GIGAswitch/ATM System

Management

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This document explains how to manage the GIGAswitch/ATM system.

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Preface

This document provides instructions for managing the GIGAswitch™/ATM system. For information about configuring and testing your particular system, refer to your Installation and Service manual.

Intended Audience

This document is intended for personnel who are experienced in managing network hardware.

Document Structure

This document is structured as follows:

- Chapter 1 describes the management information covered by this manual.
- Chapter 2 describes useful console commands.
- Chapter 3 describes the procedures for using the out–of–band management (OBM) interface.
- Chapter 4 describes how to configure dynamic routing.
- Chapter 5 describes the LAN emulation support.
- Chapter 6 introduces SNMP management concepts. It also describes how to use SNMP to manage your ATM system.
- Appendix A describes the ATM SNMP agent.
- Appendix B lists the object identifiers for MIBs that support the ATM system.

Additional Resources

The following document provides additional information:

- *Configuring the SNMP Agent*, AA–PR84A–TE

The following documents provide information about the implemented standards:

- UNI V3.0, ATM User–Network Interface Specification
- UNI V3.1, ATM User–Network Interface Specification
- LAN Emulation Over ATM Version 1.0
- RFC 1157: SNMP Standard
- RFC 1213: MIB–II
- RFC 1406: DS1/E1 MIB
- RFC 1407: DS3/E3 MIB
- RFC 1573: Evolution of the Interfaces Group of MIB–II
- RFC 1595: SONET MIB
- RFC 1695: ATM MIB
- DEC ATM MIB
- DEC ATM Signalling MIB
- DEC ATM Switch Chassis MIB
- DEC LAN Emulation Service MIBs

Documentation for your network management station (NMS) is also available for regular use. RFCs can be obtained from `gatekeeper.dec.com` in the `/pub/net/info/rfc` directory using anonymous ftp. You can obtain a list of primary RFC repositories from `nic.ddn.mil` using anonymous ftp.

Conventions

The following conventions are used in this document:

Bold typeface	Indicates that a word or phrase is being emphasized to the reader. Also indicates a MIB object.
`Special typeface`	Indicates a literal example of system output or user input. In text, indicates command names, keywords, node names, filenames, directories, and utilities.
Italic typeface	Indicates the complete titles of manuals.
<Return>	Indicates that you press the Return key on the keyboard.
<Ctrl/*x*>	Indicates that you must hold down the key labeled Ctrl while you press another key or a pointing device button.

1

Introduction

The GIGAswitch/ATM system is a standalone, intelligent, switching system that forwards cells among a set of connected ATM links based on the VCI field within the cell header. The links can be connected to end stations, bridges, routers, another vendor's switches, and to other GIGAswitch/ATM systems. The core of the GIGAswitch/ATM system is a crossbar module (CBM) that forms point–to–point and point–to–multipoint communication paths by mapping inputs to outputs.

1.1 GIGAswitch/ATM System Features

The GIGAswitch/ATM system provides point–to–point and point–to–multipoint circuits in both single and multiple switch environments. It supports Constant Bit Rate (CBR) and Available Bit Rate (ABR) traffic classes, including ABR with credit–based flow control, in the following manner.

- CBR point–to–point circuits
- CBR point–to–multipoint circuits
- ABR point–to–point circuits — where credit–based flow control is enabled automatically on compatible devices
- ABR point–to–multipoint circuits

The GIGAswitch/ATM system also allows you to set up these circuits in the following manner.

- PVC — using the local console or a remote system with a network connection.
- PVC — using SNMP and the ATM MIB (RFC 1695).
- SVC — using the ATM Forum UNI specification.

The GIGAswitch/ATM system offers such management features as routing, LAN emulation, and management interfaces.

1.1.1 SVC Routing

The GIGAswitch/ATM system provides multiswitch routing features that support ATM Forum Interim Interswitch Signaling Protocol (IISP) functions for third–party interoperability. These routing features include:

- Automatic configuration
- Shortest path first (SPF) routing
- Congestion avoidance
- Congestion detection
- Smart multipoint routing
- Rapid recovery

The network manager does not need to configure the network because the following operations are performed automatically if ILMI is supported.

- The default ATM NSAP addressing information for all switches is configured.
- The ATM NSAP prefix is distributed throughout the network from a single switch.
- The IISP static routes are distributed.
- ATM addresses are registered using ILMI.
- The network topology is determined.

The network automatically determines if the other object is a Digital host, a Digital switch, or another vendor's equipment. If the environment contains only Digital equipment, autoconfiguration takes place. However, if you are dealing with a mixed environment, you might have to perform some configuration. For example, if you must add other vendor's equipment that is not standard–compliant or you have hosts that do not support ILMI, you must perform some configuration procedures for static routing using the out–of–band management (OBM) facility.

1.1.2 LAN Emulation

LAN emulation allows existing network applications to operate on a native ATM end station without modification. Supported LAN emulation features include:

- A command line interface to manage LAN emulation servers.
- A LAN Emulation Configuration Server (LECS) supporting multiple emulated LANs.
- Multiple LAN Emulation Servers (LESs) allowing for the support of multiple emulated LANs.
- Multiple Broadcast and Unknown Servers (BUSs) to support multiple emulated LANs.

1.1.3 Management Interfaces

The out–of–band management (OBM) facility provides several management functions for the GIGAswitch/ATM system. You can use the OBM facility by connecting a terminal to an asynchronous serial line port on the clock management module (CMM) or creating an OBM session from a remote system on the network using Telnet, TCP/IP, and Ethernet. Diagnostic services for the GIGAswitch/ATM system are also available from the local console or the network connection. The OBM facility provides the ability to:

- Assign an IP address to the GIGAswitch/ATM system.
- Show and change the state of system modules.
- Set initial parameters for switch operation.
- Set and show important operational parameters when SNMP management is unavailable.

The GIGAswitch/ATM system can be managed from anywhere on the Ethernet network using a network management station (NMS) that implements Simple Network Management Protocol (SNMP). The GIGAswitch/ATM system has an SNMP agent that allows an SNMP–compliant NMS to read and set certain management parameters contained in Management Information Bases (MIBs).

The GIGAswitch/ATM system supports a wide range of standard MIBs as well as vendor–specific and device–specific MIBs. All supported MIBs must be loaded onto the NMS before it can be used to manage a GIGAswitch/ATM system. Any SNMP management station on the network can manage the GIGAswitch/ATM system once it knows the GIGAswitch/ATM system's IP address.

1.2 System Versions

The management features described in this book are supported for the GIGAswitch/ATM system and its supported line cards.

2

Using Console Commands

This chapter describes useful console commands, such as `obm`, `pvc`, `pvcr`, `script`, `setpasswd`, `uni`, and `versions`. Use these commands by connecting a terminal to the console port and pressing the <Ctrl/O> key sequence when in local mode on the CMM (refer to *GIGAswitch/ATM System Installation and Service*) or using Telnet to connect to the GIGAswitch/ATM system. The console prompt (`GIGAswitch/ATM–>`) appears.

2.1 Invoking the OBM Utility

The `obm` command is another method used to invoke the OBM utility.

```
GIGAswitch/ATM–> obm
```

This command causes the display of the Main Menu. Chapter 3 provides more information about using the OBM interface.

2.2 Displaying Version Numbers

The `versions` command displays the version numbers for the Boot ROM and the firmware image that are running on the Master line card as shown in the following example.

```
GIGAswitch/ATM–> versions
RomVersion: Release 1.3[16] : Wed Oct 25 12:01:52 EST 1995
AppVersion: Release 1.3[22] : Wed Oct 25 12:06:15 EST 1995
Host IP Address for flash downloads 16.17.18.19.
Host Boot Filename AN3V1_3.bin.
value = 0 = 0x0
GIGAswitch/ATM–>
```

2.3 Displaying the Current Date and Time

The `date` command displays the current date and time as shown in the following example.

```
GIGAswitch/ATM–> date
Jun 11 15:07:33 1996
master is up for 24 hrs, 30 mins, 20 sec
value = 0 = 0x0
GIGAswitch/ATM–>
```

2.4 Displaying PVCs

The `pvcr` command displays the permanent virtual circuits (PVCs) contained in nonvolatile memory (Flash). PVCs that are set up, but not recorded in Flash, are not displayed. Section 2.5.1 tells you how to display active PVCs.

```
GIGAswitch/ATM–> pvcr
”pvcr” displays the non–volatile flash PVC records, not the current PVCs. If
the switch slot configuration is changed it may be necessary to rewrite the
PVC flash records. To show the state of active pvc’s on the switch use ”pvc –a”

Point–to–Point PVC flash record read successfully
Link1:  4:4: 400 inflow: 0 Link2:  4:3: 450 outflow 0 dupl: 1 fwd: 0 rvs: 0
Point–to–Point PVC flash record read successfully
Link1:  4:1: 460 inflow: 0 Link2:  4:2: 360 outflow 0 dupl: 1 fwd: 14 rvs: 0

CBR Point–to–Multipoint Root flash record read successfully
Root Input:  4:1: 102 branch outvci: 202 rate: 14
CBR Point–to–Multipoint Root flash record read successfully
Root Input:  4:1: 340 branch outvci: 370 rate: 14

ABR Point–to–Multipoint Root flash record read successfully
Root Input:  4:4: 410 inflow: 0
ABR Point–to–Multipoint Root flash record read successfully
Root Input:  4:1:  34 inflow: 0

ABR Point–to–Multipoint Branch flash record read successfully
Branch output on slot:port:vci: 4:3: 411 outflow: 0
ABR Point–to–Multipoint Branch flash record read successfully
Branch output on slot:port:vci: 4:2:  43 outflow: 0

CBR Point–to–Multipoint Branch flash record read successfully
From CBR root slot:port:vci: 4:1: 102 to output slot:port:vci: 4:2: 202
CBR Point–to–Multipoint Branch flash record read successfully
From CBR root slot:port:vci: 4:1: 340 to output slot:port:vci: 4:3: 370

PVC Replay Complete
value = 21 = 0x15
GIGAswitch/ATM–>
```

The PVC records provide the following information.

slot:*port*: *vci*	Indicates the slot, port, and vci as numbers for links and root input.
inflow	Indicates support for flow control on the inbound link. 1 indicates that flow control is supported and 0 indicates that flow control is not supported.
outflow	Indicates support for flow control on the outbound link. 1 indicates that flow control is supported and 0 indicates that flow control is not supported.
dupl	Indicates whether the circuit is half–duplex (0) or full–duplex (1).
fwd	Is the forward rate, where 0 indicates an ABR circuit. Otherwise, the rate is displayed in Mb/s.
rvs	Is the reverse rate, where 0 indicates an ABR circuit. Otherwise, the rate is displayed in Mb/s.
rate	Is the forward rate for a CBR point–to–multipoint root in Mb/s.

2.5 Manipulating PVCs

The pvc command lets you manipulate the permanent virtual circuits (PVCs) on the GIGAswitch/ATM system. You can display, set up, and delete PVCs using different options. The arguments for these commands no longer require the use of quotation marks. However, the use of quotation marks is still supported for backward compatibility.

2.5.1 Displaying Active PVCs

The –a option displays the active PVCs. The syntax for this option is:

pvc –a [–L*slot*:*port*:*vci*]

where *slot* is the slot number, *port* is the port number, and *vci* is the virtual circuit number. If slot, port, and virtual circuit numbers are provided on the command line, then only those VCs are listed.

For example, the following pvc –a console command displays all the active PVCs.

```
GIGAswitch/ATM–> pvc –a

 VCIs on Linecard 4 and Port 1:

 InVCI: Type: Allocation:        OutCard:Port:VCI: Xmit Cells: FLOWmaster
  500   PVC   CBR P–P  ( 20 Mbps)     4:  2:  501         0       N/A
  600   PVC   CBR P–P  ( 20 Mbps)     4:  2:  601         0       N/A

 VCIs on Linecard 4 and Port 2:

 InVCI: Type: Allocation:        OutCard:Port:VCI: Xmit Cells: FLOWmaster
  501   PVC   ABR P–P  (  0 Mbps)     4:  1:  500         0       Off
  601   PVC   CBR P–P  ( 20 Mbps)     4:  1:  600         0       N/A

 VCIs on Linecard 4 and Port 3:

 InVCI: Type: Allocation:        OutCard:Port:VCI: Xmit Cells: FLOWmaster
  400   PVC   ABR P–P  (  0 Mbps)     4:  4:  401         0       Off
  500   PVC   ABR P–P  (  0 Mbps)     4:  3:  501         0       Off

 VCIs on Linecard 4 and Port 4:

 InVCI: Type: Allocation:        OutCard:Port:VCI: Xmit Cells: FLOWmaster
  401   PVC   ABR P–P  (  0 Mbps)     4:  3:  400         0       Off
```

2.5.2 Setting PVC Parameters

The –s option sets parameters for PVCs. You can specify the slot, port, VCI, and bandwidth limitations for a given circuit. The syntax for this option is:

pvc –s –pp | –root | –branch [–fcin] [–fcout] [–bw*mbs*]
[–rbw*mbs*] [–bvci*vci*] [–dup | –nodup] [–nv]
–L*slot1*:*port1*:*vc1* –M*slot2*:*port2*:*vc2*

where

–pp	Specifies that a point–to–point circuit setup should be attempted.
–root	Specifies that a point–to–multipoint circuit setup should be attempted.
–branch	Specifies that a branch for a point–to–multipoint circuit setup should be attempted. Note that branch setup should always follow root setup and must specify the line card, port, and VCI for both the root input and the branch output.

`-fcin`	Specifies flow control for your VC input ports. This setting is used only on ABR circuits. Note that the link must support FLOWmaster flow control for flow control to be enabled. Make sure that the virtual circuit and the link to the end station are created with flow control support.
`-fcout`	Specifies flow control for your VC output ports. This setting is used only on ABR circuits. Note that the link must support FLOWmaster flow control for flow control to be enabled. Make sure that the virtual circuit and the link to the end station are created with flow control support.
`-bw`*`mbs`*	Specifies the transmit bandwidth for the forward bandwidth, where *`mbs`* is the bandwidth in Mbits/second. By default, all circuits are ABR circuits. If you specify 0 for the bandwidth value, then the circuit is an ABR circuit. If the circuit is a CBR circuit, then 126 is the maximum bandwidth value that can be specified (120 if LAN emulation is enabled).
`-rbw`*`mbs`*	Specifies the transmit bandwidth for the reverse bandwidth (usually needed for duplex circuits), where *`mbs`* is the bandwidth in Mbits/second. By default, all circuits are ABR circuits. If you specify 0 for the bandwidth value, then the circuit is an ABR circuit. If the circuit is a CBR circuit, then 126 is the maximum bandwidth value that can be specified (120 if LAN emulation is enabled).
`-bvci`*`vci`*	Specifies the outvci for the branch of a CBR point–to–multipoint, where *`vci`* is the virtual circuit number for the common branch outvci because CBR root setup requires the reservation of the branch outvci on all switch ports when the root is initialized. If you specify 0 for the value, an available vci is selected for you. This setting only applies to CBR root setup. NOTE: If you have 4–port modular line cards (DAGGL–BA), you cannot specify a vci greater than 1023.
`-dup`	Specifies that the circuit is duplex. This setting is the default for point–to–point circuits.
`-nodup`	Specifies that the circuit is half–duplex. This setting is the default for point–to–multipoint circuits.
`-nv`	Specifies that the circuit is written to Flash if it is created successfully.
`-L`*`slot1`*`:`*`port1`*`:`*`vc1`*	Specifies the link on which the PVC should be set up, where *`slot1`* is the slot number, *`port1`* is the port number, and *`vc1`* is the virtual circuit number. For half–duplex, point–to–point VCs, this link is used for the input. For full–duplex, point–to–point VCs, this link is used for both the input and the output. For point–to–multipoint roots, this link is used for the input. For point–to–multipoint branches, this link identifies the associated root and is used in conjunction with the `-M` setting.

`–M`*`slot2`*`:`*`port2`*`:`*`vc2`* Specifies the link on which the PVC should be set up, where *slot2* is the slot number, *port2* is the port number, and *vc2* is the virtual circuit number. For half–duplex, point–to–point VCs, this link is used for the output. For point–to–multipoint branches, this link identifies the branch being added. This setting is only used for point–to–point circuit and point–to–multipoint branch setup.
NOTE: If you have different types of line cards in your system, a branch set up for 4–port 155 Mb/s line cards (DAGGL–AA or DAGGL–AB) cannot have an output vci that is different from the vci value specified at root creation with the `–bvci` option. However, a branch set up for 4–port modular line cards (DAGGL–BA) can have a different output vci.

For example, the following command creates a half–duplex, point–to–point ABR circuit that supports flow control from line card 2, port 3, VCI 300 to line card 4, port 1, VCI 400.

```
GIGAswitch/ATM–> pvc –s –pp –nodup –fcin –L2:3:300 –M4:1:400
```

The following command creates a full–duplex, point–to–point CBR circuit with 20 Mb/s forward and reverse bandwidth that is stored in Flash. Because the VCIs are specified as 0, the circuit setup makes internal assignments.

```
GIGAswitch/ATM–> pvc –s –pp –bw20 –rbw20 –nv –L3:2:0 –M5:1:0
```

The following command creates a point–to–multipoint CBR circuit on line card 3, port 1 with invci 200 that is stored in Flash. CBR circuits must specify the –bvci argument with a valid value. VCI 201 is reserved at all ports even though no branches are created.

```
GIGAswitch/ATM–> pvc –s –root –nv –bw10 –L3:1:200 –bvci201

        CBR P–MP Cct rsvd from Linecard.Port 3.1 and Invci: 200 for Outvci: 201

        The reserved bandwidth for the circuit is 10 Megabits per sec
        The reserved bandwidth for the circuit is 26292 cells per second
        The reserved bandwidth for the circuit is 14 slots per frame

        Point–to–Point PVC Record committed to flash successfully.
```

The following command adds a branch to the circuit in the preceding example. Note that whenever a branch is added, the root invci must be specified completely to correctly associate the branch. If a CBR branch is added, the branch VCI must correspond to the one chosen during root creation (or it must be specified as zero) for DAGGL–AA or DAGGL–AB line cards.

```
GIGAswitch/ATM–> pvc –s –branch –nv –L3:1:200 –M3:2:201

        CBR P–MP Branch added on outvci: 201 from invci: 200

        Point–to–Multipoint PVC Branch Record committed to flash successfully.
```

2.5.3 Deleting PVCs

The `–d` option deletes addresses from the VC/address mapping and removes them from Flash. The syntax for this option is:

```
pvc –d –pp | –branch | –root –Lslot:port:vci
```

where *slot* is the slot number, *port* is the port number, and *vci* is the virtual circuit number for the point–to–point circuit or point–to–multipoint root. If you specify `–pp`, then a point–to–point circuit teardown is attempted. If you specify `–branch`, then a branch deletion is attempted. If you specify `–root`, then a point–to–multipoint circuit teardown is attempted. In the case of a point–to–multipoint circuit teardown, the entire circuit (including branches) is deleted.

2.6 Displaying Network Interface Information

The `ifShow` command displays network interface information for the line card.

```
GIGAswitch/ATM–> ifShow
lo (unit number 0):
     Flags: (0x69) UP LOOPBACK ARP RUNNING
     Internet address: 127.0.0.1
     Netmask 255.0.0.0, Subnetmask 255.255.0.0
     Metric is 0
     Maximum Transfer Unit size is 4096
     1137 packets received; 1137 packets sent
     0 input errors; 0 output errors
     0 collisions
sn (unit number 0):
     Flags: (0x63) UP BROADCAST ARP RUNNING
     Internet address: 16.17.18.19
     Broadcast address: 16.17.18.20
     Internet address: 127.1.4.3
     Broadcast address: 127.0.255.255
     Netmask 255.0.0.0, Subnetmask 255.255.0.0
     Ethernet address is 08:00:2b:a5:ac:00
     Metric is 0
     Maximum Transfer Unit size is 1500
     4896 packets received; 2659 packets sent
     0 input errors; 0 output errors
     0 collisions
value = 18 = 0x12
GIGAswitch/ATM–>
```

2.7 Using Scripts

Scripts are used in conjunction with the OBM utility to facilitate VC definition during startup. Chapter 3 provides more information about using the OBM interface. The syntax for the `script` command is as follows.

```
script "username","user–password","host–address","host–dir","file–name"
```

Each argument is enclosed in quotes. The host IP address is optional. If 0 is specified, then the file is loaded from the bootp server.

You might use a command resembling the following command to execute your script file.

```
GIGAswitch/ATM–> script ”smith”,”smithpswd”,”16.17.18.19”,
”/users/smith”,”pvcset”
```

2.7.1 Creating PVCs

This example script command creates point–to–multipoint ABR circuits and commits them to Flash memory. The script file called `pvc1.scr` is shown first with the command and the log of the script running on the console following it.

```
pvc –s –root –nv –L3:1:100
pvc –s –branch –nv –L3:1:100 –M3:2:101
pvc –s –branch –nv –L3:1:100 –M3:3:102
pvc –s –branch –nv –L3:1:100 –M3:4:103
```

```
GIGAswitch/ATM–> script ”smith”,”smithpswd”,”16.17.18.19”,”/users/smith”,
”pvc1.scr”

GIGAswitch/ATM–> pvc –s –root –nv –L3:1:100

        ABR PMP circuit reserved on slot: 3 port: 1 Invci: 100

        Point–to–Point PVC Record committed to flash successfully.

GIGAswitch/ATM–> pvc –s –branch –nv –L3:1:100 –M3:2:101

        ABR P–MP Branch added to root at slot: 3 port: 1 from invci: 100
        ABR P–MP Branch added on slot: 3 port: 2 with outvci: 0

        Point–to–Multipoint PVC Branch Record committed to flash successfully.

GIGAswitch/ATM–> pvc –s –branch –nv –L3:1:100 –M3:3:102

        ABR P–MP Branch added to root at slot: 3 port: 1 from invci: 100
        ABR P–MP Branch added on slot: 3 port: 3 with outvci: 0

        Point–to–Multipoint PVC Branch Record committed to flash successfully.

GIGAswitch/ATM–> pvc –s –branch –nv –L3:1:100 –M3:4:103

        ABR P–MP Branch added to root at slot: 3 port: 1 from invci: 100
        ABR P–MP Branch added on slot: 3 port: 4 with outvci: 0

        Point–to–Multipoint PVC Branch Record committed to flash successfully.
```

Use the `pvc –a` console command to display the created PVCs.

2.7.2 Deleting PVCs

The following delete script called `del1.scr` removes the PVCs. By specifying 0 as the third argument, the log of this script shows the bootp server as the load source of the script.

```
pvc –d –branch –L3:1:100 –M3:2:101
pvc –d –branch –L3:1:100 –M3:3:102
pvc –d –branch –L3:1:100 –M3:4:103
pvc –d –root –L3:1:100


GIGAswitch/ATM–> script ”smith”,”ihateath”,”0”,”/users/smith”,
”del1.scr”

  pvc –d –branch –L3:1:100 –M3:2:101

        1 Circuits were unbound on Linecard 3, Port 2
        ABR Branch Record deleted from flash successfully.
value = 0 = 0x0

  pvc –d –branch –L3:1:100 –M3:3:102

        1 Circuits were unbound on Linecard 3, Port 3
        ABR Branch Record deleted from flash successfully.
value = 0 = 0x0

  pvc –d –branch –L3:1:100 –M3:4:103

        1 Circuits were unbound on Linecard 3, Port 4
        ABR Branch Record deleted from flash successfully.
value = 0 = 0x0

  pvc –d –root –L3:1:100

        1 Circuits were unbound on Linecard 3, Port 1
        ABR PMP Record deleted from flash successfully.
value = 0 = 0x0
value = 0 = 0x0
```

Use the `pvc –a` console command to display the status of the deleted PVCs as demonstrated by the following example.

```
GIGAswitch/ATM–> pvc –a

          VCIs on Linecard 2 and Port 1

          VCIs on Linecard 2 and Port 2

          VCIs on Linecard 2 and Port 3

          VCIs on Linecard 2 and Port 4
value = 0 = 0x0
```

2.8 Changing Passwords

The `setpasswd` command lets users change the passwords for the user or manager accounts using the following menu.

```
GIGAswitch/ATM–> setpasswd

        1. Change User Password
        2. Change Manager Password
        3. Exit

        Enter Selection:
```

You will be prompted for additional information. You can also change passwords using the OBM interface. The default password for the user account is username. The default password for the manager account is managername.

2.9 Using LAN Emulation Commands

The `bus`, `elan`, `elanall`, `lecs`, and `les` commands are used to support LAN emulation. Refer to Section 5.5 for more information about these commands.

2.10 Configuring UNI Versions

The `uni` command lets users configure the UNI version for an individual link on their ATM switch. It also lets users view the UNI status of all links, store the configuration into Flash for permanent storage, and restore UNI operation mode as stored in Flash.

The physical link is toggled and the new UNI version is in effect 10 seconds after the `uni` configuration command is executed.

When the user types either `uni` or `uni ?`, information about the command appears on the screen.

The `uni` command has the following syntax.

```
uni [unique option] [option list]
```

where `unique option` is one of the following options:

`–ver`	Is the UNI version and should have one of these values:
	0 autoconfigure mode
	30 UNI version 3.0
	31 UNI version 3.1
	40 UNI version 4.0
`–status`	Displays the UNI status of all links in memory.
`–flash`	Displays the UNI configuration stored in Flash.
`–/+nv`	Clears/Stores the UNI version configuration.
`–r`	Restores the UNI version configuration as stored in Flash.

where `option list` is both of the following options:

`–s`	Is the slot number.
`–p`	Is the port number.

2.10.1 Configuring the UNI Version for Each Link

To configure the UNI version for a link, use the following command.

```
uni –ver30 –s3 –p2
```

If the port was in autosensing mode before the change, the following message appears:

```
slot 3 port 2 changed from AUTOSENSING to UNI30
```

If the port is already running UNI 3.0, the following message appears:

```
slot 3 port 2 is already running UNI30
```

2.10.2 Displaying the Link Status

To view the protocol status of links, use the following command.

```
uni –status
```

This command causes a display similar to the following to appear.

```
                UNI Configuration in memory

                port 1     port 2     port 3     port 4

   slot  1      down       down       down       down
   slot  2      down       down       down       down
   slot  3      down    <UNI30>       down       down
   slot  4      down       down       down       down
   slot  5      down       down       down       down
   slot  6      down       down       down       down
   slot  8      down       down       down       down
   slot  9      down       down       down       down
   slot 10      down       down       down       down
   slot 11      down       down       down       down
   slot 12      down       down       down       down
   slot 13      down       down       down       down
   slot 14      down       down       down       down
```

The UNI version indicated by <UNI*nn*> in the display is detected using ILMI.

2.10.3 Storing the UNI Configuration

To store the configuration in Flash, use the following command.

```
uni +nv
```

There is no output message for this command unless an error occurs when writing to Flash.

2.10.4 Clearing the UNI Configuration

To clear the configuration in Flash, use the following command.

```
uni –nv
```

There is no output message for this command unless an error occurs when clearing Flash.

2.10.5 Displaying the Stored Configuration

To display the database stored in Flash, use the following command.

```
uni –flash
```

This command causes a display similar to the following to appear.

```
                UNI Configuration in flash

                port 1     port 2     port 3     port 4

   slot  1       auto       auto       auto       auto
   slot  2       auto       auto       auto       auto
   slot  3       auto      uni30       auto       auto
   slot  4       auto       auto       auto       auto
   slot  5       auto       auto       auto       auto
   slot  6       auto       auto       auto       auto
   slot  8       auto       auto       auto       auto
   slot  9       auto       auto       auto       auto
   slot 10       auto       auto       auto       auto
   slot 11       auto       auto       auto       auto
   slot 12       auto       auto       auto       auto
   slot 13       auto       auto       auto       auto
   slot 14       auto       auto       auto       auto
```

From the display, you can tell that slot 3 port 2 was configured to be UNI 3.0 and the rest of the links were in autosensing mode.

2.10.6 Restoring the UNI Configuration

To restore the UNI configuration stored in Flash, use the following command.

```
uni –r
```

There is no output message for this command unless an error occurs when reading Flash.

2.11 Setting Up bootp Information

If the V2.0 firmware is already installed on your system and you do not wish to use the bootp server to download images, you can use the `set_download_info` command to set up the information normally obtained from the bootp process. This command prompts you for the switch IP address, the switch net mask, the host IP address, and the default configuration file name as shown in the following display:

```
GIGAswitch/ATM–> set_download_info
set up default switch IP address (XXX.XXX.XXX.XXX) => 16.17.18.19
set up default switch net mask (XXX.XXX.XXX.XXX) => 255.0.0.0
set up default host IP address (XXX.XXX.XXX.XXX) => 16.17.18.20
set up default configuration file name => AN3_VER20
```

2.12 Forcing Image Downloads

After downloading kernel and application images from the network and storing them in Flash, the switch stores a flag indicating that the download is successful and that it has valid images. This flag is used to prevent the downloading of images for each system reboot. The `force_image_reload` command clears this flag so that you can perform a one–time download of a different firmware version.

To download a different version of firmware (for example, when upgrading to a new version or downgrading to an older version), use the `force_image_reload` command to clear the flag and then reboot the switch. While rebooting, the switch detects that new images have to be loaded because the flag has been cleared. The switch uses the setup information from Flash (set by the `set_download_info` command) or from the bootp process (if no information is available in Flash) to perform the download.

2.13 Modifying Parameters in Nonvolatile Memory

To modify the parameters in nonvolatile memory, use the `uploadNVData` and `downloadNVData` commands. To use these commands, the target host must be running `tftp`.

2.13.1 Transferring Stored Parameters to the Host

The `uploadNVData(`*`"ip-addr"`*`,`*`"file-name"`*`,`*`port`*`)` command transfers all the parameters currently stored in the nonvolatile area as a file to the specified host. The *`ip-addr`* is the IP address of the host. The *`file-name`* is the file name. The *`port`* is the port number (usually 0). For example, your command might resemble the following command:

```
uploadNVData("128.89.7.90","mydata",0)
```

2.13.2 Retrieving Stored Parameters from the Host

The `downloadNVData(`*`"ip-addr"`*`,`*`"file-name"`*`,`*`port`*`,`*`overwrite`*`)` command retrieves the parameter file previously saved at the host using the `uploadNVData` command and programs them into the nonvolatile area if they are set up manually. The *`ip-addr`* is the IP address of the host. The *`file-name`* is the file name. The *`port`* is the port number (usually 0). The *`overwrite`* parameter specifies whether this set of parameters should overwrite the current ones (0 indicates these parameters do not overwrite existing ones). For example, your command might resemble the following command:

```
downloadNVData("128.89.7.90","mydata",0,0)
```

2.14 Obtaining Information About Other Commands

Other console commands are available. You can generate a partial list by using the `help` command.

```
GIGAswitch/ATM-> help

help                        Print this list
pvcr                        Read PVC records stored in Flash memory
obm                         Run OBM
obmClear                    Clear OBM in use Flag
pvc                         pvc command, see management manual
pvc -a                      pvc display command
pvc -s                      pvc set-up command
pvc -d                      pvc delete command
nvdataErase                 Erase PVC, Params, ErrorLogs from Flash
alog_printError             typ, n  Print n Errorlog Entries type=1,2,or 3
versions                    Print ROM, and FlashImage Versions
netHelp                     Print network help info
spyHelp                     Print task histogrammer help info
timexHelp                   Print execution timer help info
h         [n]               Print (or set) shell history
i         [task]            Summary of tasks' TCBs
ti        task              Complete info on TCB for task
iam       "user"[,"passwd"]  Set user name and passwd
whoami                      Print user name

Type <CR> to continue, Q<CR> to stop:

devs                        List devices
ld        [syms[,noAbort][,"name"]] Load stdin, or file, into memory
                              (syms = add symbols to table:
                               -1 = none, 0 = globals, 1 = all)
checkStack  [task]          List task stack sizes and usage
printErrno  value           Print the name of a status value
lecs ?                      More help on LAN Emulation LECS setup
elan ?                      More help on LAN Emulation ELAN setup
les  ?                      More help on LAN Emulation LES setup
bus  ?                      More help on LAN Emulation BUS setup
uni  ?                      More help on uni version configuration

NOTE:  Arguments specifying 'task' can be either task ID or name.

value = 1 = 0x1
GIGAswitch/ATM->
```

Note

The *task* argument specifies either the task ID or the name.

3

Using the OBM Interface

The out–of–band management (OBM) facility for the GIGAswitch/ATM system has a basic, menu–driven interface for managing the system configuration. This OBM interface lets you perform the following procedures:

- Managing addresses
- Configuring virtual circuits
- Configuring the GIGAswitch/ATM system
- Configuring routing information
- Displaying signaling statistics

3.1 Connecting to the OBM Session

OBM is implemented as a Telnet server connection on the Master line card. *GIGAswitch/ATM System Installation and Service* explains how to connect to the OBM session. You might issue the following command from a Digital UNIX system:

```
#telnet an222 5000
Trying 16.17.18.19...
Connected to an222.nac.lkg.dec.com.
Escape character is '^]'.
```

where an222 is the name associated with the GIGAswitch/ATM system's IP address (listed in the `/etc/hosts` file).

The OBM facility can also be accessed from the console using the `obm` console command described in Chapter 2.

Once connected, the Main Menu resembling the following display appears.

```
+=======================================+
     Digital GIGAswitch/ATM Switch

          Out–of–Band Management
                Interface

               Appl Vers: Release 2.0

  Appl Build: Thu May 14 12:59:05 EDT 1996

         Date: May 16 15:04:45 1996


+=======================================+




          Digital ATM Switch Main Menu

1. Management Parameter Menu
2. Virtual Circuit Configuration Menu
3. Switch Configuration Menu
4. SNMP Parameters Menu
5. System Utility Menu
6. Routing/Signaling Configuration Menu
7. Disconnect Session

Input <Control–D> to terminate session
Enter Selection:
```

3.2 OBM Interface Menus

The following figures show the various menu screens that are supported for this release. Except for the Main Menu, each menu is labelled by levels, so that you always know where you are in relation to the Main Menu and its submenus. For example, if you select the first menu item from the Main Menu, the displayed submenu is labelled:

```
1 Management Parameter Selection Menu
```

If you try to use unsupported parameters or menus, an error message appears or nothing happens when you try to execute your command.

Press <Ctrl/D> to return to the previous menu.

Figure 3–1 Main Menu Screen

```
                Digital ATM Switch Main Menu

        1. Management Parameter Menu
        2. Virtual Circuit Configuration Menu
        3. Switch Configuration Menu
        4. SNMP Parameters Menu
        5. System Utility Menu
        6. Routing/Signaling Configuration Menu
        7. Disconnect Session

        Input <Control–D> to terminate session
        Enter Selection:
```

Figure 3–2 Management Parameter Selection Menu Screen

```
                1 Management Parameter Selection Menu

        1. Show Cell Counters per Port
        2. Show SUNI Error Counters per Port
        3. Show Box Ethernet IP address and Subnet Mask
        4. Set Box Ethernet IP address and Subnet Mask
        5. Show Box ATM IP address and Subnet Mask
        6. Set Box ATM IP address and Subnet Mask
        7. Show Box SLIP IP address and Host IP address
        8. Set Box SLIP IP address and Host IP address
        9. Set VCI point–to–multipoint/point–to–point boundary
        10. Main Menu

        Input <Control–D> to terminate operation
        Enter Selection:
```

Figure 3–3 VCI Configuration Menu Screen

```
                2 VCI Configuration Menu

        1. Show VCI Configuration Menu
        2. Set VCI Configuration Menu
        3. Delete VCI Configuration Menu
        4. Main Menu

        Input <Control–D> to terminate operation
        Enter Selection:
```

Figure 3–4 Switch Configuration Menu Screen

```
        3 Switch Configuration Menu

1. Display Slot Configuration
2. Disable Port
3. Enable Port
4. Read/Modify System Timeout
5. Read/Modify Switch OAM Support
6. Read/Modify SDH/SONET Support
7. Reboot Switch Software
8. Main Menu

Input <Control–D> to terminate operation
Enter Selection:
```

Figure 3–5 System Utility Menu

```
        5 GIGAswitch/ATM System Utility Menu

1. Read Current Date and Time
2. Change Passwords
3. Read/Modify Module Mask
4. Read/Modify Error Mask
5. Read QLC Linecard Error Logs
6. Clear Flash Storage for PVCs and Parameters
7. Main Menu

Input <Control–D> to terminate operation
Enter Selection:
```

Figure 3–6 Routing/Signaling Configuration/Statistics Menu

```
        6 Routing/Signaling Configuration/Statistics Menu

1. Set/Show Routing Configuration
2. Show Routing Statistics
3. Show Signaling Statistics
4. Save Routing and Signaling Configuration to Flash
5. Delete Configuration from Flash
6. Main Menu

Input <Control–D> to terminate operation
Enter Selection:
```

3.2.1 Setting Management Parameters

The following examples demonstrate how to set supported management parameters.

```
         Digital ATM Switch Main Menu

1. Management Parameter Menu
2. Virtual Circuit Configuration Menu
3. Switch Configuration Menu
4. SNMP Parameters Menu
5. System Utility Menu
6. Routing/Signaling Configuration Menu
7. Disconnect Session

Input <Control–D> to terminate session
Enter Selection: 1
```

Example 3–1 demonstrates how to display SUNI error counters. You should see listings for the running counters for each SUNI interface. These counters include BIP (Byte interleave parity) errors, Far end bit errors, and HCS (Header check sequence) errors.

Example 3–1 Displaying SUNI Error Counters

```
         1 Management Parameter Selection Menu

1. Show Cell Counters per Port
2. Show SUNI Error Counters per Port
3. Show Box Ethernet IP address and Subnet Mask
4. Set Box Ethernet IP address and Subnet Mask
5. Show Box ATM IP address and Subnet Mask
6. Set Box ATM IP address and Subnet Mask
7. Show Box SLIP IP address and Host IP address
8. Set Box SLIP IP address and Host IP address
9. Set VCI point–to–multipoint/point–to–point boundary
10. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 2

Enter desired slot (1–6,8–14) for suni error counts: 2
Enter desired port for suni error counts (1–4): 1

SUNI Counts for slot: 2 and link: 1

Rcv Section Overhead BIP Errors:                    436
Rcv Line Overhead BIP Errors:                       370
Rcv Path Overhead Line Far–End Bit Errors:           70
Rcv Path Overhead BIP Errors:                       148
Rcv Path Overhead Far–End Bit Errors:              2125
Rcv ATM Cell Correctable HCS Errors:                  0
```

```
Rcv ATM Cell Uncorrectable HCS Errors:                0
```

Example 3–2 Displaying Box Ethernet IP Addresses and Subnet Masks

```
         1 Management Parameter Selection Menu

1. Show Cell Counters per Port
2. Show SUNI Error Counters per Port
3. Show Box Ethernet IP address and Subnet Mask
4. Set Box Ethernet IP address and Subnet Mask
5. Show Box ATM IP address and Subnet Mask
6. Set Box ATM IP address and Subnet Mask
7. Show Box SLIP IP address and Host IP address
8. Set Box SLIP IP address and Host IP address
9. Set VCI point–to–multipoint/point–to–point boundary
10. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 3

Ethernet IP address: 16.17.18.19
Ethernet IP mask: 255.255.0.0
```

Example 3–3 Setting Box Ethernet IP Addresses and Subnet Masks

```
         1 Management Parameter Selection Menu

1. Show Cell Counters per Port
2. Show SUNI Error Counters per Port
3. Show Box Ethernet IP address and Subnet Mask
4. Set Box Ethernet IP address and Subnet Mask
5. Show Box ATM IP address and Subnet Mask
6. Set Box ATM IP address and Subnet Mask
7. Show Box SLIP IP address and Host IP address
8. Set Box SLIP IP address and Host IP address
9. Set VCI point–to–multipoint/point–to–point boundary
10. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 4

Current ENET IP address: 16.17.18.19
Current ENET IP mask: 255.255.0.0

Enter the new Ethernet IP Address in a.b.c.d notation: 16.17.18.20

Enter the new Ethernet IP Mask in a.b.c.d notation: 255.255.255.0
```

```
Proposed new ENET IP address: 16.17.18.20
Proposed new ENET IP mask: 255.255.255.0

Commit IP address to non–volatile storage, y or n? y

New Ethernet IP Address and Mask written to non–volatile storage

Note: OBM Session (telnet only) will be lost if the current E–net
IP addr is replaced.  Otherwise, IP Address in non–volatile
storage will take effect after the next switch reboot.

Replace the current IP address and mask with new values, y or n?:
```

Example 3–4 Displaying Box SLIP IP and Host IP Addresses

```
        1 Management Parameter Selection Menu

1. Show Cell Counters per Port
2. Show SUNI Error Counters per Port
3. Show Box Ethernet IP address and Subnet Mask
4. Set Box Ethernet IP address and Subnet Mask
5. Show Box ATM IP address and Subnet Mask
6. Set Box ATM IP address and Subnet Mask
7. Show Box SLIP IP address and Host IP address
8. Set Box SLIP IP address and Host IP address
9. Set VCI point–to–multipoint/point–to–point boundary
10. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 7

Slip IP address not initialized currently
```

Example 3–5 Setting Box SLIP IP and Host IP Addresses

```
        1 Management Parameter Selection Menu

1. Show Cell Counters per Port
2. Show SUNI Error Counters per Port
3. Show Box Ethernet IP address and Subnet Mask
4. Set Box Ethernet IP address and Subnet Mask
5. Show Box ATM IP address and Subnet Mask
6. Set Box ATM IP address and Subnet Mask
7. Show Box SLIP IP address and Host IP address
8. Set Box SLIP IP address and Host IP address
9. Set VCI point–to–multipoint/point–to–point boundary
```

```
        10. Main Menu

        Input <Control–D> to terminate operation
        Enter Selection: 8

        Enter the new Slip IP Address in a.b.c.d notation: 16.24.96.101

        Enter the new Slip Host IP Address in a.b.c.d notation: 16.24.96.102

        Proposed new SLIP IP address: 16.24.96.101
        Proposed new SLIP Host IP address: 16.24.96.102
        Commit IP address to non–volatile storage, y or n? (n): y

SLIP: switch ip address 16.24.96.101, Host ip address 16.24.96.102, status 0
```

Example 3–6 Setting VC Ranges

```
                1 Management Parameter Selection Menu

        1. Show Cell Counters per Port
        2. Show SUNI Error Counters per Port
        3. Show Box Ethernet IP address and Subnet Mask
        4. Set Box Ethernet IP address and Subnet Mask
        5. Show Box ATM IP address and Subnet Mask
        6. Set Box ATM IP address and Subnet Mask
        7. Show Box SLIP IP address and Host IP address
        8. Set Box SLIP IP address and Host IP address
        9. Set VCI point–to–multipoint/point–to–point boundary
        10. Main Menu

        Input <Control–D> to terminate operation
        Enter Selection: 9

        Enter the desired slot (1–6, 8–14) for VCI point–to–point minimum boundary: 3
        Enter the desired port for VCI point–to–point minimum boundary (1–4): 1

        For linecard: 3 and port: 1 the VC ranges are:

        Minimum CBR Point–to–Multipoint VCI:          32
        Maximum CBR Point–to–Multipoint VCI:          63
        Minimum Point–to–Point VCI:             64
        Maximum Point–to–Point VCI:             1791
        Minimum Switched VCI:                   64
        Maximum Switched VCI:                   1791
```

3.2.2 Displaying Information About Virtual Circuits

The following examples demonstrate how to display information about virtual circuits.

```
         Digital ATM Switch Main Menu

1. Management Parameter Menu
2. Virtual Circuit Configuration Menu
3. Switch Configuration Menu
4. SNMP Parameters Menu
5. System Utility Menu
6. Routing/Signaling Configuration Menu
7. Disconnect Session

Input <Control–D> to terminate session
Enter Selection: 2


        2 VCI Configuration Menu

1. Show VCI Configuration Menu
2. Set VCI Configuration Menu
3. Delete VCI Configuration Menu
4. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 1
```

Example 3–7 Displaying Ports For Each Line Card

```
        2.1 Show VCI Configuration Menu

1. Show Ports per Linecard
2. Show VCI Allocation Ranges
3. Show Circuit Mapping Parameters
4. Show VCI Circuit Usage
5. Show VCI In State
6. Show VCI Out State
7. Show VCs per Port
8. Show VCs per Port for Switch
9. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 1

Enter desired slot (1–6,8–14): 9

Linecard 9 supports 4 lines.
```

Example 3–8 Displaying VCI Type Ranges

```
        2.1 Show VCI Configuration Menu

1. Show Ports per Linecard
2. Show VCI Allocation Ranges
3. Show Circuit Mapping Parameters
4. Show VCI Circuit Usage
5. Show VCI In State
6. Show VCI Out State
7. Show VCs per Port
8. Show VCs per Port for Switch
9. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 2

Permanent Virtual Circuit Indices can range from: 128 to: 1918
```

Example 3–9 Displaying Circuit Mapping Parameters

```
        2.1 Show VCI Configuration Menu

1. Show Ports per Linecard
2. Show VCI Allocation Ranges
3. Show Circuit Mapping Parameters
4. Show VCI Circuit Usage
5. Show VCI In State
6. Show VCI Out State
7. Show VCs per Port
8. Show VCs per Port for Switch
9. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 3

Enter desired slot (1–6,8–14): 9
Enter desired port (1–4): 1

For linecard: 9 and port: 1 the base and size are:
VCI Base:     0
VCI Size:     8192
```

Example 3–10 Displaying VCI Circuit Usage

```
        2.1 Show VCI Configuration Menu

1. Show Ports per Linecard
2. Show VCI Allocation Ranges
3. Show Circuit Mapping Parameters
4. Show VCI Circuit Usage
5. Show VCI In State
6. Show VCI Out State
7. Show VCs per Port
8. Show VCs per Port for Switch
9. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 4

Enter desired slot (1–6,8–14): 9
Enter desired port (1–4): 1
Input vci: 400

VCI 400 on linecard 9  port 1 is in use in both directions
```

Example 3–11 Displaying VCI In State

```
        2.1 Show VCI Configuration Menu

1. Show Ports per Linecard
2. Show VCI Allocation Ranges
3. Show Circuit Mapping Parameters
4. Show VCI Circuit Usage
5. Show VCI In State
6. Show VCI Out State
7. Show VCs per Port
8. Show VCs per Port for Switch
9. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 5

Enter desired slot (1–6,8–14) for in state: 4
Enter desired port for in state (1–4): 2
Input vci: 400

* VCI 400 on linecard 4 port 2 is a permanent virtual circuit
* VCI index: 400
* VC is an ABR point–to–point circuit
* The out Linecard is: 4
* The outport is: 2
* The outbound VCI for the circuit is: 401
```

Example 3–12 Displaying VCI Out State

```
        2.1 Show VCI Configuration Menu

1. Show Ports per Linecard
2. Show VCI Allocation Ranges
3. Show Circuit Mapping Parameters
4. Show VCI Circuit Usage
5. Show VCI In State
6. Show VCI Out State
7. Show VCs per Port
8. Show VCs per Port for Switch
9. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 6

Enter desired slot (1–6,8–14) for out state: 4
Enter desired port for usage (1–4): 3
Input vci: 401

* VCI 401 on linecard 4 is a permanent virtual circuit
* VCI index: 401
* The corresponding linecard forwarding is: 4
* The corresponding port forwarding here is: 2
* The corresponding VCI forwarding here is: 401
```

Sometimes you might want to display the VCs for particular ports. You can use the `pvc –a` console command described in Section 2.5.1 to perform this function, or you can use the OBM utility as shown in Example 3–13.

Example 3–13 Displaying VCs for Particular Ports

```
        2.1 Show VCI Configuration Menu

1. Show Ports per Linecard
2. Show VCI Allocation Ranges
3. Show Circuit Mapping Parameters
4. Show VCI Circuit Usage
5. Show VCI In State
6. Show VCI Out State
7. Show VCs per Port
8. Show VCs per Port for Switch
9. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 8
```

```
 VCIs on Linecard 3 and Port 1:

 InVCI: Type: Allocation:        OutCard:Port:VCI: Xmit Cells: FLOWmaster
  500   PVC   CBR P–P  ( 20 Mbps)     3:  2:  501         0       N/A
  600   PVC   CBR P–P  ( 20 Mbps)     3:  2:  601         0       N/A

 VCIs on Linecard 3 and Port 2:

 InVCI: Type: Allocation:        OutCard:Port:VCI: Xmit Cells: FLOWmaster
  501   PVC   ABR P–P  (  0 Mbps)     3:  1:  500         0       Off
  601   PVC   CBR P–P  ( 20 Mbps)     3:  1:  600         0       N/A

 VCIs on Linecard 3 and Port 3:

 InVCI: Type: Allocation:        OutCard:Port:VCI: Xmit Cells: FLOWmaster
  400   PVC   ABR P–P  (  0 Mbps)     3:  4:  401         0       Off
  500   PVC   ABR P–P  (  0 Mbps)     3:  4:  501         0       Off

 VCIs on Linecard 3 and Port 4:

 InVCI: Type: Allocation:        OutCard:Port:VCI: Xmit Cells: FLOWmaster
  401   PVC   ABR P–P  (  0 Mbps)     3:  3:  400         0       Off
  501   PVC   ABR P–P  (  0 Mbps)     3:  3:  500         0       Off

 Continue to Display Circuits for other linecards, y or n (y)?: n
```

Example 3–14 Displaying VCs for the Switch

```
        2.1 Show VCI Configuration Menu

1. Show Ports per Linecard
2. Show VCI Allocation Ranges
3. Show Circuit Mapping Parameters
4. Show VCI Circuit Usage
5. Show VCI In State
6. Show VCI Out State
7. Show VCs per Port
8. Show VCs per Port for Switch
9. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 8
```

```
VCIs on Linecard 2 and Port 1:

InVCI: Type: Allocation:        OutCard:Port:VCI: Xmit Cells: FLOWmaster
 201   PVC   CBR P–P  ( 10 Mbps)     5:  1:  221         0       N/A
 301   PVC   CBR P–P  ( 10 Mbps)     5:  1:  211         0       N/A
 311   PVC   CBR P–P  ( 10 Mbps)     5:  1:  311         0       N/A
 341   PVC   ABR P–P  (  0 Mbps)     5:  1:  341         0       Off
 351   PVC   ABR P–P  (  0 Mbps)     5:  1:  351         0       Off
 361   PVC   ABR P–P  (  0 Mbps)     5:  1:  361         0       Off
 371   PVC   ABR P–P  (  0 Mbps)     5:  1:  371         0       Off
 400   PVC   CBR P–MP ( 10 Mbps)
             CBR P–MP Branch         2:  2:  401         0       N/A
             CBR P–MP Branch         2:  3:  401         0       N/A
             CBR P–MP Branch         2:  4:  401         0       N/A
             CBR P–MP Branch         5:  1:  401         0       N/A
             CBR P–MP Branch         5:  2:  401         0       N/A
             CBR P–MP Branch         5:  3:  401         0       N/A
             CBR P–MP Branch         5:  4:  401         0       N/A

Display More Circuits for this port, y or n (y)?: y


InVCI: Type: Allocation:        OutCard:Port:VCI: Xmit Cells: FLOWmaster
 431   PVC   CBR P–P  ( 10 Mbps)     5:  1:  441         0       N/A
 500   PVC   ABR P–P  (  0 Mbps)

Continue to Display Circuits for other ports, y or n (y)?: n
```

3.2.3 Setting Up Virtual Circuits

The following examples demonstrate how to set up virtual circuits. These examples include the creation of a CBR point–to–point circuit, a CBR point–to–multipoint circuit, an ABR point–to–point circuit, and an ABR point–to–multipoint circuit. They also show how to disable and enable circuits.

```
         Digital ATM Switch Main Menu

1. Management Parameter Menu
2. Virtual Circuit Configuration Menu
3. Switch Configuration Menu
4. SNMP Parameters Menu
5. System Utility Menu
6. Routing/Signaling Configuration Menu
7. Disconnect Session

Input <Control–D> to terminate session
Enter Selection: 2
```

```
        2 VCI Configuration Menu

1. Show VCI Configuration Menu
2. Set VCI Configuration Menu
3. Delete VCI Configuration Menu
4. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 2
```

Example 3–15 Creating Point–To–Point CBR Circuits

```
        2.2 Set VCI Configuration Menu

1. Connect Point–to–Point Circuit
2. Connect Point–to–Multipoint Circuit
3. Add Point–to–Multipoint ABR Circuit Branch
4. Add Point–to–Multipoint CBR Circuit Branch
5. Disable Virtual Circuit
6. Enable Virtual Circuit
7. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 1

Input Virtual Circuit Parameters:

Enter desired slot (1–6,8–14) for input: 4
Enter desired port for input (1–4): 1
Zero as input results in a system provided PVC/SVC VCI
Enter input vci: 200

Output Virtual Circuit Parameters:

Enter desired slot (1–6,8–14) for output: 4
Enter desired port for output (1–4): 2
Zero as input results in a system provided PVC/SVC VCI
Enter output vci: 201
Enter desired CBR bandwidth, in Megabits/sec (max 126)
zero will create a ABR circuit: 20
Should this be a duplex circuit, y or n (y)?: n

Circuit established between 4.1 Invci: 200 and 4.2 Outvci: 201

The forward rate in Megabits per sec is: 20
The forward rate in cells per sec is: 47160
The slots per frame reserved is: 28
```

```
Commit permanent virtual circuit to non–volatile storage y or n (n)?: y

Point–to–Point PVC Record committed to flash successfully.
```

Note that 126 is the maximum bandwidth value that you can specify for CBR circuits. If LAN emulation is enabled, 120 is the maximum bandwith value that you can specify.

Example 3–16 Creating Point–To–Multipoint CBR Circuits

```
        2.2 Set VCI Configuration Menu

1. Connect Point–to–Point Circuit
2. Connect Point–to–Multipoint Circuit
3. Add Point–to–Multipoint ABR Circuit Branch
4. Add Point–to–Multipoint CBR Circuit Branch
5. Disable Virtual Circuit
6. Enable Virtual Circuit
7. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 2

Select type of Point to Multipoint Circuit
Constant Bit Rate (1) or Available Bit Rate (0): 1

Input Virtual Circuit Parameters:

Enter desired slot (1–6,8–14) for cbr root input: 4
Enter desired port for cbr root input (1–4): 3

Zero as input results in a system provided PVC/SVC VCI
Enter input vci: 300

Output Virtual Circuit Parameters:

Provide the VCI to be bound for output branches of this circuit,
Zero as input results in a system provided PVC/SVC VCI
Output vci: 301
Enter desired CBR bandwidth in Mbps (mandatory, max 126): 20

CBR P–MP Cct rsvd from Linecard.Port 4.3 and Invci: 300 for Outvci: 301

The reserved bandwidth for the circuit is 20 Megabits per sec
The reserved bandwidth for the circuit is 47160 cells per second
The slots per frame reserved is: 28

Commit permanent virtual circuit to non–volatile storage y or n?: y
```

```
Point–to–Multipoint PVC Record committed to flash successfully.
```

Note that 126 is the maximum bandwidth value that you can specify for CBR circuits. If LAN emulation is enabled, 120 is the maximum bandwith value that you can specify.

Example 3–17 Adding a Point–To–Multipoint CBR Circuit Branch

```
        2.2 Set VCI Configuration Menu

1. Connect Point–to–Point Circuit
2. Connect Point–to–Multipoint Circuit
3. Add Point–to–Multipoint ABR Circuit Branch
4. Add Point–to–Multipoint CBR Circuit Branch
5. Disable Virtual Circuit
6. Enable Virtual Circuit
7. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 4

Enter desired slot (1–6,8–14) used for CBR root input: 4
Enter desired port used for CBR root (1–4): 3
Enter invci selected during Root CBR Reservation
Enter vci for CBR Branch invci: 300

Enter desired slot (1–6,8–14) for CBR Branch output: 4
Enter desired port for CBR Branch output (1–4): 4
CBR P–MP Branch added on outvci: 301 from invci: 300

Commit permanent virtual circuit to non–volatile storage y or n?: y

Point–to–Multi Point PVC Branch Record committed to flash successfully.
```

Example 3–18 Creating Point–To–Multipoint ABR Circuits

```
        2.2 Set VCI Configuration Menu

1. Connect Point–to–Point Circuit
2. Connect Point–to–Multipoint Circuit
3. Add Point–to–Multipoint ABR Circuit Branch
4. Add Point–to–Multipoint CBR Circuit Branch
5. Disable Virtual Circuit
6. Enable Virtual Circuit
7. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 2
```

```
Select type of Point to Multipoint Circuit
Constant Bit Rate (1) or Available Bit Rate (0): 0

Input ABR Virtual Circuit Parameters:

Enter desired slot (1–6,8–14) for abr root input: 4
Enter desired port for abr root input (1–4): 1

Enter inVCI for abr root.
Zero as input results in a system provided PVC/SVC VCI
Enter input vci: 500

Should this be a FLOWmaster circuit at the input, y or n? n

ABR PMP circuit reserved on slot: 4 port: 1 Invci: 500

Commit permanent virtual circuit to non–volatile storage y or n?: y

Point–to–Multi Point PVC Record committed to flash successfully.
```

Note that the link must support FLOWmaster flow control for flow control to be enabled. Make sure that the virtual circuit and the link to the end station are created with flow control support.

Example 3–19 Adding a Point–To–Multipoint ABR Circuit Branch

```
        2.2 Set VCI Configuration Menu

1. Connect Point–to–Point Circuit
2. Connect Point–to–Multipoint Circuit
3. Add Point–to–Multipoint ABR Circuit Branch
4. Add Point–to–Multipoint CBR Circuit Branch
5. Disable Virtual Circuit
6. Enable Virtual Circuit
7. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 3

Enter desired slot (1–6,8–14) used for abr root input: 4
Enter desired port used for root input (1–4): 1
Enter the In VCI used for the ABR root
Enter vci for abr root: 500

Enter desired slot (1–6,8–14) used for abr root input: 4
Enter desired port used for root input (1–4): 1
Enter the In VCI used for the ABR root
Enter vci for abr root: 500
```

```
Enter desired slot (1–6,8–14) for abr branch output: 4
Enter desired port for abr branch output (1–4): 2
Zero as input results in a system provided PVC/SVC VCI
Enter abr branch outvci: 501

Should this be a FLOWmaster circuit at the output, y or n? n

ABR P–MP Branch added to  root at slot: 4 port 1: from invci: 500
ABR P–MP Branch added on slot 4 port: 2 with outvci: 501

Commit permanent virtual circuit to non–volatile storage y or n?: y

Point–to–Multi Point PVC Branch Record committed to flash successfully.
```

Note that the link must support FLOWmaster flow control for flow control to be enabled. Make sure that the virtual circuit and the link to the end station are created with flow control support.

Example 3–20 Disabling and Enabling Virtual Circuits

```
        2.2 Set VCI Configuration Menu

1. Connect Point–to–Point Circuit
2. Connect Point–to–Multipoint Circuit
3. Add Point–to–Multipoint ABR Circuit Branch
4. Add Point–to–Multipoint CBR Circuit Branch
5. Disable Virtual Circuit
6. Enable Virtual Circuit
7. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 5

Enter desired slot (1–6,8–14) for disable: 4
Enter desired port for disable (1–4): 1
Enter vci for disable: 300
Linecard: 4 Port: 1 VCI: 300 has been disabled
```

```
        2.2 Set VCI Configuration Menu

1. Connect Point–to–Point Circuit
2. Connect Point–to–Multipoint Circuit
3. Add Point–to–Multipoint ABR Circuit Branch
4. Add Point–to–Multipoint CBR Circuit Branch
5. Disable Virtual Circuit
6. Enable Virtual Circuit
7. Return to VCI Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 6

Enter desired slot (1–6,8–14) for enable: 4
Enter desired port for enable (1–4): 1
Enter vci for enable: 300
Linecard: 4 Port: 1 VCI: 300 has been enabled
```

3.2.4 Deleting Virtual Circuits

The following examples demonstrate how to delete virtual circuits.

```
         Digital ATM Switch Main Menu

1. Management Parameter Menu
2. Virtual Circuit Configuration Menu
3. Switch Configuration Menu
4. SNMP Parameters Menu
5. System Utility Menu
6. Routing/Signaling Configuration Menu
7. Disconnect Session

Input <Control–D> to terminate session
Enter Selection: 2


        2 VCI Configuration Menu

1. Show VCI Configuration Menu
2. Set VCI Configuration Menu
3. Delete VCI Configuration Menu
4. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 3
```

Example 3–21 Removing Point–to–Point Virtual Circuits

```
        2.3 Virtual Circuit Delete Menu

1. Remove Point–to–Point VC
2. Remove ABR Point–to–Multipoint VC Circuit
3. Remove CBR Point–to–Multipoint VC Circuit
4. Remove CBR Point–to–Multipoint Branch VC
5. Remove PVC Record from flash only
6. Unbind VC Range in volatile memory
7. Return to Virtual Circuit Menu

Input <Control–D> to terminate operation
Enter Selection: 1

Enter desired slot (1–6,8–14): 4
Enter desired port (input) for deletion (1–4): 1
Input vci: 300

Circuit removed, Invci: 300 and Inlinecard: 4 Inport 1

PVC Record deleted from flash successfully.
```

Example 3–22 Removing CBR Point–to–Multipoint Virtual Circuits

```
        2.3 Virtual Circuit Delete Menu

1. Remove Point–to–Point VC
2. Remove ABR Point–to–Multipoint VC Circuit
3. Remove CBR Point–to–Multipoint VC Circuit
4. Remove CBR Point–to–Multipoint Branch VC
5. Remove PVC Record from flash only
6. Unbind VC Range in volatile memory
7. Return to Virtual Circuit Menu

Input <Control–D> to terminate operation
Enter Selection: 3

Enter desired slot (1–6,8–14) for CBR point–to–multipoint delete: 4
Enter desired port for CBR point–to–multipoint delete (1–4): 1
Enter vci for CBR point–to–multipoint delete: 400
```

Sometimes you must delete nonvolatile PVC records from Flash memory only. For example, it is helpful to delete the old PVC record for a previous configuration from Flash memory if a card is moved from one slot to another. You can use the `pvcr` console command described in Section 2.4 to confirm this function. Example 3–23 describes how to remove PVC records from Flash memory.

Example 3–23 Removing PVC Records From Flash Memory

```
        2.3 Virtual Circuit Delete Menu

1. Remove Point–to–Point VC
2. Remove ABR Point–to–Multipoint VC Circuit
3. Remove CBR Point–to–Multipoint VC Circuit
4. Remove CBR Point–to–Multipoint Branch VC
5. Remove PVC Record from flash only
6. Unbind VC Range in volatile memory
7. Return to Virtual Circuit Menu

Input <Control–D> to terminate operation
Enter Selection: 5



2.3.5 Flash VC Record Delete Menu

1. Remove Point–to–Point PVC from Flash Memory
2. Remove ABR Point–to–Multipoint Root PVC from Flash Memory
3. Remove CBR Point–to–Multipoint Root PVC from Flash Memory
4. Remove ABR Point–to–Multipoint Branch PVC from Flash Memory
5. Remove CBR Point–to–Multipoint Branch PVC from Flash Memory

Enter Selection: 1

Enter desired slot (1–6,8–14) used for point–to–point input delete: 4
Enter desired port for point–to–point input delete (1–4): 1
Enter vci for point–to–point input delete: 200

PVC Record deleted from flash successfully.



        2.3 Virtual Circuit Delete Menu

1. Remove Point–to–Point VC
2. Remove ABR Point–to–Multipoint VC Circuit
3. Remove CBR Point–to–Multipoint VC Circuit
4. Remove CBR Point–to–Multipoint Branch VC
5. Remove PVC Record from flash only
6. Unbind VC Range in volatile memory
7. Return to Virtual Circuit Menu

Input <Control–D> to terminate operation
Enter Selection: 5
```

```
2.3.5 Flash VC Record Delete Menu

1. Remove Point–to–Point PVC from Flash Memory
2. Remove ABR Point–to–Multipoint Root PVC from Flash Memory
3. Remove CBR Point–to–Multipoint Root PVC from Flash Memory
4. Remove ABR Point–to–Multipoint Branch PVC from Flash Memory
5. Remove CBR Point–to–Multipoint Branch PVC from Flash Memory

Enter Selection: 5

Enter desired slot (1–6,8–14) for CBR root input, p–to–mp branch delete: 4
Enter desired port for CBR root input, p–to–mp branch delete (1–4): 3
Enter vci for CBR root input, p–to–mp branch delete: 300

Enter desired slot (1–6,8–14) for CBR branch output, p–to–mp branch delete: 4
Enter desired port for CBR branch output, p–to–mp branch delete (1–4): 4

PVC Record deleted from flash successfully.
```

```
        2.3 Virtual Circuit Delete Menu

1. Remove Point–to–Point VC
2. Remove ABR Point–to–Multipoint VC Circuit
3. Remove CBR Point–to–Multipoint VC Circuit
4. Remove CBR Point–to–Multipoint Branch VC
5. Remove PVC Record from flash only
6. Unbind VC Range in volatile memory
7. Return to Virtual Circuit Menu

Input <Control–D> to terminate operation
Enter Selection: 5
```

```
2.3.5 Flash VC Record Delete Menu

1. Remove Point–to–Point PVC from Flash Memory
2. Remove ABR Point–to–Multipoint Root PVC from Flash Memory
3. Remove CBR Point–to–Multipoint Root PVC from Flash Memory
4. Remove ABR Point–to–Multipoint Branch PVC from Flash Memory
5. Remove CBR Point–to–Multipoint Branch PVC from Flash Memory

Enter Selection: 3

Enter desired slot (1–6,8–14) used for CBR point–to–multipoint delete: 4
Enter desired port for CBR point–to–multipoint delete (1–4): 3
Enter vci for CBR point–to–multipoint delete: 300

PVC Record deleted from flash successfully.
```

```
        2.3 Virtual Circuit Delete Menu

1. Remove Point–to–Point VC
2. Remove ABR Point–to–Multipoint VC Circuit
3. Remove CBR Point–to–Multipoint VC Circuit
4. Remove CBR Point–to–Multipoint Branch VC
5. Remove PVC Record from flash only
6. Unbind VC Range in volatile memory
7. Return to Virtual Circuit Menu

Input <Control–D> to terminate operation
Enter Selection: 5
```

2.3.5 Flash VC Record Delete Menu

```
1. Remove Point–to–Point PVC from Flash Memory
2. Remove ABR Point–to–Multipoint Root PVC from Flash Memory
3. Remove CBR Point–to–Multipoint Root PVC from Flash Memory
4. Remove ABR Point–to–Multipoint Branch PVC from Flash Memory
5. Remove CBR Point–to–Multipoint Branch PVC from Flash Memory

Enter Selection: 4

Enter desired slot (1–6,8–14) for ABR root input, p–to–mp branch delete: 4
Enter desired slot (1–6,8–14) for ABR branch output, p–to–mp delete: 4
Enter desired port for ABR branch output, p–to–mp delete (1–4): 2
Enter vci for ABR branch output, p–to–mp delete: 501

PVC Record deleted from flash successfully.
```

```
        2.3 Virtual Circuit Delete Menu

1. Remove Point–to–Point VC
2. Remove ABR Point–to–Multipoint VC Circuit
3. Remove CBR Point–to–Multipoint VC Circuit
4. Remove CBR Point–to–Multipoint Branch VC
5. Remove PVC Record from flash only
6. Unbind VC Range in volatile memory
7. Return to Virtual Circuit Menu

Input <Control–D> to terminate operation
Enter Selection: 5
```

```
2.3.5 Flash VC Record Delete Menu

1. Remove Point–to–Point PVC from Flash Memory
2. Remove ABR Point–to–Multipoint Root PVC from Flash Memory
3. Remove CBR Point–to–Multipoint Root PVC from Flash Memory
4. Remove ABR Point–to–Multipoint Branch PVC from Flash Memory
5. Remove CBR Point–to–Multipoint Branch PVC from Flash Memory

Enter Selection: 2

Enter desired slot (1–6,8–14) used for ABR point–to–multipoint delete: 9
Enter desired port for ABR point–to–multipoint delete (1–4): 1
Enter vci for ABR point–to–multipoint delete: 400

PVC Record deleted from flash successfully.
```

3.2.5 Configuring the GIGAswitch/ATM System

The following examples demonstrate how to configure the GIGAswitch/ATM system with the supported options. They show you how to display the slot configuration, read and modify SDH or SONET support, and reboot the software.

```
          Digital ATM Switch Main Menu

1. Management Parameter Menu
2. Virtual Circuit Configuration Menu
3. Switch Configuration Menu
4. SNMP Parameters Menu
5. System Utility Menu
6. Routing/Signaling Configuration Menu
7. Disconnect Session

Input <Control–D> to terminate session
Enter Selection: 3
```

Example 3–24 Displaying the Slot Configuration

```
        3 Switch Configuration Menu

1. Display Slot Configuration
2. Disable Port
3. Enable Port
4. Read/Modify System Timeout
5. Read/Modify Switch OAM Support
6. Read/Modify SDH/SONET Support
7. Reboot Switch Software
8. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 1
```

```
          Slot:    Master:     Enet Addr:      FW Rev:     FW String:
              1     Master    08:00:2b:22:33:30  000022  Release 2.0 DAGGL–BA:
QLCv2
              2     Empty
              3     Empty
              4     Empty
              5     Empty
              6     Empty
              7     Clock
              8     Empty
              9     Slave     08:00:2b:22:3b:78  000022  Release 2.0 DAGGL–AA:
QLCv1.5
             10     Empty
             11     Empty
             12     Empty
             13     Empty
             14     Empty
```

Example 3–25 Reading and Modifying SDH/SONET Support

```
        3 Switch Configuration Menu

1. Display Slot Configuration
2. Disable Port
3. Enable Port
4. Read/Modify System Timeout
5. Read/Modify Switch OAM Support
6. Read/Modify SDH/SONET Support
7. Reboot Switch Software
8. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 6

Enter desired slot (1–6,8–14) for SDH setup: 4

Linecard 4 Framing Configuration

       Port:        SONET/SDH:

          1         SONET
          2         SONET
          3         SONET
          4         SONET

Do you want to modify this linecards framing support, y or n?: y

Enter the port number to modify SDH/SONET support: 1

SONET is currently enabled on Linecard 4 Port 1
```

```
Would you like to set it to SDH, y or n?: y

SDH/SONET Record for Linecard 4 committed to flash successfully.
SDH/SONET change will take effect at next switch initialization.
```

Example 3–26 Rebooting the Switch Software

```
        3 Switch Configuration Menu

1. Display Slot Configuration
2. Disable Port
3. Enable Port
4. Read/Modify System Timeout
5. Read/Modify Switch OAM Support
6. Read/Modify SDH/SONET Support
7. Reboot Switch Software
8. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 7

Switch Reboot will disconnect this OBM session and disconnect all
circuits as well.  The GIGAswitch/ATM will reboot automatically.

Are you sure you want to perform this action, y or n? (n): y
```

If you reply with y, the switch reboots at this point and you will see the console prompt or the Clock Management Module Console Port Help Screen display. The line card mode that you were in when you rebooted the switch determines what you will see after the switch reboots.

3.2.6 Using the System Utility Menu

The following examples demonstrate how to use the System Utility menu to display the current time, change passwords, display error logs for the Master line card, and erase the Flash storage.

```
         Digital ATM Switch Main Menu

1. Management Parameter Menu
2. Virtual Circuit Configuration Menu
3. Switch Configuration Menu
4. SNMP Parameters Menu
5. System Utility Menu
6. Routing/Signaling Configuration Menu
7. Disconnect Session

Input <Control–D> to terminate session
Enter Selection: 5


        5 GIGAswitch/ATM System Utility Menu

1. Read Current Date and Time
2. Change Passwords
3. Read/Modify Module Mask
4. Read/Modify Error Mask
5. Read QLC Linecard Error Logs
6. Clear Flash Storage for PVCs and Parameters
7. Main Menu

Input <Control–D> to terminate operation
Enter Selection:
```

Example 3–27 Displaying the Current Date and Time

```
        5 GIGAswitch/ATM System Utility Menu

1. Read Current Date and Time
2. Change Passwords
3. Read/Modify Module Mask
4. Read/Modify Error Mask
5. Read QLC Linecard Error Logs
6. Clear Flash Storage for PVCs and Parameters
7. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 1

Current Time is  Sep 11 15:07:19 1995
```

Example 3–28 Changing Passwords

```
        5 GIGAswitch/ATM System Utility Menu

1. Read Current Date and Time
2. Change Passwords
3. Read/Modify Module Mask
4. Read/Modify Error Mask
5. Read QLC Linecard Error Logs
6. Clear Flash Storage for PVCs and Parameters
7. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 2


        5.2 Change Passwords Menu

1. Change User Password
2. Change Manager Password
3. Return to GIGAswitch/ATM System Utility Menu

Input <Control–D> to terminate operation
Enter Selection: 1

Changing password for user

Old password:

This operation changes the user access password, inform
other authorized switch users of the new password

Do you want to continue this operation, y or n? (n): y

Enter new password:
Verify:

User account password updated and committed to flash storage.
```

```
        5.2 Change Passwords Menu

1. Change User Password
2. Change Manager Password
3. Return to GIGAswitch/ATM System Utility Menu

Input <Control–D> to terminate operation
Enter Selection: 2

Changing password for manager

Old password:

This operation changes the manager access password, inform
other authorized switch managers of the new password

Do you want to continue this operation, y or n? (n): y

Enter new password:
Verify:

Manager account password updated and committed to flash storage.
```

Example 3–29 Displaying Earliest Log Entries

```
        5 GIGAswitch/ATM System Utility Menu

1. Read Current Date and Time
2. Change Passwords
3. Read/Modify Module Mask
4. Read/Modify Error Mask
5. Read QLC Linecard Error Logs
6. Clear Flash Storage for PVCs and Parameters
7. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 5
```

```
  5.5 GIGAswitch/ATM Error Log Display Menu

  1. Display Error Log from Earliest Log
  2. Display Error Log from Current Log
  3. Display All Error Logs

  Input <Control–D> to terminate session
  Enter Selection: 1

  Enter desired slot (1–6,8–14) for error display: 3
  Input the number of logs to display: 2


LOGERROR in src/app/util/alog.c at 385. Module: 20 Code: 1
   TimeStamp Master StartNum: 1 Time–seconds: 45 Time–nsec: 950000000
   ErrMsg: Master UID: aa: 0: 3: 2:ff: 1  Master StartNum: 1
LOGERROR in tLMCS_Worker at –2145283156. Module: 0 Code: 0
   TimeStamp Master StartNum: 1 Time–seconds: 1224 Time–nsec: 370000000
   ErrMsg: assert_failed: qlc_write_creditram: bad group
```

Example 3–30 Displaying Latest Log Entries

```
        5 GIGAswitch/ATM System Utility Menu

  1. Read Current Date and Time
  2. Change Passwords
  3. Read/Modify Module Mask
  4. Read/Modify Error Mask
  5. Read QLC Linecard Error Logs
  6. Clear Flash Storage for PVCs and Parameters
  7. Main Menu

  Input <Control–D> to terminate operation
  Enter Selection: 5


  5.5 GIGAswitch/ATM Error Log Display Menu

  1. Display Error Log Entries from Earliest Entry
  2. Display Error Log Entries from Next Entry
  3. Display Latest Log Entries
  4. Display All Error Logs
  5. Return to the System Utility Menu

  Input <Control–D> to terminate session
  Enter Selection: 3
  Enter desired slot (1–6,8–14) for log entry display: 2

  Input the number of logs to display: 2
```

```
LOGERROR in src/app/util/alog.c at 388. Module: 20 Code: 1
   TimeStamp Master StartNum: 1 Time–seconds: 39 Time–nsec: 420000000
   ErrMsg: Master Slot: 2 Master StartNum: 1
LOGERROR in src/app/util/alog.c at 388. Module: 20 Code: 1
   TimeStamp Master StartNum: 2 Time–seconds: 39 Time–nsec: 420000000
   ErrMsg: Master Slot: 2 Master StartNum: 2
```

The following example demonstrates how to erase management parameters from Flash storage. In firmware versions preceding Version 2.0, the GIGAswitch/ATM system reboots when you choose this option to guarantee Flash integrity. Do not select this option if you do not want the switch to reboot. For firmware versions of V2.0 or later, the system no longer reboots when clearing Flash storage.

Example 3–31 Erasing Flash Storage

```
        5 GIGAswitch/ATM System Utility Menu

1. Read Current Date and Time
2. Change Passwords
3. Read/Modify Module Mask
4. Read/Modify Error Mask
5. Read QLC Linecard Error Logs
6. Clear Flash Storage for PVCs and Parameters
7. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 6

Continue with flash erase: y or n (n)?: y
```

3.2.7 Configuring Routing and Signaling

The following examples demonstrate how to configure routing and display signaling statistics.

```
         Digital ATM Switch Main Menu

1. Management Parameter Menu
2. Virtual Circuit Configuration Menu
3. Switch Configuration Menu
4. SNMP Parameters Menu
5. System Utility Menu
6. Routing/Signaling Configuration Menu
7. Disconnect Session

Input <Control–D> to terminate session
Enter Selection: 6
```

3.2.7.1 Setting and Displaying Routing Information

This section shows the submenu used to set and show the routing configuration or to display routing statistics. Section 4.2 provides some examples.

```
        6 Routing/Signaling Configuration/Statistics Menu

1. Set/Show Routing Configuration
2. Show Routing Statistics
3. Show Signaling Statistics
4. Save Routing and Signaling Configuration to Flash
5. Delete Configuration from Flash
6. Main Menu

Input <Control–D> to terminate operation
Enter Selection:
```

3.2.7.2 Displaying Signaling Statistics

This section shows you how to display signaling statistics.

```
        6 Routing/Signaling Configuration/Statistics Menu

1. Set/Show Routing Configuration
2. Show Routing Statistics
3. Show Signaling Statistics
4. Save Routing and Signaling Configuration to Flash
5. Delete Configuration from Flash
6. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 3
```

Example 3–32 Displaying Q.SAAL Link Statistics

```
        6.3 Show Signaling Statistics Menu

1. Show Q.SAAL Link Statistics
2. Show Q.93B Link Statistics
3. Show Connection Summary
4. Show Link Connections
5. Show Q.SAAL Link Status
6. Return to Routing/Signaling Configuration/Statistic Menu

Input <Control–D> to terminate operation
Enter Selection: 1

Enter desired slot (1–6,8–14) for signaling statistics: 5
Enter desired port for signaling statistics (1–4): 1
```

```
QSAAL Statistics Information for Slot 5   Port 1

BGN PDUs Received         0          BGN PDUs Transmitted      0
BGNAK PDUs Received       0          BGNAK PDUs Transmitted    0
BGREJ PDUs Received       0          BGREJ PDUs Transmitted    0
END PDUs Received         0          END PDUs Transmitted      0
ENDAK PDUs Received       0          ENDAK PDUs Transmitted    0

POLL PDUs Received        0          POLL PDUs Transmitted     0
STAT PDUs Received        0          STAT PDUs Transmitted     0
USTAT PDUs Received       0          USTAT PDUs Transmitted    0

RS PDUs Received          0          RS PDUs Transmitted       0
RSAK PDUs Received        0          RSAK PDUs Transmitted     0
SD PDUs Received          0          SD PDUs Transmitted       0
SDP PDUs Received         0          SDP PDUs Transmitted      0
UD PDUs Received          0          UD PDUs Transmitted       0
MD PDUs Received          0          MD PDUs Transmitted       0

Receive Error PDUs        0          Transmit Error PDUs       0
Receive Discarded PDUs    0          Transmit Discarded PDUs   0
Transmit Discarded PDUs   0
```

Example 3–33 Displaying Q.93B Link Statistics

```
        6.3 Show Signaling Statistics Menu

1. Show Q.SAAL Link Statistics
2. Show Q.93B Link Statistics
3. Show Connection Summary
4. Show Link Connections
5. Show Q.SAAL Link Status
6. Return to Routing/Signaling Configuration/Statistic Menu

Input <Control–D> to terminate operation
Enter Selection: 2

Enter desired slot (1–6,8–14) for signaling statistics: 5
Enter desired port for signaling statistics (1–4): 2

Q.93B Statistics Information for Slot 5   Port 2

Setup          Msgs Rcvd 0          Setup          Msgs Xmtd 0
Call   Proc    Msgs Rcvd 0          Call   Proc    Msgs Xmtd 0
Connect        Msgs Rcvd 0          Connect        Msgs Xmtd 0
Connect  Ack   Msgs Rcvd 0          Connect  Ack   Msgs Xmtd 0
Release        Msgs Rcvd 0          Release        Msgs Xmtd 0
Release  Comp  Msgs Rcvd 0          Release  Comp  Msgs Xmtd 0
Restart        Msgs Rcvd 0          Restart        Msgs Xmtd 0
Restart  Ack   Msgs Rcvd 0          Restart  Ack   Msgs Xmtd 0
Status         Msgs Rcvd 0          Status         Msgs Xmtd 0
Status   Enq   Msgs Rcvd 0          Status   Enq   Msgs Xmtd 0
Add  Party     Msgs Rcvd 0          Add  Party     Msgs Xmtd 0
```

```
Add Party  Ack Msgs Rcvd 0          Add Party  Ack Msgs Xmtd 0
Add Party  Rej Msgs Rcvd 0          Add Party  Rej Msgs Xmtd 0
Drop Party     Msgs Rcvd 0          Drop Party     Msgs Xmtd 0
Drop Party Ack Msgs Rcvd 0          Drop Party Ack Msgs Xmtd 0
Total Conns Established  0          Active Conns 0
Last Rcvd Cause Code     0          Last Xmtd Cause Code     0
Last Rcvd Diagnostic Code 0          Last Xmtd Diagnostic Code 0
```

Example 3–34 Displaying Connection Summary

```
        6.3 Show Signaling Statistics Menu

1. Show Q.SAAL Link Statistics
2. Show Q.93B Link Statistics
3. Show Connection Summary
4. Show Link Connections
5. Show Q.SAAL Link Status
6. Return to Routing/Signaling Configuration/Statistic Menu

Input <Control–D> to terminate operation
Enter Selection: 3


                SVC Connection Matrix

             Number of Active SVCs Per Port

             LCP    Port 1    Port 2    Port 3    Port 4

Slot  1      0      0         0         0         0
Slot  2      0      0         0         0         0
Slot  3      0      0         0         0         0
Slot  4      0      0         0         0         0
Slot  5      0      0         0         0         0
Slot  6      0      0         0         0         0

      ---------------- CLOCK CARD (SLOT 7) ----------

Slot  8      0      0         0         0         0
Slot  9      0      0         0         0         0
Slot 10      0      0         0         0         0
Slot 11      0      0         0         0         0
Slot 12      0      0         0         0         0
Slot 13      0      0         0         0         0
Slot 14      0      0         0         0         0

             Total Number of Active SVCs: 0
```

Example 3–35 Displaying Link Connections

```
        6.3 Show Signaling Statistics Menu

    1. Show Q.SAAL Link Statistics
    2. Show Q.93B Link Statistics
    3. Show Connection Summary
    4. Show Link Connections
    5. Show Q.SAAL Link Status
    6. Return to Routing/Signaling Configuration/Statistic Menu

    Input <Control–D> to terminate operation
    Enter Selection: 4

    Enter desired slot (1–6,8–14) for signaling statistics: 5
    Enter desired port for signaling statistics (1–4): 2


          Incoming SVC Connections on Slot 5 Port 2
Callid    Ingress VCI     Egress Slot    Egress Port    Egress VCI


          Outgoing SVC Connections on Slot 5 Port 2
Callid    Egress VCI     Ingress Slot     Ingress Port   Ingress VCI
```

Example 3–36 Displaying Q.SAAL Link Status

```
        6.3 Show Signaling Statistics Menu

    1. Show Q.SAAL Link Statistics
    2. Show Q.93B Link Statistics
    3. Show Connection Summary
    4. Show Link Connections
    5. Show Q.SAAL Link Status
    6. Return to Routing/Signaling Configuration/Statistic Menu

    Input <Control–D> to terminate operation
    Enter Selection: 5

    Enter desired slot (1–6,8–14) for Q.SAAL protocol status: 5

    QSAAL protocol is DOWN on Slot 5 Port 1
    QSAAL protocol is DOWN on Slot 5 Port 2
    QSAAL protocol is DOWN on Slot 5 Port 3
    QSAAL protocol is DOWN on Slot 5 Port 4
```

3.2.7.3 Saving the Routing and Signaling Configuration

This section shows you how to save the routing and signaling configuration to Flash.

```
        6 Routing/Signaling Configuration/Statistics Menu

1. Set/Show Routing Configuration
2. Show Routing Statistics
3. Show Signaling Statistics
4. Save Routing and Signaling Configuration to Flash
5. Delete Configuration from Flash
6. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 4

Writing configuration number 0. Version is 1.0.0 .....

Configuration number 0 saved
```

3.2.8 Disconnecting From the OBM Session

The following example demonstrates how to disconnect from the OBM session after you return to the Main Menu.

```
         Digital ATM Switch Main Menu

1. Management Parameter Menu
2. Virtual Circuit Configuration Menu
3. Switch Configuration Menu
4. SNMP Parameters Menu
5. System Utility Menu
6. Routing/Signaling Configuration Menu
7. Disconnect Session

Input <Control–D> to terminate session
Enter Selection: 7


OBM Session disconnecting......


Connection closed by foreign host.
% exit
```

4

Configuring Dynamic Routing

This chapter describes configuration options for dynamic switched virtual circuit (SVC) call routing in the GIGAswitch/ATM system. It describes the features and functions of GIGAswitch/ATM routing and the routing configuration options available with the GIGAswitch/ATM system.

4.1 Overview of Dynamic Routing

The GIGAswitch/ATM system has automatic routing features that allow the routing of User–to–Network Interface (UNI) SVC calls in a multiswitch ATM network. The GIGAswitch/ATM system also supports the ATM Forum Interim Interswitch Signaling Protocol (IISP) for signaling SVC calls between switches in a multivendor ATM switch network.

The GIGAswitch/ATM system has the following automatic routing and addressing features:

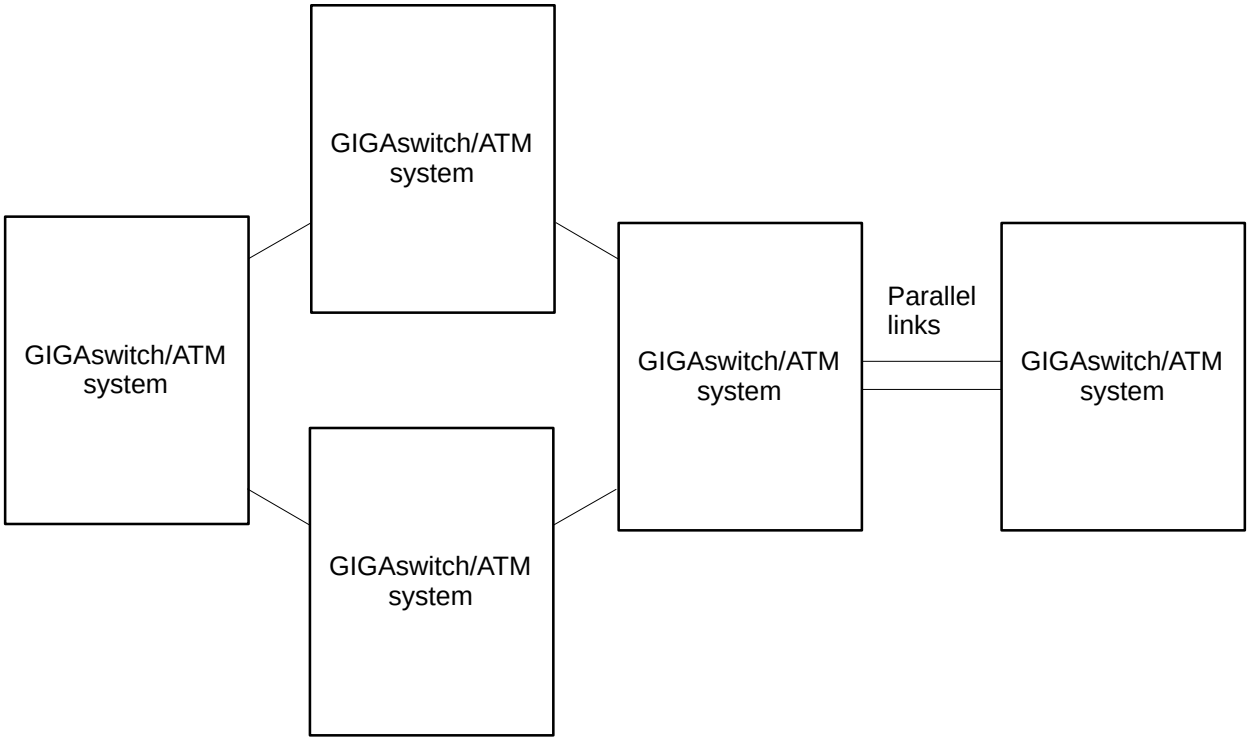
- Automatic Topology Discovery

  The GIGAswitch/ATM system automatically discovers the topology of the ATM network by exchanging Link State Packets between switches. When a link initializes, the GIGAswitch/ATM system determines if the link is to another switch or to an end system. By exchanging Link State Packets on all links between switches, each switch in the ATM network has a complete and identical topological view of the network. Included in the distributed Link State Packets is resource information, such as available CBR bandwidth, for making intelligent routing decisions based on current resource utilization. If a link fails, then all switches in the network are informed of the link failure automatically. As available CBR bandwidth on a link changes, these changes are advertised to other switches in the network so that appropriate call routing decisions are made.

- Shortest Path Routing

  SVC call setup requests received at a switch are routed to the destination along the shortest available path. In most cases, the shortest path is based on hop count. For CBR calls, if there is no bandwidth available along the shortest path, the GIGAswitch/ATM system attempts to find an alternate path that can support the requested bandwidth. If multiple shortest paths are possible, then the GIGAswitch/ATM system balances calls over the shortest paths available.

Figure 4–1 GIGAswitch/ATM Network Configuration Example



- Parallel Links Between Switches and VC Load Balancing

  For increasing available bandwidth between switches, multiple parallel links can be used between switches. The GIGAswitch/ATM system balances calls routed between the switches across the parallel links. For ABR calls, the link with the least ABR calls active is selected. For CBR or VBR calls, the link with the most bandwidth available is selected.

- Static Routing

  To provide more flexibility and for use in conjunction with the ATM Forum IISP, the GIGAswitch/ATM system provides static routing features. Static routing is used to override automatic routing features and to allow the network administrator to specify the route that a particular call follows. Static routes are manually configured by the network administrator.

  Static routes are based on the Called Party Address received in a UNI SVC Call Setup message. The Called Party Address is the 20–byte ATM Forum NSAP address of the destination ATM end system that a call is destined for. Static routes specify particular patterns that are compared with all calls routed by the switch. If a pattern match is found during call setup, then the call is routed to the particular link specified when the static route is configured.

Note

The last byte of the ATM NSAP address is the selector field (SEL Field) and this field is NOT used for static or automatic routing.

The GIGAswitch/ATM system supports static routes based on the first 19 bytes of the ATM NSAP address or on any portion of the ATM NSAP address prefix (1–13 bytes). If a 19–byte pattern is specified for a static route, then the called party address present in the signaled setup message must match the pattern EXACTLY for the static route to be used. A 19–byte static route is a route to a specific end system.

A prefix route can be configured when the network administrator specifies between 1 and 13 bytes as a pattern. In this case, a partial prefix match is performed with all calls received at the switch. When performing a partial prefix match, the switch determines a successful match if all the bits of the configured pattern match the corresponding bits of a called party address prefix.

When configuring such static routes, it is possible that a particular called party address matches many configured static routes. This is possible because multiple partial prefix routes can be configured and full 19–byte address routes can also be configured. If an address matches multiple static routes, the GIGAswitch/ATM system selects the route with the BEST MATCH. The best match route is the route where most preceding bits of the configured pattern match the called party address being considered. If one such route is a complete 19–byte pattern, then that route is always selected because there can be no better match than all the bits of the pattern.

Static routing works in conjunction with other GIGAswitch/ATM routing features. If an address fails to match any configured static route, then the normal GIGAswitch/ATM automatic call routing features are used to determine the best route to the destination.

In general, great care must be taken when constructing static routes. The network administrator must ensure that no loops are introduced by improper configuration of static routes. Static routing should only be used when absolutely necessary as automatic routing features ensure optimal routes and adapt to changing network topologies.

Figure 4–2 Static Route Configuration Example

Static Routes Configured†	Called Party Address
Pattern 1: 3961XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX –> Link 2	Address 1: 396100000000008002b651cfb08002b163ab8 matches Pattern 1.
Pattern 2: 396100000000000000000000008002b132f4d –> Link 3	Address 2: 394500000000000000000000008002b163ab8 matches no pattern.
Pattern 3: 39614f5dXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Address 3: 396100000000000000000000008002b132f4d matches Pattern 2.
	Address 3: 3961455d76820000000000000008002bfabc6d matches Pattern 3.

† X indicates that it does not matter what value is inserted.

- Exporting Static Routes

  To reduce manual configuration by the network administrator, the GIGAswitch/ATM system supports automatic exporting of a configured static route throughout the ATM network. This option can be selected individually for each configured static route. If a static route is exported, then an LSP containing the static route is distributed periodically to all other switches. All calls that match the static route are routed to the switch where the static route is configured and then the call is routed to the link specified in the static route. Exporting of static routes can be used in conjunction with the ATM Forum Interim Interswitch Signaling Protocol to provide IISP Gateway functionality.

- IISP Support

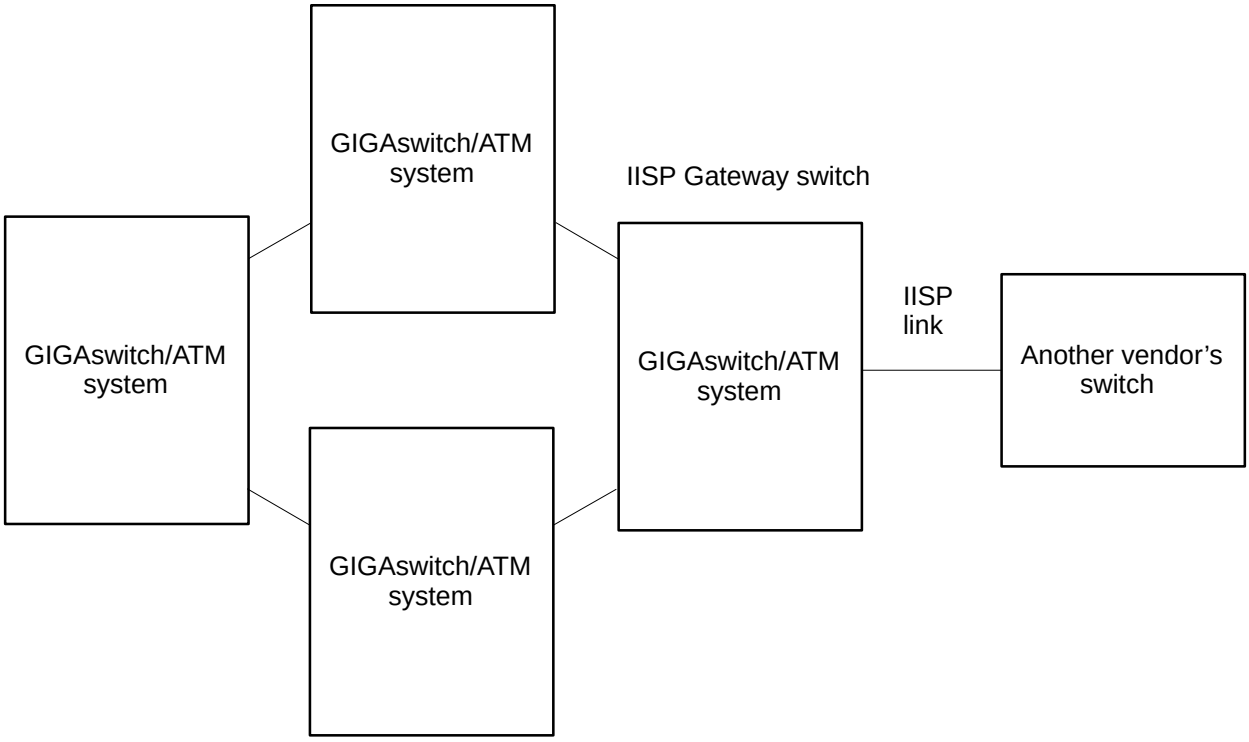
  The ATM Forum has standardized a signaling protocol for signaling calls between ATM switches in a multivendor ATM switch network. Because IISP does not standardize distribution of network topology information between ATM switches, IISP must be used in conjunction with static routing to construct multivendor ATM switch networks. The GIGAswitch/ATM system supports IISP and requires no additional configuration of the IISP interface. IISP does require the configuration of static routes. Currently, the GIGAswitch/ATM system must play the role of the network side of the IISP link and the GIGAswitch/ATM system automatically adopts that role.

  To support call routing, systems that are reachable across an IISP link must have static routes configured for them. Because the GIGAswitch/ATM system supports prefix–based routing, a static route does not have to be entered for each end system. For example, if all end systems reachable across an IISP link have the same unique ATM address prefix, then only one static route with the unique portion of the prefix needs to be configured in the GIGAswitch/ATM system.

- IISP Gateway Functionality

  To further reduce network administrator configuration required, the GIGAswitch/ATM system supports IISP Gateway functionality by using the ability to export static routes to other GIGAswitch/ATM switches. If a GIGAswitch/ATM system is connected to another vendor's switch across an IISP link, then the GIGAswitch/ATM system can act as a gateway for all other GIGAswitch/ATM switches attached to it. The gateway function is achieved by "exporting" all static routes configured for the IISP link. Other GIGAswitch/ATM systems do not need to be configured. Automatic routing features are used to forward calls to the correct GATEWAY switch.

Figure 4–3 GIGAswitch/ATM IISP Gateway

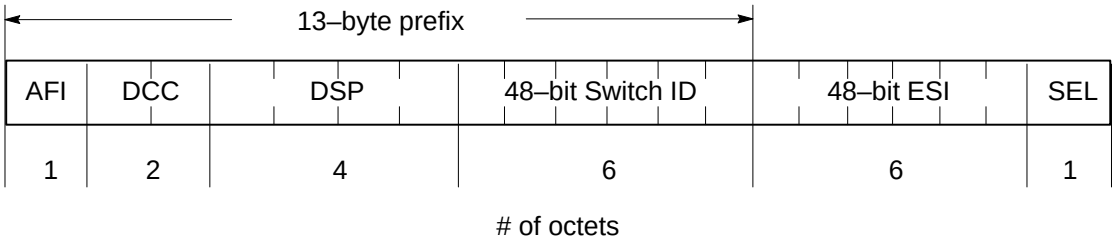


- Addressing Guidelines for GIGAswitch/ATM Networks

  The GIGAswitch/ATM system conforms to all ATM Forum standards relating to addressing and UNI signaling. This section provides guidelines for address configuration in ATM networks.

  The prefix portion is assigned by the network administrator. Each switch in the ATM network should have a unique 13–byte ATM prefix. The ATM prefix is assigned by the network administrator and this prefix is communicated to all end systems attached to the switch during ILMI address registration. The 13–byte ATM address prefix is used to route calls through the ATM network. The GIGAswitch/ATM system requires that the last 6 bytes of the address prefix be unique for each switch. Thus, each switch in the GIGAswitch/ATM network has a unique 6–byte switch ID and this switch ID is used as the last portion of the 13–byte address prefix. This addressing convention allows the GIGAswitch/ATM system to autoconfigure addresses, route calls efficiently, and reduce the amount of routing traffic distributed between switches. For the GIGAswitch/ATM system, the address structure used is shown in Figure 4–4.

Figure 4–4 ATM NSAP Address Format



AFI	is the address format identifier.
DCC	is the data country code.
DSP	is the domain–specific part (first 4 bytes).
Switch ID	is the unique ID for this switch.
ESI	is the end system identifier.
SEL	is the selector field (not used by routing).

NOTE:
All portions of the 13–byte prefix are configurable. If the prefix is not configured, the GIGAswitch/ATM system selects valid default values for the default prefix.

- Address Autoconfiguration

  The GIGAswitch/ATM system exploits some of the addressing properties described previously to allow for autoconfiguration of all addresses in a GIGAswitch/ATM network. Each GIGAswitch/ATM system generates a unique 13–byte address prefix and communicates this prefix to all ATM end systems using ILMI address registration to ensure that each addressable entity has a unique address. By default, the prefix is generated and communicated to all end systems supporting ILMI.

  The first 7 bytes of the 13–byte prefix is identical for all GIGAswitch/ATM switches and the remaining 6 bytes are unique for each switch. The 48–bit unique Ethernet address of the switch is used as the unique switch ID when constructing the default prefix.

- Controlling the Default Prefix

  The address prefix that the GIGAswitch/ATM system autoconfigures is called the default prefix. To ensure maximum flexibility, the values used to generate the default prefix can be altered through manual configuration. The values used to generate the default prefix can be controlled by altering the value of a GIGAswitch/ATM switch ID and by specifying a value to be used for the preceding 7 bytes of the default prefix. If the switch ID is altered, the network administrator must ensure that each switch in the network has a unique ID. The default prefix is registered on all lines. If this is undesirable, then the generation of the default prefix can be disabled altogether.

- Configuring Address Prefixes Per Line

  Multiple 13–byte prefixes can be registered on each ATM interface individually. When configuring such prefixes, the network administrator must ensure that the lower 6 bytes of the prefix contain the switch ID for that switch. If this is not done, calls are not routed to those addresses from remote switches in the network. Configuring address prefixes per line is not necessary in most networks, and controlling the content of the default prefix is recommended.

4.2 Configuring Routing Parameters

You can configure routing parameters using the OBM interface described in Chapter 3. This section provides information about manipulating the routing parameters.

4.2.1 Displaying Routing Statistics

This section describes the menus used to display information about routing statistics.

```
          6 Routing/Signaling Configuration/Statistics Menu

1. Set/Show Routing Configuration
2. Show Routing Statistics
3. Show Signaling Statistics
4. Save Routing and Signaling Configuration to Flash
5. Delete Configuration from Flash
6. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 2


         6.2 Show Routing Statistics Menu

1. Show Address Registered
2. Show Routing Information
3. Show Static Routes Learned
4. Return to Routing/Signaling Configuration/Statistic Menu

Input <Control–D> to terminate operation
Enter Selection:
```

The first menu item shows all the addresses learned through ILMI address registration procedures and the ports over which those addresses were learned.

The second menu item displays some routing information about this switch.

The third menu item displays all the static routes that were configured locally and the routes that were learned from another switch; that is, those routes that were configured on another switch and exported. If a route is learned from another switch, then the switch ID of the relevant switch and the learned route is displayed.

4.2.2 Configuring or Displaying Static Routes

This section describes the menus used to configure or display static routes.

```
          6 Routing/Signaling Configuration/Statistics Menu

1. Set/Show Routing Configuration
2. Show Routing Statistics
3. Show Signaling Statistics
4. Save Routing and Signaling Configuration to Flash
5. Delete Configuration from Flash
6. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 1


        6.1 Set/Show Routing Configuration Menu

1. ATM Address Prefix
2. Static Routes
3. Default DEC Address Prefix
4. DEC Switch ID
5. Return to Routing/Signaling Configuration/Statistic Menu

Input <Control–D> to terminate operation
Enter Selection: 2


        6.1.2 Set/Show Static Routes Menu

1. Configure New Static Route
2. Alter Existing Static Route
3. Delete Static Route
4. Show All Static Routes
5. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection:
```

4.2.2.1 Configuring a Static Route

This section describes the menu used to configure a static route.

The ATM prefix must be entered in hexadecimal digits.

When asked whether this static route is a partial match, answer 0 (No) if the address previously entered is the full 20–byte NSAP address of an end system. If a more general address prefix was entered, then Answer 1 (Yes) so that a partial match on the address is a successful match.

When asked whether the route is an export route, answer 0 (No) if it is a single switch configuration or if other switches do NOT need to route using this static route. If 1 (Yes) is entered, then the GIGAswitch/ATM system broadcasts this route to all other GIGAswitch/ATM systems. The network administrator should ensure that there are only a small number of export routes configured in the ATM network.

The slot and port entered are the slot and port where SVCs are routed if the Called Party Address matches this static route. Enter 0 as your forwarding port if you want to use the local service (for example, LAN emulation).

```
       6.1.2 Set/Show Static Routes Menu

1. Configure New Static Route
2. Alter Existing Static Route
3. Delete Static Route
4. Show All Static Routes
5. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 1

ATM Prefix (HEX digits) : df

Allow Partial Match? (1–Yes, 0–No) : 1

Forwarding Slot (1–6,8–14) : 1

Forwarding Port (0–4) : 1

Export Route (1–Yes, 0–No) : 1

Instance created OK

Added route
Net  df:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
Mask ff:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
through slot 1 link 1.
Exported routed added to LSP
```

4.2.2.2 Altering an Existing Static Route

This section describes the menu used to alter a static route that was already configured.

During alteration of routing configuration, parameters that can be altered have existing values displayed in square brackets. Press the Return key to leave the existing value unchanged.

To alter a static route, you must enter the static route that you want to alter and its match characteristics. If you are unsure about previous entries, use the Show All Static Routes submenu from the Set/Show Static Routes menu.

The slot and port can be altered. You can also change the the route to be an export route.

If you want to alter the address to be matched or the match characteristics of the route, delete an unneeded route and add another with the desired address prefix and match characteristics. Enter 0 as your forwarding port if you want to use the local service (for example, LAN emulation).

```
       6.1.2 Set/Show Static Routes Menu

1. Configure New Static Route
2. Alter Existing Static Route
3. Delete Static Route
4. Show All Static Routes
5. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 2

ATM Prefix (HEX digits) : df

Allow Partial Match? (1–Yes, 0–No) : [1] :

Forwarding Slot (1–6,8–14) : [1] :

Forwarding Port (0–4) : [1] :4

Export Route (1–Yes, 0–No) : [1] :

Deleted route to
Net df:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
Mask ff:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
Export route deleted from lsp
Added route
Net  df:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
Mask ff:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
through slot 1 link 4.
Exported routed added to LSP
```

4.2.2.3 Deleting a Static Route

This section describes the menu used to delete static routes that were already configured. You must enter the address and match characteristics of this route as you do when altering a static route.

```
       6.1.2 Set/Show Static Routes Menu

1. Configure New Static Route
2. Alter Existing Static Route
3. Delete Static Route
4. Show All Static Routes
5. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 3

ATM Prefix (HEX digits) : df

Allow Partial Match? (1–Yes, 0–No) : 1

Deleted route to
Net df:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
Mask ff:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
Export route deleted from lsp
```

4.2.2.4 Displaying Static Routes

This section describes the menu used to display static routes that were already configured.

Note that this option shows configured static routes. To display all the static routes that were configured and learned from other switches, use the Show Routing Statistics menu.

```
       6.1.2 Set/Show Static Routes Menu

1. Configure New Static Route
2. Alter Existing Static Route
3. Delete Static Route
4. Show All Static Routes
5. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 4

ATM Prefix (HEX digits) : df0000000000000000000000000000000000000000
Allow Partial Match? (1–Yes, 0–No) : 1
Forwarding Slot (1–6,8–14) : 1
Forwarding Port (1–4) : 4
Export Route (1–Yes, 0–No) : 1
```

4.2.3 Configuring or Displaying the Default DEC Address Prefix

This section describes the menus used to configure or display the default DEC address prefix.

```
          6 Routing/Signaling Configuration/Statistics Menu

1. Set/Show Routing Configuration
2. Show Routing Statistics
3. Show Signaling Statistics
4. Save Routing and Signaling Configuration to Flash
5. Delete Configuration from Flash
6. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 1


       6.1 Set/Show Routing Configuration Menu

1. ATM Address Prefix
2. Static Routes
3. Default DEC Address Prefix
4. DEC Switch ID
5. Return to Routing/Signaling Configuration/Statistic Menu

Input <Control–D> to terminate operation
Enter Selection: 3


       6.1.3 Set/Show Default DEC Address Prefix Menu

1. Configure Default DEC Address Prefix
2. Delete Default DEC Address Prefix
3. Show Configured Default DEC Address Prefix
4. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection:
```

4.2.3.1 Configuring the Default DEC Address Prefix

This section describes the menu used to configure the default DEC address prefix.

Use this configuration option only if the default prefix used by the GIGAswitch/ATM system is unsuitable and you must have a specific 7 bytes for the default prefix.

Enter the 7 bytes that are used as the first 7 bytes of the default DEC prefix.

If you want to disable the default prefix feature, then answer 0 (Disable) when asked whether you want to Enable Default Prefix. If you disable this feature, then the GIGAswitch/ATM system does not automatically register a prefix on all lines during line initialization. You should have this feature enabled unless you have very specific addressing needs that require manual address configuration.

Configuration and alteration of the default DEC address prefix takes effect upon the next switch reboot.

```
        6.1.3 Set/Show Default DEC Address Prefix Menu

1. Configure Default DEC Address Prefix
2. Delete Default DEC Address Prefix
3. Show Configured Default DEC Address Prefix
4. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 1

Default Prefix Preceding 7 bytes (HEX) : 3936

Enable Default Prefix (1–Enable, 0–Disable) : 1

Instance Created OK
```

4.2.3.2 Deleting the Default Address Prefix

To disable the default prefix feature (where a unique ATM address is automatically registered on all lines), configure a default prefix with the disable option.

To delete the configured default DEC prefix, choose Option 2 on the Set/Show Default DEC Address Prefix menu. This option causes the GIGAswitch/ATM system to return to using the preconfigured prefix for the first 7 bytes of the default prefix upon the next switch reboot.

4.2.4 Configuring or Displaying the DEC Switch UID

This section describes the menus used to configure or display the DEC switch UID.

```
          6 Routing/Signaling Configuration/Statistics Menu

1. Set/Show Routing Configuration
2. Show Routing Statistics
3. Show Signaling Statistics
4. Save Routing and Signaling Configuration to Flash
5. Delete Configuration from Flash
6. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 1
```

```
       6.1 Set/Show Routing Configuration Menu

1. ATM Address Prefix
2. Static Routes
3. Default DEC Address Prefix
4. DEC Switch ID
5. Return to Routing/Signaling Configuration/Statistic Menu

Input <Control–D> to terminate operation
Enter Selection: 4
```

```
       6.1.4 Set/Show DEC Switch ID Menu

1. Configure DEC Switch ID
2. Delete DEC Switch ID
3. Show Configured DEC Switch ID
4. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection:
```

4.2.4.1 Configuring the DEC Switch UID

This section describes the menu used to configure the DEC switch UID.

Only use this option if the default switch UID is not suitable. In most cases, the default UID is suitable.

Enter the 12 hexadecimal digits to be used for the unique ID of this switch.

Configuration and alteration of the DEC switch UID takes effect upon the next switch reboot.

```
       6.1.4 Set/Show DEC Switch ID Menu

1. Configure DEC Switch ID
2. Delete DEC Switch ID
3. Show Configured DEC Switch ID
4. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 1

Local Switch UID (HEX digits) : 1234
```

```
Instance Created OK

Switch UID 08:00:2b:a5:67:00
Need to save CONFIG and REBOOT the switch for uid 12:34:00:00:00:00 to
take effect.
```

4.2.4.2 Deleting a DEC Switch UID

To disable the default prefix feature (where a unique ATM address is automatically registered on all lines), configure a default prefix with the disable option.

To delete the configured DEC switch UID, choose Option 2 on the Set/Show DEC Switch ID menu. This option causes the GIGAswitch/ATM system to return to using the hardware UID of the Master line card as the switch UID upon the next switch reboot.

4.2.5 Configuring or Displaying the ATM Address Prefix

This section describes the menus used to configure or display the ATM address prefix.

```
          6 Routing/Signaling Configuration/Statistics Menu

1. Set/Show Routing Configuration
2. Show Routing Statistics
3. Show Signaling Statistics
4. Save Routing and Signaling Configuration to Flash
5. Delete Configuration from Flash
6. Main Menu

Input <Control–D> to terminate operation
Enter Selection: 1


        6.1 Set/Show Routing Configuration Menu

1. ATM Address Prefix
2. Static Routes
3. Default DEC Address Prefix
4. DEC Switch ID
5. Return to Routing/Signaling Configuration/Statistic Menu

Input <Control–D> to terminate operation
Enter Selection: 1
```

```
        6.1.1 Set/Show ATM Address Prefix Menu

1. Configure New ATM Address Prefix
2. Alter Existing ATM Address Prefix
3. Delete Existing ATM Address Prefix
4. Show All Address Prefixes Configured
5. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection:
```

4.2.5.1 Configuring the ATM Address Prefix for Each Line

This section describes the menu used to configure the ATM address prefix for each line. Enter the address prefix, slot, and port that the address is to be registered on. You should ensure that the configured address conforms to the outlined addressing guidelines and that the switch UID is contained in the last 6 bytes (12 HEX digits) of the address prefix.

```
        6.1.1 Set/Show ATM Address Prefix Menu

1. Configure New ATM Address Prefix
2. Alter Existing ATM Address Prefix
3. Delete Existing ATM Address Prefix
4. Show All Address Prefixes Configured
5. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 1

ATM Prefix (HEX digits) : 394d67

Forwarding Slot (1–6,8–14,0 for all slots) : 1

Port (1–4, or 0 for all ports) : 2

Instance created OK
Setting prefix on slot 1, link 2
```

4.2.5.2 Altering the ATM Address Prefix Configured For Each Line

To alter a prefix configured for a particular line, delete the unneeded prefix first and then add the new one.

4.2.5.3 Deleting the ATM Address Configured For Each Line

This section describes the menu used to delete the configured ATM address for each line. In addition to the address prefix being deleted, you must also enter the slot and port that the address prefix was configured on.

```
        6.1.1 Set/Show ATM Address Prefix Menu

1. Configure New ATM Address Prefix
2. Alter Existing ATM Address Prefix
3. Delete Existing ATM Address Prefix
4. Show All Address Prefixes Configured
5. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 3

ATM Prefix (HEX digits) : 394d67

Forwarding Slot (1–6,8–14,0 for all slots) : 1

Port (1–4, or 0 for all ports) : 2

Deleting prefix on slot 1, link 2
```

4.2.5.4 Displaying the ATM Address Prefix Configured For Each Line

This section describes the menu used to display the configured ATM address prefixes for each line.

```
        6.1.1 Set/Show ATM Address Prefix Menu

1. Configure New ATM Address Prefix
2. Alter Existing ATM Address Prefix
3. Delete Existing ATM Address Prefix
4. Show All Address Prefixes Configured
5. Return to Routing Configuration Menu

Input <Control–D> to terminate operation
Enter Selection: 4

ATM Prefix (HEX digits) : ab00000000000000000000000
Forwarding Slot (1–6,8–14,0 for all slots) : 2
Port (1–4, or 0 for all ports) : 1

ATM Prefix (HEX digits) : 394d6700000000000000000000
Forwarding Slot (1–6,8–14,0 for all slots) : 1
Port (1–4, or 0 for all ports) : 2
```

5

LAN Emulation

This chapter describes the LAN Emulation Server (LES), the Broadcast and Unknown Server (BUS), and LAN Emulation Configuration Server (LECS) functions in the GIGAswitch/ATM system.

LAN emulation (LANE) lets existing network applications operate on a native ATM end station without modification by preserving supported packet formats during transmission to the ATM LAN. The GIGAswitch/ATM system supports LAN emulation features that include:

- A command line interface to instantiate and configure LANE servers in the switch.
- A LECS supporting multiple emulated LANs (ELANs).
- Multiple LESs to support multiple ELANs.
- Multiple BUSs to support multiple ELANs.
- SNMP MIBs to create, configure, and monitor LANE servers.

5.1 LANE Configuration Overview

The switch administrator uses the command line interface to create, configure, enable, monitor, disable, and delete LANE servers. Server configurations can be saved for restoring after reboot.

The LECS always exists and cannot be deleted. It can only be enabled and disabled. By default, it is disabled. Associated with the LECS is a group of ELAN entries describing the various emulated LANs that the LECS can tell clients to join. Each of these ELAN entries can be independently enabled and disabled.

To create an emulated LAN and advertise it to clients through the LECS, the following actions must be taken using either SNMP or the commands described in Section 5.5.

- A BUS must be created.

- A LES must be created and configured with the BUS ATM address.
- An ELAN entry must be created and configured with the LES ATM address.
- The LECS must be configured to direct clients to the ELAN.
- All of the components must be configured to agree on the values for such crucial parameters as LAN type and maximum frame size.
- All of the components must be enabled.

Most LANE server characteristics cannot be modified once the server is running. Exceptions to this are noted within the sections for each type of server.

5.2 LAN Emulation Configuration Server

The GIGAswitch/ATM system allows the operation of one resident LECS that lets the switch provide complete ELAN support without the need for other external LANE service components.

The LECS supports multiple ELANs. Clients can be distributed among multiple emulated LANs by:

- ELAN name, where clients that specify an ELAN name in the Configure request will be directed to the appropriate LESs (if the requested ELANs exist).
- Default ELANs, where clients that specify a blank or invalid ELAN name will be directed to default ELANs that are compatible with their requirements. The network manager can denote several ELANs as default ELANs. For example, there might be a default IEEE 802.3 ELAN and a default IEEE 802.5 ELAN. When two or more default ELANs match a client request, the client is assigned to the lowest–numbered ELAN. Note that while several ELANs with the same LAN type and maximum frame size can be denoted as default ELANs, there is no advantage in doing so.

5.2.1 Initializing the LECS

At boot time, a check is made for configured LECS information in Flash. This information is used to configure and enable the LECS. If no LECS configuration exists, a default LECS is created, but it is left in the disabled state.

When the LECS is enabled, it starts listening for incoming Configuration Direct VCCs. The LECS listens on the well–known LECS address and its own address for Configure request frames from LECs.

5.2.2 Connecting to the LECS

A LEC can access the LECS by attempting to connect to the well–known LECS ATM address. The GIGAswitch/ATM system routes the connection to the LECS well–known address because the LECS well–known address is registered with routing whenever the LECS is enabled.

The LECS does not support connection timeout. The LEC must terminate the Configure Direct VCC.

5.2.3 Configuring the LEC

Once the LECS has accepted a Configuration Direct VCC, it discards any frame that is not a Configure request.

Configure requests are processed as follows:

1. If the Configure request specifies an ELAN name, and there is an enabled ELAN with that name that is compatible with the client, the LECS assigns the client to that ELAN. Note that if several ELANs have the same name, the LECS only considers the one with the lowest–numbered ID.
2. Otherwise, if there are one or more enabled default ELANs that are compatible with the client, the LECS tells the client to use one of them. If possible, it will pick a default ELAN whose maximum frame size exactly matches that of the client.
3. If no fit is found, the LECS sends a failure response to the client.

5.2.4 Managing the LECS

Set Attributes

Each LECS can only be enabled or disabled.

Viewable Attributes

All of the set attributes are viewable attributes. Other attributes (including the LECS address and LECS statistics) can also be viewed for monitoring.

5.2.5 Configuring the ELAN

The attributes that can be set by the system manager cannot be changed once the ELAN is configured and operational. These characteristics are:

- name
- type

- maximum frame size
- control timeout
- maximum unknown frame count
- maximum unknown frame time
- VCC timeout period
- maximum retry count
- aging time
- forward delay time
- expected LE ARP response time
- flush timeout
- Multicast Send VCC type
- Multicast Send VCC average rate
- Multicast Send VCC peak rate
- LES ATM address

5.3 LAN Emulation Server

The GIGAswitch/ATM system can provide multiple LE Servers. Each LES is configured and enabled through the LANE Command Line Interpreter (CLI).

5.3.1 Initializing the LES

At boot time, a check is made for configured LES information in Flash. This information is used to configure and enable the LES. If no LES configuration exists, a default LES is created, but it is left in the disabled state. The default LES is created with default characteristics that are set to the LANE specification with the following exceptions:

- Ethernet/IEEE 802.3 LAN Type
- 1516 Maximum Data Frame Size
- No ELAN name

When the LES is enabled, it starts listening on its own address for incoming Control Direct VCCs.

5.3.2 Joining the Emulated LAN

The LEC joins an emulated LAN by creating a Control Direct VCC to the LES ATM address. The B–LLI codepoint in the SETUP message must be properly encoded. The LES accepts the connection if it has resources to support another LEC. The LES then starts the control timeout timer and waits for a Join request. If the request does not come, the LES tears down the connection.

The LES ATM address is unique to a specific emulated LAN.

The Join request is tested to ensure the following.

1. The LEC ATM address matches the calling party in the Control Direct VCC.
2. The LEC ATM address is not in use by any other LEC on the emulated LAN.
3. The LAN type is compatible with the emulated LAN.
4. The maximum frame size is either unspecified or greater than or equal to the emulated LAN maximum frame size.
5. If the optional MAC address is included, it does not duplicate one that is already registered by another LEC that is a member of this emulated LAN.
6. There is enough memory to support minimal LEC database entries.

If any test fails, the LES returns a Join response with failure status. If the Control Direct VCC has not been released when the control timeout timer fires, the LES releases the VCC.

If the Join request is valid, the LES creates a Control Distribute VCC to the LEC ATM address by creating a point–to–multipoint VCC if the LEC is the first one to join the emulated LAN or adding a party to the existing VCC if the LEC is not the first to join. If this connection fails, the LES sends a Join response with failure status to the LEC. If the Control Direct VCC has not been released when the control timeout timer fires, the LES releases the VCC.

If the Control Distribute VCC is created, the LES stops the control timeout timer and returns a Join response with success status. The LAN type and maximum frame size fields reflect the emulated LAN settings.

The response also contains a LEC ID assigned by the LES for use by the LEC while joined to the emulated LAN. The LEC ID may be used by the LEC to identify and filter its own data traffic forwarded by the BUS. It also uniquely identifies the sender of all control and data frames within the emulated LAN.

For each emulated LAN, the LES maintains a database of LECs that have successfully completed the Join phase. The database includes information about each LEC.

For each emulated LAN, the LES maintains a database of LEC ATM addresses for use in verifying that no two LECs share an ATM address.

All Join responses are sent over the Control Direct VCC.

The LES supports all types of emulated LANs.

5.3.3 Registering MAC Addresses

The LEC can register a MAC address in the Join request. It can also register additional MAC addresses by sending Register requests to the LES after completing the Join phase.

For each emulated LAN, the LES maintains a database that maps MAC addresses to ATM addresses.

The LES accepts Register requests from a LEC that has successfully completed the Join phase. The LES tests the following items before registering the new MAC address.

1. The ATM address is not registered by another LEC.
2. The MAC address is not registered by another LEC.
3. The MAC address is not a multicast address.

If the tests succeed, the LES creates an entry in the MAC Address to ATM Address Database and returns a Register response with successful status. If any test fails, the LES sends a Register response with failure status.

The LEC can unregister a MAC address at any time by sending an Unregister request to the LES. The LES validates the request by checking the following items.

1. The LEC ID to ATM address pairing is valid.
2. The MAC address being unregistered is registered to the LEC.

If the Unregister request is valid, the LES deletes the entry in the database. The LES always returns an Unregister response with successful status.

Registered MAC addresses are not aged from the LES database.

The LEC can also register route descriptors in the same way as MAC addresses.

5.3.4 Address Resolution

The LES responds to LE ARP requests for registered destinations without forwarding the request to all LECs. The LES sends the LE ARP response using the requesting LECs' Control Direct VCC.

The LES forwards any LE ARP requests it cannot resolve and all LE NARP requests to all the LECs using the Control Distribute VCC.

The Join request identifies whether or not the LEC is a proxy for unregistered destinations. If it is a proxy, it must receive all LE ARP requests for unknown destinations and respond when appropriate.

Whenever the LES receives an LE ARP response, it forwards it to the requesting LEC using the appropriate Control Direct VCC.

The BUS ATM address is returned by the LES whenever an LE ARP request is received for the broadcast MAC address.

The LES filters all invalid LE ARP requests, including those requesting a multicast address resolution.

5.3.5 Topology Changes

Topology Change requests are used to help the LECs maintain valid destination to ATM address mappings. The LES receives Topology Change requests from LECs and uses the Control Distribute VCC to forward them to all other LECs. These frames contain information allowing the LECs to adjust their address resolution table aging times to improve address resolution during LAN topology changes.

The LES starts a timer when it sends a Topology Change request with the topology change flag set. If the timer expires before the LES receives another Topology request, the LES sends a Topology Change request with the topology change flag cleared.

Topology Change requests have no effect on the LES databases.

5.3.6 Flushing Data VCCs

When switching from an existing data VCC to a new data VCC, LECs must send a Flush request to flush all pending data in the existing VCC pipeline. This reduces the chance of data being delivered out of order.

The Flush response is sent by the LEC to the LES for forwarding on to the requesting LEC. The LES validates the requesting LEC ID to ATM address pairing. If invalid, the LES drops the frame. If valid, the LES forwards the response on to the Control Direct VCC for the requesting LEC.

The LES does not respond to Flush requests directed at it.

5.3.7 Terminating the Connection

When a LEC loses a control connection, multicast forward, or distribute connection, it should terminate its membership in the emulated LAN and no longer send traffic until it has rejoined the LAN and received a new LEC ID.

Whenever the LES sees that one control connection is released, it terminates the other control connection and unregisters all destination mappings for the LEC associated with the Control Direct VCC. The LEC ID can be reused by the LES.

5.3.8 Managing the LES

Set Attributes

The following attributes can be set by the system manager for each LES.

- control timeout
- topology change timeout
- emulated LAN name
- emulated LAN type
- maximum frame size
- BUS ATM address

Viewable Attributes

All of the set attributes are viewable attributes. Other attributes (including the LES address and LES statistics) can also be viewed for monitoring.

5.4 Broadcast and Unknown Destination Server

The GIGAswitch/ATM system can provide multiple BUSs. Each Broadcast and Unknown Destination Server (BUS) is configured and enabled through the LANE CLI.

5.4.1 Initializing the BUS

At boot time, a check is made for configured BUS information in flash. This information is used to configure and enable the BUS. If no BUS configuration exists, a default BUS is created, but it is left in the disabled state. The default BUS is created with default characteristics that are set to the LANE specification with the following exceptions:

- Ethernet/IEEE 802.3 LAN Type
- 1516 Maximum Data Frame Size

When the BUS is enabled, it starts listening on its own address for incoming Multicast Send VCCs.

5.4.2 Forwarding Data Frames

Each emulated LAN has a BUS that is uniquely identified by its ATM address.

Every LEC must set up a Multicast Send VCC to the BUS to distribute data frames with a multicast or destination address for which no ATM address is known.

When the BUS accepts an incoming Multicast Send VCC, it creates a Multicast Forward VCC to the ATM address of the accepted connection by creating a point–to–multipoint VCC if the LEC is the first one to connect to the BUS or adding a party to the existing VCC if the LEC is not the first. If the LEC does not accept the Multicast Forward VCC, the BUS terminates the Multicast Send VCC.

The BUS receives data and control frames on the Multicast Send VCCs. It verifies that the LE header is valid and the length does not exceed the maximum frame size. If the frame checks out, it is sent on the Multicast Forward VCC.

The BUS must be configured with the emulated LAN type only to accept the correct type of incoming Multicast Send VCCs. The BUS does not manipulate the data frames in any way.

5.4.3 Forwarding Control Frames

The only control frame the BUS can receive is a Flush request. Other control frames are discarded.

The BUS forwards all Flush request frames it receives even if its ATM address is the target. The BUS takes no specific action on Flush requests. Flush requests are always queued behind previously received data frames to maintain frame synchronicity.

5.4.4 Managing the BUS

Set Attributes

The following attributes can be set by the system manager.

- emulated LAN type
- maximum frame age

Viewable Attributes

All of the set attributes are viewable attributes. Other attributes (including the BUS address and BUS statistics) can also be viewed for monitoring.

5.5 Command Summary

The Command Line Interpreter (CLI) allows the switch administrator to create or delete LANE services, configure them, and display their characteristics. This section describes the interface provided by the CLI.

5.5.1 LECS Commands

LECS commands include the `lecs`, `elan`, and `elanall` commands.

5.5.1.1 lecs Command

Name

`lecs` – Control LAN Emulation Configuration Server services

Syntax

`lecs` [*option*]

Options

–e	Enables the LECS and causes the LECS to respond to Configure Requests.
–d	Disables the LECS and causes the LECS to stop responding to Configure Requests.
–c	Displays the LECS counters.
–sc	Displays clients connected to the LECS.
+/–nv	Sets/Clears the LECS configuration in memory.

Description

The `lecs` command is used to display all information configured at the LECS. It is used to enable and disable the LECS. You would use the `–d` option (disable) if you have another LECS in the network.

Note

The syntax is such that a plus sign (+) adds the optional parameter and a minus sign (–) removes it.

Examples

```
GIGAswitch/ATM–> lecs

                LAN Emulation Configuration Server Parameters

     State:                      Disabled

     LECS address: 39999900000000008002ba5aa80.aa000302ff15.00
```

This example provides configuration information about the LECS, including the state. This example shows that the specified LECS is in the disabled state. LECS can be in the enabled, disabled, disabling, or deleting state.

```
GIGAswitch/ATM–> lecs –c

                LAN Emulation Configuration Server Counters

     Configuration Direct VCCs
         active:                          0
         releasing:                       0
         attempts:                        0
          failures
              invalid setup:              0
              no resources:               0
     Frames
         received:                        0
          discarded
              invalid frame:              0
              receive queue full:         0
              frames too short:           0
              other:                      0
     Configure Requests
         received:                        0
          discarded
              receive queue full:         0
              no resources:               0
     Configure Responses
         total sent:                      0
          failures
              invalid type:               0
              invalid size:               0
              invalid LEC ID:             0
              invalid parameter:          0
```

This example displays the LECS counters. Note that counters are never reset to zero. Also, note that the receive queue full field is used to indicate the number of frames that are discarded after the server has passed the queue limit for processing frames as specified by this server.

```
GIGAswitch/ATM-> lecs -sc

               Connected Clients for LAN Emulation Configuration Server

                   39000000000000000000000000.08002b123456.00
                   39000000000000000000000000.08002b123456.00
```

This example displays the clients connected to the LECS.

5.5.1.2 elan Command

Name

`elan` – Create or configure emulated LANs (ELANs)

Syntax

`elan` [*number*] [*unique option* | [*option list*]]

number	Is the index number of the ELAN for which you want to configure or display characteristics; *number* is between 1 – 255.

Unique Options

–e	Enables the ELAN.
–d	Disables the ELAN.
–x	Deletes the ELAN from memory and nonvolatile storage.
–flash	Displays ELAN configuration in nonvolatile storage.

Option List

+def	Marks ELAN as a default ELAN. In case of a tie, the lowest number wins.
–def	Removes ELAN from the list of default ELANs.
+/–n *string*	Sets/Clears the ELAN name specified as a string that is up to 32 characters long and is in the format of an SNMPv2 DisplayString.
+y *type*	Sets the ELAN type; *type* must be set to 8023 (Ethernet/IEEE 802.3) or 8025 (IEEE 802.5).
+f *size*	Sets the ELAN maximum frame size. The maximum size frame that all members of the ELAN must be capable of receiving; *size* must be 1516, 4544, 9234, or 18190.
+/–p *time*	Sets/Clears the ELAN path switching delay in seconds; *time* must be 1 – 8.

+/–r *count*	Sets/Clears the ELAN maximum retry count. Maximum number of LE ARP retries for a given destination; *count* must be 0 – 2.
+/–s	Sets/Clears the local segment ID (for emulated 802.5 LANs).
+/–u *count*	Sets/Clears the ELAN maximum unknown frame count. The maximum number of frames for a given unicast MAC address or route descriptor that can be sent to the BUS within the maximum unknown frame time; *count* must be 1 – 10.
+/–tc *time*	Sets/Clears the ELAN control timeout in seconds. The timeout used during LEC initialization; *time* must be 10 – 300.
+/–tu *time*	Sets/Clears the ELAN maximum unknown frame time in seconds. (See the u option for maximum unknown frame count.) This value must be 1 – 60.
+/–tv *time*	Sets/Clears the ELAN VCC timeout period in minutes. The inactivity timeout for terminating unused Data Direct VCCs; *time* must be 1 – 4294967295.
+/–ta *time*	Sets/Clears the ELAN ARP aging time in seconds. The age time for LE ARP cache entries which have not been reverified; *time* must be 10 – 300.
+/–td *time*	Sets/Clears the ELAN forward delay time in seconds. The age time when the Topology Change state is true for non–local LE ARP cache entries which have not been reverified; *time* must be 4 – 15.
+/–tp *time*	Sets/Clears the ELAN connection complete time in seconds; *time* must be 1 – 10.
+/–tr *time*	Sets/Clears the ELAN expected LE ARP response time in seconds. The time to wait for an LE ARP response to be returned to a LEC before it retransmits the LE ARP request; *time* must be 1 – 30.
+/–tf *time*	Sets/Clears the ELAN flush timeout in seconds. The time to wait for a response to a Flush request; *time* must be 1 – 4. LECs should wait at least this long before taking any recovery action.
+/–mt *type*	Sets/Clears the ELAN Multicast Send VCC type. The signaling parameter used when establishing the Multicast Send VCC; *type* must be ABR (available bit rate), VBR (variable bit rate), or CBR (constant bit rate).
+/–mp *rate*	Sets/Clears the ELAN Multicast Send VCC peak rate in cells/second. The signaling parameter used when establishing the Multicast Send VCC; *rate* must be 1 – 16777215. This forward and backward peak cell rate is used only if the mt option is specified as VBR or CBR.

+/–ma *rate*
: Sets/Clears the ELAN Multicast Send VCC average rate in cells/second. The signaling parameter used when establishing the Multicast Send VCC; *rate* must be 1 – 16777215. This forward and backward sustained cell rate is used only if the `mt` option is specified as `VBR`.

+les *addr*
: Sets the LES address; *addr* is in the format:

  `aaccccddddddddsssssssssssseeeeeeeeeeeel`

  where `aa` is the AFI in hex, `cccc` is the DCC in hex, `dddddddd` is the DSP in hex, `ssssssssssss` is the switch ID in hex, `eeeeeeeeeeee` is the ESI in hex, and `l` is the selector in hex.

  The system manager can indicate that the address should be a local LES address. In this case, the syntax for *addr* is les*nn* where *nn* is the identifier for the LES.

Description

The `elan` command is used to create and configure emulated LANs. Any parameters not set by the switch administrator take on the defaults listed in the LAN Emulation Over ATM Specification. The LES address must be configured.

The `elan` *`number`* command with no other switches creates an ELAN with the index number if one does not already exist. The default values are used for its parameters. If the ELAN already exists, its parameters are displayed. All `elan` commands must contain the number of the LES the command is issued for, with the exception of the summary command `elan`.

If you choose to specify a unique option, you must specify only one option. You can specify more than one option from the option list, but the options must be separated by a space. If you specify a unique option, you should not specify any options from the option list because they will be ignored.

Note

The syntax is such that a plus sign (+) adds the optional parameter and a minus sign (–) removes it.

Examples

```
GIGAswitch/ATM–> elan

                          LECS Emulated LAN Summary

  Number   Status    Name                                  Default   Type   Size

       1   disabled                                                  802.3  1516
```

This example displays a summary of the emulated LANs.

```
GIGAswitch/ATM-> elan 1

              LAN Emulation Configuration Server ELAN Parameters

    name:                                    control time-out:
    type:            Ethernet/IEEE 802.3     inactive VC time-out:
    max frame size:                 1516     ARP entry time-out:
    max unknown frame count:                 forward delay time-out:
    max unknown frame time:                  expected ARP response:
    max retry count:                         flush time-out:
    path switch delay:                       conn. complete time:
     local segment ID:

    State:                      Disabled

     LES address:  00000000000000000000000000.000000000000.00

     Multicast Send VCC:
          type:
          average rate:
          peak rate:
```

This example displays information about the specified ELAN, including the state. This example shows that the specified ELAN is in the disabled state. ELANs can be in the enabled or disabled state.

5.5.1.3 elanall Command

Name

`elanall` – Configure or create emulated LANs (ELANs)

Syntax

`elanall` *number* [*unique option* | [*option list*]]

number	Is the index number of the ELAN for which you want to configure or display characteristics; *number* is between 1 – 255.

Unique Options

–e	Enables the ELAN and its associated BUS and LES.
–d	Disables the ELAN and its associated BUS and LES.
–x	Deletes the ELAN and its associated BUS and LES from memory and nonvolatile storage.
–s	Displays the states of the ELAN, BUS, and LES along with the addresses of the LES and BUS.

Option List

+y *type*	Sets the ELAN type in the ELAN, BUS, and LES; *type* must be set to 8023 (Ethernet/IEEE 802.3) or 8025 (IEEE 802.5).
+f *size*	Sets the maximum ELAN frame size in the ELAN, BUS, and LES. The maximum size frame that all members of the ELAN must be capable of receiving; *size* must be 1516, 4544, 9234, or 18190.
+/–n *string*	Sets/Clears the ELAN name specified as a string that is up to 32 characters long and is in the format of an SNMPv2 DisplayString.
+/–des *string*	Sets/Clears the description for the LES and BUS to the specified string.

Description

The `elanall` command is used to create and configure emulated LANs. Any parameters not set by the switch administrator take on the defaults listed in the LAN Emulation Over ATM Specification.

The `elanall` *`number`* command with no other switches creates an ELAN with the index number if one does not already exist. The default values are used for its parameters. If the ELAN already exists, its parameters are displayed. All `elanall` commands must contain the index number of the ELAN.

If you choose to specify a unique option, you must specify only one option. You can specify more than one option from the option list, but the options must be separated by a space. If you specify a unique option, you should not specify any options from the option list because they will be ignored.

Note

The syntax is such that a plus sign (+) adds the optional parameter and a minus sign (–) removes it.

Examples

```
GIGAswitch/ATM–> elanall 7

 ELAN 7 created.

 LES 7 created.

 BUS 7 created.
```

This example creates an emulated LAN with 7 as its index number and the corresponding LES and BUS.

```
GIGAswitch/ATM-> elanall 7 -s

                                    Enabled

LES 7     LES address:399999000000000 8002b223b40.08002b223b53.00     enabled
BUS 7    BUS address:399999000000000 8002b223b40.08002b223b54.00     enabled
```

This example displays the states of the ELAN, BUS, and LES and the addresses of the LES and BUS.

5.5.2 LES Commands

Name

`les` – Configure or display LES characteristics.

Syntax

`les` [*number*] [*unique option* | [*option list*]]

number	Is the index number of the LES for which you want to configure or display characteristics; *number* is between 1 – 99.

Unique Options

–e	Enables the LES and causes the LES to allow LECs to join the ELAN.
–d	Disables the LES and causes the LES to terminate all LEC ELAN memberships and not allow any new joins.
–x	Deletes the LES and removes the numbered LES from memory and nonvolatile storage.
+/– flash	Displays nonvolatile configuration for all LESs. Including the *number* parameter displays information for the specified LES.
–ca	Displays LES arp counters.
–cf	Displays LES flush counters.
–cj	Displays LES join counters.
–cr	Displays LES register counters.
–ct	Displays LES topology change counters.
–cv	Displays Control VCC counters.
–sc	Displays clients connected to the specified LES.
–sm	Displays client address mappings for the specified LES.

Option List

+bus *addr*	Address of the BUS; *addr* is in the format: `aaccccddddddddsssssssssssseeeeeeeeeeeel` where `aa` is the AFI in hex, `cccc` is the DCC in hex, `dddddddd` is the DSP in hex, `ssssssssssss` is the switch ID in hex, `eeeeeeeeeeee` is the ESI in hex, and `l` is the selector in hex. The system manager can indicate that the address should be a local BUS address. In this case, the syntax for *addr* is bus*nn* where *nn* is the identifier for the BUS.
+/–n *string*	Sets the ELAN name specified by a string that is up to 32 characters long and is in the format of an SNMPv2 DisplayString.
+y *type*	Sets the ELAN type; *type* must be 8023 (Ethernet/IEEE 802.3) or 8025 (IEEE 802.5).
+f *size*	Sets the ELAN maximum frame size. The maximum size frame that all members of the emulated LAN must be capable of receiving; *size* must be 1516, 4544, 9234, or 18190.
+tc *time*	Sets the ELAN control timeout in seconds. The timeout used during LEC initialization; *time* must be 10 – 300.
+tt *time*	Sets the ELAN topology change timeout in seconds. The timeout used to force an emulated LAN out of the topology change state when no topology change requests are seen; *time* must be 10 – 300.
+/–des *string*	Sets the description for the LES to string.
+/–arp	Enables/disables the forwarding of LE–ARP responses to all clients.
+/–narp	Enables/disables forwarding of LE–NARP requests.

Description

The `les` command is used to display all information configured at the LES, enable and disable the LES, delete a LES, and set the LES configuration. Any parameters not set by the switch administrator take on the defaults listed in the LAN Emulation Over ATM Specification. The BUS address must be configured.

The `les` *`number`* command with no other switches creates a LES with the index number if one does not already exist. The default values are used for its parameters. If the LES already exists, its parameters are displayed. All `les` commands must contain the number of the LES the command is issued for, with the exception of the summary command `les`.

If you choose to specify a unique option, you must specify only one option. You can specify more than one option from the option list, but the options must be separated by a space. If you specify a unique option, you should not specify any options from the option list because they will be ignored.

Note

The syntax is such that a plus sign (+) adds the optional parameter and a minus sign (–) removes it.

Examples

```
GIGAswitch/ATM–> les

        LAN Emulation Servers

LES Number        Status            Description
    1             enabled           Accounting LAN
    2             disabling         Marketing LAN
    3             disabled          Under construction
    4             enabled           IP VLAN
```

This example displays a summary of the LESs.

```
GIGAswitch/ATM–> les 1

          LAN Emulation Server 1 Parameters

Description:                Accounting LAN
LAN Name:                   Accounting
Type:                       Ethernet/IEEE 802.3
Max frame size:             1516
Control time–out:           120 sec
Topology Change time–out:   300 sec
State:                      Enabled

LES address:  39010000000100123456789abc.08002b035817.00

BUS address:  39010000000100123456789abc.08002b035816.00
```

This example displays information about the specified LES, including the state. This example shows that the specified LES is in the enabled state. LESs can be in the enabled, disabled, disabling, or deleting state.

```
GIGAswitch/ATM–> les 1 –cv

              LAN Emulation Server 1 Control VCC Counters

     Control Direct
         attempts:                              0
         failures
              invalid setup info:               0
              no resources:                     0
     Control Distribute
         failures
              no resources:                     0
              client rejected:                  0
     Frames received:                           0
     Frames discarded:
         invalid frame:                         0
         receive queue full:                    0
         LEC not joined:                        0
         frame too short:                       0
         other:                                 0
```

This example displays the Control VCC counters. Note that counters are never reset to zero. The client rejected field is used for troubleshooting and indicates to the server that the connect attempt failed. The receive queue full field is used to indicate the number of frames that are discarded after the server has passed the queue limit for processing frames as specified by this server.

```
GIGAswitch/ATM–> les 1 –cj

              LAN Emulation Server 1 Join Counters

     LEC member states
         awaiting request:                    0
         control distribute in process:       0
         joined:                              0
         releasing:                           0
     Join requests:
         received:                            0
         duplicates:                          0
         discarded
              receive queue full:             0
     Join failures
         duplicate ATM address:               0
         duplicate destination:               0
         invalid ATM address:                 0
         invalid destination:                 0
         invalid LAN type:                    0
         invalid max frame size:              0
         invalid LEC ID:                      0
         invalid parameter:                   0
         non–duplicate request:               0
         control time–out:                    0
         no resources:                        0
         rejected Control Distribute:         0
    Join responses sent:                      0

    Active proxies:                           0
```

This example displays the LES join counters. Note that counters are never reset to zero. The awaiting request field indicates that the LEC is connected and the LES is waiting for a Join request. The control distribute in process field indicates that the Join request was received and the LES is in the process of creating a Control Distribute to the LEC. The joined field indicates that the LEC has completed joining the LES. The releasing field indicates that the LES is waiting for the LEC to release all connections (Join failed). The receive queue full field is used to indicate the number of frames that are discarded after the server has passed the queue limit for processing frames as specified by this server.

```
GIGAswitch/ATM–> les 1 –cr

              LAN Emulation Server 1 Register Counters

    Registered destinations:                    0
     Register requests
         received:                              0
         discarded
              receive queue full:               0
              no resources:                     0
     Invalid register requests
         duplicate ATM address:                 0
         duplicate destination:                 0
         invalid destination:                   0
         invalid LEC ID:                        0
    Register responses sent:                    0
    Unregister requests:                        0
         received:                              0
         discarded
              receive queue full:               0
              no resources:                     0
     Invalid Unregister requests
         invalid address pair:                  0
         invalid destination:                   0
         invalid LEC ID:                        0
         unregistered dest:                     0
```

This example displays the LES register counters. Note that counters are never reset to zero. The receive queue full field is used to indicate the number of frames that are discarded after the server has passed the queue limit for processing frames as specified by this server.

```
GIGAswitch/ATM–> les 1 –ca

              LAN Emulation Server 1 ARP Counters

    LE ARP requests answered:                   0
    LE ARP requests forwarded:                  0
    LE ARP requests discarded
         invalid destination:                   0
         receive queue full:                    0
         no resources:                          0
    LE NARP requests forwarded:                 0
    LE NARP requests discarded
         receive queue full:                    0
         no resources:                          0
    LE ARP responses forwarded:                 0
    LE ARP responses discarded
         receive queue full:                    0
         invalid LEC ID:                        0
         no resources:                          0
```

This example displays the LES ARP counters. Note that counters are never reset to zero. The receive queue full field is used to indicate the number of frames that are discarded after the server has passed the queue limit for processing frames as specified by this server.

```
GIGAswitch/ATM–> les 1 –ct

               LAN Emulation Server 1 Topology Change Counters

Topology Change State:                                  TRUE
Time in state:                          nnnnnnnnnn seconds
Topology Change requests
     received:                                    nnnnnnnnnn
     forwarded:                                   nnnnnnnnnn
     discarded
               receive queue full:                nnnnnnnnnn
               no resources:                      nnnnnnnnnn
Topology Change requests generated:               nnnnnnnnnn
Topology Change request generation failures:      nnnnnnnnnn
```

This example displays the LES topology change counters. Note that counters are never reset to zero. The Topology Change State field is TRUE or FALSE; if it is TRUE, the ELAN is in the topology change state.

```
GIGAswitch/ATM–> les 1 –cf

               LAN Emulation Server 1 Flush Counters

    Flush responses
         received:                                  0
         discarded
         receive queue full:                        0
         other:                                     0
         invalid LEC ID:                            0
         no resources:
    Flush responses forwarded:                      0
```

This example displays the LES flush counters. Note that counters are never reset to zero. The receive queue full field is used to indicate the number of frames that are discarded after the server has passed the queue limit for processing frames as specified by this server.

```
GIGAswitch/ATM–> les 1 –sc

              Connected Clients for LAN Emulation Server 1

 LEC ID     1  Joined              39999900000000008002bb51200.08002b223430.00
```

This example displays the clients connected to the specified LES, including information about their state and ATM address.

```
GIGAswitch/ATM–> les 1 –sm

               Registered Addresses for LAN Emulation Server 1

    LEC ID     1  Primary Addr  39999900000000008002bb51200.08002b223430.00
             MAC  08002b223430  39999900000000008002bb51200.08002b223430.00
```

This example displays the client address mappings for the specified LES. These mappings can be for the primary address, the MAC address, or the route descriptor (RD). The primary address is the ATM address used by the LEC to connect to the LES. The MAC address or the route descriptor do not have to match the primary address.

5.5.3 BUS Commands

Name

`bus` – Configure or display the LAN Emulation BUS characteristics

Syntax

`bus` [*number*] [*unique option* | [*option list*]]

number	Is the index number of the BUS for which you want to configure or display characteristics; *number* is between 1 – 99.

Unique Option

–c	Displays counters.
–sc	Displays clients connected to the specified BUS.
–e	Enables the BUS and causes the BUS to accept Multicast Send VCCs.
–d	Disables the BUS and causes the BUS to terminate all Multicast Send and Forward VCCs.
–x	Deletes the BUS and removes the numbered BUS from memory and nonvolatile storage.
+/– flash	Displays nonvolatile configuration for all BUSs. Including the *number* parameter displays information for the specified BUS.

Option List

+/–n *string*	Sets/Clears the ELAN name specified by a string (optional) that is up to 32 characters long and is in the format of an SNMPv2 DisplayString.
+y *type*	Sets the ELAN type; *type* must be 8023 (Ethernet/IEEE 802.3) or 8025 (IEEE 802.5).

+f *size*	Sets the ELAN maximum frame size. The maximum size frame that all members of the ELAN must be capable of receiving; *size* must be 1516, 4544, 9234, or 18190.
+/–tf	Sets/Clears maximum forwarding rate from 100 – 5000 kb/s.
+/–des *string*	Sets/Clears the description for the BUS to string.

Description

The `bus` command is used to display all information configured at the BUS, enable and disable the BUS, delete a BUS, and set the BUS configuration. Any parameters not set by the switch administrator take on the defaults listed in the LAN Emulation Over ATM Specification.

The `bus` *`number`* command with no other switches creates a BUS with the index number if one does not already exist. The default values are used for its parameters. If the BUS already exists, its parameters are displayed. All `bus` commands must contain the number of the BUS the command is issued for, with the exception of the summary command `bus`.

If you choose to specify a unique option, you must specify only one option. You can specify more than one option from the option list, but the options must be separated by a space. If you specify a unique option, you should not specify any options from the option list because they will be ignored.

Note

The syntax is such that a plus sign (+) adds the optional parameter and a minus sign (–) removes it.

Examples

```
GIGAswitch/ATM-> bus

         LE Broadcast and Unknown Servers

BUS Number          Status          Description
    1               enabled         Accounting LAN
    2               disabling       Marketing LAN
    3               disabled        Under construction
    4               enabled         IP VLAN
```

This example displays a summary of the BUSs.

```
GIGAswitch/ATM–> bus 1

         LE Broadcast and Unknown Server 1 Parameters

Description:               Accounting LAN
LAN Name:                  Accounting
Type:                      Ethernet/IEEE 802.3
Max frame size:            1516
State:                     Enabled

BUS address:  39010000000100123456789abc.08002b035816.00
```

This example displays information about the specified BUS, including the state. This example shows that the specified LES is in the enabled state. BUSs can be in the enabled, disabled, disabling, or deleting state.

```
GIGAswitch/ATM–> bus 1 –c

               Broadcast and Unknown Server 1 Status

     LEC member states
         Multicast Forward in process:          0
         forwarding:                            0
         releasing:                             0
     Multicast Send
         attempts:                              0
         failures
              no resources:                     0
              invalid setup info:               0
              wrong LAN type:                   0
              wrong frame size:                 0
     Multicast Forward failures
              no resources:                     0
              client reject:                    0
     Frames received:                           0
     Frames forwarded:                          0
     Frames discarded
         no resources:                          0
         receive queue full:                    0
         invalid length:                        0
         invalid lec state:                     0
         multicast fwd not ready:               0
         rate limited:                          0
         other:                                 0
```

This example displays the BUS counters. Note that counters are never reset to zero. The Multicast Forward in process field indicates that the LEC is connected to the BUS and the BUS is trying to create a Multicast Forward back to the LEC. The forwarding field indicates that the BUS is forwarding frames to and from the LEC. The releasing field indicates that the LES is waiting for the LEC to release all connections (Join failed). The receive queue full field is used to indicate the number of frames that are discarded after the server has passed the queue limit for processing frames as specified by this server.

```
GIGAswitch/ATM–> bus 1 –sc

               Connected Clients for Broadcast and Unknown Server 1

         Mult Forw in Process  39999900000000008002bb51200.08002b123456.00
         Forwarding            39999900000000008002bb51200.08002b789123.00
         Releasing             39999900000000008002bb51200.08002b456789.00
```

This example displays the clients connected to the specified BUS, including information about their state and ATM address.

6

Managing the System Using SNMP

An extended LAN containing GIGAswitch/ATM systems is managed with a network management station (NMS) using the Simple Network Management Protocol (SNMP). SNMP is a protocol used for communicating between a network manager and an agent (in this case, the GIGAswitch/ATM system).

Using NMS–specific commands, you can:

- Examine GIGAswitch/ATM characteristics, including firmware version, hardware status, and module status.
- Examine the characteristics of ports and counters.
- Examine port status and address information.
- Enable or disable a port connection to the LAN.
- Monitor events.

6.1 SNMP Management Concepts

If you need additional information about using SNMP management, Table 6–1 lists some additional sources of information.

Table 6–1 Additional Information About SNMP

For information about:	Refer to:
SNMP and manageable objects	*The Simple Book* by Marshall T. Rose
The at, icmp, if, ip, snmp, sys, or udp groups	Appropriate RFC
An SNMP object	Appropriate public or private MIB
Manipulating SNMP objects using your NMS	Appropriate user documentation

SNMP communicates management information between a manager and an agent. SNMP allows the network manager to view or modify (`get` or `set`) information from an agent. The manager requests the information using SNMP, and the agent sends back the information. Note that with SNMP, you can create objects when you set them for the first time.

Requests for information, or commands to modify information, are often accompanied by a password called a community name. Because only users who are retrieving or modifying information know the community name, this is a simple form of security.

The information that can be requested or modified from the agent consists of a number of objects. Taken together, these objects form the Management Information Base (MIB). These MIBs can be loaded on an NMS, and all of the objects defined in the MIBs can then be viewed or modified as appropriate.

The Management Information Base was defined by the Internet Engineering Task Force (IETF) for SNMP management. The MIB is a repository for all data (variables) gathered and used by a network node. It describes the name, object identifier, data type, and accessibility of all data items that can be read or written using SNMP. An object or object identifier's structure is like that of the UNIX file system. It can be represented as a tree–like, branched structure that spreads downward from a root. Below the root is a configuration–dependent number of managed objects that are defined as software resources that enable network services.

MIB object groups are placed at various points in the MIB tree. MIB objects can be referred to by their name or their number in the MIB tree. When you specify a MIB object, you must give its full name or object ID number, or you must specify its leaf name (which can often be done using different methods that depend on your NMS).

To access a specific variable within the MIB, you must supply the complete variable name (object name). These object names mirror the hierarchical structure of the information base, and are made up of the sequence of the branches of the MIB tree that lead down to the object.

A MIB object can be entered on an NMS by either typing the complete object name, typing the complete object ID, or using a window–based system to click on each correct sequential tree branch until the desired object is fully specified.

6.2 Initial NMS Commands

When you first use the NMS, you might want to:

- Familiarize yourself with your NMS's command syntax.
- Set a default gateway configuration.
- Set your community name (password) for read–only users, read–write users, and traps.

Different software packages for your NMS require different command syntax structures. The syntax often contains an action (such as `set` or `get`), a variable (a MIB object), a type (such as an octet or an integer), and a value. Set commands must often identify an action, an object, the type of string that an object accommodates, and the value that you are giving it.

6.3 The GIGAswitch/ATM SNMP Implementation

The SNMP implementation in the GIGAswitch/ATM system consists of two components: the Address Registration Unit (ARU) and the SNMP agent.

The Address Registration Unit is an SNMP client that performs ATM address registration according to the UNI specification. The address registration process establishes a unique ATM address for each of the end nodes connected to the ATM links. Signaling software uses ATM addresses for establishing virtual circuits. Routing software uses ATM addresses for routing calls through the ATM network. The ARU also sends keep alive messages to its peers to detect UNI down events.

The SNMP agent supports management operations on the ILMI VCI (VCI=16) on each of the ATM links, and also over the Ethernet/IP/UDP path. The access over the ILMI VCI is limited to the following:

- System group of MIB–II
- ATM–FORUM–MIB
- ATM–FORUM–ADDR–REG
- DEC–ATM–MIB

6.3.1 Address Registration Unit

The ARU maintains an `atmfAddressTable` that contains ATM address information for each of the ATM links. During initialization, the switch sets the table to empty state. Whenever a carrier is detected on an ATM link, a cold start trap is received, or polling fails for 20 seconds, the switch deletes the entries associated with that link.

ARU sends `coldStart` trap to its peer at the beginning of the address registration process. It skips sending `coldStart` trap if `coldStart` trap is already received from its peer. It sends `GetNext` request to its peer to verify that there are no entries associated with the line in the peer's `atmfNetPrefixTable`. If any entries are found, it restarts the registration process by sending `coldStart` trap. If the peer's `atmfNetPrefixTable` is found empty, the switch sends SNMP `Set` requests to add one or more entries to the peer's `atmfNetPrefixTable`.

The peer has to perform a SNMP `Set` operation on the local `atmfAddressTable` to establish its ATM addresses. The peer can add additional ATM addresses or delete addresses previously registered by sending SNMP `Set` requests. The peer can also send `Get` and `GetNext` requests at any time during or after the address registration process.

6.3.2 SNMP Agent

The SNMP agent provides a general SNMP interface to all the management information available. The SNMP agent supports receiving SNMP requests from two sources:

- UDP/IP on Ethernet
- Raw ATM (AAL5) on VCI=16 on ATM links

The SNMP agent provides access to all the MIB variables according to the community name for all the requests received over the IP path. The agent provides read–only access to all the MIB variables and read–write access to a limited set of entries in the ATM address table for raw ATM (SNMP/AAL5) requests received over VCI 16 on an ATM link. This set is limited to the entries corresponding to the line over which the request is received.

The DEC–ATM–MIB contains device and link attributes, such as FLOWmaster support and switch type (whether it is a Digital switch). This information is exchanged during link initialization and used when VCs are set up on the link.

6.4 Implemented MIB Object Groups

The MIBs used by the GIGAswitch/ATM system include:

- MIB–II (RFC 1213)
- ILMI MIB (UNI V3.0)
- DS1/E1 MIB (RFC 1406)
- DS3/E3 MIB (RFC 1407)
- SONET MIB (RFC 1595)
- ATM MIB (RFC 1695)
- DEC ATM MIB (V1.0)
- DEC ATM Signalling MIB
- DEC ATM Switch Chassis MIB
- DEC LAN Emulation Service MIBs (LES, BUS, LECS)

Consult the MIBs directly for complete information.

Table 6–2 lists the object groups implemented by the supported MIBs.

Table 6–2 MIB Object Groups

MIB	Object Groups
MIB–II	system, interfaces, at, ip, icmp, tcp, udp, snmp
ILMI MIB	
DS1/E1 MIB	DS1/E1 Near End Group
DS3/E3 MIB	DS3/E3 Near End Group
SONET MIB	sonetObjects, sonetObjectsPath, sonetObjectsVT, sonetConformance
ATM MIB	atmMIBObjects, atmMIBConformance
DEC ATM MIB	ema
DEC ATM Signalling MIB	
DEC ATM Switch Chassis MIB	
DEC LES MIB	decLesConfigGroup, decLesClientStatesGroup, decLesClientGroup, decLesLecGroup, decLesMacAddressGroup, decLesRouteDescrGroup, decLesTrafficGroup, decLesCallStatsGroup, decLesJoinStatsGroup, decLesRegisterStatsGroup, decLesArpStatsGroup, decLesFlushStatsGroup, decLesEventLogGroup
DEC BUS MIB	decBusConfigGroup, decBusClientStatesGroup, decBusTrafficGroup, decBusClientGroup, decBusLecGroup, decBusCallStatsGroup, decBusEventLogGroup
DEC LECS MIB	decElanCConfGroup, decLecsCStatGroup, decLecsCGroup, decLecsCFaultGroup

A

The GIGAswitch/ATM SNMP Agent

This appendix describes the capabilities of the GIGAswitch/ATM SNMP agent (`gigaSwitchATMAgent`). It supports RFC1213–MIB and includes the `system`, `at`, `ip`, `icmp`, `tcp`, `udp`, and `snmp` groups with the following variations:

`atEntry`

Description: Creation requires `atPhysAddress`

`ipForwarding`

Syntax: integer (1..1)

Description: Always set to 1.

`ipDefaultTTL`

Syntax: integer (255..255)

Description: Always set to 255.

`ipRouteEntry`

Description: Creation requires `ipRouteNextHop` and `ipRouteType`.

`ipNetToMediaEntry`

Description: Creation requires `ipNetToMediaPhysAddress` and `ipNetToMediaType`.

`tcpConnState`

Access: read–only

Description: Cannot be set in the GIGAswitch/ATM system.

The GIGAswitch/ATM SNMP agent supports the IF–MIB and includes the `ifGeneralGroup`, `ifPacketGroup`, `ifHCFixedLengthGroup`, `ifStackGroup`, `ifInNUcastPkts`, `ifOutNUcastPkts`, `ifOutQLen`, `ifSpecific`, and `ifPromiscuousMode` groups.

There are eight kinds of interfaces supported by the current release of the SNMP agent in the GIGAswitch/ATM system. These are: loopback, Ethernet, SLIP, ATM, SONET path, SONET line, DS1/E1, and DS3/E3. The `ifGeneralGroup` is supported for interfaces of all types. The `ifPacketGroup` is supported for the loopback and Ethernet interfaces. Also, `ifInNUcastPkts`, `ifOutNUcastPkts`, `ifOutQlen`, and `ifSpecific` are supported for loopback and Ethernet interfaces. The `ifPromiscuousMode` can be read for some interfaces, but promiscuous mode cannot be set for any of them. The `ifIndex` values are assigned as follows:

- The software loopback interface has ifIndex 1.
- The Ethernet interface has ifIndex 2.
- The SLIP interface has ifIndex 3 (when it exists).
- All other ifIndex values are calculated as BASE + LINK_NUMBER, where BASE is an even multiple of 1000 that identifies the interface layer (refer to Table A–1). The LINK_NUMBER is calculated as:

  16 * (*slot_number* – 1) + *port_number*

  with the clock card slot treated as if it did not exist (refer to Table A–2). For example, a DS3/E3 modular PHY located in slot 4, port 2 would have the ifIndex values of 5050 (for the logical ATM layer interface) and 8050 (for the PHY layer interface).

  Note that decoding the ifIndex value is not the only method for getting configuration information. The `ifDescr`, `ifType`, and `ifStackTable` objects and the DEC ATM Switch Chassis MIB all provide help for obtaining this information.

Table A–1 Interface Numbering

Interface Layer	ifIndex Range
ATM	5001 – 5xxx
SONET path	6001 – 6xxx
SONET section/line/medium	7001 – 7xxx
DS3/E3	8001 – 8xxx
DS1/E1	9001 – 9xxx

Table A–2 Link Numbering

Slot Number	Link Numbers
1	001–004
2	017–020
3	033–036
4	049–052
5	065–068
6	081–084
7	None (clock card slot)
8	097–100
9	113–116
10	129–132
11	145–148
12	161–164
13	177–180
14	193–196

The following variations are supported for the IF–MIB.

`ifAdminStatus`

Syntax: integer – up(1), down(2)

Description: This is applicable to ethernet and ATM interfaces only (indexes: 2 and 5XXX).

`ifAdminStatus`

Syntax: integer – up(1)

Description: This is applicable to loopback, SONET path and SONET line interfaces only (indexes 1, 6XXX and 7XXX).

`ifHCInOctets`

Access: not–implemented

Description: Counter64 is an unknown type for SNMPv1.

`ifHCOutOctets`

Access: not–implemented

Description: Counter64 is an unknown type for SNMPv1.

The GIGAswitch/ATM SNMP agent supports the SONET–MIB and includes the `sonetMediumStuff` group.

It supports the DS3/E3 and DS1/E1 MIBs, including the near end groups (but not the far end or fractional groups).

It supports the ATM–MIB and includes the `atmInterfaceConfGroup` and `atmInterfaceTCGroup` groups with the `atmInterfaceMaxVpcs`, `atmInterfaceMaxVccs`, `atmInterfaceMaxActiveVpiBits`, `atmInterfaceMaxActiveVciBits`, `atmInterfaceIlmiVpi`, and `atmInterfaceIlmiVci` variations with read–only access.

The GIGAswitch/ATM SNMP agent supports the ATM–FORUM–MIB and includes the `atmfPhysicalGroup` and `atmfAtmLayerGroup` group. The `PortIndex` value for all tables is equal to the `ifIndex` for the corresponding ATM interface minus 5000. ATM–FORUM–MIB variables can be accessed through both IP and raw ATM.

It supports the ATM–FORUM–ADDR–REG MIB and includes the `atmfAddressGroup` group. The `atmfAddressPort` value is equal to the ifIndex for the corresponding ATM interface minus 5000. The ATM–FORUM–ADDR–REG variable can be accessed through both IP and raw ATM.

It supports the DECATM–MIB and includes the `ad` group. The `adpPortIndex` value is equal to the `ifIndex` for the corresponding ATM interface minus 5000. DECATM–MIB variables can be accessed through both IP and raw ATM.

B

MIB Object Identifiers

Object identifiers (OIDs) can be used interchangeably with object names. This appendix lists the object identifiers associated with all MIB objects in groups implemented by the GIGAswitch/ATM system. These objects are in the MIB–II, ILMI, DS1/E1, DS3/E3, SONET, ATM, DEC ATM, DEC ATM Signalling, DEC ATM Switch Chassis, DEC LES, DEC BUS, and DEC LECS MIBs. Use these tables as a quick reference when specifying OIDs with your network management station.

Table B–1 MIB–II MIB Object Identifiers

Object	ID
mib–2	1.3.6.1.2.1
system	1.3.6.1.2.1.1
sysDescr	1.3.6.1.2.1.1.1
sysObjectID	1.3.6.1.2.1.1.2
sysUpTime	1.3.6.1.2.1.1.3
sysContact	1.3.6.1.2.1.1.4
sysName	1.3.6.1.2.1.1.5
sysLocation	1.3.6.1.2.1.1.6
sysServices	1.3.6.1.2.1.1.7
interfaces	1.3.6.1.2.1.2
ifNumber	1.3.6.1.2.1.2.1
ifTable	1.3.6.1.2.1.2.2
ifEntry	1.3.6.1.2.1.2.2.1
ifIndex	1.3.6.1.2.1.2.2.1.1
ifDescr	1.3.6.1.2.1.2.2.1.2
ifType	1.3.6.1.2.1.2.2.1.3
ifMtu	1.3.6.1.2.1.2.2.1.4
ifSpeed	1.3.6.1.2.1.2.2.1.5
ifPhysAddress	1.3.6.1.2.1.2.2.1.6
ifAdminStatus	1.3.6.1.2.1.2.2.1.7
ifOperStatus	1.3.6.1.2.1.2.2.1.8
ifLastChange	1.3.6.1.2.1.2.2.1.9

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Table B–1 (Cont.) MIB–II MIB Object Identifiers

Object	ID
ifInOctets	1.3.6.1.2.1.2.2.1.10
ifInUcastPkts	1.3.6.1.2.1.2.2.1.11
ifInNUcastPkts	1.3.6.1.2.1.2.2.1.12
ifInDiscards	1.3.6.1.2.1.2.2.1.13
ifInErrors	1.3.6.1.2.1.2.2.1.14
ifInUnknownProtos	1.3.6.1.2.1.2.2.1.15
ifOutOctets	1.3.6.1.2.1.2.2.1.16
ifOutUcastPkts	1.3.6.1.2.1.2.2.1.17
ifOutNUcastPkts	1.3.6.1.2.1.2.2.1.18
ifOutDiscards	1.3.6.1.2.1.2.2.1.19
ifOutErrors	1.3.6.1.2.1.2.2.1.20
ifOutQLen	1.3.6.1.2.1.2.2.1.21
ifSpecific	1.3.6.1.2.1.2.2.1.22
at	1.3.6.1.2.1.3
atTable	1.3.6.1.2.1.3.1
atEntry	1.3.6.1.2.1.3.1.1
atIfIndex	1.3.6.1.2.1.3.1.1.1
atPhysAddress	1.3.6.1.2.1.3.1.1.2
atNetAddress	1.3.6.1.2.1.3.1.1.3
ip	1.3.6.1.2.1.4
ipForwarding	1.3.6.1.2.1.4.1
ipDefaultTTL	1.3.6.1.2.1.4.2
ipInReceives	1.3.6.1.2.1.4.3
ipInHdrErrors	1.3.6.1.2.1.4.4
ipInAddrErrors	1.3.6.1.2.1.4.5
ipForwDatagrams	1.3.6.1.2.1.4.6
ipInUnknownProtos	1.3.6.1.2.1.4.7
ipInDiscards	1.3.6.1.2.1.4.8
ipInDelivers	1.3.6.1.2.1.4.9
ipOutRequests	1.3.6.1.2.1.4.10
ipOutDiscards	1.3.6.1.2.1.4.11
ipOutNoRoutes	1.3.6.1.2.1.4.12

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Table B–1 (Cont.) MIB–II MIB Object Identifiers

Object	ID
ipReasmTimeout	1.3.6.1.2.1.4.13
ipReasmReqds	1.3.6.1.2.1.4.14
ipReasmOKs	1.3.6.1.2.1.4.15
ipReasmFails	1.3.6.1.2.1.4.16
ipFragOKs	1.3.6.1.2.1.4.17
ipFragFails	1.3.6.1.2.1.4.18
ipFragCreates	1.3.6.1.2.1.4.19
ipAddrTable	1.3.6.1.2.1.4.20
ipAddrEntry	1.3.6.1.2.1.4.20.1
ipAdEntAddr	1.3.6.1.2.1.4.20.1.1
ipAdEntIfIndex	1.3.6.1.2.1.4.20.1.2
ipAdEntNetMask	1.3.6.1.2.1.4.20.1.3
ipAdEntBcastAddr	1.3.6.1.2.1.4.20.1.4
ipAdEntReasmMaxSize	1.3.6.1.2.1.4.20.1.5
ipRouteTable	1.3.6.1.2.1.4.21
ipRouteEntry	1.3.6.1.2.1.4.21.1
ipRouteDest	1.3.6.1.2.1.4.21.1.1
ipRouteIfIndex	1.3.6.1.2.1.4.21.1.2
ipRouteMetric1	1.3.6.1.2.1.4.21.1.3
ipRouteMetric2	1.3.6.1.2.1.4.21.1.4
ipRouteMetric3	1.3.6.1.2.1.4.21.1.5
ipRouteMetric4	1.3.6.1.2.1.4.21.1.6
ipRouteNextHop	1.3.6.1.2.1.4.21.1.7
ipRouteType	1.3.6.1.2.1.4.21.1.8
ipRouteProto	1.3.6.1.2.1.4.21.1.9
ipRouteAge	1.3.6.1.2.1.4.21.1.10
ipRouteMask	1.3.6.1.2.1.4.21.1.11
ipRouteMetric5	1.3.6.1.2.1.4.21.1.12
ipRouteInfo	1.3.6.1.2.1.4.21.1.13
ipNetToMediaTable	1.3.6.1.2.1.4.22
ipNetToMediaEntry	1.3.6.1.2.1.4.22.1
ipNetToMediaIfIndex	1.3.6.1.2.1.4.22.1.1

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Table B–1 (Cont.) MIB–II MIB Object Identifiers

Object	ID
ipNetToMediaPhysAddress	1.3.6.1.2.1.4.22.1.2
ipNetToMediaNetAddress	1.3.6.1.2.1.4.22.1.3
ipNetToMediaType	1.3.6.1.2.1.4.22.1.4
ipRoutingDiscards	1.3.6.1.2.1.4.23
icmp	1.3.6.1.2.1.5
icmpInMsgs	1.3.6.1.2.1.5.1
icmpInErrors	1.3.6.1.2.1.5.2
icmpInDestUnreachs	1.3.6.1.2.1.5.3
icmpInTimeExcds	1.3.6.1.2.1.5.4
icmpInParmProbs	1.3.6.1.2.1.5.5
icmpInSrcQuenchs	1.3.6.1.2.1.5.6
icmpInRedirects	1.3.6.1.2.1.5.7
icmpInEchos	1.3.6.1.2.1.5.8
icmpInEchoReps	1.3.6.1.2.1.5.9
icmpInTimestamps	1.3.6.1.2.1.5.10
icmpInTimestampReps	1.3.6.1.2.1.5.11
icmpInAddrMasks	1.3.6.1.2.1.5.12
icmpInAddrMaskReps	1.3.6.1.2.1.5.13
icmpOutMsgs	1.3.6.1.2.1.5.14
icmpOutErrors	1.3.6.1.2.1.5.15
icmpOutDestUnreachs	1.3.6.1.2.1.5.16
icmpOutTimeExcds	1.3.6.1.2.1.5.17
icmpOutParmProbs	1.3.6.1.2.1.5.18
icmpOutSrcQuenchs	1.3.6.1.2.1.5.19
icmpOutRedirects	1.3.6.1.2.1.5.20
icmpOutEchos	1.3.6.1.2.1.5.21
icmpOutEchoReps	1.3.6.1.2.1.5.22
icmpOutTimestamps	1.3.6.1.2.1.5.23
icmpOutTimestampReps	1.3.6.1.2.1.5.24
icmpOutAddrMasks	1.3.6.1.2.1.5.25
icmpOutAddrMaskReps	1.3.6.1.2.1.5.26
tcp	1.3.6.1.2.1.6

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Table B–1 (Cont.) MIB–II MIB Object Identifiers

Object	ID
udp	1.3.6.1.2.1.7
udpInDatagrams	1.3.6.1.2.1.7.1
udpNoPorts	1.3.6.1.2.1.7.2
udpInErrors	1.3.6.1.2.1.7.3
udpOutDatagrams	1.3.6.1.2.1.7.4
udpTable	1.3.6.1.2.1.7.5
udpEntry	1.3.6.1.2.1.7.5.1
udpLocalAddress	1.3.6.1.2.1.7.5.1.1
udpLocalPort	1.3.6.1.2.1.7.5.1.2
egp	1.3.6.1.2.1.8
transmission	1.3.6.1.2.1.10
snmp	1.3.6.1.2.1.11
snmpInPkts	1.3.6.1.2.1.11.1
snmpOutPkts	1.3.6.1.2.1.11.2
snmpInBadVersions	1.3.6.1.2.1.11.3
snmpInBadCommunityNames	1.3.6.1.2.1.11.4
snmpInBadCommunityUses	1.3.6.1.2.1.11.5
snmpInASNParseErrs	1.3.6.1.2.1.11.6
snmpInTooBigs	1.3.6.1.2.1.11.8
snmpInNoSuchNames	1.3.6.1.2.1.11.9
snmpInBadValues	1.3.6.1.2.1.11.10
snmpInReadOnlys	1.3.6.1.2.1.11.11
snmpInGenErrs	1.3.6.1.2.1.11.12
snmpInTotalReqVars	1.3.6.1.2.1.11.13
snmpInTotalSetVars	1.3.6.1.2.1.11.14
snmpInGetRequests	1.3.6.1.2.1.11.15
snmpInGetNexts	1.3.6.1.2.1.11.16
snmpInSetRequests	1.3.6.1.2.1.11.17
snmpInGetResponses	1.3.6.1.2.1.11.18
snmpInTraps	1.3.6.1.2.1.11.19
snmpOutTooBigs	1.3.6.1.2.1.11.20
snmpOutNoSuchNames	1.3.6.1.2.1.11.21
snmpOutBadValues	1.3.6.1.2.1.11.22
snmpOutGenErrs	1.3.6.1.2.1.11.24
snmpOutGetRequests	1.3.6.1.2.1.11.25
snmpOutGetNexts	1.3.6.1.2.1.11.26
snmpOutSetRequests	1.3.6.1.2.1.11.27
snmpOutGetResponses	1.3.6.1.2.1.11.28
snmpOutTraps	1.3.6.1.2.1.11.29
snmpEnableAuthenTraps	1.3.6.1.2.1.11.30

Table B–2 MIB–II Extensions Object Identifiers

Object	ID
ifMIB	1.3.6.1.2.1.31
ifMIBObjects	1.3.6.1.2.1.31.1
ifXTable	1.3.6.1.2.1.31.1.1
ifXEntry	1.3.6.1.2.1.31.1.1.1
ifName	1.3.6.1.2.1.31.1.1.1.1
ifInMulticastPkts	1.3.6.1.2.1.31.1.1.1.2
ifInBroadcastPkts	1.3.6.1.2.1.31.1.1.1.3
ifOutMulticastPkts	1.3.6.1.2.1.31.1.1.1.4
ifOutBroadcastPkts	1.3.6.1.2.1.31.1.1.1.5
ifHCInOctets	1.3.6.1.2.1.31.1.1.1.6
ifHCInUcastPkts	1.3.6.1.2.1.31.1.1.1.7
ifHCInMulticastPkts	1.3.6.1.2.1.31.1.1.1.8
ifHCInBroadcastPkts	1.3.6.1.2.1.31.1.1.1.9
ifHCOutOctets	1.3.6.1.2.1.31.1.1.1.10
ifHCOutUcastPkts	1.3.6.1.2.1.31.1.1.1.11
ifHCOutMulticastPkts	1.3.6.1.2.1.31.1.1.1.12
ifHCOutBroadcastPkts	1.3.6.1.2.1.31.1.1.1.13
ifLinkUpDownTrapEnable	1.3.6.1.2.1.31.1.1.1.14
ifHighSpeed	1.3.6.1.2.1.31.1.1.1.15
ifPromiscuousMode	1.3.6.1.2.1.31.1.1.1.16
ifConnectorPresent	1.3.6.1.2.1.31.1.1.1.17
ifStackTable	1.3.6.1.2.1.31.1.2
ifStackEntry	1.3.6.1.2.1.31.1.2.1
ifStackHigherLayer	1.3.6.1.2.1.31.1.2.1.1
ifStackLowerLayer	1.3.6.1.2.1.31.1.2.1.2
ifStackStatus	1.3.6.1.2.1.31.1.2.1.3
ifTestTable	1.3.6.1.2.1.31.1.3
ifTestEntry	1.3.6.1.2.1.31.1.3.1
ifTestId	1.3.6.1.2.1.31.1.3.1.1
ifTestStatus	1.3.6.1.2.1.31.1.3.1.2
ifTestType	1.3.6.1.2.1.31.1.3.1.3
ifTestResult	1.3.6.1.2.1.31.1.3.1.4
ifTestCode	1.3.6.1.2.1.31.1.3.1.5

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Table B–2 (Cont.) MIB–II Extensions Object Identifiers

Object	ID
ifTestOwner	1.3.6.1.2.1.31.1.3.1.6
ifRcvAddressTable	1.3.6.1.2.1.31.1.4
ifRcvAddressEntry	1.3.6.1.2.1.31.1.4.1
ifRcvAddressAddress	1.3.6.1.2.1.31.1.4.1.1
ifRcvAddressStatus	1.3.6.1.2.1.31.1.4.1.2
ifRcvAddressType	1.3.6.1.2.1.31.1.4.1.3
linkDown	
linkUp	
ifConformance	1.3.6.1.2.1.31.2
ifGroups	1.3.6.1.2.1.31.2.1
ifGeneralGroup	1.3.6.1.2.1.31.2.1.1
ifFixedLengthGroup	1.3.6.1.2.1.31.2.1.2
ifHCFixedLengthGroup	1.3.6.1.2.1.31.2.1.3
ifPacketGroup	1.3.6.1.2.1.31.2.1.4
ifHCPacketGroup	1.3.6.1.2.1.31.2.1.5
ifVHCPacketGroup	1.3.6.1.2.1.31.2.1.6
ifRcvAddressGroup	1.3.6.1.2.1.31.2.1.7
ifTestGroup	1.3.6.1.2.1.31.2.1.8
ifStackGroup	1.3.6.1.2.1.31.2.1.9
ifCompliances	1.3.6.1.2.1.31.2.2
ifCompliance	1.3.6.1.2.1.31.2.2.1

Table B–3 ATM Forum MIB Object Identifiers

Object	ID
atmForum	1.3.6.1.4.1.353
atmForumAdmin	1.3.6.1.4.1.353.1
atmfTransmissionTypes	1.3.6.1.4.1.353.1.2
atmfUnknownType	1.3.6.1.4.1.353.1.2.1
atmfSonetSTS3c	1.3.6.1.4.1.353.1.2.2
atmfDs3	1.3.6.1.4.1.353.1.2.3

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Table B–3 (Cont.) ATM Forum MIB Object Identifiers

Object	ID
atmf4B5B	1.3.6.1.4.1.353.1.2.4
atmf8B10B	1.3.6.1.4.1.353.1.2.5
atmfMediaTypes	1.3.6.1.4.1.353.1.3
atmfMediaUnknownType	1.3.6.1.4.1.353.1.3.1
atmfMediaCoaxCable	1.3.6.1.4.1.353.1.3.2
atmfMediaSingleMode	1.3.6.1.4.1.353.1.3.3
atmfMediaMultiMode	1.3.6.1.4.1.353.1.3.4
atmfMediaStp	1.3.6.1.4.1.353.1.3.5
atmfMediaUtp	1.3.6.1.4.1.353.1.3.6
atmfTrafficDescrTypes	1.3.6.1.4.1.353.1.4
atmfNoDescriptor	1.3.6.1.4.1.353.1.4.1
atmfPeakRate	1.3.6.1.4.1.353.1.4.2
atmfClpNoTaggingNoScr	1.3.6.1.4.1.353.1.4.4
atmfClpTaggingNoScr	1.3.6.1.4.1.353.1.4.5
atmfNoClpScr	1.3.6.1.4.1.353.1.4.6
atmfClpNoTaggingScr	1.3.6.1.4.1.353.1.4.7
atmfClpTaggingScr	1.3.6.1.4.1.353.1.4.8
atmForumUni	1.3.6.1.4.1.353.2
atmfPhysicalGroup	1.3.6.1.4.1.353.2.1
atmfPortTable	1.3.6.1.4.1.353.2.1.1
atmfPortEntry	1.3.6.1.4.1.353.2.1.1.1
atmfPortIndex	1.3.6.1.4.1.353.2.1.1.1.1
atmfPortAddress	1.3.6.1.4.1.353.2.1.1.1.2
atmfPortTransmissionType	1.3.6.1.4.1.353.2.1.1.1.3
atmfPortMediaType	1.3.6.1.4.1.353.2.1.1.1.4
atmfPortOperStatus	1.3.6.1.4.1.353.2.1.1.1.5
atmfPortSpecific	1.3.6.1.4.1.353.2.1.1.1.6
atmfAtmLayerGroup	1.3.6.1.4.1.353.2.2
atmfAtmLayerTable	1.3.6.1.4.1.353.2.2.1
atmfAtmLayerEntry	1.3.6.1.4.1.353.2.2.1.1
atmfAtmLayerIndex	1.3.6.1.4.1.353.2.2.1.1.1
atmfAtmLayerMaxVPCs	1.3.6.1.4.1.353.2.2.1.1.2

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Table B–3 (Cont.) ATM Forum MIB Object Identifiers

Object	ID
atmfAtmLayerMaxVCCs	1.3.6.1.4.1.353.2.2.1.1.3
atmfAtmLayerConfiguredVPCs	1.3.6.1.4.1.353.2.2.1.1.4
atmfAtmLayerConfiguredVCCs	1.3.6.1.4.1.353.2.2.1.1.5
atmfAtmLayerMaxVpiBits	1.3.6.1.4.1.353.2.2.1.1.6
atmfAtmLayerMaxVciBits	1.3.6.1.4.1.353.2.2.1.1.7
atmfAtmLayerUniType	1.3.6.1.4.1.353.2.2.1.1.8
atmfAtmStatsGroup	1.3.6.1.4.1.353.2.3
atmfAtmStatsTable	1.3.6.1.4.1.353.2.3.1
atmfAtmStatsEntry	1.3.6.1.4.1.353.2.3.1.1
atmfAtmStatsIndex	1.3.6.1.4.1.353.2.3.1.1.1
atmfAtmStatsReceivedCells	1.3.6.1.4.1.353.2.3.1.1.2
atmfAtmStatsDroppedReceivedCells	1.3.6.1.4.1.353.2.3.1.1.3
atmfAtmStatsTransmittedCells	1.3.6.1.4.1.353.2.3.1.1.4
atmfVpcGroup	1.3.6.1.4.1.353.2.4
atmfVpcTable	1.3.6.1.4.1.353.2.4.1
atmfVpcEntry	1.3.6.1.4.1.353.2.4.1.1
atmfVpcPortIndex	1.3.6.1.4.1.353.2.4.1.1.1
atmfVpcVpi	1.3.6.1.4.1.353.2.4.1.1.2
atmfVpcOperStatus	1.3.6.1.4.1.353.2.4.1.1.3
atmfVpcTransmitTrafficDescriptorType	1.3.6.1.4.1.353.2.4.1.1.4
atmfVpcTransmitTrafficDescriptorParam1	1.3.6.1.4.1.353.2.4.1.1.5
atmfVpcTransmitTrafficDescriptorParam2	1.3.6.1.4.1.353.2.4.1.1.6
atmfVpcTransmitTrafficDescriptorParam3	1.3.6.1.4.1.353.2.4.1.1.7
atmfVpcTransmitTrafficDescriptorParam4	1.3.6.1.4.1.353.2.4.1.1.8
atmfVpcTransmitTrafficDescriptorParam5	1.3.6.1.4.1.353.2.4.1.1.9
atmfVpcReceiveTrafficDescriptorType	1.3.6.1.4.1.353.2.4.1.1.10
atmfVpcReceiveTrafficDescriptorParam1	1.3.6.1.4.1.353.2.4.1.1.11
atmfVpcReceiveTrafficDescriptorParam2	1.3.6.1.4.1.353.2.4.1.1.12
atmfVpcReceiveTrafficDescriptorParam3	1.3.6.1.4.1.353.2.4.1.1.13
atmfVpcReceiveTrafficDescriptorParam4	1.3.6.1.4.1.353.2.4.1.1.14
atmfVpcReceiveTrafficDescriptorParam5	1.3.6.1.4.1.353.2.4.1.1.15
atmfVpcQoSCategory	1.3.6.1.4.1.353.2.4.1.1.16

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Table B–3 (Cont.) ATM Forum MIB Object Identifiers

Object	ID
atmfVpcTransmitQoSClass	1.3.6.1.4.1.353.2.4.1.1.17
atmfVpcReceiveQoSClass	1.3.6.1.4.1.353.2.4.1.1.18
atmfVccGroup	1.3.6.1.4.1.353.2.5
atmfVccTable	1.3.6.1.4.1.353.2.5.1
atmfVccEntry	1.3.6.1.4.1.353.2.5.1.1
atmfVccPortIndex	1.3.6.1.4.1.353.2.5.1.1.1
atmfVccVpi	1.3.6.1.4.1.353.2.5.1.1.2
atmfVccVci	1.3.6.1.4.1.353.2.5.1.1.3
atmfVccOperStatus	1.3.6.1.4.1.353.2.5.1.1.4
atmfVccTransmitTrafficDescriptorType	1.3.6.1.4.1.353.2.5.1.1.5
atmfVccTransmitTrafficDescriptorParam1	1.3.6.1.4.1.353.2.5.1.1.6
atmfVccTransmitTrafficDescriptorParam2	1.3.6.1.4.1.353.2.5.1.1.7
atmfVccTransmitTrafficDescriptorParam3	1.3.6.1.4.1.353.2.5.1.1.8
atmfVccTransmitTrafficDescriptorParam4	1.3.6.1.4.1.353.2.5.1.1.9
atmfVccTransmitTrafficDescriptorParam5	1.3.6.1.4.1.353.2.5.1.1.10
atmfVccReceiveTrafficDescriptorType	1.3.6.1.4.1.353.2.5.1.1.11
atmfVccReceiveTrafficDescriptorParam1	1.3.6.1.4.1.353.2.5.1.1.12
atmfVccReceiveTrafficDescriptorParam2	1.3.6.1.4.1.353.2.5.1.1.13
atmfVccReceiveTrafficDescriptorParam3	1.3.6.1.4.1.353.2.5.1.1.14
atmfVccReceiveTrafficDescriptorParam4	1.3.6.1.4.1.353.2.5.1.1.15
atmfVccReceiveTrafficDescriptorParam5	1.3.6.1.4.1.353.2.5.1.1.16
atmfVccQoSCategory	1.3.6.1.4.1.353.2.5.1.1.17
atmfVccTransmitQoSClass	1.3.6.1.4.1.353.2.5.1.1.18
atmfVccReceiveQoSClass	1.3.6.1.4.1.353.2.5.1.1.19

Table B–4 DS1/E1 MIB Object Identifiers

Object	ID
ds1	1.3.6.1.2.1.10.18
dsx1ConfigTable	1.3.6.1.2.1.10.18.6
dsx1ConfigEntry	1.3.6.1.2.1.10.18.6.1
dsx1LineIndex	1.3.6.1.2.1.10.18.6.1.1
dsx1IfIndex	1.3.6.1.2.1.10.18.6.1.2
dsx1TimeElapsed	1.3.6.1.2.1.10.18.6.1.3
dsx1ValidIntervals	1.3.6.1.2.1.10.18.6.1.4
dsx1LineType	1.3.6.1.2.1.10.18.6.1.5
dsx1LineCoding	1.3.6.1.2.1.10.18.6.1.6
dsx1SendCode	1.3.6.1.2.1.10.18.6.1.7

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Table B–4 (Cont.) DS1/E1 MIB Object Identifiers

Object	ID
dsx1CircuitIdentifier	1.3.6.1.2.1.10.18.6.1.8
dsx1LoopbackConfig	1.3.6.1.2.1.10.18.6.1.9
dsx1LineStatus	1.3.6.1.2.1.10.18.6.1.10
dsx1SignalMOde	1.3.6.1.2.1.10.18.6.1.11
dsx1TransmitClockSource	1.3.6.1.2.1.10.18.6.1.12
dsx1Fdl	1.3.6.1.2.1.10.18.6.1.13
dsx1CurrentTable	1.3.6.1.2.1.10.18.7
dsx1CurrentEntry	1.3.6.1.2.1.10.18.7.1
dsx1CurrentIndex	1.3.6.1.2.1.10.18.7.1.1
dsx1CurrentESs	1.3.6.1.2.1.10.18.7.1.2
dsx1CurrentSESs	1.3.6.1.2.1.10.18.7.1.3
dsx1CurrentSEFSs	1.3.6.1.2.1.10.18.7.1.4
dsx1CurrentUASs	1.3.6.1.2.1.10.18.7.1.5
dsx1CurrentCSSs	1.3.6.1.2.1.10.18.7.1.6
dsx1CurrentPCVs	1.3.6.1.2.1.10.18.7.1.7
dsx1CurrentLESs	1.3.6.1.2.1.10.18.7.1.8
dsx1CurrentBESs	1.3.6.1.2.1.10.18.7.1.9
dsx1CurrentDMs	1.3.6.1.2.1.10.18.7.1.10
dsx1CurrentLCVs	1.3.6.1.2.1.10.18.7.1.11
dsx1IntervalTable	1.3.6.1.2.1.10.18.8
dsx1IntervalEntry	1.3.6.1.2.1.10.18.8.1
dsx1IntervalIndex	1.3.6.1.2.1.10.18.8.1.1
dsx1IntervalNumber	1.3.6.1.2.1.10.18.8.1.2
dsx1IntervalESs	1.3.6.1.2.1.10.18.8.1.3
dsx1IntervalSESs	1.3.6.1.2.1.10.18.8.1.4
dsx1IntervalSEFSs	1.3.6.1.2.1.10.18.8.1.5
dsx1IntervalUASs	1.3.6.1.2.1.10.18.8.1.6
dsx1IntervalCSSs	1.3.6.1.2.1.10.18.8.1.7
dsx1IntervalPCVs	1.3.6.1.2.1.10.18.8.1.8
dsx1IntervalLESs	1.3.6.1.2.1.10.18.8.1.9
dsx1IntervalBESs	1.3.6.1.2.1.10.18.8.1.10
dsx1IntervalDMs	1.3.6.1.2.1.10.18.8.1.11
dsx1IntervalLCVs	1.3.6.1.2.1.10.18.8.1.12
dsx1TotalTable	1.3.6.1.2.1.10.18.9
dsx1TotalEntry	1.3.6.1.2.1.10.18.9.1
dsx1TotalIndex	1.3.6.1.2.1.10.18.9.1.1

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Table B–4 (Cont.) DS1/E1 MIB Object Identifiers

Object	ID
dsx1TotalESs	1.3.6.1.2.1.10.18.9.1.2
dsx1TotalSESs	1.3.6.1.2.1.10.18.9.1.3
dsx1TotalSEFSs	1.3.6.1.2.1.10.18.9.1.4
dsx1TotalUASs	1.3.6.1.2.1.10.18.9.1.5
dsx1TotalCSSs	1.3.6.1.2.1.10.18.9.1.6
dsx1TotalPCVs	1.3.6.1.2.1.10.18.9.1.7
dsx1TotalLESs	1.3.6.1.2.1.10.18.9.1.8
dsx1TotalBESs	1.3.6.1.2.1.10.18.9.1.9
dsx1TotalDMs	1.3.6.1.2.1.10.18.9.1.10
dsx1TotalLCVs	1.3.6.1.2.1.10.18.9.1.11

Table B–5 DS3/E3 MIB Object Identifiers

Object	ID
ds3	1.3.6.1.2.1.10.30
dsx3ConfigTable	1.3.6.1.2.1.10.30.5
dsx3ConfigEntry	1.3.6.1.2.1.10.30.5.1
dsx3LineIndex	1.3.6.1.2.1.10.30.5.1.1
dsx3IfIndex	1.3.6.1.2.1.10.30.5.1.2
dsx3TimeElapsed	1.3.6.1.2.1.10.30.5.1.3
dsx3ValidIntervals	1.3.6.1.2.1.10.30.5.1.4
dsx3LineType	1.3.6.1.2.1.10.30.5.1.5
dsx3LineCoding	1.3.6.1.2.1.10.30.5.1.6
dsx3SendCode	1.3.6.1.2.1.10.30.5.1.7
dsx3CircuitIdentifier	1.3.6.1.2.1.10.30.5.1.8
dsx3LoopbackConfig	1.3.6.1.2.1.10.30.5.1.9
dsx3LineStatus	1.3.6.1.2.1.10.30.5.1.10
dsx3TransmitClockSource	1.3.6.1.2.1.10.30.5.1.11
dsx3CurrentTable	1.3.6.1.2.1.10.30.6
dsx3CurrentEntry	1.3.6.1.2.1.10.30.6.1
dsx3CurrentIndex	1.3.6.1.2.1.10.30.6.1.1
dsx3CurrentPESs	1.3.6.1.2.1.10.30.6.1.2
dsx3CurrentPSESs	1.3.6.1.2.1.10.30.6.1.3
dsx3CurrentSEFSs	1.3.6.1.2.1.10.30.6.1.4
dsx3CurrentUASs	1.3.6.1.2.1.10.30.6.1.5
dsx3CurrentLCVs	1.3.6.1.2.1.10.30.6.1.6
dsx3CurrentPCVs	1.3.6.1.2.1.10.30.6.1.7
dsx3CurrentLESs	1.3.6.1.2.1.10.30.6.1.8

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Table B–5 (Cont.) DS3/E3 MIB Object Identifiers

Object	ID
dsx3CurrentCCVs	1.3.6.1.2.1.10.30.6.1.9
dsx3CurrentCESs	1.3.6.1.2.1.10.30.6.1.10
dsx3CurrentCSESs	1.3.6.1.2.1.10.30.6.1.11
dsx3IntervalTable	1.3.6.1.2.1.10.30.7
dsx3IntervalEntry	1.3.6.1.2.1.10.30.7.1
dsx3IntervalIndex	1.3.6.1.2.1.10.30.7.1.1
dsx3IntervalNumber	1.3.6.1.2.1.10.30.7.1.2
dsx3IntervalPESs	1.3.6.1.2.1.10.30.7.1.3
dsx3IntervalPSESs	1.3.6.1.2.1.10.30.7.1.4
dsx3IntervalSEFSs	1.3.6.1.2.1.10.30.7.1.5
dsx3IntervalUASs	1.3.6.1.2.1.10.30.7.1.6
dsx3IntervalLCVs	1.3.6.1.2.1.10.30.7.1.7
dsx3IntervalPCVs	1.3.6.1.2.1.10.30.7.1.8
dsx3IntervalLESs	1.3.6.1.2.1.10.30.7.1.9
dsx3IntervalCCVs	1.3.6.1.2.1.10.30.7.1.10
dsx3IntervalCESs	1.3.6.1.2.1.10.30.7.1.11
dsx3IntervalCSESs	1.3.6.1.2.1.10.30.7.1.12
dsx3TotalTable	1.3.6.1.2.1.10.30.8
dsx3TotalEntry	1.3.6.1.2.1.10.30.8.1
dsx3TotalIndex	1.3.6.1.2.1.10.30.8.1.1
dsx3TotalPESs	1.3.6.1.2.1.10.30.8.1.2
dsx3TotalPSESs	1.3.6.1.2.1.10.30.8.1.3
dsx3TotalSEFSs	1.3.6.1.2.1.10.30.8.1.4
dsx3TotalUASs	1.3.6.1.2.1.10.30.8.1.5
dsx3TotalLCVs	1.3.6.1.2.1.10.30.8.1.6
dsx3TotalPCVs	1.3.6.1.2.1.10.30.8.1.7
dsx3TotalLESs	1.3.6.1.2.1.10.30.8.1.8
dsx3TotalCCVs	1.3.6.1.2.1.10.30.8.1.9
dsx3TotalCESs	1.3.6.1.2.1.10.30.8.1.10
dsx3TotalCSESs	1.3.6.1.2.1.10.30.8.1.11

Table B–6 SONET MIB Object Identifiers

Object	ID
sonetMIB	1.3.6.1.2.1.10.39
sonetObjects	1.3.6.1.2.1.10.39.1
sonetMedium	1.3.6.1.2.1.10.39.1.1
sonetMediumTable	1.3.6.1.2.1.10.39.1.1.1
sonetMediumEntry	1.3.6.1.2.1.10.39.1.1.1.1
sonetMediumType	1.3.6.1.2.1.10.39.1.1.1.1.1
sonetMediumTimeElapsed	1.3.6.1.2.1.10.39.1.1.1.1.2
sonetMediumValidIntervals	1.3.6.1.2.1.10.39.1.1.1.1.3
sonetMediumLineCoding	1.3.6.1.2.1.10.39.1.1.1.1.4
sonetMediumLineType	1.3.6.1.2.1.10.39.1.1.1.1.5
sonetMediumCircuitIdentifier	1.3.6.1.2.1.10.39.1.1.1.1.6
sonetSection	1.3.6.1.2.1.10.39.1.2
sonetSectionCurrentTable	1.3.6.1.2.1.10.39.1.2.1
sonetSectionCurrentEntry	1.3.6.1.2.1.10.39.1.2.1.1
sonetSectionCurrentStatus	1.3.6.1.2.1.10.39.1.2.1.1.1
sonetSectionCurrentESs	1.3.6.1.2.1.10.39.1.2.1.1.2
sonetSectionCurrentSESs	1.3.6.1.2.1.10.39.1.2.1.1.3
sonetSectionCurrentSEFSs	1.3.6.1.2.1.10.39.1.2.1.1.4
sonetSectionCurrentCVs	1.3.6.1.2.1.10.39.1.2.1.1.5
sonetSectionIntervalTable	1.3.6.1.2.1.10.39.1.2.2
sonetSectionIntervalEntry	1.3.6.1.2.1.10.39.1.2.2.1
sonetSectionIntervalNumber	1.3.6.1.2.1.10.39.1.2.2.1.1
sonetSectionIntervalESs	1.3.6.1.2.1.10.39.1.2.2.1.2
sonetSectionIntervalSESs	1.3.6.1.2.1.10.39.1.2.2.1.3
sonetSectionIntervalSEFSs	1.3.6.1.2.1.10.39.1.2.2.1.4
sonetSectionIntervalCVs	1.3.6.1.2.1.10.39.1.2.2.1.5
sonetLine	1.3.6.1.2.1.10.39.1.3
sonetLineCurrentTable	1.3.6.1.2.1.10.39.1.3.1
sonetLineCurrentEntry	1.3.6.1.2.1.10.39.1.3.1.1
sonetLineCurrentStatus	1.3.6.1.2.1.10.39.1.3.1.1.1
sonetLineCurrentESs	1.3.6.1.2.1.10.39.1.3.1.1.2
sonetLineCurrentSESs	1.3.6.1.2.1.10.39.1.3.1.1.3
sonetLineCurrentCVs	1.3.6.1.2.1.10.39.1.3.1.1.4
sonetLineCurrentUASs	1.3.6.1.2.1.10.39.1.3.1.1.5
sonetLineIntervalTable	1.3.6.1.2.1.10.39.1.3.2

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Table B–6 (Cont.) SONET MIB Object Identifiers

Object	ID
sonetLineIntervalEntry	1.3.6.1.2.1.10.39.1.3.2.1
sonetLineIntervalNumber	1.3.6.1.2.1.10.39.1.3.2.1.1
sonetLineIntervalESs	1.3.6.1.2.1.10.39.1.3.2.1.2
sonetLineIntervalSESs	1.3.6.1.2.1.10.39.1.3.2.1.3
sonetLineIntervalCVs	1.3.6.1.2.1.10.39.1.3.2.1.4
sonetLineIntervalUASs	1.3.6.1.2.1.10.39.1.3.2.1.5
sonetFarEndLine	1.3.6.1.2.1.10.39.1.4
sonetFarEndLineCurrentTable	1.3.6.1.2.1.10.39.1.4.1
sonetFarEndLineCurrentEntry	1.3.6.1.2.1.10.39.1.4.1.1
sonetFarEndLineCurrentESs	1.3.6.1.2.1.10.39.1.4.1.1.1
sonetFarEndLineCurrentSESs	1.3.6.1.2.1.10.39.1.4.1.1.2
sonetFarEndLineCurrentCVs	1.3.6.1.2.1.10.39.1.4.1.1.3
sonetFarEndLineCurrentUASs	1.3.6.1.2.1.10.39.1.4.1.1.4
sonetFarEndLineIntervalTable	1.3.6.1.2.1.10.39.1.4.2
sonetFarEndLineIntervalEntry	1.3.6.1.2.1.10.39.1.4.2.1
sonetFarEndLineIntervalNumber	1.3.6.1.2.1.10.39.1.4.2.1.1
sonetFarEndLineIntervalESs	1.3.6.1.2.1.10.39.1.4.2.1.2
sonetFarEndLineIntervalSESs	1.3.6.1.2.1.10.39.1.4.2.1.3
sonetFarEndLineIntervalCVs	1.3.6.1.2.1.10.39.1.4.2.1.4
sonetFarEndLineIntervalUASs	1.3.6.1.2.1.10.39.1.4.2.1.5
sonetObjectsPath	1.3.6.1.2.1.10.39.2
sonetPath	1.3.6.1.2.1.10.39.2.1
sonetPathCurrentTable	1.3.6.1.2.1.10.39.2.1.1
sonetPathCurrentEntry	1.3.6.1.2.1.10.39.2.1.1.1
sonetPathCurrentWidth	1.3.6.1.2.1.10.39.2.1.1.1.1
sonetPathCurrentStatus	1.3.6.1.2.1.10.39.2.1.1.1.2
sonetPathCurrentESs	1.3.6.1.2.1.10.39.2.1.1.1.3
sonetPathCurrentSESs	1.3.6.1.2.1.10.39.2.1.1.1.4
sonetPathCurrentCVs	1.3.6.1.2.1.10.39.2.1.1.1.5
sonetPathCurrentUASs	1.3.6.1.2.1.10.39.2.1.1.1.6
sonetPathIntervalTable	1.3.6.1.2.1.10.39.2.1.2
sonetPathIntervalEntry	1.3.6.1.2.1.10.39.2.1.2.1

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Table B–6 (Cont.) SONET MIB Object Identifiers

Object	ID
sonetPathIntervalNumber	1.3.6.1.2.1.10.39.2.1.2.1.1
sonetPathIntervalESs	1.3.6.1.2.1.10.39.2.1.2.1.2
sonetPathIntervalSESs	1.3.6.1.2.1.10.39.2.1.2.1.3
sonetPathIntervalCVs	1.3.6.1.2.1.10.39.2.1.2.1.4
sonetPathIntervalUASs	1.3.6.1.2.1.10.39.2.1.2.1.5
sonetFarEndPath	1.3.6.1.2.1.10.39.2.2
sonetFarEndPathCurrentTable	1.3.6.1.2.1.10.39.2.2.1
sonetFarEndPathCurrentEntry	1.3.6.1.2.1.10.39.2.2.1.1
sonetFarEndPathCurrentESs	1.3.6.1.2.1.10.39.2.2.1.1.1
sonetFarEndPathCurrentSESs	1.3.6.1.2.1.10.39.2.2.1.1.2
sonetFarEndPathCurrentCVs	1.3.6.1.2.1.10.39.2.2.1.1.3
sonetFarEndPathCurrentUASs	1.3.6.1.2.1.10.39.2.2.1.1.4
sonetFarEndPathIntervalTable	1.3.6.1.2.1.10.39.2.2.2
sonetFarEndPathIntervalEntry	1.3.6.1.2.1.10.39.2.2.2.1
sonetFarEndPathIntervalNumber	1.3.6.1.2.1.10.39.2.2.2.1.1
sonetFarEndPathIntervalESs	1.3.6.1.2.1.10.39.2.2.2.1.2
sonetFarEndPathIntervalSESs	1.3.6.1.2.1.10.39.2.2.2.1.3
sonetFarEndPathIntervalCVs	1.3.6.1.2.1.10.39.2.2.2.1.4
sonetFarEndPathIntervalUASs	1.3.6.1.2.1.10.39.2.2.2.1.5
sonetObjectsVT	1.3.6.1.2.1.10.39.3
sonetVT	1.3.6.1.2.1.10.39.3.1
sonetVTCurrentTable	1.3.6.1.2.1.10.39.3.1.1
sonetVTCurrentEntry	1.3.6.1.2.1.10.39.3.1.1.1
sonetVTCurrentWidth	1.3.6.1.2.1.10.39.3.1.1.1.1
sonetVTCurrentStatus	1.3.6.1.2.1.10.39.3.1.1.1.2
sonetVTCurrentESs	1.3.6.1.2.1.10.39.3.1.1.1.3
sonetVTCurrentSESs	1.3.6.1.2.1.10.39.3.1.1.1.4
sonetVTCurrentCVs	1.3.6.1.2.1.10.39.3.1.1.1.5
sonetVTCurrentUASs	1.3.6.1.2.1.10.39.3.1.1.1.6
sonetVTIntervalTable	1.3.6.1.2.1.10.39.3.1.2
sonetVTIntervalEntry	1.3.6.1.2.1.10.39.3.1.2.1
sonetVTIntervalNumber	1.3.6.1.2.1.10.39.3.1.2.1.1

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Table B–6 (Cont.) SONET MIB Object Identifiers

Object	ID
sonetVTIntervalESs	1.3.6.1.2.1.10.39.3.1.2.1.2
sonetVTIntervalSESs	1.3.6.1.2.1.10.39.3.1.2.1.3
sonetVTIntervalCVs	1.3.6.1.2.1.10.39.3.1.2.1.4
sonetVTIntervalUASs	1.3.6.1.2.1.10.39.3.1.2.1.5
sonetFarEndVT	1.3.6.1.2.1.10.39.3.2
sonetFarEndVTCurrentTable	1.3.6.1.2.1.10.39.3.2.1
sonetFarEndVTCurrentEntry	1.3.6.1.2.1.10.39.3.2.1.1
sonetFarEndVTCurrentESs	1.3.6.1.2.1.10.39.3.2.1.1.1
sonetFarEndVTCurrentSESs	1.3.6.1.2.1.10.39.3.2.1.1.2
sonetFarEndVTCurrentCVs	1.3.6.1.2.1.10.39.3.2.1.1.3
sonetFarEndVTCurrentUASs	1.3.6.1.2.1.10.39.3.2.1.1.4
sonetFarEndVTIntervalTable	1.3.6.1.2.1.10.39.3.2.2
sonetFarEndVTIntervalEntry	1.3.6.1.2.1.10.39.3.2.2.1
sonetFarEndVTIntervalNumber	1.3.6.1.2.1.10.39.3.2.2.1.1
sonetFarEndVTIntervalESs	1.3.6.1.2.1.10.39.3.2.2.1.2
sonetFarEndVTIntervalSESs	1.3.6.1.2.1.10.39.3.2.2.1.3
sonetFarEndVTIntervalCVs	1.3.6.1.2.1.10.39.3.2.2.1.4
sonetFarEndVTIntervalUASs	1.3.6.1.2.1.10.39.3.2.2.1.5
sonetConformance	1.3.6.1.2.1.10.39.4
sonetGroups	1.3.6.1.2.1.10.39.4.1
sonetMediumStuff	1.3.6.1.2.1.10.39.4.1.1
sonetSectionStuff	1.3.6.1.2.1.10.39.4.1.2
sonetLineStuff	1.3.6.1.2.1.10.39.4.1.3
sonetFarEndLineStuff	1.3.6.1.2.1.10.39.4.1.4
sonetPathStuff	1.3.6.1.2.1.10.39.4.1.5
sonetFarEndPathStuff	1.3.6.1.2.1.10.39.4.1.6
sonetVTStuff	1.3.6.1.2.1.10.39.4.1.7
sonetFarEndVTStuff	1.3.6.1.2.1.10.39.4.1.8
sonetCompliances	1.3.6.1.2.1.10.39.4.2
sonetCompliance	1.3.6.1.2.1.10.39.4.2.1

Table B–7 ATM Forum Address Registration MIB Object Identifiers

Object	ID
atmfAddressGroup	1.3.6.1.4.1.353.2.6
atmfAddressTable	1.3.6.1.4.1.353.2.6.1
atmfAddressEntry	1.3.6.1.4.1.353.2.6.1.1
atmfAddressPort	1.3.6.1.4.1.353.2.6.1.1.1
atmfAddressAtmAddress	1.3.6.1.4.1.353.2.6.1.1.2
atmfAddressStatus	1.3.6.1.4.1.353.2.6.1.1.3
atmfNetPrefixGroup	1.3.6.1.4.1.353.2.7
atmfNetPrefixTable	1.3.6.1.4.1.353.2.7.1
atmfNetPrefixEntry	1.3.6.1.4.1.353.2.7.1.1
atmfNetPrefixPort	1.3.6.1.4.1.353.2.7.1.1.1
atmfNetPrefixPrefix	1.3.6.1.4.1.353.2.7.1.1.2
atmfNetPrefixStatus	1.3.6.1.4.1.353.2.7.1.1.3

Table B–8 ATM MIB Object Identifiers

Object	ID
atmMIB	1.3.6.1.2.1.37
atmMIBObjects	1.3.6.1.2.1.37.1
atmTrafficDescriptorTypes	1.3.6.1.2.1.37.1.1
atmNoTrafficDescriptor	1.3.6.1.2.1.37.1.1.1
atmNoClpNoScr	1.3.6.1.2.1.37.1.1.2
atmClpNoTaggingNoScr	1.3.6.1.2.1.37.1.1.3
atmClpTaggingNoScr	1.3.6.1.2.1.37.1.1.4
atmNoClpScr	1.3.6.1.2.1.37.1.1.5
atmClpNoTaggingScr	1.3.6.1.2.1.37.1.1.6
atmClpTaggingScr	1.3.6.1.2.1.37.1.1.7
atmInterfaceConfTable	1.3.6.1.2.1.37.1.2
atmInterfaceConfEntry	1.3.6.1.2.1.37.1.2.1
atmInterfaceMaxVpcs	1.3.6.1.2.1.37.1.2.1.1
atmInterfaceMaxVccs	1.3.6.1.2.1.37.1.2.1.2
atmInterfaceConfVpcs	1.3.6.1.2.1.37.1.2.1.3
atmInterfaceConfVccs	1.3.6.1.2.1.37.1.2.1.4

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Table B–8 (Cont.) ATM MIB Object Identifiers

Object	ID
atmInterfaceMaxActiveVpiBits	1.3.6.1.2.1.37.1.2.1.5
atmInterfaceMaxActiveVciBits	1.3.6.1.2.1.37.1.2.1.6
atmInterfaceIlmiVpi	1.3.6.1.2.1.37.1.2.1.7
atmInterfaceIlmiVci	1.3.6.1.2.1.37.1.2.1.8
atmInterfaceAddressType	1.3.6.1.2.1.37.1.2.1.9
atmInterfaceAdminAddress	1.3.6.1.2.1.37.1.2.1.10
atmInterfaceMyNeighborIpAddress	1.3.6.1.2.1.37.1.2.1.11
atmInterfaceMyNeighborIfName	1.3.6.1.2.1.37.1.2.1.12
atmInterfaceDs3PlcpTable	1.3.6.1.2.1.37.1.3
atmInterfaceDs3PlcpEntry	1.3.6.1.2.1.37.1.3.1
atmInterfaceDs3PlcpSEFSs	1.3.6.1.2.1.37.1.3.1.1
atmInterfaceDs3PlcpAlarmState	1.3.6.1.2.1.37.1.3.1.2
atmInterfaceDs3PlcpUASs	1.3.6.1.2.1.37.1.3.1.3
atmInterfaceTCTable	1.3.6.1.2.1.37.1.4
atmInterfaceTCEntry	1.3.6.1.2.1.37.1.4.1
atmInterfaceOCDEvents	1.3.6.1.2.1.37.1.4.1.1
atmInterfaceTCAlarmState	1.3.6.1.2.1.37.1.4.1.2
atmTrafficDescrParamTable	1.3.6.1.2.1.37.1.5
atmTrafficDescrParamEntry	1.3.6.1.2.1.37.1.5.1
atmTrafficDescrParamIndex	1.3.6.1.2.1.37.1.5.1.1
atmTrafficDescrType	1.3.6.1.2.1.37.1.5.1.2
atmTrafficDescrParam1	1.3.6.1.2.1.37.1.5.1.3
atmTrafficDescrParam2	1.3.6.1.2.1.37.1.5.1.4
atmTrafficDescrParam3	1.3.6.1.2.1.37.1.5.1.5
atmTrafficDescrParam4	1.3.6.1.2.1.37.1.5.1.6
atmTrafficDescrParam5	1.3.6.1.2.1.37.1.5.1.7
atmTrafficQoSClass	1.3.6.1.2.1.37.1.5.1.8
atmTrafficDescrRowStatus	1.3.6.1.2.1.37.1.5.1.9
atmVplTable	1.3.6.1.2.1.37.1.6
atmVplEntry	1.3.6.1.2.1.37.1.6.1
atmVplVpi	1.3.6.1.2.1.37.1.6.1.1
atmVplAdminStatus	1.3.6.1.2.1.37.1.6.1.2

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Table B–8 (Cont.) ATM MIB Object Identifiers

Object	ID
atmVplOperStatus	1.3.6.1.2.1.37.1.6.1.3
atmVplLastChange	1.3.6.1.2.1.37.1.6.1.4
atmVplReceiveTrafficDescrIndex	1.3.6.1.2.1.37.1.6.1.5
atmVplTransmitTrafficDescrIndex	1.3.6.1.2.1.37.1.6.1.6
atmVplCrossConnectIdentifier	1.3.6.1.2.1.37.1.6.1.7
atmVplRowStatus	1.3.6.1.2.1.37.1.6.1.8
atmVclTable	1.3.6.1.2.1.37.1.7
atmVclEntry	1.3.6.1.2.1.37.1.7.1
atmVclVpi	1.3.6.1.2.1.37.1.7.1.1
atmVclVci	1.3.6.1.2.1.37.1.7.1.2
atmVclAdminStatus	1.3.6.1.2.1.37.1.7.1.3
atmVclOperStatus	1.3.6.1.2.1.37.1.7.1.4
atmVclLastChange	1.3.6.1.2.1.37.1.7.1.5
atmVclReceiveTrafficDescrIndex	1.3.6.1.2.1.37.1.7.1.6
atmVclTransmitTrafficDescrIndex	1.3.6.1.2.1.37.1.7.1.7
atmVccAalType	1.3.6.1.2.1.37.1.7.1.8
atmVccAal5CpcsTransmitSduSize	1.3.6.1.2.1.37.1.7.1.9
atmVccAal5CpcsReceiveSduSize	1.3.6.1.2.1.37.1.7.1.10
atmVccAal5EncapsType	1.3.6.1.2.1.37.1.7.1.11
atmVclCrossConnectIdentifier	1.3.6.1.2.1.37.1.7.1.12
atmVclRowStatus	1.3.6.1.2.1.37.1.7.1.13
atmVpCrossConnectIndexNext	1.3.6.1.2.1.37.1.8
atmVpCrossConnectTable	1.3.6.1.2.1.37.1.9
atmVpCrossConnectEntry	1.3.6.1.2.1.37.1.9.1
atmVpCrossConnectIndex	1.3.6.1.2.1.37.1.9.1.1
atmVpCrossConnectLowIfIndex	1.3.6.1.2.1.37.1.9.1.2
atmVpCrossConnectLowVpi	1.3.6.1.2.1.37.1.9.1.3
atmVpCrossConnectHighIfIndex	1.3.6.1.2.1.37.1.9.1.4
atmVpCrossConnectHighVpi	1.3.6.1.2.1.37.1.9.1.5
atmVpCrossConnectAdminStatus	1.3.6.1.2.1.37.1.9.1.6
atmVpCrossConnectL2HOperStatus	1.3.6.1.2.1.37.1.9.1.7
atmVpCrossConnectH2LOperStatus	1.3.6.1.2.1.37.1.9.1.8

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Table B–8 (Cont.) ATM MIB Object Identifiers

Object	ID
atmVpCrossConnectL2HLastChange	1.3.6.1.2.1.37.1.9.1.9
atmVpCrossConnectH2LLastChange	1.3.6.1.2.1.37.1.9.1.10
atmVpCrossConnectRowStatus	1.3.6.1.2.1.37.1.9.1.11
atmVcCrossConnectIndexNext	1.3.6.1.2.1.37.1.10
atmVcCrossConnectTable	1.3.6.1.2.1.37.1.11
atmVcCrossConnectEntry	1.3.6.1.2.1.37.1.11.1
atmVcCrossConnectIndex	1.3.6.1.2.1.37.1.11.1.1
atmVcCrossConnectLowIfIndex	1.3.6.1.2.1.37.1.11.1.2
atmVcCrossConnectLowVpi	1.3.6.1.2.1.37.1.11.1.3
atmVcCrossConnectLowVci	1.3.6.1.2.1.37.1.11.1.4
atmVcCrossConnectHighIfIndex	1.3.6.1.2.1.37.1.11.1.5
atmVcCrossConnectHighVpi	1.3.6.1.2.1.37.1.11.1.6
atmVcCrossConnectHighVci	1.3.6.1.2.1.37.1.11.1.7
atmVcCrossConnectAdminStatus	1.3.6.1.2.1.37.1.11.1.8
atmVcCrossConnectL2HOperStatus	1.3.6.1.2.1.37.1.11.1.9
atmVcCrossConnectH2LOperStatus	1.3.6.1.2.1.37.1.11.1.10
atmVcCrossConnectL2HLastChange	1.3.6.1.2.1.37.1.11.1.11
atmVcCrossConnectH2LLastChange	1.3.6.1.2.1.37.1.11.1.12
atmVcCrossConnectRowStatus	1.3.6.1.2.1.37.1.11.1.13
aal5VccTable	1.3.6.1.2.1.37.1.12
aal5VccEntry	1.3.6.1.2.1.37.1.12.1
aal5VccVpi	1.3.6.1.2.1.37.1.12.1.1
aal5VccVci	1.3.6.1.2.1.37.1.12.1.2
aal5VccCrcErrors	1.3.6.1.2.1.37.1.12.1.3
aal5VccSarTimeOuts	1.3.6.1.2.1.37.1.12.1.4
aal5VccOverSizedSDUs	1.3.6.1.2.1.37.1.12.1.5
atmMIBConformance	1.3.6.1.2.1.37.2
atmMIBGroups	1.3.6.1.2.1.37.2.1
atmInterfaceConfGroup	1.3.6.1.2.1.37.2.1.1
atmTrafficDescrGroup	1.3.6.1.2.1.37.2.1.2
atmInterfaceDs3PlcpGroup	1.3.6.1.2.1.37.2.1.3
atmInterfaceTCGroup	1.3.6.1.2.1.37.2.1.4
atmVpcTerminationGroup	1.3.6.1.2.1.37.2.1.5
atmVccTerminationGroup	1.3.6.1.2.1.37.2.1.6
atmVpCrossConnectGroup	1.3.6.1.2.1.37.2.1.7
atmVcCrossConnectGroup	1.3.6.1.2.1.37.2.1.8
aal5VccGroup	1.3.6.1.2.1.37.2.1.9
atmMIBCompliances	1.3.6.1.2.1.37.2.2
atmMIBCompliance	1.3.6.1.2.1.37.2.2.1

Table B–9 DEC ATM MIB Object Identifiers

Object	ID
dec	1.3.6.1.4.1.36
ema	1.3.6.1.4.1.36.2
sysid	1.3.6.1.4.1.36.2.15
atmSwitch	1.3.6.1.4.1.36.2.15.14
atmSwitch1	1.3.6.1.4.1.36.2.15.14.1
atmversion1	1.3.6.1.4.1.36.2.15.14.1.1
atmSwitch2	1.3.6.1.4.1.36.2.15.14.2
atmversion2	1.3.6.1.4.1.36.2.15.14.2.1
decMIBextension	1.3.6.1.4.1.36.2.18
atmExpand	1.3.6.1.4.1.36.2.18.17
ad	1.3.6.1.4.1.36.2.18.17.1
adUID	1.3.6.1.4.1.36.2.18.17.1.1
adEscapeSupport	1.3.6.1.4.1.36.2.18.17.1.2
adFlowMaster	1.3.6.1.4.1.36.2.18.17.1.3
adRVC	1.3.6.1.4.1.36.2.18.17.1.4
adObjectId	1.3.6.1.4.1.36.2.18.17.1.5
adObjectSubId	1.3.6.1.4.1.36.2.18.17.1.6
adNumPorts	1.3.6.1.4.1.36.2.18.17.1.7
adPortTable	1.3.6.1.4.1.36.2.18.17.1.8
adPortTableEntry	1.3.6.1.4.1.36.2.18.17.1.8.1
adpPortIndex	1.3.6.1.4.1.36.2.18.17.1.8.1.1
adpType	1.3.6.1.4.1.36.2.18.17.1.8.1.2
adpSubType	1.3.6.1.4.1.36.2.18.17.1.8.1.3
adpFlowMaster	1.3.6.1.4.1.36.2.18.17.1.8.1.4
adpCreditResync	1.3.6.1.4.1.36.2.18.17.1.8.1.5
adpResyncVCI	1.3.6.1.4.1.36.2.18.17.1.8.1.6
adpReceiveBuffers	1.3.6.1.4.1.36.2.18.17.1.8.1.7
adpPVCMin	1.3.6.1.4.1.36.2.18.17.1.8.1.8
adpPVCMax	1.3.6.1.4.1.36.2.18.17.1.8.1.9
adpSVCMin	1.3.6.1.4.1.36.2.18.17.1.8.1.10
adpSVCMax	1.3.6.1.4.1.36.2.18.17.1.8.1.11
adpRVCMin	1.3.6.1.4.1.36.2.18.17.1.8.1.12
adpRVCMax	1.3.6.1.4.1.36.2.18.17.1.8.1.13
adpBroadcastVCI	1.3.6.1.4.1.36.2.18.17.1.8.1.14
adpArpVCI	1.3.6.1.4.1.36.2.18.17.1.8.1.15
adpHomeVCI	1.3.6.1.4.1.36.2.18.17.1.8.1.16
adpMaxReceiveBufferCounter	1.3.6.1.4.1.36.2.18.17.1.8.1.17

Table B–10 DEC ATM Signalling MIB Object Identifiers

Object	ID
decAtmSignallingMIB	1.3.6.1.4.1.36.2.18.27
decAtmSignallingMIBObjects	1.3.6.1.4.1.36.2.18.27.1
decSignalPortGroup	1.3.6.1.4.1.36.2.18.27.1.1
decSignalPortTable	1.3.6.1.4.1.36.2.18.27.1.1.1
decSignalPortEntry	1.3.6.1.4.1.36.2.18.27.1.1.1.1
decConfigSignallingMode	1.3.6.1.4.1.36.2.18.27.1.1.1.1.1
decQ2931StatGroup	1.3.6.1.4.1.36.2.18.27.1.2
decQ2931MsgTable	1.3.6.1.4.1.36.2.18.27.1.2.1
decQ2931MsgEntry	1.3.6.1.4.1.36.2.18.27.1.2.1.1
callProceedingTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.1
callProceedingRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.2
connectTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.3
connectRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.4
connectAcknowledgeTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.5
connectAcknowledgeRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.6
setupTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.7
setupRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.8
releaseTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.9
releaseRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.10
releaseCompleteTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.11
releaseCompleteRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.12
restartTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.13
restartRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.14
restartAcknowledgeTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.15
restartAcknowledgeRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.16
statusTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.17
statusRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.18
statusEnquiryTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.19
statusEnquiryRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.20
addPartyTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.21
addPartyRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.22
addPartyAcknowledgeTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.23
addPartyAcknowledgeRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.24
addPartyRejectTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.25
addPartyRejectRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.26
dropPartyTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.27
dropPartyRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.28
dropPartyAcknowledgeTx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.29
dropPartyAcknowledgeRx	1.3.6.1.4.1.36.2.18.27.1.2.1.1.30

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Table B–10 (Cont.) DEC ATM Signalling MIB Object Identifiers

Object	ID
decQ2931MiscTable	1.3.6.1.4.1.36.2.18.27.1.2.2
decQ2931MiscEntry	1.3.6.1.4.1.36.2.18.27.1.2.2.1
totalConns	1.3.6.1.4.1.36.2.18.27.1.2.2.1.1
activeConns	1.3.6.1.4.1.36.2.18.27.1.2.2.1.2
lastTxCause	1.3.6.1.4.1.36.2.18.27.1.2.2.1.3
lastTxDiagnostic	1.3.6.1.4.1.36.2.18.27.1.2.2.1.4
lastRxCause	1.3.6.1.4.1.36.2.18.27.1.2.2.1.5
lastRxDiagnostic	1.3.6.1.4.1.36.2.18.27.1.2.2.1.6
decQSaalGroup	1.3.6.1.4.1.36.2.18.27.1.3
decQSaalStatusTable	1.3.6.1.4.1.36.2.18.27.1.3.1
decQSaalStatusEntry	1.3.6.1.4.1.36.2.18.27.1.3.1.1
decQSaalState	1.3.6.1.4.1.36.2.18.27.1.3.1.1.1
decQSaalMsgTable	1.3.6.1.4.1.36.2.18.27.1.3.2
decQSaalMsgEntry	1.3.6.1.4.1.36.2.18.27.1.3.2.1
txDiscardedSdus	1.3.6.1.4.1.36.2.18.27.1.3.2.1.1
rxErrorPdus	1.3.6.1.4.1.36.2.18.27.1.3.2.1.2
txErrorPdus	1.3.6.1.4.1.36.2.18.27.1.3.2.1.3
rxDiscardedPdus	1.3.6.1.4.1.36.2.18.27.1.3.2.1.4
txDiscardedPdus	1.3.6.1.4.1.36.2.18.27.1.3.2.1.5
bgnTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.6
bgnRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.7
bgakTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.8
bgakRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.9
endTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.10
endRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.11
endakTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.12
endakRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.13
rsTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.14
rsRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.15
rsakTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.16
rsakRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.17
bgrejTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.18
bgrejRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.19
sdTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.20
sdRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.21
sdpTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.22
sdpRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.23
erTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.24
erRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.25

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Table B–10 (Cont.) DEC ATM Signalling MIB Object Identifiers

Object	ID
pollTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.26
pollRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.27
statTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.28
statRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.29
ustatTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.30
ustatRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.31
udTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.32
udRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.33
mdTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.34
mdRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.35
erakTx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.36
erakRx	1.3.6.1.4.1.36.2.18.27.1.3.2.1.37
decQ2931TimerGroup	1.3.6.1.4.1.36.2.18.27.1.4
decQ2931TimerTable	1.3.6.1.4.1.36.2.18.27.1.4.1
decQ2931TimerEntry	1.3.6.1.4.1.36.2.18.27.1.4.1.1
t303	1.3.6.1.4.1.36.2.18.27.1.4.1.1.1
t308	1.3.6.1.4.1.36.2.18.27.1.4.1.1.2
t309	1.3.6.1.4.1.36.2.18.27.1.4.1.1.3
t310	1.3.6.1.4.1.36.2.18.27.1.4.1.1.4
t313	1.3.6.1.4.1.36.2.18.27.1.4.1.1.5
t316	1.3.6.1.4.1.36.2.18.27.1.4.1.1.6
t317	1.3.6.1.4.1.36.2.18.27.1.4.1.1.7
t322	1.3.6.1.4.1.36.2.18.27.1.4.1.1.8
t398	1.3.6.1.4.1.36.2.18.27.1.4.1.1.9
t399	1.3.6.1.4.1.36.2.18.27.1.4.1.1.10

Table B–11 DEC ATM Switch Chassis MIB Object Identifiers

Object	ID
decAtmChassisMIB	1.3.6.1.4.1.36.2.18.30
decAtmChassisMIBObjects	1.3.6.1.4.1.36.2.18.30.1
decAtmSysGroup	1.3.6.1.4.1.36.2.18.30.1.1
decAtmSysType	1.3.6.1.4.1.36.2.18.30.1.1.1
decAtmKeyswitchPosition	1.3.6.1.4.1.36.2.18.30.1.1.2
decAtmSlot	1.3.6.1.4.1.36.2.18.30.1.2
decAtmSlotNumber	1.3.6.1.4.1.36.2.18.30.1.2.1
decAtmMasterLinecardSlot	1.3.6.1.4.1.36.2.18.30.1.2.2
decAtmStandbyLinecardSlot	1.3.6.1.4.1.36.2.18.30.1.2.3
decAtmSlotTable	1.3.6.1.4.1.36.2.18.30.1.2.4
decAtmSlotEntry	1.3.6.1.4.1.36.2.18.30.1.2.4.1
decAtmSlotIndex	1.3.6.1.4.1.36.2.18.30.1.2.4.1.1
decAtmCardStatus	1.3.6.1.4.1.36.2.18.30.1.2.4.1.2
decAtmCardType	1.3.6.1.4.1.36.2.18.30.1.2.4.1.3
decAtmCardHasModPhys	1.3.6.1.4.1.36.2.18.30.1.2.4.1.4
decAtmCardHwRev	1.3.6.1.4.1.36.2.18.30.1.2.4.1.5
decAtmCardFwRev	1.3.6.1.4.1.36.2.18.30.1.2.4.1.6
decAtmCardFault	1.3.6.1.4.1.36.2.18.30.1.2.4.1.7
decAtmPort	1.3.6.1.4.1.36.2.18.30.1.3
decAtmPortTable	1.3.6.1.4.1.36.2.18.30.1.3.1
decAtmPortEntry	1.3.6.1.4.1.36.2.18.30.1.3.1.1
decAtmPortIndex	1.3.6.1.4.1.36.2.18.30.1.3.1.1.1
decAtmPortConnector	1.3.6.1.4.1.36.2.18.30.1.3.1.1.2
decAtmLed	1.3.6.1.4.1.36.2.18.30.1.4
decAtmSlotLedTable	1.3.6.1.4.1.36.2.18.30.1.4.1
decAtmSlotLedEntry	1.3.6.1.4.1.36.2.18.30.1.4.1.1
decAtmSlotLedIndex	1.3.6.1.4.1.36.2.18.30.1.4.1.1.1
decAtmSlotLedDescr	1.3.6.1.4.1.36.2.18.30.1.4.1.1.2
decAtmSlotLedProgram	1.3.6.1.4.1.36.2.18.30.1.4.1.1.3
decAtmPortLedTable	1.3.6.1.4.1.36.2.18.30.1.4.2
decAtmPortLedEntry	1.3.6.1.4.1.36.2.18.30.1.4.2.1
decAtmPortLedIndex	1.3.6.1.4.1.36.2.18.30.1.4.2.1.1
decAtmPortLedDescr	1.3.6.1.4.1.36.2.18.30.1.4.2.1.2
decAtmPortLedProgram	1.3.6.1.4.1.36.2.18.30.1.4.2.1.3
decAtmLedInterestingChanges	1.3.6.1.4.1.36.2.18.30.1.4.3
decAtmClockCard	1.3.6.1.4.1.36.2.18.30.1.5

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Table B–11 (Cont.) DEC ATM Switch Chassis MIB Object Identifiers

Object	ID
decAtmMgmtMemoryAvail	1.3.6.1.4.1.36.2.18.30.1.5.1
decAtmMgmtMemoryAction	1.3.6.1.4.1.36.2.18.30.1.5.2
decGigaAtmIntEthPktsSent	1.3.6.1.4.1.36.2.18.30.1.5.3
decGigaAtmIntEthPktsRcvd	1.3.6.1.4.1.36.2.18.30.1.5.4
decGigaAtmExtEthPktsSent	1.3.6.1.4.1.36.2.18.30.1.5.5
decGigaAtmExtEthPktsRcvd	1.3.6.1.4.1.36.2.18.30.1.5.6
decAtmPsc	1.3.6.1.4.1.36.2.18.30.1.6
decAtmPscStatus	1.3.6.1.4.1.36.2.18.30.1.6.1
decAtmPscFwRev	1.3.6.1.4.1.36.2.18.30.1.6.2
decAtmPscHwRev	1.3.6.1.4.1.36.2.18.30.1.6.3
decAtmPscFwImageStatus	1.3.6.1.4.1.36.2.18.30.1.6.4
decAtmPscBackplaneStatus	1.3.6.1.4.1.36.2.18.30.1.6.5
decAtmPowerSupply	1.3.6.1.4.1.36.2.18.30.1.7
decAtmPowerSupplyTable	1.3.6.1.4.1.36.2.18.30.1.7.1
decAtmPowerSupplyEntry	1.3.6.1.4.1.36.2.18.30.1.7.1.1
decAtmPowerIndex	1.3.6.1.4.1.36.2.18.30.1.7.1.1.1
decAtmPowerStatus	1.3.6.1.4.1.36.2.18.30.1.7.1.1.2
decAtmPowerInputSource	1.3.6.1.4.1.36.2.18.30.1.7.1.1.3
decAtmPowerVoltage	1.3.6.1.4.1.36.2.18.30.1.7.1.1.4
decAtmPowerOutputInWatts	1.3.6.1.4.1.36.2.18.30.1.7.1.1.5
decAtmBattery	1.3.6.1.4.1.36.2.18.30.1.8
decAtmBatteryStatus	1.3.6.1.4.1.36.2.18.30.1.8.1
decAtmBatteryUsing	1.3.6.1.4.1.36.2.18.30.1.8.2
decAtmBatteryCharge	1.3.6.1.4.1.36.2.18.30.1.8.3
decAtmBatteryTest	1.3.6.1.4.1.36.2.18.30.1.8.4
decAtmTemperature	1.3.6.1.4.1.36.2.18.30.1.9
decAtmCabinetTemperature	1.3.6.1.4.1.36.2.18.30.1.9.1
decAtmTemperatureWarning	1.3.6.1.4.1.36.2.18.30.1.9.2
decAtmFan	1.3.6.1.4.1.36.2.18.30.1.10
decAtmFanSpeed	1.3.6.1.4.1.36.2.18.30.1.10.1
decAtmFanTable	1.3.6.1.4.1.36.2.18.30.1.10.2
decAtmFanEntry	1.3.6.1.4.1.36.2.18.30.1.10.2.1
decAtmFanIndex	1.3.6.1.4.1.36.2.18.30.1.10.2.1.1
decAtmFanStatus	1.3.6.1.4.1.36.2.18.30.1.10.2.1.2
decAtmFppnTable	1.3.6.1.4.1.36.2.18.30.1.11
decAtmFppnEntry	1.3.6.1.4.1.36.2.18.30.1.11.1
decAtmFppnSlotNumber	1.3.6.1.4.1.36.2.18.30.1.11.1.1
decAtmFppnPortOfThatSlot	1.3.6.1.4.1.36.2.18.30.1.11.1.2
decAtmFppnIfIndex	1.3.6.1.4.1.36.2.18.30.1.11.1.3

Table B–12 DEC LES MIB Object Identifiers

Object	ID
decLesMIB	1.3.6.1.4.1.36.2.18.28
decLesMIBObjects	1.3.6.1.4.1.36.2.18.28.1
decLesConfigTable	1.3.6.1.4.1.36.2.18.28.1.1
decLesConfigEntry	1.3.6.1.4.1.36.2.18.28.1.1.1
decLesIndex	1.3.6.1.4.1.36.2.18.28.1.1.1.1
decLesRowStatus	1.3.6.1.4.1.36.2.18.28.1.1.1.2
decLesAdminStatus	1.3.6.1.4.1.36.2.18.28.1.1.1.3
decLesOperStatus	1.3.6.1.4.1.36.2.18.28.1.1.1.4
decLesLastChange	1.3.6.1.4.1.36.2.18.28.1.1.1.5
decLesAtmAddress	1.3.6.1.4.1.36.2.18.28.1.1.1.6
decLesDescription	1.3.6.1.4.1.36.2.18.28.1.1.1.7
decLesLanName	1.3.6.1.4.1.36.2.18.28.1.1.1.8
decLesLanType	1.3.6.1.4.1.36.2.18.28.1.1.1.9
decLesMaxDataFrameSize	1.3.6.1.4.1.36.2.18.28.1.1.1.10
decLesAtmAddressOfBUS	1.3.6.1.4.1.36.2.18.28.1.1.1.11
decLesControlTimeout	1.3.6.1.4.1.36.2.18.28.1.1.1.12
decLesArpResponsePolicy	1.3.6.1.4.1.36.2.18.28.1.1.1.13
decLesNarpRequestPolicy	1.3.6.1.4.1.36.2.18.28.1.1.1.14
decLesTopologyChangeMode	1.3.6.1.4.1.36.2.18.28.1.1.1.15
decLesLastTcModeChange	1.3.6.1.4.1.36.2.18.28.1.1.1.16
decLesTopologyChangeTimeout	1.3.6.1.4.1.36.2.18.28.1.1.1.17
decLesClientStatesTable	1.3.6.1.4.1.36.2.18.28.1.2
decLesClientStatesEntry	1.3.6.1.4.1.36.2.18.28.1.2.1
decLesActiveClients	1.3.6.1.4.1.36.2.18.28.1.2.1.1
decLesActiveProxyClients	1.3.6.1.4.1.36.2.18.28.1.2.1.2
decLesAwaitingJoinRequest	1.3.6.1.4.1.36.2.18.28.1.2.1.3
decLesCtlDistributeInProgress	1.3.6.1.4.1.36.2.18.28.1.2.1.4
decLesTerminating	1.3.6.1.4.1.36.2.18.28.1.2.1.5
decLesClientTable	1.3.6.1.4.1.36.2.18.28.1.3
decLesClientEntry	1.3.6.1.4.1.36.2.18.28.1.3.1
decLesClientID	1.3.6.1.4.1.36.2.18.28.1.3.1.1
decLesClientAtmAddress	1.3.6.1.4.1.36.2.18.28.1.3.1.2
decLesClientIsProxy	1.3.6.1.4.1.36.2.18.28.1.3.1.3
decLesClientState	1.3.6.1.4.1.36.2.18.28.1.3.1.4
decLesClientRowStatus	1.3.6.1.4.1.36.2.18.28.1.3.1.5
decLesLecTable	1.3.6.1.4.1.36.2.18.28.1.4

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Table B–12 (Cont.) DEC LES MIB Object Identifiers

Object	ID
decLesLecEntry	1.3.6.1.4.1.36.2.18.28.1.4.1
decLesLecAtmAddress	1.3.6.1.4.1.36.2.18.28.1.4.1.1
decLesLecID	1.3.6.1.4.1.36.2.18.28.1.4.1.2
decLesLecIsProxy	1.3.6.1.4.1.36.2.18.28.1.4.1.3
decLesLecState	1.3.6.1.4.1.36.2.18.28.1.4.1.4
decLesLecRowStatus	1.3.6.1.4.1.36.2.18.28.1.4.1.5
decLesCtlDirectTable	1.3.6.1.4.1.36.2.18.28.1.5
decLesCtlDirectEntry	1.3.6.1.4.1.36.2.18.28.1.5.1
decLesControlDirectInterface	1.3.6.1.4.1.36.2.18.28.1.5.1.1
decLesControlDirectVpi	1.3.6.1.4.1.36.2.18.28.1.5.1.2
decLesControlDirectVci	1.3.6.1.4.1.36.2.18.28.1.5.1.3
decLesControlDirectRowStatus	1.3.6.1.4.1.36.2.18.28.1.5.1.4
decLesCtlDistTable	1.3.6.1.4.1.36.2.18.28.1.6
decLesCtlDistEntry	1.3.6.1.4.1.36.2.18.28.1.6.1
decLesControlDistInterface	1.3.6.1.4.1.36.2.18.28.1.6.1.1
decLesControlDistVpi	1.3.6.1.4.1.36.2.18.28.1.6.1.2
decLesControlDistVci	1.3.6.1.4.1.36.2.18.28.1.6.1.3
decLesControlDistRowStatus	1.3.6.1.4.1.36.2.18.28.1.6.1.4
decLesMacAddressTable	1.3.6.1.4.1.36.2.18.28.1.7
decLesMacAddressEntry	1.3.6.1.4.1.36.2.18.28.1.7.1
decLesMacAddress	1.3.6.1.4.1.36.2.18.28.1.7.1.1
decLesMacAddressOwner	1.3.6.1.4.1.36.2.18.28.1.7.1.2
decLesMacAddressAtmBinding	1.3.6.1.4.1.36.2.18.28.1.7.1.3
decLesRouteDescrTable	1.3.6.1.4.1.36.2.18.28.1.8
decLesRouteDescrEntry	1.3.6.1.4.1.36.2.18.28.1.8.1
decLesRouteDescrSegmentID	1.3.6.1.4.1.36.2.18.28.1.8.1.1
decLesRouteDescrBridgeNumber	1.3.6.1.4.1.36.2.18.28.1.8.1.2
decLesRouteDescrOwner	1.3.6.1.4.1.36.2.18.28.1.8.1.3
decLesRouteDescrAtmBinding	1.3.6.1.4.1.36.2.18.28.1.8.1.4
decLesTrafficTable	1.3.6.1.4.1.36.2.18.28.1.9
decLesTrafficEntry	1.3.6.1.4.1.36.2.18.28.1.9.1
decLesControlFramesIn	1.3.6.1.4.1.36.2.18.28.1.9.1.1
decLesShortFrames	1.3.6.1.4.1.36.2.18.28.1.9.1.2
decLesUnjoinedClientFrames	1.3.6.1.4.1.36.2.18.28.1.9.1.3
decLesVersionsNotSupported	1.3.6.1.4.1.36.2.18.28.1.9.1.4
decLesInvalidFrames	1.3.6.1.4.1.36.2.18.28.1.9.1.5

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Table B–12 (Cont.) DEC LES MIB Object Identifiers

Object	ID
decLesReceiveQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.9.1.6
decLesMiscDiscards	1.3.6.1.4.1.36.2.18.28.1.9.1.7
decLesCallStatsTable	1.3.6.1.4.1.36.2.18.28.1.10
decLesCallStatsEntry	1.3.6.1.4.1.36.2.18.28.1.10.1
decLesCtlDirectCalls	1.3.6.1.4.1.36.2.18.28.1.10.1.1
decLesCtlDirectFailures	1.3.6.1.4.1.36.2.18.28.1.10.1.2
decLesCtlDirectOutOfResources	1.3.6.1.4.1.36.2.18.28.1.10.1.3
decLesCtlDirectInvalidInfoElements	1.3.6.1.4.1.36.2.18.28.1.10.1.4
decLesCtlDistributeCalls	1.3.6.1.4.1.36.2.18.28.1.10.1.5
decLesCtlDistributeFailures	1.3.6.1.4.1.36.2.18.28.1.10.1.6
decLesCtlDistribOutOfResources	1.3.6.1.4.1.36.2.18.28.1.10.1.7
decLesJoinTable	1.3.6.1.4.1.36.2.18.28.1.11
decLesJoinEntry	1.3.6.1.4.1.36.2.18.28.1.11.1
decLesJoinRequests	1.3.6.1.4.1.36.2.18.28.1.11.1.1
decLesJoinSuccesses	1.3.6.1.4.1.36.2.18.28.1.11.1.2
decLesJoinFailures	1.3.6.1.4.1.36.2.18.28.1.11.1.3
decLesJoinDuplicates	1.3.6.1.4.1.36.2.18.28.1.11.1.4
decLesJoinNonDuplicates	1.3.6.1.4.1.36.2.18.28.1.11.1.5
decLesJoinDiscards	1.3.6.1.4.1.36.2.18.28.1.11.1.6
decLesJoinTimeouts	1.3.6.1.4.1.36.2.18.28.1.11.1.7
decLesJoinVersionsNotSupported	1.3.6.1.4.1.36.2.18.28.1.11.1.8
decLesJoinInvalidParameters	1.3.6.1.4.1.36.2.18.28.1.11.1.9
decLesJoinDuplicateAtmAddresses	1.3.6.1.4.1.36.2.18.28.1.11.1.10
decLesJoinDuplicateLanDestinations	1.3.6.1.4.1.36.2.18.28.1.11.1.11
decLesJoinInvalidAtmAddresses	1.3.6.1.4.1.36.2.18.28.1.11.1.12
decLesJoinInvalidLanDestinations	1.3.6.1.4.1.36.2.18.28.1.11.1.13
decLesJoinWrongLanTypes	1.3.6.1.4.1.36.2.18.28.1.11.1.14
decLesJoinMaxFrameSizesTooSmall	1.3.6.1.4.1.36.2.18.28.1.11.1.15
decLesJoinInvalidLECIDs	1.3.6.1.4.1.36.2.18.28.1.11.1.16
decLesJoinCtlDistributeRejects	1.3.6.1.4.1.36.2.18.28.1.11.1.17
decLesJoinOutOfResources	1.3.6.1.4.1.36.2.18.28.1.11.1.18
decLesJoinRcvQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.11.1.19
decLesJoinLecRcvQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.11.1.20
decLesJoinResourceDiscards	1.3.6.1.4.1.36.2.18.28.1.11.1.21
decLesRegisterTable	1.3.6.1.4.1.36.2.18.28.1.12
decLesRegisterEntry	1.3.6.1.4.1.36.2.18.28.1.12.1

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Table B–12 (Cont.) DEC LES MIB Object Identifiers

Object	ID
decLesRegisterRequests	1.3.6.1.4.1.36.2.18.28.1.12.1.1
decLesRegisterSuccesses	1.3.6.1.4.1.36.2.18.28.1.12.1.2
decLesRegisterFailures	1.3.6.1.4.1.36.2.18.28.1.12.1.3
decLesRegisterDiscards	1.3.6.1.4.1.36.2.18.28.1.12.1.4
decLesUnregisterRequests	1.3.6.1.4.1.36.2.18.28.1.12.1.5
decLesUnregisterSuccesses	1.3.6.1.4.1.36.2.18.28.1.12.1.6
decLesUnregisterFailures	1.3.6.1.4.1.36.2.18.28.1.12.1.7
decLesUnregisterDiscards	1.3.6.1.4.1.36.2.18.28.1.12.1.8
decLesRegDuplicateAtmAddresses	1.3.6.1.4.1.36.2.18.28.1.12.1.9
decLesRegDuplicateLanDestinations	1.3.6.1.4.1.36.2.18.28.1.12.1.10
decLesRegInvalidAtmAddresses	1.3.6.1.4.1.36.2.18.28.1.12.1.11
decLesRegInvalidLanDestinations	1.3.6.1.4.1.36.2.18.28.1.12.1.12
decLesRegInvalidLECIDs	1.3.6.1.4.1.36.2.18.28.1.12.1.13
decLesRegOutOfResources	1.3.6.1.4.1.36.2.18.28.1.12.1.14
decLesRegRcvQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.12.1.15
decLesRegLecRcvQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.12.1.16
decLesRegResourceDiscards	1.3.6.1.4.1.36.2.18.28.1.12.1.17
decLesUnRegInvalidLanDestinations	1.3.6.1.4.1.36.2.18.28.1.12.1.18
decLesUnRegInvalidLECIDs	1.3.6.1.4.1.36.2.18.28.1.12.1.19
decLesUnRegRcvQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.12.1.20
decLesUnRegLecRcvQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.12.1.21
decLesUnRegResourceDiscards	1.3.6.1.4.1.36.2.18.28.1.12.1.22
decLesRegAlreadyRegistered	1.3.6.1.4.1.36.2.18.28.1.12.1.23
decLesUnRegNoSuchLanDestinations	1.3.6.1.4.1.36.2.18.28.1.12.1.24
decLesUnRegNoSuchAddressPairs	1.3.6.1.4.1.36.2.18.28.1.12.1.25
decLesUnRegOwnedByOthers	1.3.6.1.4.1.36.2.18.28.1.12.1.26
decLesArpTable	1.3.6.1.4.1.36.2.18.28.1.13
decLesArpEntry	1.3.6.1.4.1.36.2.18.28.1.13.1
decLesArpRequestsAnswered	1.3.6.1.4.1.36.2.18.28.1.13.1.1
decLesArpRequestsForwarded	1.3.6.1.4.1.36.2.18.28.1.13.1.2
decLesArpRequestsRejected	1.3.6.1.4.1.36.2.18.28.1.13.1.3
decLesArpRequestsDiscarded	1.3.6.1.4.1.36.2.18.28.1.13.1.4
decLesArpResponsesForwarded	1.3.6.1.4.1.36.2.18.28.1.13.1.5
decLesArpResponsesRejected	1.3.6.1.4.1.36.2.18.28.1.13.1.6
decLesArpResponsesDiscarded	1.3.6.1.4.1.36.2.18.28.1.13.1.7
decLesNarpRequestsForwarded	1.3.6.1.4.1.36.2.18.28.1.13.1.8

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Table B–12 (Cont.) DEC LES MIB Object Identifiers

Object	ID
decLesNarpRequestsFiltered	1.3.6.1.4.1.36.2.18.28.1.13.1.9
decLesNarpRequestsRejected	1.3.6.1.4.1.36.2.18.28.1.13.1.10
decLesNarpRequestsDiscarded	1.3.6.1.4.1.36.2.18.28.1.13.1.11
decLesTopologyRequestsForwarded	1.3.6.1.4.1.36.2.18.28.1.13.1.12
decLesTopologyRequestsGenerated	1.3.6.1.4.1.36.2.18.28.1.13.1.13
decLesTopologyRequestsRejected	1.3.6.1.4.1.36.2.18.28.1.13.1.14
decLesTopologyRequestsDiscarded	1.3.6.1.4.1.36.2.18.28.1.13.1.15
decLesTopologyRequestGenFailures	1.3.6.1.4.1.36.2.18.28.1.13.1.16
decLesArpReqInvalidAtmAddresses	1.3.6.1.4.1.36.2.18.28.1.13.1.17
decLesArpReqInvalidLanDestinations	1.3.6.1.4.1.36.2.18.28.1.13.1.18
decLesArpReqInvalidLECIDs	1.3.6.1.4.1.36.2.18.28.1.13.1.19
decLesArpReqReceiveQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.13.1.20
decLesArpReqResourceDiscards	1.3.6.1.4.1.36.2.18.28.1.13.1.21
decLesArpRespInvalidLECIDs	1.3.6.1.4.1.36.2.18.28.1.13.1.22
decLesArpRespReceiveQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.13.1.23
decLesArpRespResourceDiscards	1.3.6.1.4.1.36.2.18.28.1.13.1.24
decLesNarpReqInvalidAtmAddresses	1.3.6.1.4.1.36.2.18.28.1.13.1.25
decLesNarpReqInvalidLanDestinations	1.3.6.1.4.1.36.2.18.28.1.13.1.26
decLesNarpReqInvalidLECIDs	1.3.6.1.4.1.36.2.18.28.1.13.1.27
decLesNarpReqReceiveQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.13.1.28
decLesNarpReqResourceDiscards	1.3.6.1.4.1.36.2.18.28.1.13.1.29
decLesTopoReqReceiveQueueDiscards	1.3.6.1.4.1.36.2.18.28.1.13.1.30
decLesTopoReqResourceDiscards	1.3.6.1.4.1.36.2.18.28.1.13.1.31
decLesFlushTable	1.3.6.1.4.1.36.2.18.28.1.14
decLesFlushEntry	1.3.6.1.4.1.36.2.18.28.1.14.1
decLesFlushResponsesForwarded	1.3.6.1.4.1.36.2.18.28.1.14.1.1
decLesFlushResponsesRejected	1.3.6.1.4.1.36.2.18.28.1.14.1.2
decLesFlushResponsesDiscarded	1.3.6.1.4.1.36.2.18.28.1.14.1.3
decLesEventLogMaximumSize	1.3.6.1.4.1.36.2.18.28.1.15
decLesEventLogTable	1.3.6.1.4.1.36.2.18.28.1.16
decLesEventLogEntry	1.3.6.1.4.1.36.2.18.28.1.16.1
decLesEventIndex	1.3.6.1.4.1.36.2.18.28.1.16.1.1
decLesEventType	1.3.6.1.4.1.36.2.18.28.1.16.1.2
decLesEventReason	1.3.6.1.4.1.36.2.18.28.1.16.1.3
decLesEventServer	1.3.6.1.4.1.36.2.18.28.1.16.1.4
decLesEventServerAtmAddress	1.3.6.1.4.1.36.2.18.28.1.16.1.5
decLesEventClientAtmAddress	1.3.6.1.4.1.36.2.18.28.1.16.1.6
decLesEventClientMacAddress	1.3.6.1.4.1.36.2.18.28.1.16.1.7
decLesEventTimestamp	1.3.6.1.4.1.36.2.18.28.1.16.1.8

Table B–13 DEC BUS MIB Object Identifiers

Object	ID
decBusMIB	1.3.6.1.4.1.36.2.18.29
decBusMIBObjects	1.3.6.1.4.1.36.2.18.29.1
decBusConfigTable	1.3.6.1.4.1.36.2.18.29.1.1
decBusConfigEntry	1.3.6.1.4.1.36.2.18.29.1.1.1
decBusIndex	1.3.6.1.4.1.36.2.18.29.1.1.1.1
decBusRowStatus	1.3.6.1.4.1.36.2.18.29.1.1.1.2
decBusAdminStatus	1.3.6.1.4.1.36.2.18.29.1.1.1.3
decBusOperStatus	1.3.6.1.4.1.36.2.18.29.1.1.1.4
decBusLastChange	1.3.6.1.4.1.36.2.18.29.1.1.1.5
decBusAtmAddress	1.3.6.1.4.1.36.2.18.29.1.1.1.6
decBusDescription	1.3.6.1.4.1.36.2.18.29.1.1.1.7
decBusLanName	1.3.6.1.4.1.36.2.18.29.1.1.1.8
decBusLanType	1.3.6.1.4.1.36.2.18.29.1.1.1.9
decBusMaxDataFrameSize	1.3.6.1.4.1.36.2.18.29.1.1.1.10
decBusMaxFrameAge	1.3.6.1.4.1.36.2.18.29.1.1.1.11
decBusMaxForwardingRate	1.3.6.1.4.1.36.2.18.29.1.1.1.12
decBusClientStatesTable	1.3.6.1.4.1.36.2.18.29.1.2
decBusClientStatesEntry	1.3.6.1.4.1.36.2.18.29.1.2.1
decBusActiveClients	1.3.6.1.4.1.36.2.18.29.1.2.1.1
decBusMulticastFwdInProgress	1.3.6.1.4.1.36.2.18.29.1.2.1.2
decBusTerminating	1.3.6.1.4.1.36.2.18.29.1.2.1.3
decBusTrafficTable	1.3.6.1.4.1.36.2.18.29.1.3
decBusTrafficEntry	1.3.6.1.4.1.36.2.18.29.1.3.1
decBusFramesForwarded	1.3.6.1.4.1.36.2.18.29.1.3.1.1
decBusInvalidFrames	1.3.6.1.4.1.36.2.18.29.1.3.1.2
decBusFramesAgedOut	1.3.6.1.4.1.36.2.18.29.1.3.1.3
decBusFramesRateLimited	1.3.6.1.4.1.36.2.18.29.1.3.1.4
decBusFramesDiscarded	1.3.6.1.4.1.36.2.18.29.1.3.1.5
decBusClientTable	1.3.6.1.4.1.36.2.18.29.1.4
decBusClientEntry	1.3.6.1.4.1.36.2.18.29.1.4.1
decBusClientIndex	1.3.6.1.4.1.36.2.18.29.1.4.1.1
decBusClientAtmAddress	1.3.6.1.4.1.36.2.18.29.1.4.1.2
decBusClientID	1.3.6.1.4.1.36.2.18.29.1.4.1.3
decBusClientUsedSeveralIDs	1.3.6.1.4.1.36.2.18.29.1.4.1.4
decBusClientState	1.3.6.1.4.1.36.2.18.29.1.4.1.5
decBusClientRowStatus	1.3.6.1.4.1.36.2.18.29.1.4.1.6
decBusLecTable	1.3.6.1.4.1.36.2.18.29.1.5
decBusLecEntry	1.3.6.1.4.1.36.2.18.29.1.5.1
decBusLecAtmAddress	1.3.6.1.4.1.36.2.18.29.1.5.1.1

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Table B–13 (Cont.) DEC BUS MIB Object Identifiers

Object	ID
decBusLecIndex	1.3.6.1.4.1.36.2.18.29.1.5.1.2
decBusLecID	1.3.6.1.4.1.36.2.18.29.1.5.1.3
decBusLecUsedSeveralIDs	1.3.6.1.4.1.36.2.18.29.1.5.1.4
decBusLecState	1.3.6.1.4.1.36.2.18.29.1.5.1.5
decBusLecRowStatus	1.3.6.1.4.1.36.2.18.29.1.5.1.6
decBusMulticastSendTable	1.3.6.1.4.1.36.2.18.29.1.6
decBusMulticastSendEntry	1.3.6.1.4.1.36.2.18.29.1.6.1
decBusMulticastSendInterface	1.3.6.1.4.1.36.2.18.29.1.6.1.1
decBusMulticastSendVpi	1.3.6.1.4.1.36.2.18.29.1.6.1.2
decBusMulticastSendVci	1.3.6.1.4.1.36.2.18.29.1.6.1.3
decBusMulticastSendRowStatus	1.3.6.1.4.1.36.2.18.29.1.6.1.4
decBusMulticastFwdTable	1.3.6.1.4.1.36.2.18.29.1.7
decBusMulticastFwdEntry	1.3.6.1.4.1.36.2.18.29.1.7.1
decBusMulticastFwdInterface	1.3.6.1.4.1.36.2.18.29.1.7.1.1
decBusMulticastFwdVpi	1.3.6.1.4.1.36.2.18.29.1.7.1.2
decBusMulticastFwdVci	1.3.6.1.4.1.36.2.18.29.1.7.1.3
decBusMulticastFwdRowStatus	1.3.6.1.4.1.36.2.18.29.1.7.1.4
decBusCallStatsTable	1.3.6.1.4.1.36.2.18.29.1.8
decBusCallStatsEntry	1.3.6.1.4.1.36.2.18.29.1.8.1
decBusMulticastSendCalls	1.3.6.1.4.1.36.2.18.29.1.8.1.1
decBusMulticastSendFailures	1.3.6.1.4.1.36.2.18.29.1.8.1.2
decBusMsOutOfResourcesFailures	1.3.6.1.4.1.36.2.18.29.1.8.1.3
decBusMsInvalidInfoElements	1.3.6.1.4.1.36.2.18.29.1.8.1.4
decBusMsWrongLanTypes	1.3.6.1.4.1.36.2.18.29.1.8.1.5
decBusMsWrongMaxFrameSizes	1.3.6.1.4.1.36.2.18.29.1.8.1.6
decBusMulticastForwardCalls	1.3.6.1.4.1.36.2.18.29.1.8.1.7
decBusMulticastForwardFailures	1.3.6.1.4.1.36.2.18.29.1.8.1.8
decBusMfOutOfResourcesFailures	1.3.6.1.4.1.36.2.18.29.1.8.1.9
decBusMfClientRejects	1.3.6.1.4.1.36.2.18.29.1.8.1.10
decBusEventLogMaximumSize	1.3.6.1.4.1.36.2.18.29.1.9
decBusEventLogTable	1.3.6.1.4.1.36.2.18.29.1.10
decBusEventLogEntry	1.3.6.1.4.1.36.2.18.29.1.10.1
decBusEventIndex	1.3.6.1.4.1.36.2.18.29.1.10.1.1
decBusEventType	1.3.6.1.4.1.36.2.18.29.1.10.1.2
decBusEventReason	1.3.6.1.4.1.36.2.18.29.1.10.1.3
decBusEventServer	1.3.6.1.4.1.36.2.18.29.1.10.1.4
decBusEventServerAtmAddress	1.3.6.1.4.1.36.2.18.29.1.10.1.5
decBusEventClientAtmAddress	1.3.6.1.4.1.36.2.18.29.1.10.1.6
decBusEventTimestamp	1.3.6.1.4.1.36.2.18.29.1.10.1.7

Table B–14 DEC LECS MIB Object Identifiers

Object	ID
decLecsMIB	1.3.6.1.4.1.36.2.18.31
decElanAdminGroup	1.3.6.1.4.1.36.2.18.31.1
decElanConfGroup	1.3.6.1.4.1.36.2.18.31.2
decElanLecsGroup	1.3.6.1.4.1.36.2.18.31.3
decElanLecsConfGroup	1.3.6.1.4.1.36.2.18.31.3.1
decElanLecsFaultGroup	1.3.6.1.4.1.36.2.18.31.3.2
decElanLecsStatGroup	1.3.6.1.4.1.36.2.18.31.3.3
decElanAdminPolicyVal	1.3.6.1.4.1.36.2.18.31.1.1
assignByAtmAddr	1.3.6.1.4.1.36.2.18.31.1.1.1
assignByMacAddr	1.3.6.1.4.1.36.2.18.31.1.1.2
assignByRouteDescriptor	1.3.6.1.4.1.36.2.18.31.1.1.3
assignByElanName	1.3.6.1.4.1.36.2.18.31.1.1.4
assignByCompatibility	1.3.6.1.4.1.36.2.18.31.1.1.5
decLecsMIBConformance	1.3.6.1.4.1.36.2.18.31.4
decLecsMIBGroups	1.3.6.1.4.1.36.2.18.31.4.1
decLecsMIBCompliances	1.3.6.1.4.1.36.2.18.31.4.2
decElanConfNextId	1.3.6.1.4.1.36.2.18.31.2.1
decElanConfTable	1.3.6.1.4.1.36.2.18.31.2.2
decElanConfEntry	1.3.6.1.4.1.36.2.18.31.2.2.1
decElanConfIndex	1.3.6.1.4.1.36.2.18.31.2.2.1.1
decElanConfName	1.3.6.1.4.1.36.2.18.31.2.2.1.2
decElanConfTlvIndex	1.3.6.1.4.1.36.2.18.31.2.2.1.3
decElanConfLanType	1.3.6.1.4.1.36.2.18.31.2.2.1.4
decElanConfMaxFrameSize	1.3.6.1.4.1.36.2.18.31.2.2.1.5
decElanConfAdminStatus	1.3.6.1.4.1.36.2.18.31.2.2.1.6
decElanConfDefaultElan	1.3.6.1.4.1.36.2.18.31.2.2.1.7
decElanConfRowStatus	1.3.6.1.4.1.36.2.18.31.2.2.1.8
decElanLesTable	1.3.6.1.4.1.36.2.18.31.2.3
decElanLesEntry	1.3.6.1.4.1.36.2.18.31.2.3.1
decElanLesIndex	1.3.6.1.4.1.36.2.18.31.2.3.1.1
decElanLesAtmAddress	1.3.6.1.4.1.36.2.18.31.2.3.1.2
decElanLesRowStatus	1.3.6.1.4.1.36.2.18.31.2.3.1.3
decElanPolicyTable	1.3.6.1.4.1.36.2.18.31.2.4
decElanPolicyEntry	1.3.6.1.4.1.36.2.18.31.2.4.1
decElanPolicySelectorIndex	1.3.6.1.4.1.36.2.18.31.2.4.1.1
decElanPolicyIndex	1.3.6.1.4.1.36.2.18.31.2.4.1.2

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Table B–14 (Cont.) DEC LECS MIB Object Identifiers

Object	ID
decElanPolicyPriority	1.3.6.1.4.1.36.2.18.31.2.4.1.3
decElanPolicyType	1.3.6.1.4.1.36.2.18.31.2.4.1.4
decElanPolicyRowStatus	1.3.6.1.4.1.36.2.18.31.2.4.1.5
decElanLecAtmAddrTable	1.3.6.1.4.1.36.2.18.31.2.5
decElanLecAtmAddrEntry	1.3.6.1.4.1.36.2.18.31.2.5.1
decElanLecAtmAddress	1.3.6.1.4.1.36.2.18.31.2.5.1.1
decElanLecAtmMask	1.3.6.1.4.1.36.2.18.31.2.5.1.2
decElanLecAtmRowStatus	1.3.6.1.4.1.36.2.18.31.2.5.1.3
decElanLecMacAddrTable	1.3.6.1.4.1.36.2.18.31.2.6
decElanLecMacAddrEntry	1.3.6.1.4.1.36.2.18.31.2.6.1
decElanLecMacAddress	1.3.6.1.4.1.36.2.18.31.2.6.1.1
decElanLecMacRowStatus	1.3.6.1.4.1.36.2.18.31.2.6.1.2
decElanLecRdTable	1.3.6.1.4.1.36.2.18.31.2.7
decElanLecRdEntry	1.3.6.1.4.1.36.2.18.31.2.7.1
decElanLecRdSegId	1.3.6.1.4.1.36.2.18.31.2.7.1.1
decElanLecRdBridgeNum	1.3.6.1.4.1.36.2.18.31.2.7.1.2
decElanLecRdRowStatus	1.3.6.1.4.1.36.2.18.31.2.7.1.3
decLecsConfNextId	1.3.6.1.4.1.36.2.18.31.3.1.1
decLecsConfTable	1.3.6.1.4.1.36.2.18.31.3.1.2
decLecsConfEntry	1.3.6.1.4.1.36.2.18.31.3.1.2.1
decLecsConfIndex	1.3.6.1.4.1.36.2.18.31.3.1.2.1.1
decLecsAtmIfIndex	1.3.6.1.4.1.36.2.18.31.3.1.2.1.2
decLecsAtmAddrSpec	1.3.6.1.4.1.36.2.18.31.3.1.2.1.3
decLecsAtmAddrMask	1.3.6.1.4.1.36.2.18.31.3.1.2.1.4
decLecsAtmAddrActual	1.3.6.1.4.1.36.2.18.31.3.1.2.1.5
decLecsPolicySelIndex	1.3.6.1.4.1.36.2.18.31.3.1.2.1.6
decLecsLastInitialized	1.3.6.1.4.1.36.2.18.31.3.1.2.1.7
decLecsOperStatus	1.3.6.1.4.1.36.2.18.31.3.1.2.1.8
decLecsAdminStatus	1.3.6.1.4.1.36.2.18.31.3.1.2.1.9
decLecsRowStatus	1.3.6.1.4.1.36.2.18.31.3.1.2.1.10
decLecsTlvTable	1.3.6.1.4.1.36.2.18.31.3.1.4
decLecsTlvEntry	1.3.6.1.4.1.36.2.18.31.3.1.4.1
decLecsTlvSelectorIndex	1.3.6.1.4.1.36.2.18.31.3.1.4.1.1
decLecsTlvTag	1.3.6.1.4.1.36.2.18.31.3.1.4.1.2
decLecsTlvIndex	1.3.6.1.4.1.36.2.18.31.3.1.4.1.3
decLecsTlvVal	1.3.6.1.4.1.36.2.18.31.3.1.4.1.4

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Table B–14 (Cont.) DEC LECS MIB Object Identifiers

Object	ID
decLecsTlvRowStatus	1.3.6.1.4.1.36.2.18.31.3.1.4.1.5
decLecsStatsTable	1.3.6.1.4.1.36.2.18.31.3.3.1
decLecsStatsEntry	1.3.6.1.4.1.36.2.18.31.3.3.1.1
decLecsStatSuccessful	1.3.6.1.4.1.36.2.18.31.3.3.1.1.1
decLecsStatInBadFrames	1.3.6.1.4.1.36.2.18.31.3.3.1.1.2
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