELAY INTERFACE
Interface: 1
-----------------------------------
Num.  Ifc.  Addr.  MAC Addr. Asoc.    SAP  FR MAC Addr.       SAP FR  DLCI
(Fmt. TKR)    (Fmt. TKR)    XID Used
-------------------------------------------------------------------------------
1     2     C1     00-00-93-78-97-C9  08   F2-FF-00-00-00-80  04      fepsna
                   00:00:C9:1E:E9:93       4F:FF:00:00:00:00          020012121212
SDLC-FR Cfg>
```

b) LIST INTERFACE

Syntax:

```
SDLC-FR Cfg> LIST INTERFACE ?
FRAME-RELAY
SDLC
```

LIST INTERFACE FRAME-RELAY

Indicates which interface is used in the Frame Relay side protocol.

Example:

```
SDLC-FR Cfg> LIST INTERFACE FRAME-RELAY
FRAME-RELAY INTERFACE
Interface: 1
SDLC-FR Cfg>
```

LIST INTERFACE SDLC

Indicates which interface is used in the SDLC side protocol.

Example:

```
SDLC-FR Cfg> LIST INTERFACE SDLC
SDLC INTERFACE
Interface: 2
SDLC-FR Cfg>
```

N.B.: Only in 5.3 software and previous versions. It is unnecessary in subsequent versions.

c) LIST PU

To see the defined physical units (PU's) table.

Example:

```
SDLC-FR Cfg> LIST PU
Num.  Ifc.  Addr.  MAC Addr. Asoc.    SAP  FR MAC Addr.       SAP FR   DLCI
                   (Fmt. TKR)             (Fmt. TKR)                  XID Used
-------------------------------------------------------------------------------
1     2     C1     00-00-93-78-97-C9  08   F2-FF-00-00-00-80  04       fepsna
                   00:00:C9:1E:E9:93       4F:FF:00:00:00:00           020012121212
SDLC-FR Cfg>
```

The MAC address can be seen in Ethernet format (octets separated by dashes) and in IBM format (octets separated by two dots).

d) LIST STATUS

Indicates if the protocol is enabled or not.

Example:

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

1.8. EXIT

End the SDLC-FR protocol configuration.

Syntax:

```
SDLC-FR Cfg> EXIT
```

Example:

```
SDLC-FR Cfg> EXIT
Config>
```

2. SDLC-FR Monitoring Commands

The SDLC-FR monitoring command are introduced in the SDLC-FR> prompt.

Command	Function
? (HELP)	Lists available commands or lists the command ‘s options.
CLEAR	Initializes the session statistics.
LIST	Lists the statistics and the defined physical units (PU’s) status.
EXIT	Finish protocol monitoring.

The letters typed in **bold** are the minimum number of characters which need to be keyed in order to activate the command.

2.1. ? (HELP)

Lists available commands or lists the command ‘s options.

Syntax:

```
SDLC-FR> ?
```

Example:

```
SDLC-FR> ?
CLEAR
LIST
EXIT
```

2.2. CLEAR

Clear the PU session statistics and initiate minimum delay between connections. # = 0 (meaning all).

Syntax:

```
SDLC-FR> CLEAR < # >
```

Example:

```
SDLC-FR> CLEAR 1
SDLC-FR>
```

2.3. LIST

List the statistics and the defined physical units status. # = 0 (meaning all).

Syntax:

```
SDLC-FR> LIST < # >
```

Example:

```
SDLC-FR> LIST 1
Statistics of PU:1
-------------------------------------------------------------------------------
SDLC MAC Address:  00:00:C9:IE:E9:93   SAP: 08
FR MAC Address:    4F:FF:00:00:00:01   SAP: 04
SDLC Interface:    2
SDLC Address:      C1
DLCI Name:         fepsna
State:             Session Inactive
-------------------------------------------------------------------------------
Link SDLC
Connection Requests:  0   Connections Accepted:   0
Connections Refused:  0   Link Drops:             0
Tx Frames XID:        0   Rx  Frames XID:         0
Tx Frames INFO:       0   Rx Frames INFO:         0
Tx Bytes INFO:        0
-------------------------------------------------------------------------------
Link FR
Connection Requests:  0   Connections Accepted:   0
Connections Refused:  0   Link Drops:             0
Tx Frames XID:        0   Rx  Frames XID:         0
Tx Frames INFO:       0   Rx Frames INFO:         0
Tx Bytes INFO:        0
-------------------------------------------------------------------------------
SDLC-FR>
```

2.4. EXIT

Exit permitted from SDLC-FR protocol monitoring process.

Syntax:

```
SDLC-FR> EXIT
```

Example:

```
SDLC-FR> EXIT
+
```