Chapter 7

Overview of Physical and Layer 2 Interfaces

Introduction

This chapter introduces the physical and logical interfaces available on the base unit router and the optional interfaces available as expansion options on models that have a PIC bay.

Once you have configured the Layer 2 interfaces, you can configure a Layer 3 protocol to route traffic between these interfaces. A simple network overview showing the relationship between physical interfaces (except for ADSL), data link protocols, and network routing protocols is shown in Figure 7-1 on page 7-2. The relationship for ADSL on router models with an ADSL port is shown in Figure 7-2 on page 7-3.

Figure 7-1: Network overview

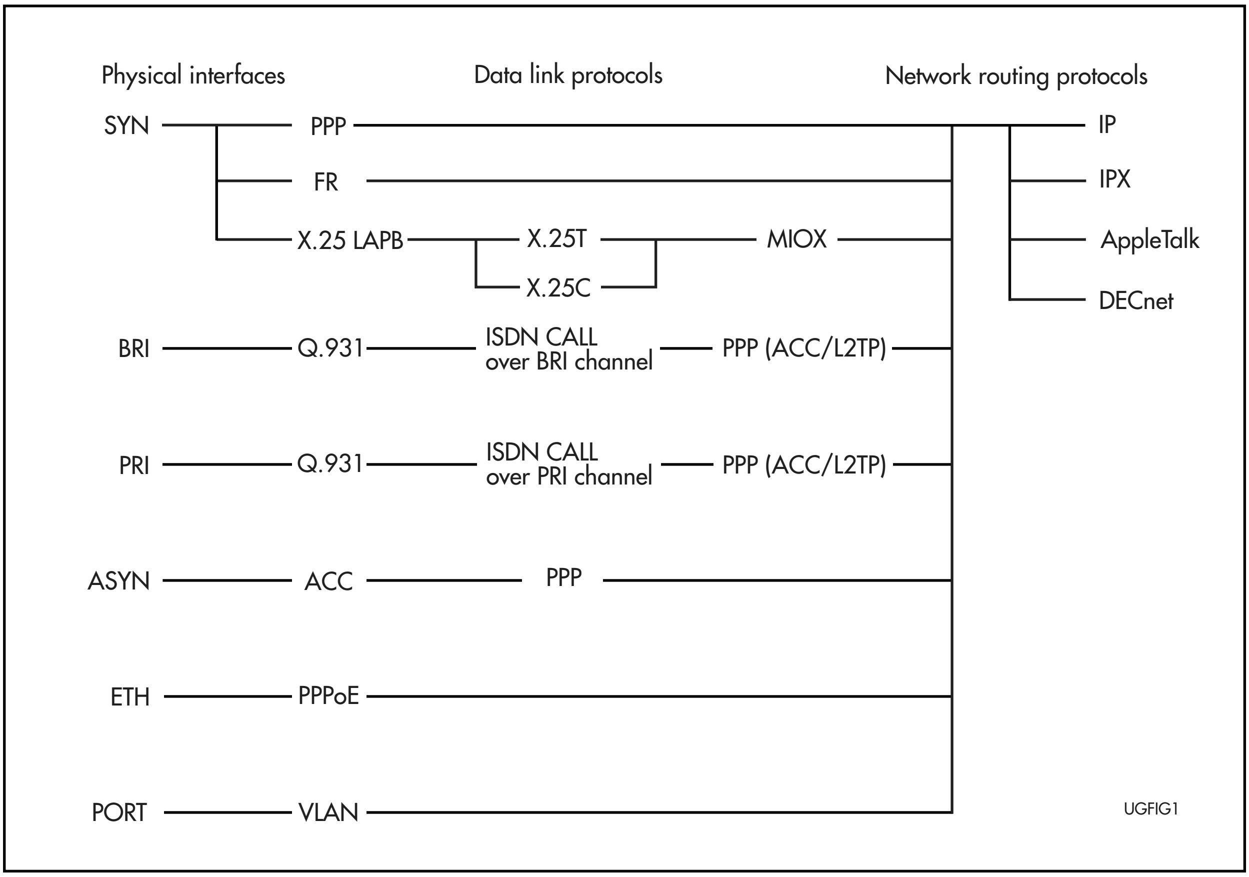
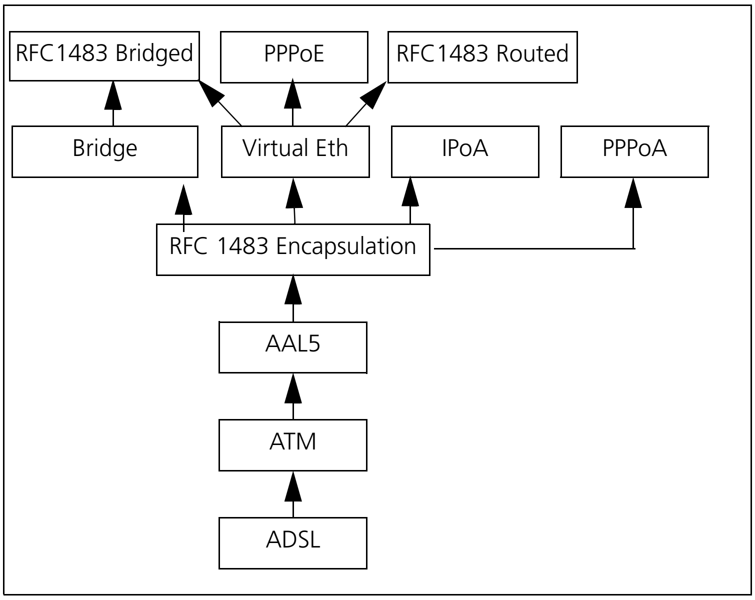


Figure 7-2: Protocols configured over ATM and ADSL



Interfaces

The physical interfaces on the base unit or expansion option, sometimes called ports, connect the router to the physical network. All data enters and leaves the router via an interface. The interface on the router and the device at the other end of the link must use the same encapsulations for the Layer 2 protocol.

You can use the asynchronous console port on the base unit, *asyn0*, to configure the router (see "Asynchronous Port" on page 7-5 and "Asynchronous Interfaces" on page 9-15 of Chapter 9, Interfaces).

Additional asynchronous ports can also connect terminals and terminal ports on host computers (see Chapter 61, Terminal Server).

Switch ports are numbered from 1. By default, all switch ports are enabled and set to autonegotiate. Autonegotiation allows switch ports to adjust their speed and duplex mode to accommodate the devices connected to them (see "Switch Ports" on page 7-8).

Switch ports are grouped into logical interfaces called Virtual LANs (VLANs), numbered from 1. You can create and modify the default VLAN configuration if necessary (see "Virtual LANs" on page 7-10).

Two of the encapsulations supported for synchronous ports (models with a PIC bay only)—Frame Relay and Point-to-Point Protocol—are described in detail Chapter 14, Frame Relay and Chapter 15, Point-to-Point Protocol (PPP).

The Basic Rate and Primary Rate ISDN interfaces (models with a PIC bay only) are described in Chapter 11, Integrated Services Digital Network (ISDN).

ATM over ADSL interfaces (models with an ADSL port only) are described in Chapter 10, ATM over xDSL.

Naming Interfaces

When you configure an interface, and configure routing over that interface, you can refer to a physical interface by its simple name or its fully qualified name.

The simple name for an interface is the interface type, followed by the interface number. The interface type is an abbreviation of the full name of the interface (see Table 7-1 on page 7-4). The fully qualified name for expansion option ports includes the expansion bay and the number of the interface within the bay.

Table 7-1: Interface type names

Type	Description
Physical interfaces	
PORT	Ethernet switch port interface, numbered from 1 (including uplinks)
ASYN	Asynchronous interface
BRI	Basic Rate ISDN interface
ETH	Ethernet interface (excluding switch ports)
PRI	Primary Rate ISDN interface
SYN	Synchronous interface
Logical interfaces	
VLAN	Virtual LAN interface over switch ports, numbered from 1
FR	Frame Relay interface
LAPB	X.25 LAPB interface
PPP	Point-to-Point Protocol interface
X25C	X.25 DCE interface
X25T	X.25 DTE interface

When you use commands with a physical interface as a parameter, you have the option to use either the simple name or the fully qualified name of the interface.

For examples of valid simple names and the equivalent fully qualified names see “Naming Interfaces” on page 9-4 of Chapter 9, Interfaces.

To display a summary of all the interfaces on the router, enter the command:

```
show interface
```

Ethernet Ports

An Ethernet interface on the router is automatically configured by the software modules when the router starts up. No user configuration of the Ethernet interfaces is required, except to enable other software modules to use the interface. This is achieved by adding a software module interface and using the clause **interface=*ethn***, where *n* is the number of the Ethernet interface being configured. For example, to add a logical interface to the IP module, enter the command:

```
add ip interface=eth0 ipaddress={ipadd|dhcp}
```

To display the modules in the router that are configured to use an Ethernet interface, and the encapsulations used on an interface, enter the command:

```
show eth=n configuration
```

where *n* is the number of the Ethernet interface.

For more information about Ethernet interfaces and encapsulations, see “Ethernet” on page 9-6 of Chapter 9, Interfaces.

Asynchronous Port

Asynchronous ports are normally used to connect a terminal to the router for configuration purposes. The default values for configurable parameters are modified by entering the command:

```
set asyn=port-number option
```

The factory default settings for asynchronous ports are shown in Table 7-2 on page 7-5.

Table 7-2: Factory defaults for configurable parameters for asynchronous ports

Option	Default setting
ATTENTION	BREAK
CDCONTROL	IGNORE
DATABITS	8
DEFAULTSERVICE	FALSE
DTRCONTROL	ON
ECHO	ON
FLOW	HARDWARE
HISTORY	30
INFLOW	HARDWARE
IPADDRESS	NONE
IPXNETWORK	NONE
MAXOQLEN	0 (Unrestricted)
MTU	1500
NAME	Asyn #
OUTFLOW	HARDWARE
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Table 7-2: Factory defaults for configurable parameters for asynchronous ports (Continued)

Option	Default setting
PARITY	NONE
PROMPT	DEFAULT (CMD>)
SECURE	ON
SERVICE	NONE
SPEED	AUTO
STOPBITS	1
TYPE	VT100

For more information about asynchronous ports, see the Hardware Reference or "Asynchronous Interfaces" on page 9-15 of Chapter 9, Interfaces.

For more information about configuring PPP interfaces across asynchronous interfaces, see Chapter 15, Point-to-Point Protocol (PPP)

Asynchronous Call Control (ACC)

You can configure the ACC module to answer calls made to a modem connected to an asynchronous port, to validate the user making the call and to configure the port to the mode appropriate for the desired service. Also, you can configure ACC to originate calls by controlling a modem attached to an asynchronous port and to switch the port to the appropriate mode once a connection to the remote device is established.

To assign a user an IP address and MTU (Maximum Transmission Unit) for use with an ACC call, enter the command:

```
set user=login-name ip=ipadd mtu=mtu
```

To assign an IP address and MTU to the asynchronous port accessed by the ACC call, enter the command:

```
set asyn=asyn-number ip=ipadd mtu=mtu
```

For more information about ACC, see Chapter 19, Asynchronous Call Control.

ADSL and ATM (models with ADSL port)

The AR440S router supports ADSL Annex A for connection to a POTS line. The AR441S router supports ADSL Annex B for connection to an ISDN line.

The routers support ATM permanent virtual channels (PVCs), AAL5, and a number of higher layer protocols that can be configured over ATM and ADSL on the router as shown in Figure 7-2 on page 7-3.

- PPPoE
- PPPoA
- IPoA
- RFC 1483 Routed
- RFC 1483 Bridged

For more information about ADSL and ATM, see Chapter 10, ATM over xDSL. The chapter includes step-by-step configuration instructions and examples for PPPoE over ATM, PPPoA and RFC 1483 Routed (used in the sense of a connection where the subscriber premises device routes packets onto the ADSL link, for a detailed definition see Chapter 10, ATM over xDSL).

Synchronous Ports (models with PIC bay)

You can use the asynchronous console port on the base unit to configure the router. Additional asynchronous ports can also connect terminals, printers and terminal ports on host computers.

Your router supports synchronous interfaces with speeds of up to 2.048 Mbps, also known as E1. The router will automatically generate a clock signal when a DCE transition cable is connected to a synchronous interface (see the Hardware Reference for details of how to construct a cable).

To set the clock speed, enter the command:

```
set syn=n speed=speed
```

For more information about synchronous interfaces, see “Synchronous Interfaces” on page 9-11 of Chapter 9, Interfaces.

Switch Ports

A switch port is one of the physical Ethernet interfaces on the base router unit. Each switch port is uniquely identified by a port number.

To display information about switch ports, enter the command:

```
show switch port[={port-list|all}]
```

All switch ports on the router are enabled by default. You can disable and enable a switch port as required. To enable or disable a switch port, enter the commands:

```
enable switch port={port-list|all}
```

```
disable switch port={port-list|all}
```

Port Speed and Duplex Mode

Switch ports can operate at either 10 Mbps or 100 Mbps, in either full duplex or half duplex mode. In full duplex mode a port can transmit and receive data simultaneously. In half duplex mode a port can either transmit or receive data, but not at the same time. This versatility makes it possible to connect devices with different speeds and duplex modes to different switch ports. Such versatility also requires that each switch port knows which speed and mode to use.

Each switch port can be either configured with a fixed speed and duplex mode, or configured to autonegotiate speed and duplex mode with a device connected to it to determine a speed and mode that will allow successful transmission. Setting the switch port to a fixed speed and duplex mode allows the port to support equipment that cannot autonegotiate. Autonegotiation allows the switch ports to adjust their speed and duplex mode to accommodate the devices connected to them. An autonegotiating switch port will adopt the speed and duplex mode required by devices connected to it. If another autonegotiating device is connected to the switch port, they will negotiate the highest possible common speed and duplex mode. When a port at one end of the link is set to a fixed speed (non-autonegotiating) set the port at the other end of the link to operate at the same speed. This is because when autonegotiation is disabled, the link partner is not able to determine the duplex mode of the link and must be forced to use the correct mode.

Note Auto MDI/MDI-X is disabled when a switch port is set to a specific speed and duplex mode.

It is also possible to require a switch port to operate at a single speed without disabling autonegotiation by allowing the port to autonegotiate, but constrain the speed/duplex options to the desired combination. For example, if one end of a link is set to **auto** and other to **100mfull** then the **auto** end will select **100mhalf** operation because without the other end autonegotiating the **auto** end has no way of knowing that the fixed end is full duplex capable. If a particular speed is required it is usually preferable to fix the speed/duplex combination using one of the autonegotiating speed values. Therefore, using **100mfauto** at one end of a link and will allow the **auto** end to autonegotiate **100mfull**.

To change this setting use the command:

```
set switch port={port-list|all}
    speed={autonegotiate|10mhalf|10mfull|10mhauto|10mfauto|10
    0mhalf|100mfull|100mhauto|100mfauto} [other-options...]
```

The **speed** parameter specifies the configured line speed and duplex mode of the port(s). If **autonegotiate** is specified, the port(s) will autonegotiate the highest mutually possible line speed and duplex mode with the link partner. If one of **10mfauto**, **10mhauto**, **100mfauto**, or **100mhauto** is specified, the port will autonegotiate with the link partner, but only accept operation at the specified speed and duplex mode. If one of **10mhalf**, **10mfull**, **100mhalf**, or **100mfull** is specified, then autonegotiation is disabled and the interface is forced to operate at the specified speed and duplex mode, regardless of whether the link partner is capable of working at that speed. The default is **autonegotiate**.

Packet Storm Protection

Using the packet storm protection feature, you can set limits on the reception rate of broadcast, multicast and destination lookup failure packets. Packet storm protection limits are set on a per port basis, beyond which each of the different packet types are discarded.

By default, packet storm protection is set to **none**, that is, disabled. Packet storm protection can be enabled, and each of the limits set, using the command:

```
set switch port=port-list polarity={mdi|mdix}
    [bclimit={none|limit}] [dlflimit={none|limit}]
    [mclimit={none|limit}] [other-options...]
```

Three sets of options are allowed for packet storm protection:

- broadcast limit only (**bclimit**)
- broadcast limit and multicast limit (**bclimit** and **mclimit**)
- broadcast limit, multicast limit, and destination lookup failure limit (**bclimit**, **mclimit**, and **dlflimit**)

The limit specified for each option, i.e the number of kilobytes per second (Kbps), must be the same for all modes of storm protection selected. The limit is set to the most recent limit specified. For example:

```
set swi port=1 polarity=mdi bclimit=256 mclimit=256
    dlflimit=256
```

To display the packet storm protection settings, use the command:

```
show switch port[={port-list|all}]
```

For more information about limiting switch traffic, see the **set switch port** command on page 8-37 of Chapter 8, Switching.

Virtual LANs

A Virtual LAN (VLAN) is a software-defined broadcast domain. The router's VLAN feature allows you to segment a network by software management to improve network performance. You can group workstations, servers, and other network equipment connected to the router according to similar data and security requirements. This is done by allocating the switch ports on the router to VLANs, each of which is a separate broadcast domain.

By default, the router has one VLAN, the default VLAN, with a VLAN Identifier (VID) of 1. All switch ports belong to the default VLAN, and all ports send untagged packets. You cannot delete the default VLAN from the router.

If all you want the router to do is switch traffic on your LAN using the default VLAN configuration, you need not perform any configuration. Simply power up the router and connect devices to the switch ports. Switch learning is enabled by default, and all valid packets are forwarded.

To create a new VLAN on the router, specify a vlanname and VID that are unique in the router. Enter the command:

```
create vlan=vlanname vid=2..4094
```

You cannot delete the default VLAN, but to delete other VLANs if they have no member ports, enter the command:

```
destroy vlan={vlanname|2..4094|all}
```

Any port in the default VLAN can be added to another VLAN, and is then automatically removed from the default VLAN. Each port can only belong to one VLAN. To add an untagged port to a VLAN, enter the command:

```
add vlan={vlanname|2..4094} port={port-list|all}
```

To return ports to the default VLAN, enter the command:

```
delete vlan={vlanname|2..4094} port={port-list|all}
```

To display the VLANs configured on the router, enter the command:

```
show vlan[={vlanname|1..4094|all}
```

To enable communication between ports in different VLANs, you need to configure IP or another Layer 3 protocol over the VLAN interfaces.

For more information about VLANs, see "Virtual Local Area Networks (VLANs)" on page 8-6 of Chapter 8, Switching.

Point to Point Protocol (PPP)

The Point-to-Point Protocol (PPP) establishes a connection between the router and a service provider, on demand. PPP provides mechanisms for transmitting data over synchronous connections, ISDN, ACC and L2TP calls, groups of TDM slots, and Ethernet.

Each protocol carried over PPP has an associated Network Control Protocol (NCP) that negotiates options for the protocol and brings up the link for that protocol.

To create or destroy a PPP interface over a synchronous port, an ISDN call, an ACC call, a MIOX circuit, an L2TP call, a TDM group (referred to as a physical layer) or a PPP over Ethernet service, enter the command.

```
create ppp=ppp-interface over=physical-interface

destroy ppp=ppp-interface
```

To add or delete a synchronous port, an ISDN call, an ACC call, a MIOX circuit, an L2TP call, TDM group or a PPP over Ethernet service to the PPP interface, enter the command:

```
add ppp=ppp-interface over=physical-interface

delete ppp=ppp-interface over=physical-interface
```

where:

- *physical-interface* is SYN*n*, ISDN-*callname*, ACC-*callname*, MIOX*n-circuitname*, TNL-*callname*, TDM-*groupname* or ETH*n-servicename*. For PPP over Ethernet, to specify that any service name is acceptable, use the special service name **any**. Service names may be up to 18 characters in length, and are usually supplied by the ISP providing the service.

There are many configurable parameters for PPP interfaces that you can modify using the SET PPP command.

Note By default, Allied Telesis routers and layer 3 switches use Link Quality Reporting (LQR=ON) to determine link quality on PPP links. When connecting to some vendors' routers it may be more suitable to turn LQR (link quality reporting) off on PPP links (LQR=OFF), and instead use LCP Echo Request and Echo Reply messages to determine link quality (ECHO=ON):
SET PPP=*ppp-interface* ECHO=ON LQR=OFF

For more information about PPP, see Chapter 15, Point-to-Point Protocol (PPP).

Dynamic PPP Interfaces and PPP Templates

A request from a lower layer (ISDN, ACC or L2TP) to create a new PPP interface creates a Dynamic PPP interface. PPP templates are blueprints that enable the full range of configuration options available on static PPP interfaces to apply to dynamic PPP interfaces.

You can use a template to specify any of the parameters configurable on a static PPP interface. Once a template is created, this template can be associated with an ISDN, ACC or L2TP call.

PPPoE

PPP over Ethernet (PPPoE) is defined in RFC 2516 "*A Method of Transmitting PPP Over Ethernet*". PPPoE is used to run PPP over the Ethernet. The same authentication, billing and transfer systems as for PPP are then available in Ethernet networks.

PPP over Ethernet enables multiple hosts at a remote site to share the same access device, while providing the access control and billing functionality of dial-up PPP connections.

The router behaves as a host, as defined in RFC 2516, creating PPP links over Ethernet to services on remote *Access Concentrators*.

Frame Relay (models with PIC bay)

Frame Relay is a wide area network service, defined by ITU-T (formerly CCITT), ANSI and vendor standards, to which routers may connect in order to communicate with one another and exchange data. Frame Relay is one of the services that you can purchase from a service provider to link several offices together at high speed. Connections are made via synchronous lines, ISDN calls or G.703 TDM (*Time Division Multiplexing*) links.

For more information, see Chapter 14, Frame Relay.

To configure Frame Relay follow these steps

1. Create the Frame Relay interface.
2. Add Static DLCs if required.
3. Add Logical Interfaces if required.
4. Enable routing modules to use the interface.

1. Create the Frame Relay interface

To create and associate the Frame Relay interface with a synchronous interface or an ISDN call, enter the command:

```
create fr=n over=physical-interface
```

where *n* is the number of the Frame Relay interface and *physical-interface* is a synchronous interface such as "syn0" or an ISDN call such as "isdn-Head Office".

To display each Frame Relay interface, the physical interface it uses, and the logical interfaces it provides, enter the command:

```
show framerelay
```

A feature of Frame Relay is the dialogue that the network maintains with the devices connected to it. This dialogue is known as the Local Management Interface (LMI). A LMI is not provided by all Frame Relay networks. Your router supports Frame Relay networks that do not run the LMI by allowing the configuration of static Data Link Connections (DLCs).

Parameters that affect the LMI dialogue are also set with the **create** command. These parameters, and the values that they can take, are defined in the Frame Relay standards. Default values for the LMI parameters are defined in the standards, and are used when parameters are not supplied.

Note Consult your Frame Relay network provider before making changes to the parameters that affect the LMI dialogue.

Parameters for setting the interface defaults for encryption and compression are also set with the **create** command. These values are used by all DLCs on the interface unless specifically overridden for a particular DLC.

After the Frame Relay interface is created, to change the LMI parameters, enter the command:

```
set framerelay
```

You may modify any or all of the parameters on a single command line. However, only ENCAPSULATION, NT1, NN1, NN2 and NN3 parameter changes take effect immediately. All other parameter changes cause the Frame Relay interface to reset automatically before they take effect.

To display the current values of the parameters, enter the command:

```
show framerelay config
```

2. **Add static DLCs if required**

If the LMI dialogue is turned off for a Frame Relay interface, the router is not informed about active DLCs. Therefore you must set up static DLCs. To set up static DLCs, enter the command:

```
add framerelay=fr-interface dlc=dlci
    [compression={default|on|off}]
    [encapsulation={default|ietf|cisco}]
    [encryption={default|on|off}]
```

To remove static DLCs, enter the command:

```
delete framerelay dlc
```

If no encryption or compression parameters are specified when the DLC is added, the interface defaults, which are set via the **defencryption** and **defcompression** parameters of the **create framerelay** and the **set framerelay** commands, are used for the DLC.

To set the encryption and compression parameters, and the CIR (Committed Information Rate), of an individual DLC, use the **set framerelay dlc** command. If a parameter is set to a non-default value for a DLC that the router is not informed about by the LMI, a DLC is created to record this information. The DLC is put into the AWAIT_LMI state until the network informs the router via the LMI that the DLC is active.

Obtain the actual values to use for DLCs from the administrators of the Frame Relay network to which your router is connected. Communication across the Frame Relay network will only occur for those DLCs that are statically configured.

Note If the LMI dialogue is enabled it is not possible to use static DLCs. In this case, DLCs are learned through the LMI dialogue.

3. **Add logical interfaces if required**

Frame Relay logical interfaces (FRLI) provide a mechanism for organising DLCs into groups. Each FRLI, or group of DLCs, are assigned its own IP address to split the Frame Relay network into subnets. A default FRLI 0 is always created when a Frame Relay interface is created. To create additional FRLI's, enter the command:

```
add framerelay=fr-interface li=logical-interface
```

By default, all DLCs are associated with the default FRLI 0. To associate DLCs with other FRLIs, enter the command:

```
set framerelay=fr-interface dlc=dlci li=logical-interface
```

4. Enable routing modules to use the interface

Once a Frame Relay interface is defined and configured, configure routing modules to use the interface. The procedures for achieving this are described in the chapter for the particular routing module.

In general, commands that contain the parameter **interface=** can refer to a Frame Relay interface by name. The form of the name is "fr*n*", where *n* is the instance for the Frame Relay module. Examples of commands that can refer to a Frame Relay interface include:

```
add ip interface=frn...
add ipx circuit=circuit interface=frn...
set dnt add=interface interface=frn...
```

One important point concerning the use of Frame Relay interfaces by the IP routing module is the way that the IP routing module maps IP addresses to a Frame Relay DLCI and vice versa. This mapping is an example of Address Resolution Protocol or ARP. Two methods of ARP are supported for Frame Relay interfaces on the router, Inverse ARP and static ARP.

The router supports the Inverse ARP, a protocol specially developed for Frame Relay that involves the exchange of packets between routers connected by a DLC in order to map an IP address to a Data Link Connection Identifier (DLCI). Inverse ARP is described in RFC 1293.

To enable the router to communicate with DTEs that do not support Inverse ARP, static ARP entries are added, by entering the command:

```
add ip arp=ipadd interface=frn dlci=dlci
```

Note The use of static DLCs and static ARP information is not normally required for interoperation of the router with other vendors' equipment. These facilities are provided for interoperation with equipment that does not fully support the Frame Relay standards. Networks that consist purely of routers that support Inverse ARP will not need static ARPs.

For more information, see Chapter 14, Frame Relay.

Integrated Services Digital Network (ISDN) (models with PIC bay)

To use ISDN connections you need to install the appropriate Port Interface Card (PIC) in the router's PIC bay. Either install an ISDN Basic Rate ISDN (BRI) or Primary Rate ISDN (PRI) PIC. Depending on the PIC installed, the router supports the following types of ISDN connections:

- Basic Rate ISDN (U)
- Basic Rate ISDN (S/T)
- Primary Rate ISDN

ISDN on the router requires minimal user configuration, other than selecting a territory, creating call definitions and configuring the Point-to-Point Protocol (PPP) to use the ISDN calls. The lower layers of the ISDN protocol stack (BRI, LAPD and Q.931) are automatically configured when the router starts up.

BRI Versus PRI

LAPD is the Link Access Protocol for the ISDN D channel, as defined by ITU-T Recommendation Q.921. The major difference between Basic and Primary Rate Interfaces as far as LAPD is concerned is that BRI S/T interfaces use a bus configuration whereas PRI interfaces use a point-to-point configuration.

For more information about ISDN, see Chapter 11, Integrated Services Digital Network (ISDN).

Configuring the Basic Rate Interface

The Basic Rate Interface (BRI) software module does not require user configuration for normal ISDN operation, but may require configuration when the interface is used for semipermanent connections.

To display the status of the BRI, enter the command:

```
show bri state
```

For more information about configuring BRI, see "BRI Physical Layer" on page 11-16 of Chapter 11, Integrated Services Digital Network (ISDN).

Configuring the Primary Rate Interface

The Primary Rate Interface (PRI) software module requires minimal user configuration for normal operation. Commands are provided to change user-configurable parameters, show the status of the module, and to examine and reset a number of data and error counters. You can reset the PRI software module, but this should not be necessary during normal operation. The PRI software module requires configuration for E1 and T1 interfaces.

To display the status of the PRI, enter the command:

```
show pri state
```

To show the higher layer modules (if any) that are attached to the PRI interface, enter the command:

```
show pri configuration
```

For more information about configuring PRI, see "PRI Physical Layer" on page 11-20 of Chapter 11, Integrated Services Digital Network (ISDN).

Default Setup

The standard LAPD configurations are shown in Chapter 11, Integrated Services Digital Network (ISDN), in:

- Table 11-6 on page 11-28 for Basic Rate Interfaces
- Table 11-6 on page 11-28 for Primary Rate Interfaces

These settings suit many situations. However, you can modify these settings as required to suit other network situations. More information, see "LAPD" on page 11-26 of Chapter 11, Integrated Services Digital Network (ISDN).

Testing the BRI or PRI PIC

To test the ISDN PRI, BRI (U), or BRI (S/T) PIC you need to configure a routing protocol, such as IP, to use ISDN.

For information about configuring ISDN calls, see "Configuration Examples" on page 11-49 of Chapter 11, Integrated Services Digital Network (ISDN).

For information about configuring IP, seeChapter 22, Internet Protocol (IP).

Ordering ISDN in the USA and Canada

In the United States and Canada, Basic Rate ISDN is provided using National ISDN-1, 5ESS or DMS-100 formats, all of which are supported by the router. If National ISDN-1 is available, you can select from a list of "Capability Packages", each providing different features. Contact your ISDN service provider for more information. The router will accept either one or two Service Profile Identifiers (SPIDs).

Connecting to a Leased Line Circuit (models with PIC bay)

Leased lines are a commonly used for building Wide Area Networks (WANs). A leased line maybe the right solution if you need to connect distant sites across public areas. By installing an AT-AR023 SYN PIC in your router this option is available to you.

To connect your router to a synchronous leased line circuit, follow these steps

1. Follow the instructions in the *Port Interface Card Quick Install Guide* to install the AT-AR023 SYN PIC.
2. Use the appropriate approved transition cable (RS-232, X.21 or V.35), to connect the synchronous port on the rear panel of the AT-AR023 SYN PIC to the telecommunication service provider's NTU.
3. To check the configuration of the port, enter the command:

   ```
   show syn=n
   ```

   where *n* is the synchronous port number. Verify that the information displayed is correct. In particular, you should set "State" to "enabled" and "Interface type" should match the transition cable used.
4. Configure a data link layer module, such as PPP (Point-to-Point Protocol), Frame Relay or X.25 LAPB, to use the synchronous interface. To create a PPP interface 0 to use synchronous port 0, enter the command:

   ```
   create ppp=0 over=syn0
   ```
5. To check the configuration, enter the commands:

   ```
   show syn=0
   show ppp=0
   ```

   The output of the **show syn** command should show "Active" set to "yes" and "Module" set to "ppp". The output of the **show ppp** command should show interface ppp0 over syn0 with "LCP" as the control protocol. The Tx and Rx LEDs are lit as data is sent and received on the interface.