Teldat Router

Configuration of Frame Relay Interfaces over ISDN

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INDEX

Chapter 1
Frame Relay Interface over ISDN

1. Introduction

This chapter describes the functions of Frame Relay interface over ISDN.

The information given in this chapter is divided into the following sections:

- ISDN base Interface.

- Frame Relay interface over ISDN.

2. ISDN base Interface

The ISDN base interface allows you to interconnect routers using the ISDN. The ISDN interface can be configured as a dedicated link with a permanent connection established; or as an on demand circuit in those connections that are automatically established by request for data transmission.

An ISDN base interface is a basic access which consists of two 64 Kbps B channels for transparent transmission of data and a D channel of 16 Kbps. The B channels are used to transmit HDLC frames in the router at 64 Kbps. The D channel is only used to request calls. (In the device node, the D channel is also used to transmit X.25 packets).

The ISDN base interface establishes connections with the remote router through ISDN. This initiates or accepts connections if the on demand connection interfaces indicate they should. Within the connection on demand interfaces the Frame Relay interfaces over ISDN are managed (named *FR over ISDN* in Teldat routers).

3. Frame Relay Interface over ISDN

The Frame Relay interface over ISDN is one of the types of connection interfaces on demand which act as ISDN base interface users. This deals with a logical interface without its own physical connection. A Frame Relay interface over ISDN should be added for each call's potential destination.

Various Frame Relay interfaces over ISDN can be configured over a single ISDN base interface. The ISDN base interface can also be configured to support semipermanent connections. In this last case it is not necessary to establish the call to transmit data through a B channel.

Addressing

To make a call you need to know the destination address. In order to permit the configuration of various distinct destination addresses it is necessary to unlink this from the ISDN base interface. The call destination address depends on the connection interface on demand which requests the call.

In order to accept calls from different routers it is necessary to know the possible callers who are authorized. Each on demand connection interface should have a different remote caller address. In this way when an incoming call arrives, a corresponding interface is assigned.

Each ISDN base interface has a maximum of two simultaneous activated calls associated (each one corresponding to an ISDN B channel). If there are two calls in progress in a specific ISDN interface and another on demand interface requests a new connection, this cannot be established. The packets sent via this third on demand interface are discarded by the router.

ISDN Calls

The call is established when there is traffic in progress through the Frame Relay interface over ISDN (except in situations where the base interface is configured as semipermanent). When there is no traffic, the call is released. The timeout due to absence of traffic in order to release the call is configurable.

> Note: If LMI is enabled in a Frame Relay interface over ISDN, the LMI traffic generated by the router means that the ISDN call remains permanently established.

Characteristics of the Interface

The Frame Relay interface over ISDN has the same functions as a Frame Relay interface over a normal serial line. The only difference consists in that the data is exchanged through an ISDN S interface. This feature has other characteristics associated such as the speed is always 64 Kbps.

The Frame Relay interface over ISDN configuration is carried out, in aspects relative to Frame Relay, in the same way as Frame Relay interfaces over a serial line. Logically some parameters are not configurable as they have no significance here (e.g. line speed, serial line configuration etc.). You can find further details on this in chapter 2, section 5 *Specific Frame Relay Configuration.*

Consequently, Frame Relay interfaces over ISDN support encryption, compression, multicast emulation, bandwidth reservation, circuit backup, WRS backup using ISDN and CIR and LMI monitoring. ISDN backup and Frame Relay switched circuits (SVC) on the other hand are not supported. For further details on these concepts, please consult the following manuals. DM503-I *Frame Relay* and DM515-I *Bandwidth Reservation System.*

Chapter 2
Configuration of Frame Relay Interface over ISDN

1. Introduction

This chapter describes the Frame Relay interface over ISDN commands.

The information found in this chapter is divided into the following sections:

- Creation of the Frame Relay interface over ISDN.

- ISDN base interface configuration.

- Configuration of Frame Relay interface over ISDN.

- Specific Frame Relay configuration.

2. Creation of Frame Relay interface over ISDN

In concept, the Teldat routers can be divided, one part, the X.25 node and the other, the router. Initially, the ISDN base interfaces do not appear linked to the router except where another Frame Relay interface over ISDN or a Backup interface for Frame Relay has been previously configured. It's in creating the Frame Relay interface over ISDN when you associate the chosen basic access to the router part and eliminate the part of the X.25 node. In order to do this, you need to follow the steps given below.

In order to access the configuration process, enter:

```
*P 4
User configuration
Config>
```

Through the **LIST DEVICES** command from the configuration process, you obtain the interface identifiers table. There can be other normal Frame Relay interfaces associated to WAN lines. In the example, the output command in a device where the line 2 has been associated to Frame Relay protocol is shown.

```
Config> LIST DEVICES

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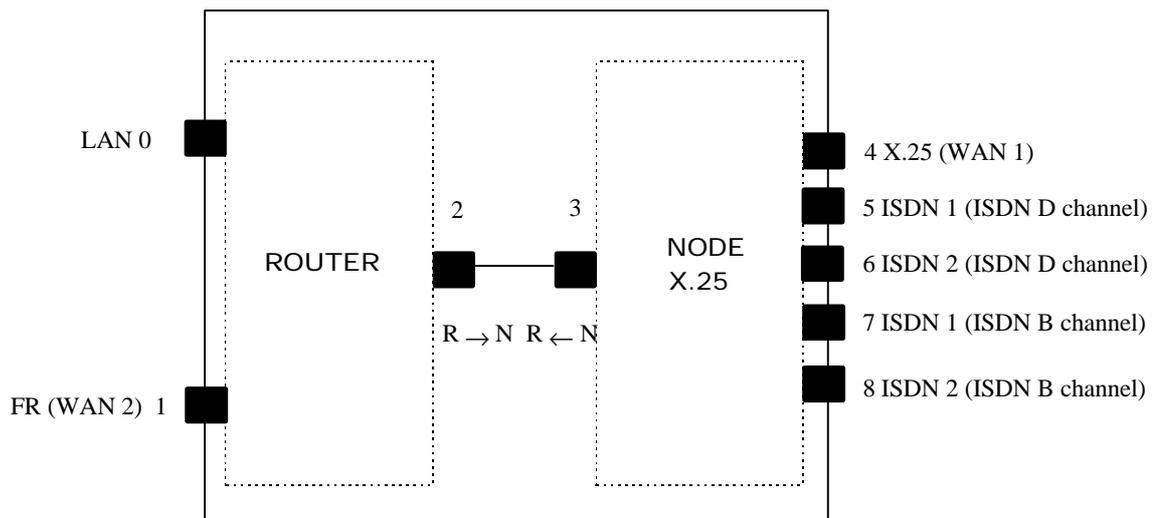

As you can see, the ISDN information appears by default in the node part of the device.

In order to use for example the number 1 basic access as Frame Relay over ISDN, you need to introduce in the cursor:

```
Config> ADD DEVICE FR-ISDN
Type basic access ISDN [2] : 1
Ifc number to delete: 7

If you are going to config more than two ISDN interfaces, you must config what
they have CSR:F011640 and CSR:F011660 over the ISDN 2 connector.
Added FR-ISDN interface with num: 3
Config>
```

```
Config> LIST DEVICES

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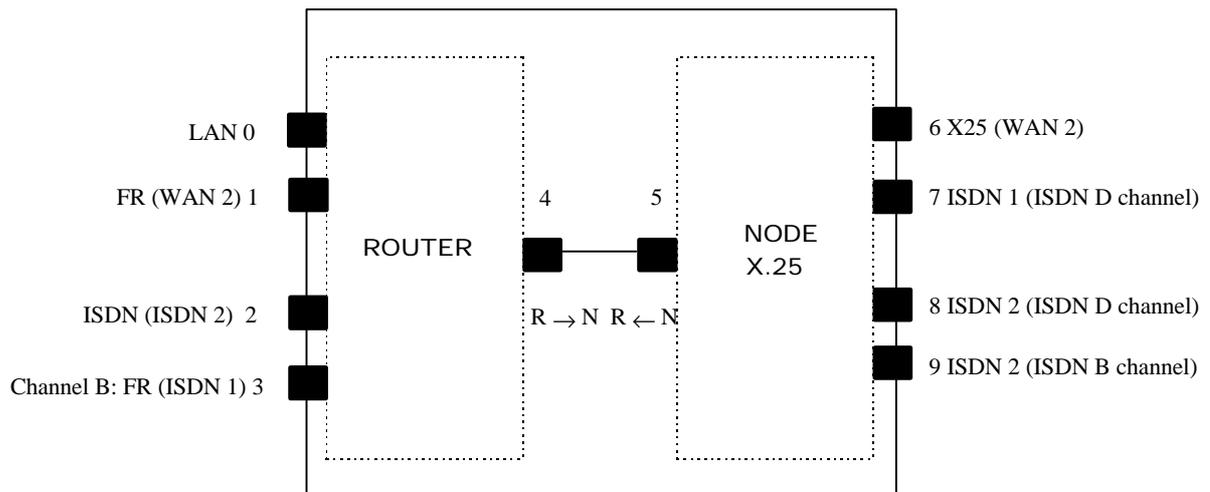

As can be seen, two new interfaces have been created: The ISDN base interface with the number 2 associated to the basic access number 1 connector and the Frame Relay logical interface over ISDN (FR over ISDN) with number 3. On the other side the interface that was associated to the B channel: X.25 in the node part of the device disappears.

> *NOTE: The same basic access cannot be used simultaneously for Frame Relay over ISDN and X.25 transport.*

Successive Frame Relay interfaces over ISDN can be created over the same ISDN base interface:

> *NOTE: There exists the possibility to add more ISDN interfaces to the same basic access in the Teldat Routers. You can also add a single interface by answering NO to the following question which appears on the screen:* `Do you wish to add another ISDN interface to this basic access?`

```
Config> ADD DEVICE FR-ISDN
Type basic access ISDN [2] : 1
Do you wish to add another ISDN interface to this basic access? NO

Added FR-ISDN interface with num:4
Config>
```

```
Config> LIST DEVICES

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

As can be observed, on adding interfaces for Frame Relay over ISDN, a change in the numbers assigned to the interfaces is produced. This can lead to configuration errors.

> *ATTENTION: It is strongly recommended that the complete configuration of all the interfaces required in the device is carried out in the first stages in order to avoid inconsistencies in the data.*

3. ISDN base interface configuration

In order to configure the parameters associated to an ISDN base interface, you have to introduce the **NETWORK** command in the configuration *Config>* prompt followed by the number of the ISDN base interface which needs to be configured.

In the previous example:

```
Config> NETWORK 2
ISDN Config
Config ISDN>
```

The parameters that can be configured by the user can be seen by listing the parameters:

```
Config ISDN> LIST ?
Local destination:
Maximum frame size:2048
ISDN Connection Type:  Switched
Config ISDN>
```

The meaning of each parameter is described in the following paragraphs:

Local destination

This is the basic access address. Any call offered in the basic access whose destination number does not coincide with the programmed address is rejected.

```
Config ISDN> SET LOCAL-ADDRESS
Local destination []? 34935432198
Config ISDN>
```

NOTE: In cases where there is a permanent connection, it is not necessary to configure this parameter.

Maximum frame size

The maximum frame size through the interface is configured with this parameter. The permitted values are 1024, 2048 and 4096 bytes. The default value is 2048 bytes.

```
Config ISDN> SET MAXIMUM-FRAME-SIZE
Maximum Frame Size(1024,2048,4096)[2048]? 4096
Config ISDN>
```

ISDN Connection Type

The type of ISDN connection, switched or permanent, can be configured through this parameter. If it is permanent the link is available without needing to make a call. It is necessary to specify which B channel access is to be used if the connections are permanent.

```
Config ISDN> SET CONNECTION-TYPE
ISDN Connection Type : 0 Switched. 1 Permanent B1. 2 Permanent B2. : [0]? 1
Config ISDN>
```

In order to return to the *Config>* prompt, enter the **EXIT** command at the *Config ISDN>* prompt.

4. Configuration of Frame Relay interface over ISDN

In order to configure the parameters associated to a Frame Relay interface over ISDN, you need to enter the **NETWORK** command in the configuration prompt *Config>* followed by the number of the Frame Relay interface over ISDN to be configured.

In the previous example:

```
Config> NETWORK 3
Circuit Config
Circuit Config>
```

The parameters which can be configured by the user can be displayed by listing the parameters:

```
Circuit Config> LIST ?
Base interface: -1
Destination address:
Inactive time:60
Permitted caller:
Circuit name:
Outgoing calls allowed: Yes
Incoming calls allowed: No
Enabled Access Control: No
Circuit Config>
```

> ***NOTE: If this is a permanent connection, it is not necessary to configure the majority of these parameters.***

The meaning of each of the parameters is described as follows:

Base Interface

The base Interface refers to the ISDN interface number over which the Frame Relay link is established. Value 1 appears by default. This value indicates that calls can be accepted from the two base interfaces that can be available.

```
Circuit Config> SET BASE-INTERFACE 1
Circuit Config>
```

Destination address

This determines the ISDN address which carries out the ISDN calls from the Frame Relay interface.

```
Circuit Config> SET DESTINATION-ADDRESS
Destination address[]? 34915432198
Circuit Config>
```

Inactive Time

If there is no exchange of frames through the interface during a pre configured period of time in this parameter, the ISDN call is released. The range of values are between 0 and 65535 seconds. A zero value maintains a permanently established connection even if there is no transmission of data. The default value is 60 seconds.

```
Circuit Config> SET INACTIVE-TIME
Inactive time (0: always active)(0-65535)[60]? 100
Circuit Config>
```

NOTE: If LMI is enabled in the Frame Relay interface over ISDN, the LMI traffic generated means that the call remains permanently established unless the time configured to send the LMI status requests is greater than that configured here as inactive time.

Permitted caller

This determines the source ISDN address whose calls are routed to this Frame Relay interface over ISDN. By default all ISDN calls are accepted. This parameter is useful when you configure more than one interface over the same ISDN base interface in order to route incoming calls.

```
Circuit Config> SET PERMITTED-CALLER
Permitted caller[]? 34935432198
Circuit Config>
```

Circuit name

This allows you to assign a name to the circuit. The name can contain a maximum of 15 ASCII characters.

```
Circuit Config> SET NAME-CIRCUIT
Assign circuit name []? CIRCUITO_FR
Circuit Config>
```

Outgoing calls allowed

This allows or prevents a device from carrying out outgoing calls.

To enable, enter the following:

```
Circuit Config> ENABLE OUTGOING
Circuit Config>
```

To disable:

```
Circuit Config> DISABLE OUTGOING
Circuit Config>
```

The outgoing calls are enabled by default.

Incoming calls allowed

This allows the device to accept or reject incoming calls. To enable, enter the following:

```
Circuit Config> ENABLE INCOMING
Circuit Config>
```

To disable:

```
Circuit Config> DISABLE INCOMING
Circuit Config>
```

The incoming calls are disabled by default.

Access Control

Enable or disable the Access Control. The Access Control is a table where calling and called pairs of numbers are stored. When an incoming call is received and this is enabled, the call data is checked against the stored pairs to see if it coincides. If it doesn't coincide with any, the call is not assigned to the interface.

In order to enable the Access Control, enter the following:

```
Circuit Config> ENABLE ACCESS
Circuit Config>
```

To disable:

```
Circuit Config> DISABLE ACCESS
Circuit Config>
```

The access control is disabled by default. In order to return to the *Config>* prompt, enter the **EXIT** command at the *Circuit Config>* prompt.

```
Circuit Config> EXIT
Config>
```

5. Specific Frame Relay configuration

Configuration of specific Frame Relay parameters (LMI, permanent circuits, IP addresses associated with DLCIs etc.) are carried out in the same way as in Frame Relay interfaces over serial lines.

Access to the Frame Relay prompt

In order to access the Frame Relay prompt within the Frame Relay interface over ISDN, you need to enter the **ENCAPSULATOR** command.

```
Circuit Config> ENCAPSULATOR

-- Frame Relay user configuration --
FR config>
```

The commands that can be used within the Frame Relay menu are the same as those described for normal interfaces over serial lines.

> *NOTE: The use of the configuration commands for Frame Relay interfaces over serial lines also valid for Frame Relay interfaces over ISDN, can be found in the DM503-I "Frame Relay" manual.*

To exit the Frame Relay specific configuration, use the **EXIT** command:

```
FR config> EXIT
Circuit Config>
```

Parameters that cannot be configured

Some specific Frame Relay parameters cannot be configured in Frame Relay interfaces over ISDN. Should you try to configure these, the following message appears:

```
FR config> ADD SVC-SWITCHED-CIRCUIT
Option not supported on FR over ISDN interfaces
FR config>
```

The following list details the commands that cannot be used:

- ADD SVC-SWITCHED-CIRCUIT
- ADD NUMBER-ADDRESS
- CHANGE SVC-SWITCHED-CIRCUIT
- DISABLE NUCLEOX-LIKE-BIR
- ENABLE NUCLEOX-LIKE-BIR

- REMOVE SVC-SWITCHED-CIRCUIT
- REMOVE NUMBER-ADDRESS
- SET ENCODING NRZ
- SET ENCODING NRZI
- SET FRAME-SIZE
- SET IDLE FLAG
- SET IDLE MARK
- SET LINE-SPEED
- SET TRANSMIT-DELAY
- SET S1-PARAMETER
- SET CALLING-ADDRESS

These commands refer to Frame Relay switched circuit configuration (not supported), the configuration of physical and HDLC parameters on a serial line (these do not exist in Frame Relay interfaces over ISDN) and the maximum frame length (this is taken from the base ISDN interface).

Frame Relay Monitoring

You access Frame Relay monitoring in the same way as Frame Relay interfaces over a serial line. For this you initially access the monitoring process by entering **P 3,** subsequently accessing the Frame Relay interface over ISDN through the **NETWORK** command:

```
*P 3

+ NETWORK 3

-- Frame Relay Console --
FR>
```

The commands that can be used are the same as those used in the interfaces over serial lines.

> NOTE: The use of the monitoring commands for Frame Relay interfaces over serial lines also valid for Frame Relay interfaces over ISDN, can be found in the DM503-I "Frame Relay" manual.

In order to exit the Frame Relay monitoring, use the **EXIT** command and to abandon the monitoring process, CTRL-P.

Chapter 3
A practical configuration example

1. A practical configuration example

Let's take the following environment:


```
                  919876543                    931234567

    ┌────────────┐            ╭─────────╮            ┌────────────┐
    │  Router A  │────────────│  ISDN   │────────────│  Router B  │
    └────────────┘            ╰─────────╯            └────────────┘

          IP 1.1.1.1                                 IP 1.1.1.2
```
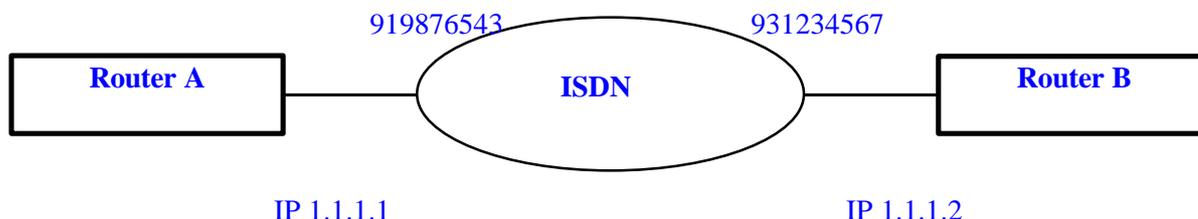
The idea is to try and establish a Frame Relay link between Router A and Router B through ISDN. The network number which router A is connected to is 919876543. This calls 931234567 which is router B's number. LMI is not enabled in this connection as the routers are directly connected through ISDN.

The configuration to be carried out in router A will be detailed.

The default configuration in a Teldat router with 2 WAN ports is as follows:

```
Config> LIST DEVICES

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

The first operation to carry out is to aggregate a Frame Relay interface over ISDN:

```
Config> ADD DEVICE FR-ISDN
Type basic access ISDN [2]? 1
If you are going to config more than two DIAL interfaces, you must config what t
hey have CSR:F011640 and CSR:F011660 over the ISDN 2 connector
Ifc number to delete: [0]? 7
Added FR-ISDN interface with num: 2
Config>
```

The interfaces should then look like this:

```
Config> LIST DEVICES

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

The configuration is then saved and the device restarted. This is in order to create the data structures which correspond to the newly created interfaces.

```
Config> SAVE
Save the config [y/n]? Y

Saving the config ...OK
Config>                                       enter (CTRL + p)

*RESTART
Are you sure to restart the system (Yes/No)? Y
Disk configuration read
Initializing



Teldat                (c)1996,97,98,99

Router model NUCLEOX-PLUS 41 CPU M68360      S/N: XXXX/XXXXX
1 LAN, 2 WAN Lines, 2 ISDN Lines


*P 4
Config>
```

At this point you can assign the IP address to the newly created interface.

```
Config> PROTOCOL IP
Internet protocol user configuration
IP config> ADD ADDRESS
Which net is this address for[0]?  2
New address [0.0.0.0]? 1.1.1.1
Address mask [255.0.0.0]? 255.255.255.0
IP config> EXIT
Config>
```

At this point you configure, with the Frame Relay interface over ISDN, the part related to establishing calls.

```
Config> NETWORK 2
Circuit Config
Circuit Config>
```

You need to check the current configuration status:

```
Circuit Config> LIST
Base interface: -1
Destination address:
Inactive time: 60
Permitted caller:
Circuit name:
Outgoing calls allowed: Yes
Incoming calls allowed: No
Enabled Access Control: No
Circuit Config>
```

You need to configure the destination address (called telephone number):

```
Circuit Config> SET DESTINATION-ADDRESS
Destination address[]? 931234567
Circuit Config>
```

The base interface and permitted caller values can be left by default. However in this example, we are going to configured the permitted caller, this is vital if you are going to configure various interfaces over the same ISDN basic access.

```
Circuit Config> SET PERMITTED CALLER
Destination address[]? 931234567
Circuit Config>
```

So that router A can received calls originating from router B, you must have the coming calls enabled:

```
Circuit Config> ENABLE INCOMING
Circuit Config>
```

Now you have the following:

```
Circuit Config> LIST
Base interface: -1
Destination address: 931234567
Inactive time: 60
Permitted caller: 931234567
Circuit name:
Outgoing calls allowed: Yes
Incoming calls allowed: Yes
Enabled Access Control Access: No
Circuit Config>
```

Once the above has been completed, you only need to configure those specific Frame Relay parameters. For this specific example, a PVC with DLCI 16 is going to be created, the LMI disabled and an association between the DLCI 16 and the IP address 1.1.1.2 (router B's address) created. First you need to enter the Frame Relay configuration menu.

```
Circuit Config> ENCAPSULATOR

-- Frame Relay user configuration --
FR config>
```

Now you need to create the permanent virtual circuit that you wish to have available:

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

You can view the created circuit configuration:

```
FR config> LIST CIRCUITS

  Maximum PVCs allowed  =   64
  Total PVCs configured =    1

         Circuit           Circuit  Circuit     CIR     Burst   Excess
         Name              Number    Type     in bps    Size    Burst  Encrypt
    ------------------------ -------- ---------- ------- ------- ------- -------
      BARCELONA               16    Permanent   16000   16000      0    No
Inverse ARP: default
FR config>
```

Associate the DLCI 16 to the IP address 1.1.1.2, so that traffic having this destination address can be sent through DLCI 16:

```
FR config> ADD PROTOCOL-ADDRESS
IP Address [0.0.0.0]? 1.1.1.2
Circuit number[16]? 16
FR config>
```

You need to check that the configuration is correct:

```
FR config> LIST PROTOCOL ADDRESSES

              Frame Relay Protocol Address Translations

 Protocol Type          Protocol Address          Circuit Number
 -------------          ----------------          --------------
      IP                     1.1.1.2                    16
FR config>
```

Finally, disable the LMI as the routers are directly connected through ISDN:

```
FR config> DISABLE LMI
FR config>
```

Save the configuration and restart the device:

```
FR config> EXIT
Circuit Config> EXIT
Config> SAVE
Save the config [y/n]? Y

Saving the config ...OK
Config>                                         enter (CTRL + p)

*RESTART
Are you sure to restart the system (Yes/No)? Y
Disk configuration read
Initializing



Teldat               (c)1996,97,98,99

Router model NUCLEOX-PLUS 41 CPU M68360     S/N: XXXX/XXXXX
1 LAN, 2 WAN Lines, 2 ISDN Lines


*
```