Management Software

AT-S63

Menus Interface User’s Guide

AT-9400 Series Layer 2+ Gigabit Ethernet Switches

Version 1.1.0

613-50570-00 Rev. B

Allied Telesyn

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Contents

Figures

Tables

Preface

This guide contains instructions on how to configure an AT-9400 Series Layer 2+ Gigabit Ethernet Switch using the AT-S63 management software and contains the following sections:

How This Guide is Organized

This guide is organized into the following sections

❐ Section I: Basic Operations

The chapters in this section explain how to start a management session and perform basic tasks including configuring switch and port parameters, setting up SNMPv1 and SNMPv2c, enhanced stacking, trunking and mirroring, and viewing Ethernet statistics.

❐ Section II: Advanced Operations

This section includes information about the file system, uploading and downloading files, using the event log, and working with classifiers, QoS, IGMP, DoS, and RRP snooping.

❐ Section III: SNMPv3

The chapter in this section is about SNMPv3.

❐ Section IV: Spanning Tree Protocols

This section includes information about STP, RSTP, and MSTP.

❐ Section V: Virtual LANs

The chapters in this section cover VLANs, GVRP, multiple VLANs, and protected ports VLANs.

❐ Section VI: Port Security

This section includes chapters on port security, 802.1x, and MAC addresses.

❐ Section VII: Management Security

This section contains chapters about the web server, encryption, PKI, Secure Shell, TACACS+ and RADIUS, and management control lists.

Where to Find Web-based Guides

The installation and user guides for all Allied Telesyn products are available in portable document format (PDF) on our web site at **www.alliedtelesyn.com**. You can view the documents online or download them onto a local workstation or server.

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New releases of management software for our managed products are available from either of the following Internet sites:

❒ Allied Telesyn web site: **www.alliedtelesyn.com**

❒ Allied Telesyn FTP server: **ftp://ftp.alliedtelesyn.com**

If you prefer to download new software from the Allied Telesyn FTP server from your workstation's command prompt, you will need FTP client software and you must log in to the server. Enter “anonymous” for the user name and your email address for the password.

Chapter 1
Overview

This chapter describes the AT-S63 software functions, the methods you can use to access the software, and the management access levels. This chapter contains the following sections:

Management Overview

The AT-S63 management software allows you to monitor and adjust the operating parameters of an AT-9400 Series switch and includes the following features:

- Basic operations such as configuring port and switch parameters, enhanced stacking, SNMPv1 and v2c, trunking, and mirroring
- Advanced operations including file uploads and downloads, event logging, traffic classifiers, access control lists, denial of service defense, Quality of Service (QoS), Class of Service (CoS), and IGMP
- SNMPv3
- Spanning tree protocols including STP, RSTP, and MSTP
- Virtual LANs
- Port security options such as 802.1x Port-based Network Access Control and MAC address tables
- Management security including encryption keys, PKI, SSL, Secure Shell, TACACS+, RADIUS, and management access control lists

The AT-S63 management software is preinstalled on the switch with default settings for all operating parameters. If the default settings are adequate for your network, you can use the device as an unmanaged switch by connecting it to your network, as explained in the hardware installation guide, and powering on the switch.

Note
The default settings for the management software are listed in Appendix A, “AT-S63 Default Settings” on page 777.

To actively manage a switch and adjust its operating parameters, you must connect to an AT-9400 Series switch and access the AT-S63 management software. There are two ways to connect to the switch:

- Locally
- Remotely

Depending upon the method you choose, specific AT-S63 software interfaces are available. When you have a local connection, you can use the menus (described in this guide) or command line interface (CLI) described in the *AT-S63 Management Software Command Line Interface User’s Guide*. With a remote connection you can use the menus, CLI, and web browser (see the *AT-S63 Management Software Web Browser Interface User’s Guide*) interfaces, or a third-party network management application.

The following sections in this chapter briefly describe each type of management session.

Local Connection

You establish a local connection with an AT-9400 Series switch when you use the RJ-45 to RS-232 management cable included with the switch to connect a terminal or a PC with a terminal emulator program to the terminal port on the switch. The terminal port is located on the front panel of the AT-9400 Series switch.

This type of connection is referred to as “local” because you must be physically close to the switch, such as in the wiring closet where the switch is located.

With a local connection you can manage the switch using the command line or menus interface. The web browser and SNMP interfaces are not available through a local connection.

Note
For instructions on how to start a local management session, refer to “Starting a Local Management Session” on page 38.

A switch does not need an Internet Protocol (IP) address for you to manage it locally. You can start a local management session on a switch at any time. It does not interfere with the device forwarding packets.

When you assign an IP address to an AT-9400 Series switch and designate it as a master switch, you can manage all of the switches that support enhanced stacking that reside in the same subnet, through the same local connection.

Note
For further information on enhanced stacking, refer to “Enhanced Stacking Overview” on page 90.

Remote Connection

You can use any management station on your network that has the Telnet application to manage an AT-9400 Series switch. This is referred to as a remote connection.

To establish a remote connection to a switch, there must be at least one enhanced stacking switch in the subnet to which you assigned an IP address. Only one switch in a subnet needs to have an IP address. After you have established a Telnet management session with the switch that has an IP address, you can use the enhanced stacking feature of the management software to access all other switches that support enhanced stacking that reside in the same subnet.

Note
For further information on enhanced stacking, refer to "Enhanced Stacking Overview" on page 90.

Note
For instructions on how to start a remote management session, refer to "Starting a Remote Management Session" on page 41.

A remote connection allows you to use any of the AT-S63 management software user interfaces—CLI, menus, and web browser—as well as a third-party network management application to manage the switch.

Using an SNMP Network Management Application

You can use the Simple Network Management Protocol (SNMP) to run a network management application such as AT-View to manage the switch through t. A familiarity with how to use management information base (MIB) objects is necessary for this type of management.

The AT-S63 software supports the following MIBs:

❒ SNMP MIB-II (RFC 1213)

❒ Bridge MIB (RFC 1493)

❒ Interface Group MIB (RFC 1573)

❒ Ethernet MIB (RFC 1643)

❒ Remote Network MIB (RFC 1757)

❒ Allied Telesyn managed switch MIBs

You must download the Allied Telesyn managed switch MIBs (atistackinfo.mib and atiswitch.mib) file from the Allied Telesyn web site and compile the files with your SNMP application. For instructions, refer to your third-party application's documentation.

Note

Third-party network management applications such as HP OpenView cannot use the enhanced stacking feature of AT-S63. Therefore, you must assign an IP address to each switch that you want to manage with one of these applications.

Management Access Levels

There are two levels of management access in the AT-S63 management software: manager and operator. When you log in as a manager, you can view and configure all of a switch’s operating parameters. When you log in as an operator, you can only view the operating parameters; you cannot change any values.

You log in as a manager or an operator when you enter the appropriate username and password when you start an AT-S63 management session. To log in as a manager, type “manager” as the login name. The default password is “friend.” The username for operator is “operator” and the default password is also “operator.” The usernames and passwords are case sensitive.

Section I

Basic Operations

The chapters in this section provide information and procedures for basic switch setup using the AT-S63 management software. The chapters include:

Chapter 2

Starting a Management Session

This chapter contains procedures for starting a management session on the switch using a local or remote connection. The sections in the chapter are:

❒ “Starting a Local Management Session” on page 38

❒ “Starting a Remote Management Session” on page 41

Starting a Local Management Session

To establish a local connection, you use the terminal port on the front panel of the AT-9400 Series switch, as explained in “Local Connection” on page 30. When you make the connection and start the AT-S63 menus interface, you start a local management session.

A switch does not need an IP address to be managed through a local management session.

When you make a local connection to a switch that has been configured as a master switch of an enhanced stack, you can manage all the switches that support enhanced stacking in the subnet from the same local management session. Therefore, you do not need to start a separate local management session for each switch.

When you start a local management session on a switch that is not part of an enhanced stack or that is a slave switch, you can only manage that switch.

Note
For information on enhanced stacking, refer to “Enhanced Stacking Overview” on page 90.

Starting a Local Management Session

To start a local management session, perform the following procedure:

1. Connect one end of the RJ-45 to RS-232 management cable to the serial terminal port on the front panel of the switch, as shown in Figure 1.

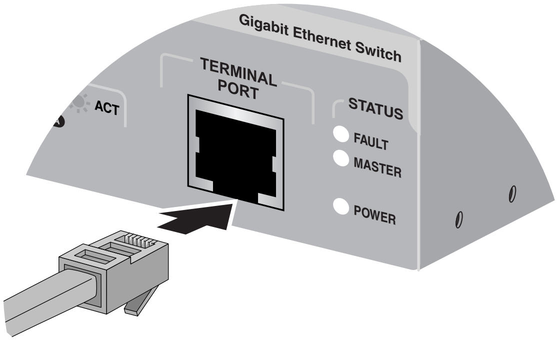


Figure 1. Connecting the Management Cable to the RJ-45 Serial Terminal Port

2. Connect the other end of the cable to an RS-232 port on a terminal or PC with a terminal emulator program.

3. Configure the terminal or terminal emulation program as follows:

   - □ Baud rate: 9600 to 115200 bps
   - □ Data bits: 8
   - □ Parity: None
   - □ Stop bits: 1
   - □ Flow control: None

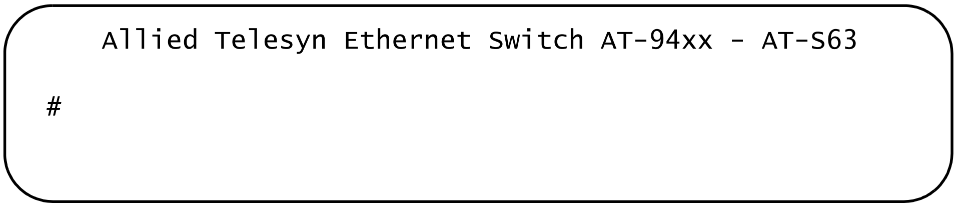
   Note
   The port settings are for a DEC VT100 or ANSI terminal, or an equivalent terminal emulator program.

4. Press Enter.

   You are prompted for a user name and password.

5. To configure the switch settings, enter “manager” as the user name. The default password for manager access is “friend.“To just view the settings, enter “operator” as the user name. The default password for operator access is “operator.” User names and passwords are case sensitive. For information on the two access levels, refer to “Management Access Levels” on page 33. (For instructions on how to change a password, refer to “Working With the Manager and Operator Passwords” on page 55.)

6. The local management session starts and the command line interface (CLI) prompt is displayed, as shown in Figure 2.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63

#
```

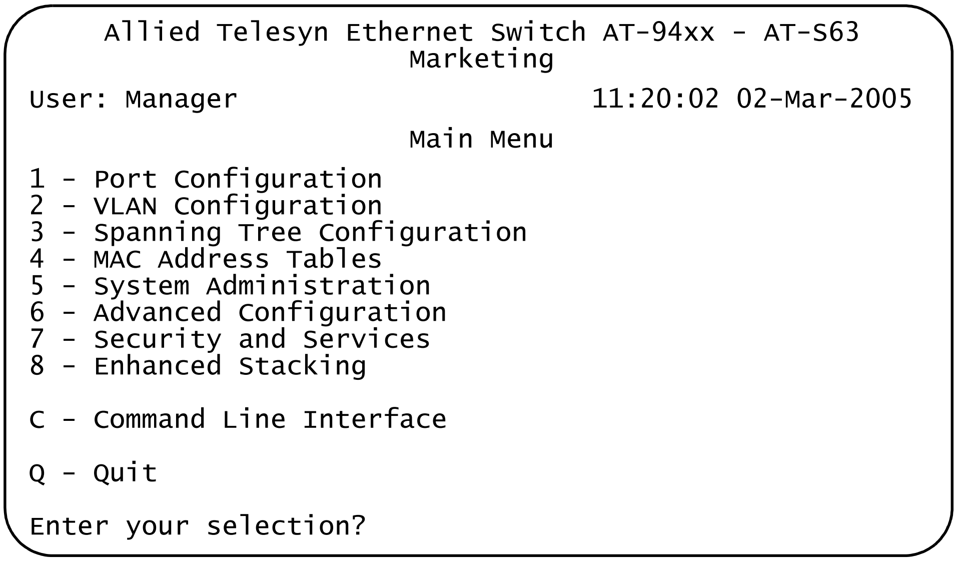
Figure 2. CLI Prompt

   If the switch has been configured with a name, the name is displayed after the software version information and before the command prompt.

   For information about the command line interface, refer to the *AT-S63 Management Software Command Line Interface User’s Guide*.

7. To use the menus interface, type **menu** and press Return.

The Main Menu is shown in Figure 3.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                       11:20:02 02-Mar-2005
                         Main Menu
1 - Port Configuration
2 - VLAN Configuration
3 - Spanning Tree Configuration
4 - MAC Address Tables
5 - System Administration
6 - Advanced Configuration
7 - Security and Services
8 - Enhanced Stacking

C - Command Line Interface

Q - Quit

Enter your selection?
```

Figure 3. Main Menu

To select a menu item, type the corresponding letter or number.

To return to the command line interface, type **C**.

When you press the Esc key or type the letter **R** in a submenu, the previous menu is redisplayed.

Note
You cannot operate both a local management session and a remote management session on the same switch simultaneously.

Quitting a Local Management Session

To quit a local management session, return to the Main Menu and type **Q** for Quit.

Note
Failure to properly exit from a local or Telnet management session may block future management sessions.

You should always exit from a management session when you are finished managing a switch. This prevents unauthorized individuals from making changes to a switch's configuration if you leave your management station unattended. For information about how to use the console timer to automatically disconnect a management session, refer to "Configuring the Console Timer" on page 63.

Starting a Remote Management Session

You can use the Telnet application from any workstation on your network to connect to an AT-9400 Series switch, as described in “Remote Connection” on page 31. When you make the connection and start the AT-S63 menus interface, you start a remote management session.

To manage a switch using remote connection, it must have an IP address or be part of an enhanced stack. To assign an IP address to a remote switch, refer to “Configuring the IP Address, Switch Name, and Other Basic Parameters” on page 46.

When you make a remote connection to a switch that has been configured as a master switch of an enhanced stack, you can manage all the switches that support enhanced stacking in the subnet from the same local management session. Therefore, you do not need to start a separate remote management session for each switch.

When you start a remote management session on a switch that is not part of an enhanced stack or that is a slave switch, you can only manage that switch.

Note
For information on enhanced stacking, refer to “Enhanced Stacking Overview” on page 90.

Starting a Remote Management Session

To make a remote connection, perform the following procedure:

1. In the Telnet application, specify the IP address of the master switch of the enhanced stack.

   You are prompted for a user name and password.

2. To configure the switch settings, enter “manager” as the user name. The default password for manager access is “friend. “To just view the settings, enter “operator” as the user name. The default password for operator access is “operator.” User names and passwords are case sensitive. For information on the two access levels, refer to “Management Access Levels” on page 33. (For instructions on how to change a password, refer to “Working With the Manager and Operator Passwords” on page 55.)

3. The local management session starts and the command line interface (CLI) prompt is displayed, as shown in Figure 2 on page 39.

   If the switch has been configured with a name, the name is displayed after the software version information and before the command prompt.

For information about the command line interface, refer to the *AT-S63 Management Software Command Line Interface User's Guide*.

4. To use the menus interface, type **menu** and press Return.

   The Main Menu is shown in Figure 3 on page 40.

To select a menu item, type the corresponding letter or number.

To return to the command line interface, type **C**.

When you press the Esc key or type the letter **R** in a submenu, the previous menu is redisplayed.

Note
You cannot operate both a local management session and a remote management session on the same switch simultaneously.

Quitting a Remote Management Session

To end a remote management session, return to the Main Menu and type **Q** for Quit.

Note
Failure to properly exit from a local or Telnet management session may block future management sessions until the console timer times out.

You should always exit from a management session when you are finished managing a switch. This prevents unauthorized individuals from making changes to a switch's configuration if you leave your management station unattended. For information about how to use the console timer to automatically disconnect a management session, refer to "Configuring the Console Timer" on page 63.

Chapter 3

Basic Switch Parameters

This chapter contains a variety of information and procedures for basic switch setup. Sections in the chapter include:

When Does a Switch Need an IP Address?

One of the tasks of building or expanding a network is deciding which managed switches need to be assigned a unique IP address. The rule was that a managed switch needed an IP address if you wanted to manage it remotely, such as with the Telnet application. However, if a network contained many managed switches, assigning each one an IP address was often cumbersome and time consuming. It was also often difficult to keep track of all the IP addresses.

The enhanced stacking feature of the AT-8400 and AT-9400 series switches simplifies all this. With enhanced stacking, you need to assign an IP address to only one switch in each subnet in your network. The switch with the IP address is referred to as the master switch of the subnetwork. All switches in the same subnet share the IP address.

When you start a local or remote management session on the master switch, you have complete management access to all the other switches in the same subnet.

This feature has two primary benefits. First, it helps reduce the number of IP addresses you must assign to your network devices. Second, it allows you to configure multiple switches through the same local or remote management session.

If your network consists of multiple subnets, you must assign a unique IP address to at least one switch in each subnet. The switch with the IP address is the master switch of that subnet.

When you assign a switch an IP address, you must also assign it a subnet mask. The switch uses the subnet mask to determine which portion of an IP address represents the network address and which the node address.

You must also assign the switch a gateway address if there is a router between the switch and the remote management station. This gateway address is the IP address of the router through which the switch and management station communicates.

Note
For further information on enhanced stacking, refer to “Enhanced Stacking Overview” on page 90.

If you do not plan to remotely manage the AT-94xx switches in your network, then you do not need to assign an IP address to any of them. The switches operate without an IP address and you can completely manage them from a local management session, if needed.

How Do You Assign an IP Address?

There are two ways that a switch can obtain an IP address.

The first way is for you to assign the IP configuration information manually. The procedure for this is explained in "Configuring the IP Address, Switch Name, and Other Basic Parameters" on page 46. You can initially assign an IP address to a switch only through a local management session.

The second method is for you to activate the BOOTP and DHCP client software on the switch and have the switch automatically download its IP configuration information from a BOOTP or DHCP server on your network. This procedure is explained in "Activating the BOOTP or DHCP Client Software" on page 49.

Configuring the IP Address, Switch Name, and Other Basic Parameters

The procedure in this section explains how to manually assign an IP address, subnet mask, and gateway address to the switch from a local or Telnet management session. (If you want the switch to obtain its IP configuration from a DHCP or BOOTP server on your network, go to the procedure “Activating the BOOTP or DHCP Client Software” on page 49.)

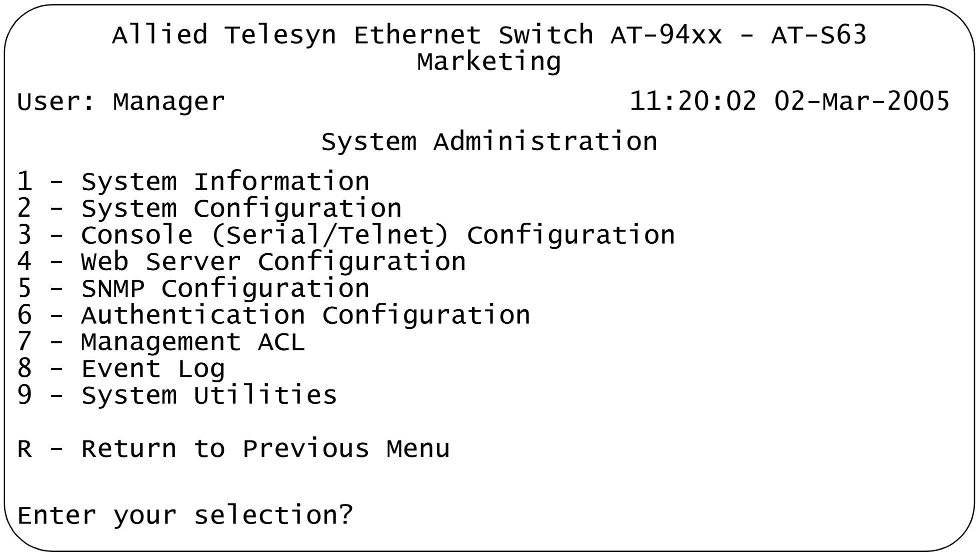
This procedure also explains how to assign a name to the switch, along with the name of the administrator responsible for maintaining the unit and the location of the switch.

Note
To change the IP address or subnet mask of a remote switch through Enhanced Stacking, change the subnet mask before you change the IP address. If you change the IP address first, you will lose your connection to the remote switch.

To manually set a switch’s IP address, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4.

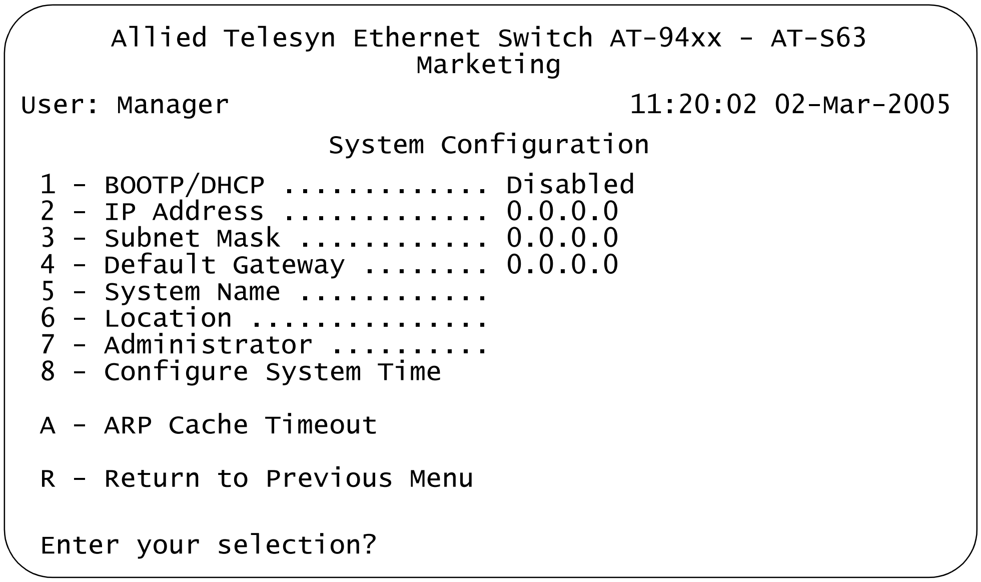


```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                   System Administration
1 - System Information
2 - System Configuration
3 - Console (Serial/Telnet) Configuration
4 - Web Server Configuration
5 - SNMP Configuration
6 - Authentication Configuration
7 - Management ACL
8 - Event Log
9 - System Utilities

R - Return to Previous Menu

Enter your selection?
```

Figure 4. System Administration Menu

2. From the System Administration menu, type **2** to select System Configuration.

The System Configuration menu is shown in Figure 5.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
                   System Configuration
 1 - BOOTP/DHCP ............ Disabled
 2 - IP Address ............ 0.0.0.0
 3 - Subnet Mask ........... 0.0.0.0
 4 - Default Gateway ....... 0.0.0.0
 5 - System Name ...........
 6 - Location ..............
 7 - Administrator .........
 8 - Configure System Time

 A - ARP Cache Timeout

 R - Return to Previous Menu

 Enter your selection?
```

Figure 5. System Configuration Menu

3. Adjust the following parameters as necessary.

Note
A change to any parameter in this menu, including the IP address, subnet mask, and gateway address, is activated immediately on the switch.

1 - BOOTP/DHCP
This selection activates and deactivates the BOOTP and DHCP client software on the switch. For information on this selection, refer to "Activating the BOOTP or DHCP Client Software" on page 49.

2 - IP Address
This parameter specifies the IP address of the switch. You must specify an IP address if you want the switch to function as the Master switch of an enhanced stack. The IP address must be entered in the format: xxx.xxx.xxx.xxx. The default value is 0.0.0.0.

3 - Subnet Mask
This parameter specifies the subnet mask for the switch. You must specify a subnet mask if you assigned an IP address to the switch. The subnet mask must be entered in the format: xxx.xxx.xxx.xxx. The default value is 0.0.0.0.

4 - Default Gateway
This parameter specifies the default router's IP address. This address is required if you intend to remotely manage the switch from a management station that is separated from the switch by a router. The

address must be entered in the format: xxx.xxx.xxx.xxx. The default value is 0.0.0.0.

5 - System Name
This parameter specifies a name for the switch (for example, Sales Ethernet switch). The name is displayed at the top of the AT-S63 management menus and pages. The name can be from 1 to 39 characters. The name can include spaces and special characters, such as exclamation points and asterisks. The default is no name. This parameter is optional.

Note
Allied Telesyn recommends that you assign each switch a name. Names can help you identify the various switches in your network and help you avoid performing a configuration procedure on the wrong switch.

6 - Location
This parameter specifies the location of the switch, (for example, 4th Floor - rm 402B). The location can be from 1 to 20 characters. The location can include spaces and special characters, such as dashes and asterisks. The default is no location. This parameter is optional.

7 - Administrator
This parameter specifies the name of the network administrator responsible for managing the switch. The name can be from 1 to 20 characters. It can include spaces and special characters, such as dashes and asterisks. The default is no name. This parameter is optional.

Note
Item 8, Configure System Time, is described in “Setting the System Time” on page 58. Item A, ARP Cache Timeout, is described in “Setting the ARP Cache Timeout” on page 168.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Activating the BOOTP or DHCP Client Software

The BOOTP and DHCP protocols were developed to simplify network management. They are used to automatically assign IP configuration information to the devices on your network, such as an IP address, subnet mask, and a default gateway address.

The AT-9400 Series switch contains the client software for these protocols and can obtain its IP configuration information from a BOOTP or DHCP server on your network. If you activate this feature, the switch seeks its IP address and other IP configuration information from a BOOTP or DHCP server on your network whenever you reset or power ON the device.

In order for this strategy to work, there must be a BOOTP or DHCP server that resides on your network and you must configure the service by entering the switch's MAC address.

BOOTP and DHCP services typically allow you to specify how the IP address is to be assigned to the switch. The choices are static and dynamic. If you choose static, the server always assigns the same IP address to the switch when the switch is reset or powered ON. This is the preferred configuration. Because the BOOTP and DHCP services always assigns the same IP address to a switch, you always know which IP address to use when you need to remotely manage a particular switch.

If you choose dynamic, the server assigns any unused IP address that it has not already assigned to another device. This means that a switch might have a different IP address each time you reset or power cycle the device, which makes it difficult for you to remotely manage the unit.

Note
The BOOTP and DHCP client software is disabled by default on the switch.

To activate or deactivate the BOOTP or DHCP client software, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **2** to select System Configuration.

   The System Configuration menu is shown in Figure 5 on page 47.

3. From the System Configuration menu, type **1** to select BOOTP/DHCP.

The following prompt is displayed:

```
DHCP/BOOTP/DISABLE: (1-DHCP, 2-BOOTP, 3-DISABLE):
```

4. Type **1** to enable DHCP, **2** to enable BOOTP, or **3** to disable the services and press Return. The default is disabled.

Note
If you activated BOOTP or DHCP, the switch immediately begins to query the network for a BOOTP or DHCP server. The switch continues to query the network for its IP configuration until it receives a response.

Any static IP address, subnet mask, or gateway address assigned to the switch is deleted from the System Configuration menu and replaced with the value the switch receives from the BOOTP or DHCP server. If you later disable BOOTP and DHCP, these values are returned to their default settings.

5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying the AT-9400 Series Switch Hardware and Software Information

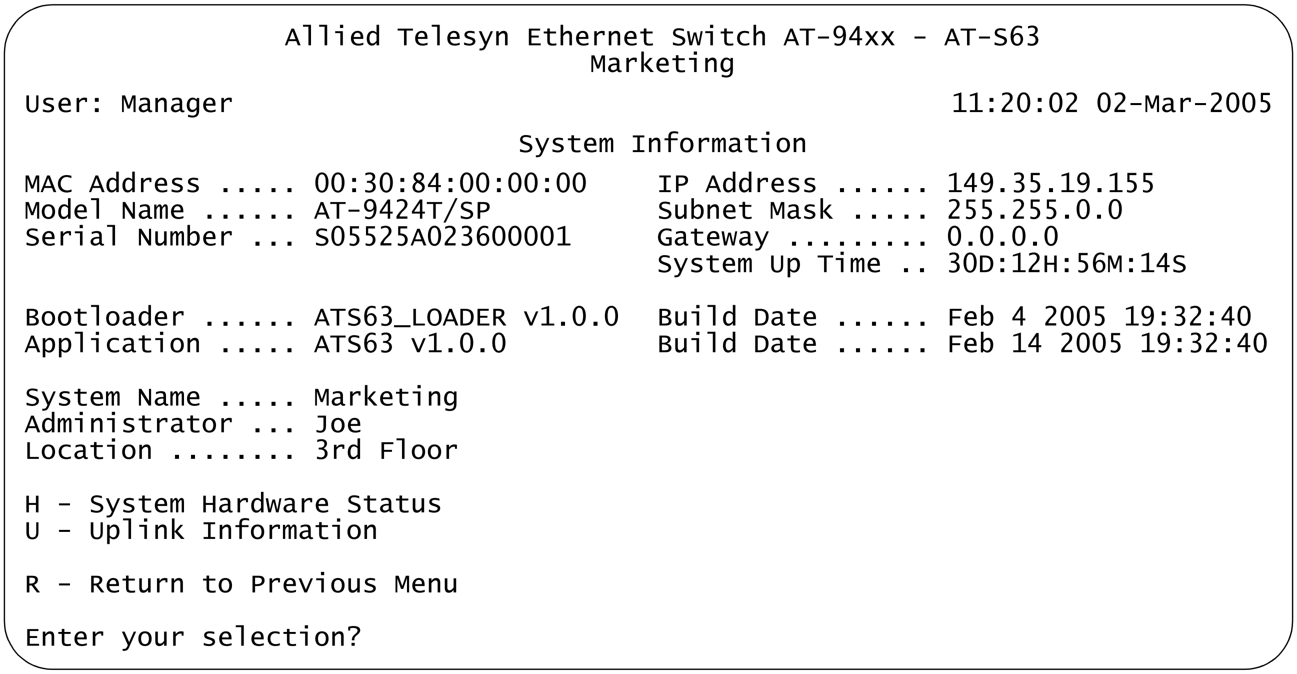
To display information about the switch hardware and software, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **1** to select System Information.

   The System Information menu is shown in Figure 6.



```
                  Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                    Marketing
User: Manager                                           11:20:02 02-Mar-2005
                                System Information
MAC Address ..... 00:30:84:00:00:00    IP Address ...... 149.35.19.155
Model Name ...... AT-9424T/SP          Subnet Mask ..... 255.255.0.0
Serial Number ... S05525A023600001     Gateway ......... 0.0.0.0
                                       System Up Time .. 30D:12H:56M:14S

Bootloader ...... ATS63_LOADER v1.0.0  Build Date ...... Feb 4 2005 19:32:40
Application ..... ATS63 v1.0.0         Build Date ...... Feb 14 2005 19:32:40

System Name ..... Marketing
Administrator ... Joe
Location ........ 3rd Floor

H - System Hardware Status
U - Uplink Information

R - Return to Previous Menu

Enter your selection?
```

Figure 6. System Information Menu

The System Information menu provides the following information:

MAC Address
The MAC address of the switch. You cannot change this parameter.

IP Address
IP address of the switch. To change a switch’s IP address, see “Configuring the IP Address, Switch Name, and Other Basic Parameters” on page 46.

Model Name
Model name of the AT-9400 Series switch. You cannot change this setting.

Subnet Mask
Subnet mask assigned to the switch. To change the subnet mask, see “Configuring the IP Address, Switch Name, and Other Basic Parameters” on page 46.

Serial Number
Serial number of the switch. You cannot change this setting.

Gateway
Gateway assigned to the switch. To change the gateway, see “Configuring the IP Address, Switch Name, and Other Basic Parameters” on page 46.

System Up Time
The number of days, hours, minutes, and seconds the switch has been operational. You cannot change this setting.

Bootloader and Build Date
The version of the bootloader software and the date it was built.

Application and Build Date
The version of the AT-S63 management software that the switch is currently running and the date it was built.

System Name
The name assigned to the switch. To change the name, see “Configuring the IP Address, Switch Name, and Other Basic Parameters” on page 46.

Administrator
The administrator of the switch. To change the administrator’s name, see “Configuring the IP Address, Switch Name, and Other Basic Parameters” on page 46.

Location
The location of the switch. To change the location information, see “Configuring the IP Address, Switch Name, and Other Basic Parameters” on page 46.

For information about selection **H**, System Hardware Status, refer to “Displaying System Hardware Information” on page 69. For information about selection **U**, Uplink Information, refer to “Displaying Uplink Port Information” on page 71.

Rebooting a Switch

This procedure reboots the switch.

Note
Any configuration changes not saved are lost after the switch reboots. To save your configuration changes, return to the Main Menu and type **S** to select Save Configuration Changes.

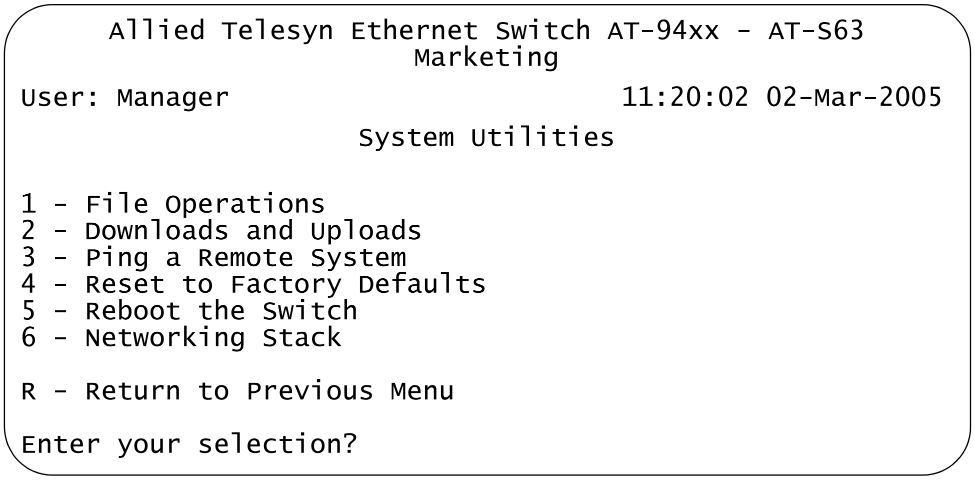
To reboot the switch, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                     System Utilities


1 - File Operations
2 - Downloads and Uploads
3 - Ping a Remote System
4 - Reset to Factory Defaults
5 - Reboot the Switch
6 - Networking Stack

R - Return to Previous Menu

Enter your selection?
```

Figure 7. System Utilities Menu

Note
Item 1 - File Operations, is described in Chapter 10, ”File System” on page 179. Item 2 - Downloads and Uploads is described in Chapter 11, ”File Downloads and Uploads” on page 205. Ping a Remote System, item 3, is described in “Pinging a Remote System” on page 66. Reset to Factory Defaults, item 4, is described in “Returning the AT-S63 Management Software to the Factory Default Values” on page 67. Item 6, Networking Stack, is described in Chapter 9, ”Networking Stack” on page 163.

3. From the System Utilities menu, type **5** to select Reboot the switch.

   The following prompt is displayed:

   ```
   The switch is about to reboot. Do you want to proceed?
   [Yes/No] ->
   ```

4. Type **Y** to reboot the switch or **N** to cancel the procedure.

⚠ **Caution**

The switch does not forward traffic while it reloads its operating software, a process that takes approximately 20 seconds to complete. Some packet traffic may be lost. After the switch finishes rebooting, you must reestablish your management session if you want to continue managing the unit.

Working With the Manager and Operator Passwords

There are two levels of management access on an AT-94xx switch: manager and operator. When you log in as manager, you can view and configure all of a switch’s operating parameters. When you log in as an operator, you can only view the operating parameters; you cannot change any values.

You log in as a manager or an operator when you enter the appropriate username and password when you start an AT-S63 management session. The default password for manager access is “friend.” The default password for operator access is “operator.” Passwords are case sensitive.

Changing the Manager or Operator Password

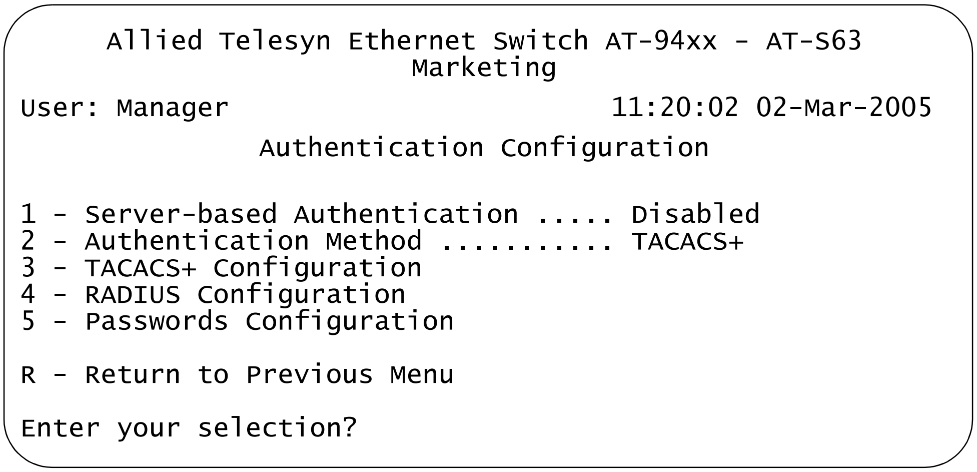
To change the manager or operator password, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **6** to select Authentication Configuration.

   The Authentication Configuration menu is shown in Figure 8.

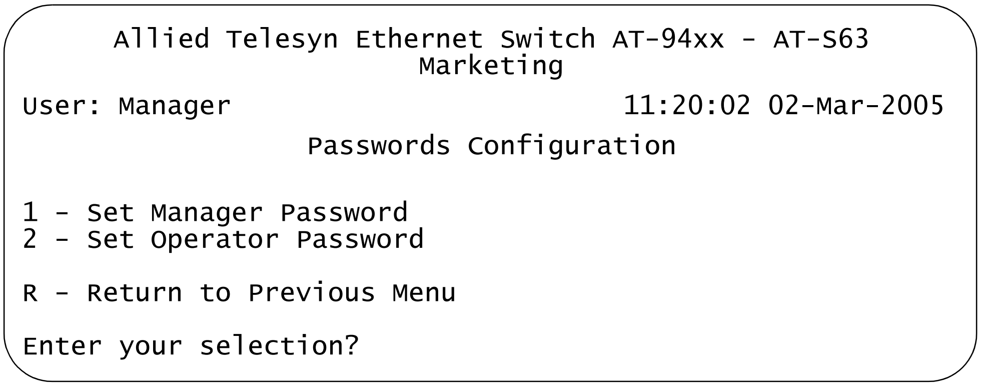


```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                        11:20:02 02-Mar-2005
               Authentication Configuration

1 - Server-based Authentication ..... Disabled
2 - Authentication Method ........... TACACS+
3 - TACACS+ Configuration
4 - RADIUS Configuration
5 - Passwords Configuration

R - Return to Previous Menu

Enter your selection?
```

Figure 8. Authentication Configuration Menu

3. From the Authentication Configuration menu, type **5** to select Passwords Configuration.

The Passwords Configuration menu is shown in Figure 9.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                        11:20:02 02-Mar-2005
                    Passwords Configuration

1 - Set Manager Password
2 - Set Operator Password

R - Return to Previous Menu

Enter your selection?
```

Figure 9. Passwords Configuration Menu

4. From the Passwords Configuration menu, type **1** to select Set Manager Password.

   The following prompt is displayed:

   ```
   Enter Current Manager Password ->
   ```

5. Type the current manager password (the default is “friend”) and press Return.

   The following prompt is displayed:

   ```
   Enter New Manager Password ->
   ```

6. When prompted, re-enter the new password.

7. Type **2** to select Set Operator Password.

   The following prompt is displayed:

   ```
   Enter New Operator Password ->
   ```

8. Type the current operator password (the default is “friend”) and press Return.

   Note
   A password can be from 0 to 16 alphanumeric characters. Passwords are case sensitive. You should not use spaces or special characters, such as asterisks (*) or exclamation points (!), in a password if you are managing the switch from a web browser. Many web browsers cannot handle special characters in passwords.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Resetting the Manager Password

If you change the manager password from the default and lose or forget it, you can reset the password. Note the following about this feature:

- This procedure is only available through a local management session.
- A remote management session always requires a login and password.
- This procedure assumes that the switch is in a secure location accessible only to authorized personnel to ensure that only those authorized persons can make a local connection.
- When the local management session ends, such as the management session timing out, a login and password are required to log in again unless you perform this procedure again.
- If the AT-S63 management software detects another active management session when you perform this procedure, a message is displayed for the other user stating that the user will be logged off. Thus, this type of session takes precedence over any other user’s management session.
- After you reset the password, you do not need to reboot the switch.

To reset the manager password, perform the following procedure:

1. Reboot the switch.

2. When the switch displays “Press <Ctrl> B to go to Boot prompt,” type **S** or **s** instead.

   You are not prompted for a login or password but you are logged in with manager privileges and the Main Menu is displayed, as shown in Figure 3 on page 40.

3. Follow the procedure in “Changing the Manager or Operator Password” on page 55 to reset the passwords.

Setting the System Time

This procedure explains how to set the switch’s date and time. Setting the system time is important if you configured the switch to send traps to your management stations. Traps from a switch where the time has not been set do not contain the correct date and time. Therefore, it becomes difficult for you to determine when the events represented by the traps occurred.

It is also important to set the system time if you intend to use the Secure Sockets Layer (SSL) certificate feature described in, Chapter 32, ”PKI Certificates and SSL” on page 719. Certificates must contain the date and time when they are created.

There are two ways to set the switch’s time. One method is to set it manually. There is, however, a drawback to this method. The switch loses the values when reset or power cycled. When you use this method you must reset the values whenever you reset the device.

The second method uses the Simple Network Time Protocol (SNTP). The AT-S63 management software is shipped with the client version of this protocol. You can configure the AT-S63 management software to obtain the current date and time from an SNTP or Network Time Protocol (NTP) server located on your network or the Internet.

SNTP is a reduced version of the NTP. However, the SNTP client software in the AT-S63 management software is interoperable with NTP servers.

Note
The default system time on the switch is midnight, January 1, 1970.

Setting the System Time Manually

To set the system time manually, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

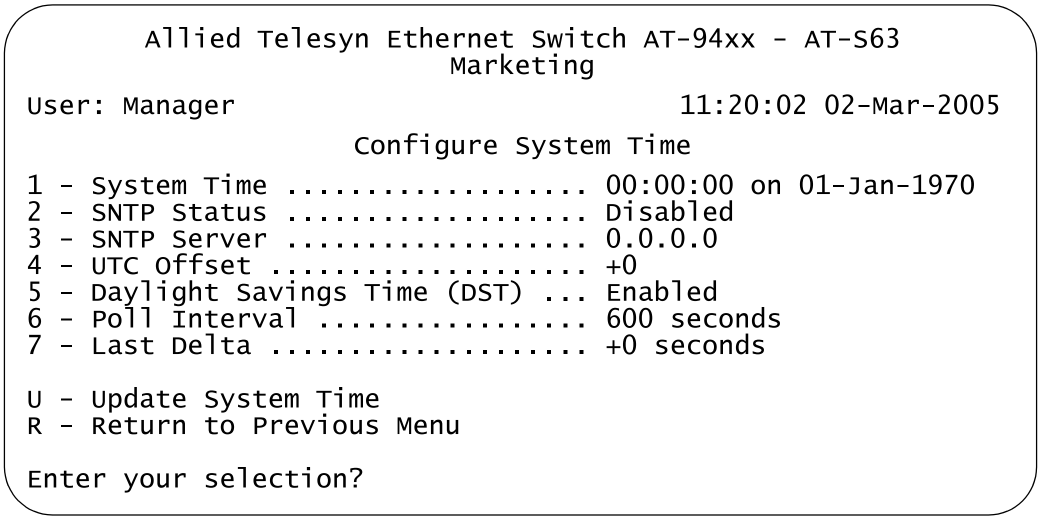
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **2** to select System Configuration.

   The System Configuration menu is shown in Figure 5 on page 47.

3. From the System Configuration menu, type **8** to select Configure System Time.

The Configure System Time menu is shown in Figure 10.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                            Marketing
User: Manager                               11:20:02 02-Mar-2005
                      Configure System Time
1 - System Time .................. 00:00:00 on 01-Jan-1970
2 - SNTP Status .................. Disabled
3 - SNTP Server .................. 0.0.0.0
4 - UTC Offset ................... +0
5 - Daylight Savings Time (DST) ... Enabled
6 - Poll Interval ................ 600 seconds
7 - Last Delta ................... +0 seconds

U - Update System Time
R - Return to Previous Menu

Enter your selection?
```

Figure 10. Configure System Time Menu

4. From the Configure System Time menu, type **1** to select System Time.

   The following prompt is displayed:

   ```
   Enter new system time [hh:mm:ss] ->
   ```

5. Enter a new time for the system in the following format: hours, minutes, and seconds all separated by colons.

   The following prompt is displayed:

   ```
   Enter new system date [dd-mm-yyyy] ->
   ```

6. Enter a new date for the system. Use two numbers to specify the day and month. Use four numbers to specify the year. Separate the values with hyphens. For example, December 5, 2004 is specified 05-12-2004.

   The new time and date are immediately activated on the switch.

Setting the System Time from an SNTP or NTP Server

To configure the switch to obtain its date and time from an SNTP or NTP server on your network or the Internet, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **2** to select System Configuration.

   The System Configuration menu is shown in Figure 5 on page 47.

3. From the System Configuration menu, type **8** to select Configure System Time.

   The Configure System Time menu is shown in Figure 10 on page 59.

4. Type **3** to select SNTP Server to enter the IP address of an SNTP server.

   > **Note**
   > If the switch is obtaining its IP address and subnet mask from a DHCP server, you can configure the DHCP server to provide the switch with an IP address of an NTP or SNTP server. If you configured the DHCP server to provide this address, then you do not need to enter it here, and you can skip ahead to step 5.

   The following prompt is displayed:

   ```
   Enter SNTP server IP address ->
   ```

5. Enter an IP address of an SNTP or NTP server.

6. Type **4** to select UTC Offset to specify the difference between the UTC and local time.

   > **Note**
   > If the switch is using DHCP, it automatically attempts to determine this value. In this case, you do not need to configure a value for the UTC Offset parameter.

   The following prompt is displayed:

   ```
   Enter UTC Offset [-12 to 12] -> 0
   ```

7. Enter a UTC Offset time.

   The default is 0 hours. The range is -12 to +12 hours.

8. Type **5** to select Daylight Savings Time (DST) to enable or disable the switch’s ability to adjust its system time to daylight savings time. The following prompt is displayed:

   ```
   Adjust for Daylight Savings Time (E - Enabled, D - Disabled) ->
   ```

9. Type **E** to enable daylight savings time and allow the switch to adjust system time to daylight savings time. This is the default value. Type **D** to disable daylight savings time and not allow the switch to adjust system time to daylight savings time.

Note
The switch does not set DST automatically. If the switch is in a locale that uses DST, you must remember to enable this in April when DST begins and disable it in October when DST ends. If the switch is in a locale that does not use DST, this option should be set to disabled all the time.

10. Type **6** to select Poll Interval to specify the time interval between queries to the SNTP server.

    The following prompt is displayed:

    ```
    Enter interval to poll SNTP server [60 to 1200] -> 600
    ```

Note
Selection 7, Last Delta, reports the last adjustment that had to be applied to the system time; the drift in the system clock between two successive queries to the SNTP server. You cannot change this value.

11. Enter the number of seconds the switch waits between polling the SNTP or NTP server. The default is 600 seconds. The range is from 60 to 1200 seconds.

12. Type **2** to select SNTP Status to enable or disable the SNTP client.

    The following prompt is displayed:

    ```
    SNTP Status (E-Enabled, D-Disabled) ->
    ```

13. Type **E** to enable SNTP client software on the switch or **D** to disable the NTP client software and press Return. The default is disabled.

    After SNTP is enabled, the switch immediately polls the SNTP or NTP server for the current date and time. (The switch also automatically polls the server whenever a change is made to any of the parameters in this menu, so long as SNTP is enabled.)

    The Last Delta option in the menu displays the last adjustment that was applied to system time due to a drift in the system clock between two successive queries to the SNTP server. This is a read only field.

    Option U, Update System Time, allows you to prompt the switch to poll the SNTP or NTP server for the current time and date. You can use this selection to update the time and date immediately rather than wait for the switch's next polling period. This selection has no effect if you set the date and time manually.

14. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring the Console Startup Mode

You can configure the AT-S63 management software to display either the Main Menu or the command line interface prompt whenever you start a local or Telnet management session. The default is the command line interface.

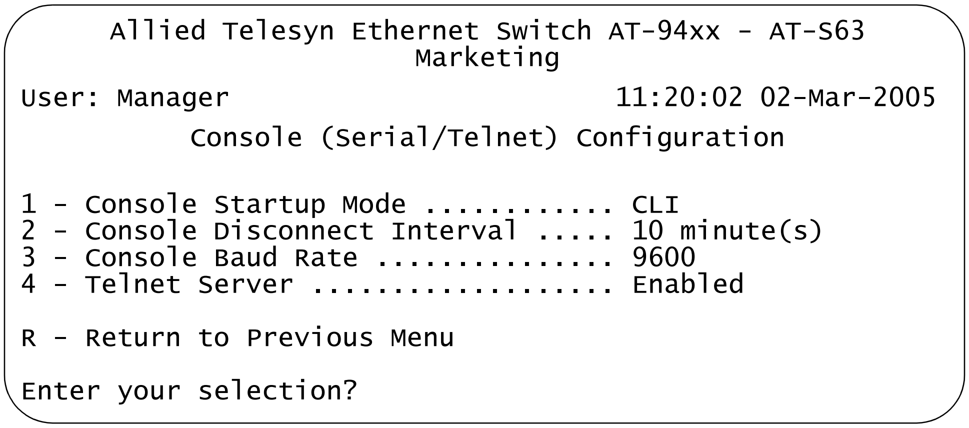
To change the console startup mode, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **3** to select Console (Serial/Telnet) Configuration.

   The Console (Serial/Telnet) Configuration menu is shown in Figure 11.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                       11:20:02 02-Mar-2005
           Console (Serial/Telnet) Configuration

1 - Console Startup Mode ............ CLI
2 - Console Disconnect Interval ..... 10 minute(s)
3 - Console Baud Rate ............... 9600
4 - Telnet Server ................... Enabled

R - Return to Previous Menu

Enter your selection?
```

Figure 11. Console (Serial/Telnet) Configuration Menu

3. Type **1** to toggle Console Startup Mode between Menu and CLI. When the mode is set to Menu, a management session starts by displaying the Main Menu. When the mode is set to CLI, a management session starts with the command line interface prompt. The system default is CLI.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

   A change to the console startup mode takes effect the next time you start a local management session.

Configuring the Console Timer

The AT-S63 management software uses the console timer, also referred to as the console disconnect interval, to automatically end inactive local and remote management sessions. A management session is automatically ended if the management software does not detect any activity from a local or remote management station after the console timer has expired. For example, if you specify two minutes as the console timer, the AT-S63 management software automatically ends a management session if it does not detect any activity from the local or remote management station after two minutes.

This security feature prevents unauthorized individuals from using your management station when you step away from your system while you are configuring a switch. The default for the console timeout value is 10 minutes.

To adjust the console timer, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **3** to select Console (Serial/Telnet) Configuration.

   The Console (Serial/Telnet) Configuration menu is shown in Figure 11 on page 62.

3. From the Console (Serial/Telnet) Configuration menu, type **2** to select Console Disconnect Interval

   The following prompt is displayed:

   ```
   Enter your new value -> [1 to 60]->
   ```

4. Enter a new console timer value. The range is 1 to 60 minutes. The default is 10 minutes.

   A change to the console timer is immediately activated on the switch.

5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Enabling or Disabling the Telnet Server

This procedure describes how to enable or disable the Telnet server on the switch. You might disable the server to prevent individuals from managing the switch with the Telnet application if you intend to use the Secure Shell (SSH) protocol.

To enable or disable the Telnet server, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **3** to select Console (Serial/Telnet) Configuration.

   The Console (Serial/Telnet) Configuration menu is shown in Figure 11 on page 62.

3. From the Console (Serial/Telnet) Configuration menu, type **4** to toggle Telnet Server between Enabled and Disabled.

   Note
   Disable Telnet access if you are using the SSH (Secure Shell) feature. (The SSH feature is not available in all versions of the AT-S63 management software.)

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Setting the Baud Rate of the Serial Terminal Port

The default baud rate of the RJ-45 type serial terminal port on the switch is 9600 bps.

To change the baud rate, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **3** to select Console (Serial/Telnet) Configuration.

   The Console (Serial/Telnet) Configuration menu is shown in Figure 11 on page 62.

3. From the Console (Serial/Telnet) Configuration menu, type **3** to select Console Baud Rate.

   The following prompt is displayed:

   ```
   Supported baud rates are:
   1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200
   Enter new baud rate value --> [1200 to 115200]
   ```

4. Type the desired baud rate value and press Return.

   The following message is displayed:

   Baud rate changed to [baud rate you typed] bps.
   Please change your terminal baud rate correspondingly.
   Press <Enter> to continue.

   Note
   If you are running a local management session, be sure to change your terminal’s baud rate.

5. Press Return.

Pinging a Remote System

You can instruct the switch to ping a remote device on your network. This procedure is useful in determining whether a valid link exists between the switch and another device.

Note
To perform this procedure, the switch must have an IP address.

To instruct the switch to ping a network device, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. For the System Utilities menu, type **3** to select Ping a Remote System.

   The following prompt is displayed:

   ```
   Please enter an IP address ->
   ```

4. Enter the IP address of the end node you want the switch to ping.

   The results of the ping command are displayed on the screen.

5. To stop the ping, press any key.

Returning the AT-S63 Management Software to the Factory Default Values

The procedure in this section returns all AT-S63 management software parameters to the default values. Please note the following before you perform this procedure:

- Returning all parameter settings to their default values also deletes any port-based or tagged VLANs you created on the switch.
- This procedure does not delete files from the AT-S63 file system. To delete files, refer to Chapter 10, ”File System” on page 179.
- This procedure does not delete any encryption keys stored in the key database. To delete encryption keys, refer to “Deleting an Encryption Key” on page 709.
- Returning a switch to its default values does not alter the contents of the active boot configuration file. To reset the file back to the default settings, you must reestablish your management session after the switch reboots and then select Save Configuration changes. Otherwise the switch reverts back to the previous configuration the next time you reset the switch.

Note
The AT-S63 management software default values are listed in Appendix 1, ”AT-S63 Default Settings” on page 1.

To return the AT-S63 management software to the default settings, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **4** to select Reset to Factory Defaults.

   The following prompt is displayed:

   ```
   Do you want to reset to factory defaults? [Yes/No] ->
   ```

4. Type **Y** for yes or **N** to cancel the procedure.

   If you respond with yes, the following prompt is displayed:

```
Do you want to reset static IP, Subnet and Gateway? [Yes/No] ->
```

5. If you type **Y** for yes, all switch parameters including the IP address, subnet mask, and gateway address are changed to the default values. If you type **N** for no, all switch parameters excluding the IP address, subnet mask, and gateway address are changed to the default values.

   The following prompt is displayed:

   ```
   The Factory Defaults take effect only after the Switch
   reboots.
   Do you want to reboot the Switch now? [Yes/No] ->
   ```

6. Type **Y** to reset the switch.

> **Caution**
> The switch does not forward traffic while it reloads its operating software, a process that takes approximately 20 seconds to complete. Some packet traffic may be lost. You must reestablish your management session if you want to continue managing the switch.

7. Reestablish your management session.

8. From the Main Menu, type **S** to select Save Configuration Changes.

   This step returns the active boot configuration file back to the default settings.

Displaying System Hardware Information

You can view information about the system hardware, including details about the fans and temperature settings.

To display the system hardware information, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

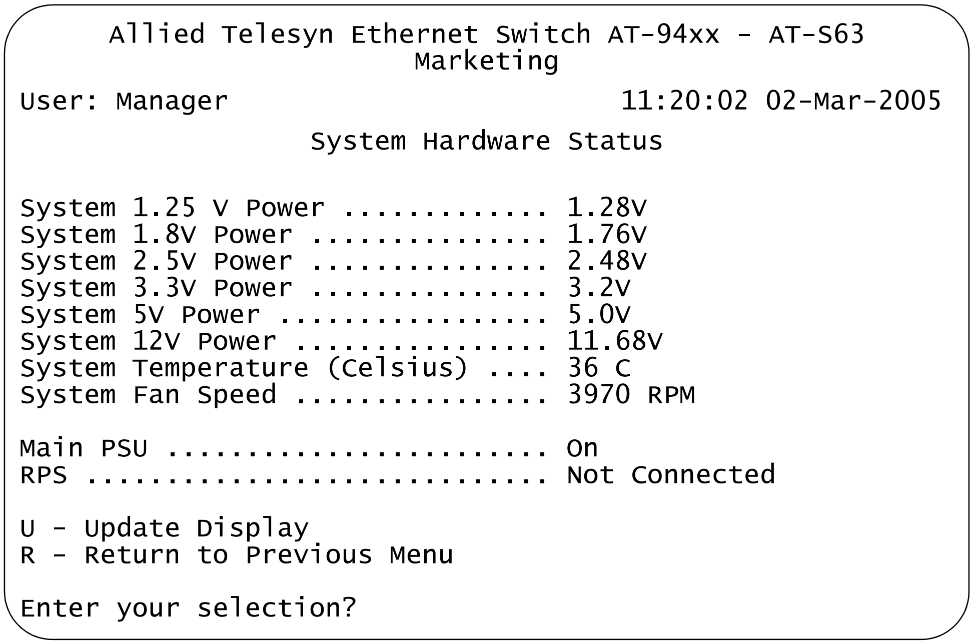
2. From the System Administration menu, type **1** to select System Information

   The System Information menu is shown in Figure 6 on page 51.

3. From the System Information menu, type **H** to select System Hardware Status.

   Note
   Menu selection U, Uplink Information, is described in “Displaying Uplink Port Information” on page 71.

   The System Hardware Status menu is shown in Figure 12.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
                   System Hardware Status


System 1.25 V Power ............. 1.28V
System 1.8V Power ............... 1.76V
System 2.5V Power ............... 2.48V
System 3.3V Power ............... 3.2V
System 5V Power ................. 5.0V
System 12V Power ................ 11.68V
System Temperature (Celsius) .... 36 C
System Fan Speed ................ 3970 RPM

Main PSU ........................ On
RPS ............................. Not Connected

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 12. System Hardware Information Menu

The System Hardware Information menu provides the following information:

System 1.25 V Power
System 1.8V Power
System 2.5 V Power
System 3.3 V Power
System 5 V Power
System 12 V Power
The current voltage of the six power supplies in the switch.

System Temperature (Celsius)
The overall system temperature.

System Fan Speed
The system fan speed.

Main PSU
RPS
The status of the main power supply unit (PSU) and the redundant power supply (RPS).

Note
The information displayed in this menu varies, depending upon the switch model.

4. Return to the Main Menu.

Displaying Uplink Port Information

To display the information about the GBIC or SFP transceivers installed in the uplink ports, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

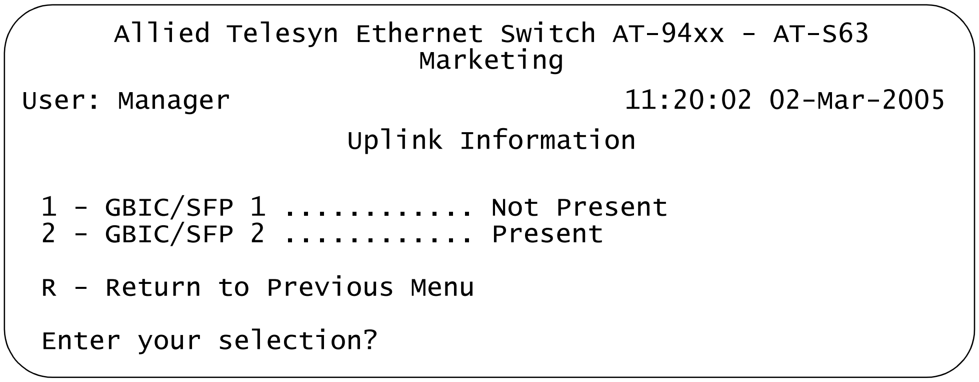
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **1** to select System Information

   The System Information menu is shown in Figure 6 on page 51.

3. From the System Information menu, type **U** to select Uplink Information.

   The Uplink Information menu is shown in Figure 13.



```
          Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                          11:20:02 02-Mar-2005
                      Uplink Information

 1 - GBIC/SFP 1 ........... Not Present
 2 - GBIC/SFP 2 ........... Present

 R - Return to Previous Menu

 Enter your selection?
```

Figure 13. Uplink Information Menu

The Uplink Information menu displays the status of the GBIC/SFP uplink ports, ports 23 and 24. If a GBIC or an SFP transceiver is installed in one of the slots, the display shows "Present." "Not Present" indicates that no GBIC or SFP transceiver is installed in that slot.

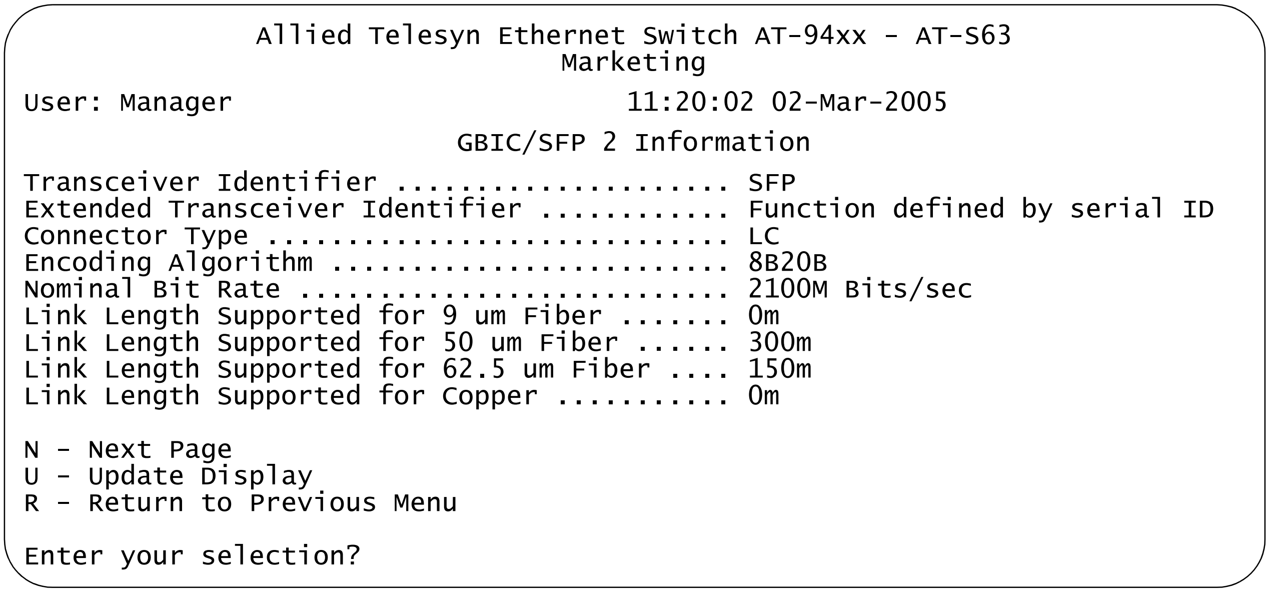
Note

The Uplink Information menu only indicates that a GBIC or an SFP is inserted in the slot. It does not indicate whether or not a fiber optic cable is connected to the GBIC or SFP.

The number of uplink ports shown in the menu varies, depending upon the AT-9400 Series switch model you are displaying.

4. Type the number corresponding to the slot where the transceiver is identified as “Present” to view detailed information about that transceiver. The information displayed depends upon the transceiver vendor and whether the slot contains an SFP or a GBIC transceiver.

   The GBIC/SFP Information menu (page 1) is displayed. Figure 14 shows some possible fields for an SFP.

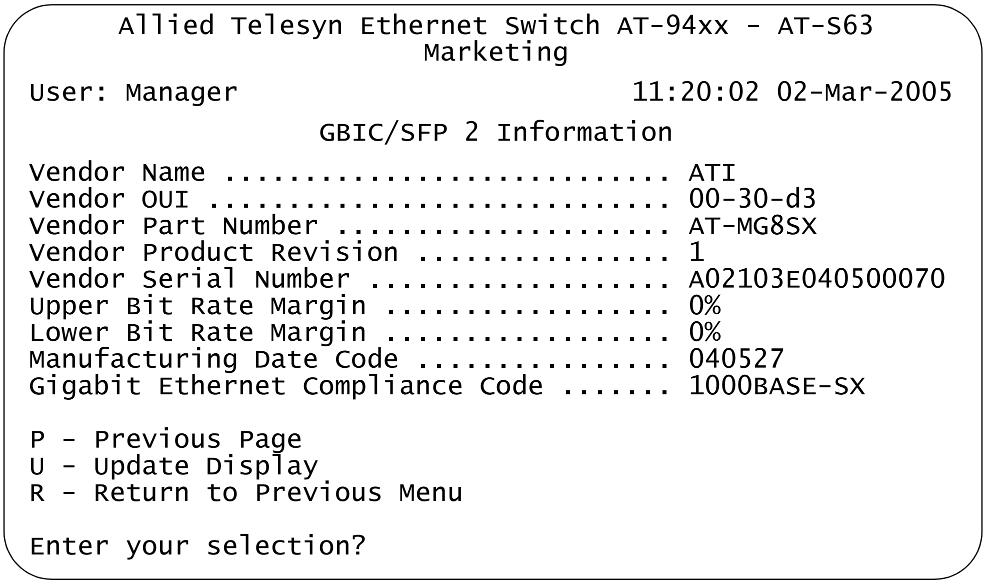


```
                Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                  Marketing
User: Manager                         11:20:02 02-Mar-2005
                            GBIC/SFP 2 Information
Transceiver Identifier .................... SFP
Extended Transceiver Identifier ........... Function defined by serial ID
Connector Type ............................ LC
Encoding Algorithm ........................ 8B20B
Nominal Bit Rate .......................... 2100M Bits/sec
Link Length Supported for 9 um Fiber ....... 0m
Link Length Supported for 50 um Fiber ...... 300m
Link Length Supported for 62.5 um Fiber .... 150m
Link Length Supported for Copper ........... 0m

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 14. GBIC/SFP Information Menu (Page 1)

5. Type **N** for Next Page to view more information.

The GBIC/SFP Information menu (page 2) is displayed. Figure 15 shows some possible fields of information.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                          11:20:02 02-Mar-2005
                     GBIC/SFP 2 Information
Vendor Name ........................... ATI
Vendor OUI ............................ 00-30-d3
Vendor Part Number .................... AT-MG8SX
Vendor Product Revision ............... 1
Vendor Serial Number .................. A02103E040500070
Upper Bit Rate Margin ................. 0%
Lower Bit Rate Margin ................. 0%
Manufacturing Date Code ............... 040527
Gigabit Ethernet Compliance Code ....... 1000BASE-SX

P - Previous Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 15. GBIC/SFP Information Menu (Page 2)

Note
The information displayed in the menus depends upon whether a GBIC or an SFP transceiver is installed and the transceiver vendor.

Chapter 4
SNMPv1 and SNMPv2c

This chapter explains how to activate SNMP management on the switch and how to create, modify, and delete SNMPv1 and SNMPv2c community strings. Sections in the chapter include:

SNMPv1 and SNMPv2c Overview

The Simple Network Management Program (SNMP) is another way for you to manage the switch. This type of management involves viewing and changing the management information base (MIB) objects on the device using an SNMP application program.

The AT-S63 management software supports SNMPv1, SNMPv2c, and SNMPv3. This chapter explains how to configure the switch's software for SNMPv1 and SNMPv2c. For instructions on how to configure the switch for SNMPv3, refer to Chapter 20, ”SNMPv3” on page 369.

The procedures in this chapter show you how to create and manage SNMPv1 and SNMPv2c community strings through which your SNMP application program at your management workstation can access the switch's MIB objects.

You can also configure SNMPv1 and SNMPv2c with the SNMPv3 Table menus described in Chapter 20, ”SNMPv3” on page 369. However, because the SNMPv3 Table menus require a much more extensive configuration, Allied Telesyn recommends configuring SNMPv1 and SNMPv2c with the procedures in this chapter.

To manage a switch using an SNMP application program, you must do the following:

- ❒ Activate SNMP management on the switch. The default setting for SNMP management is disabled. The procedure for this can be found in “Enabling or Disabling SNMP Management” on page 79.
- ❒ Load the Allied Telesyn MIBs for the switch onto your management workstation containing the SNMP application program. The MIBs are available from the Allied Telesyn web site at www.alliedtelesyn.com.

To manage a switch using SNMP, you need to know the IP address of the switch or of a master switch and at least one of the switch's community strings. A community string is a string of alphanumeric characters that gives you access to the switch.

A community string has several attributes that you can use to control who can use the string and what the string will allow a network management to do on the switch. The community string attributes are defined below:

Community String Name
You must give the community string a name. The name can be from one to eight alphanumeric characters. Spaces are allowed.

Access Mode
This defines what the community string will allow a network manager to do. There are two access modes: Read and Read/Write. A community

string with an access mode of Read can only be used to view but not change the MIB objects on a switch. A community string with a Read/Write access can be used to both view the MIB objects and change them.

Operating Status

A community string can be enabled or disabled. When disabled, no one can use it to access the switch. You might disable a community string if you suspect someone is using it for unauthorized access to the device. When a community string is enabled, then it is available for use.

Open or Closed Access Status

You can use this feature to control which management stations on your network can use a community string. If you select the open access status, any network manager who knows the community string can use it. If you assign it a closed access status, then only those network managers working from particular workstations can use it. You specify the workstations by assigning their IP addresses to the community string. A closed community string can have up to eight IP addresses of management workstations assigned to it.

If you decide to activate SNMP management on the switch, it is a good idea to assign a closed status to all community strings that have a Read/Write access mode and then assign the IP addresses of your management workstations to those strings. This helps reduce the chance of someone gaining management access to a switch through a community string and making unauthorized configuration changes.

Trap Receivers

A trap is a signal sent to one or more management workstations by the switch to indicate the occurrence of a particular operating event on the device. There are numerous operating events that can trigger a trap. For instance, resetting the switch or the failure of a cooling fan are two examples of occurrences that cause a switch to send a trap to the management workstations. You can use traps to monitor activities on the switch.

Trap receivers are the devices, typically management workstations or servers, that you want to receive the traps sent by the switch. You specify the trap receivers by their IP addresses. You assign the IP addresses to the community strings.

Each community string can have up to eight trap IP addresses.

It does not matter which community strings you assign your trap receivers. When the switch sends a trap, it looks at all the community strings and sends the trap to all trap receivers on all community strings. This is true even for community strings that have a access mode of only Read.

If you are not interested in receiving traps, then you do not need to enter any IP addresses of trap receivers.

Default SNMP Community Strings

The AT-S63 management software provides two default community strings: public and private. The public string has an access mode of just Read and the private string has an access mode of Read/Write. If you activate SNMP management on the switch, you should delete or disable the private community string, which is a standard community string in the industry, or change its status from open to closed to prevent unauthorized changes to the switch.

Enabling or Disabling SNMP Management

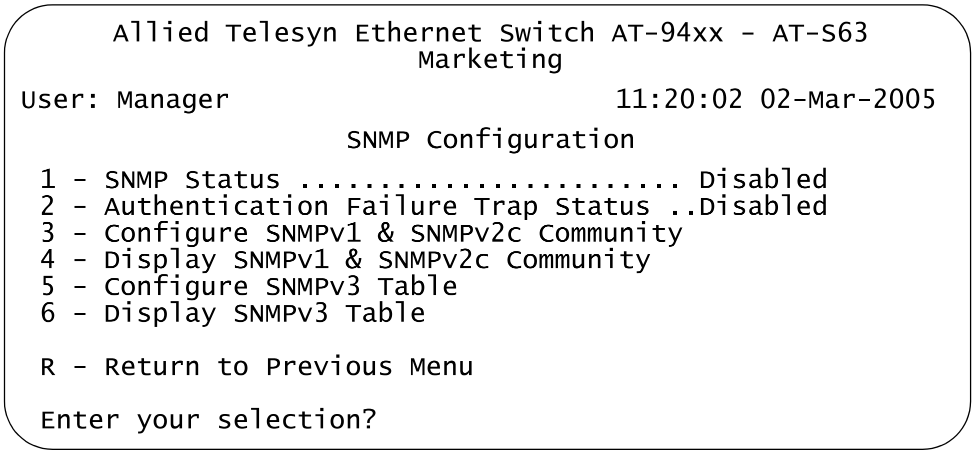
To enable or disable SNMP management for the switch, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **5** to select SNMP Configuration.

   The SNMP Configuration menu is shown in Figure 16.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                         11:20:02 02-Mar-2005
                      SNMP Configuration
 1 - SNMP Status ........................ Disabled
 2 - Authentication Failure Trap Status ..Disabled
 3 - Configure SNMPv1 & SNMPv2c Community
 4 - Display SNMPv1 & SNMPv2c Community
 5 - Configure SNMPv3 Table
 6 - Display SNMPv3 Table

 R - Return to Previous Menu

 Enter your selection?
```

Figure 16. SNMP Configuration Menu

3. From the SNMP Configuration menu, type **1** to toggle the SNMP Status option between its two settings of Enabled and Disabled. When set to Disabled, the default, you cannot manage the switch using SNMP. When set to Enabled, you can manage the switch using SNMP.

   A change to the SNMP status is immediately activated on the switch.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Setting the Authentication Failure Trap

As mentioned in the SNMP Overview section in this chapter, a trap is a message sent by the switch to a management workstation or server to signal an operating event, such as when the device is reset.

An authentication failure trap is similar to other the traps. It too signals an operating event on the switch. But this trap is somewhat special because it relates to SNMP management. A switch that sends this trap could be indicating an attempt by someone to gain unauthorized management access using an SNMP application program to the switch. There are two events that can cause a switch to send this trap:

- An SNMP management station attempts to access the switch using an incorrect or invalid community name.
- An SNMP management station tried to access a closed access community string, to which its IP address is not assigned.

Given the importance of this trap to the protection of your switch, the management software allows you to disable and enable it separately from the other traps. If you enable it, the switch will send this trap if either of the above events occur. If you disable it, the switch will not send this trap. The default is disabled.

If you enable this trap, be sure to add one or more IP addresses of trap receivers to the community strings so that the switch will know where to send the trap if it needs to.

To enable or disable the authentication trap, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **5** to select SNMP Configuration.

   The SNMP Configuration menu is shown in Figure 16 on page 79.

3. From the SNMP Configuration menu, type **2** to toggle Authentication Failure Trap Status between enabled and disabled. The default is disabled.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Creating an SNMP Community String

To create a new SNMP community string, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

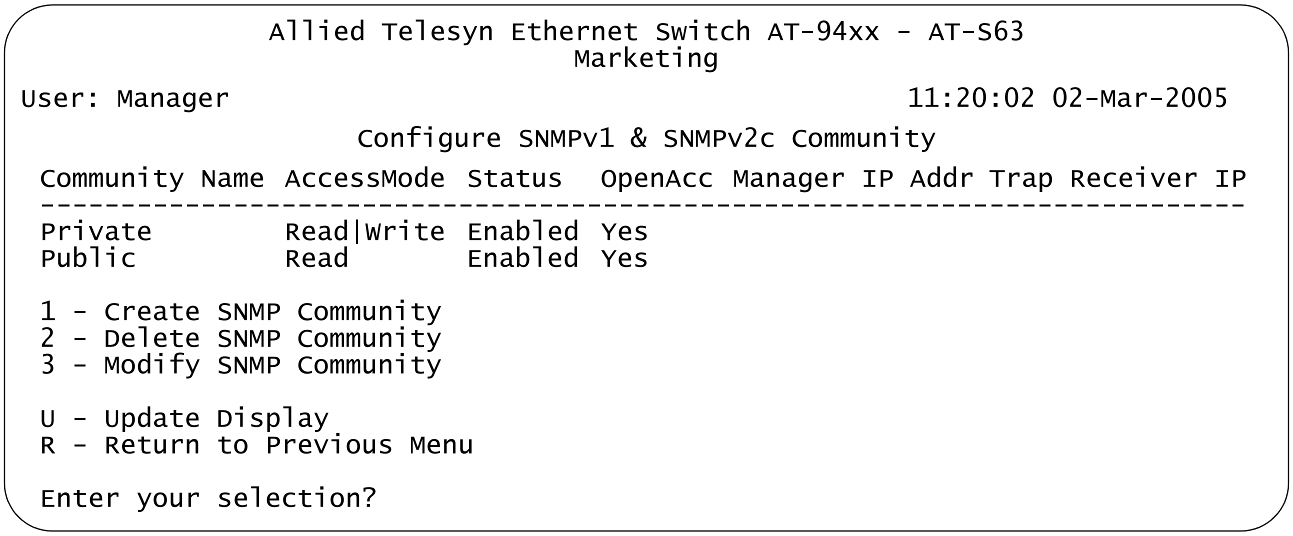
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **5** to select SNMP Configuration.

   The SNMP Configuration menu is shown in Figure 16 on page 79.

3. From the SNMP Configuration menu, type **3** to select Configure SNMPv1 & SNMPv2c Community.

   The Configure SNMPv1 & SNMPv2c Community menu is shown in Figure 17.



```
                Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                   Marketing
User: Manager                                                  11:20:02 02-Mar-2005
                         Configure SNMPv1 & SNMPv2c Community
 Community Name AccessMode Status   OpenAcc Manager IP Addr Trap Receiver IP
 ---------------------------------------------------------------------------
 Private        Read|Write Enabled Yes
 Public         Read       Enabled Yes

 1 - Create SNMP Community
 2 - Delete SNMP Community
 3 - Modify SNMP Community

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 17. SNMPv1 & SNMPv2c Community Menu

This menu lists the current community strings on the switch and their attributes. For attribute definitions, refer to "SNMPv1 and SNMPv2c Overview" on page 76.

4. Type **1** to select Create SNMP Community.

   The following prompt is displayed:

   ```
   Enter SNMP Community Name:
   ```

5. Enter the new SNMP community string. The name can be from one to fifteen alphanumeric characters. Spaces are allowed.

The following prompt is displayed:

```
Enter Access Mode [R-Read Only, W-Read/Write]:
```

6. Specify the access mode for the new SNMP community string. If you specify Read, the community string will only allow you to view the MIB objects on the switch. If you specify Read/Write, the community string will allow you to both view and change the SNMP MIB objects on the switch.

   The following prompt is displayed:

```
Enter Open Access Status [Y-Yes, N-No]:
```

7. Specify the open access status. If you enter Yes, any network manager who knows the community string can use it. If you respond with No, making it closed access, only those management workstations whose IP addresses you assign to the community string can use it.

   The following prompt is displayed:

```
Enter SNMP Manager IP Addr:
```

8. If in Step 7 you responded with No making this a closed community string, specify the IP address of the management workstation that can use the string. A community string can have up to eight IP addresses of management workstations. But you can assign only one to it initially with this procedure. To add additional IP addresses, refer to “Modifying a Community String” on page 84.

   If you assigned the community string an access status of open, leave this field blank by pressing Return.

   The following prompt is displayed:

```
Enter Trap Receiver IP Addr:
```

9. If you want the switch to send traps to a management workstation or server, enter the IP address of the node here. A community string can have up to eight IP addresses of trap receivers. But you can assign only one initially with this procedure. To add additional IP addresses, refer to “Modifying a Community String” on page 84.

   If you do not want to add a IP address of a trap receiver to the community string, leave this field blank by pressing Return.

   The AT-S63 management software creates the new community string and adds it to the list in the SNMP Community menu. A new community string is immediately available for use to manage the switch.

10. If desired, repeat this procedure starting with Step 4 to create additional community strings.

11. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a Community String

To modify a community string, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **5** to select SNMP Configuration.

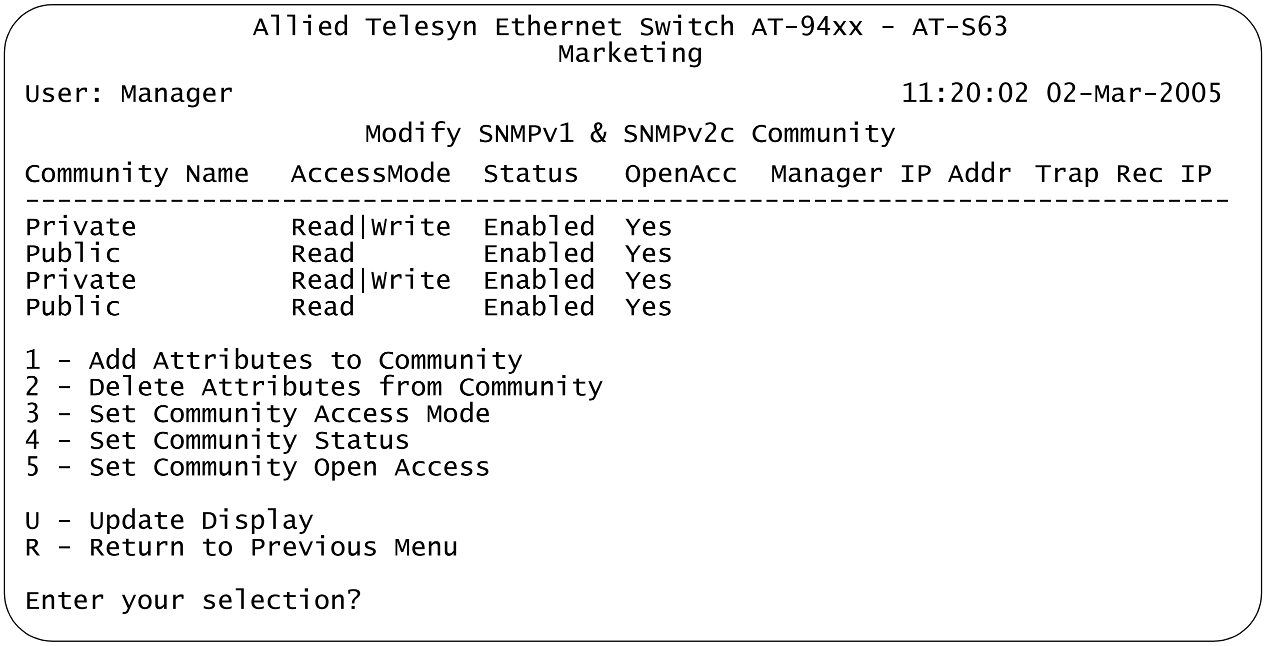
   The SNMP Configuration menu is shown in Figure 16 on page 79.

3. From the SNMP Configuration menu, type **3** to select Configure SNMPv1 &SNMPv2c Community.

   The Configure SNMPv1 &SNMPv2c Community menu in shown in Figure 17 on page 81.

4. From the Configure SNMPv1 &SNMPv2c Community menu, type **3** to select Modify SNMP Community.

   The Modify SNMP Community menu is shown in Figure 18.



```
               Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                  Marketing
User: Manager                                         11:20:02 02-Mar-2005
                        Modify SNMPv1 & SNMPv2c Community
Community Name   AccessMode  Status   OpenAcc  Manager IP Addr  Trap Rec IP
---------------------------------------------------------------------------
Private          Read|Write  Enabled  Yes
Public           Read        Enabled  Yes
Private          Read|Write  Enabled  Yes
Public           Read        Enabled  Yes

1 - Add Attributes to Community
2 - Delete Attributes from Community
3 - Set Community Access Mode
4 - Set Community Status
5 - Set Community Open Access

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 18. Modify SNMP Community Menu

This menu lists the current community strings on the switch and their attributes. For attribute definitions, refer to “SNMPv1 and SNMPv2c Overview” on page 76.

The menu options are described below:

1 - Add Attributes to Community
If a community string has a closed access mode, you can use this selection to add new IP addresses of management workstations that can use the string. You can also use this option to add IP addresses of new trap receivers. To use this option, do the following:

a. From the Modify SNMP Community menu, type **1** to select Add Attributes to Community. The following prompt is displayed:

```
Enter SNMP Community Name:
```

b. Enter the community string you want to modify. Community strings are case sensitive. This prompt is displayed:

```
Enter SNMP Manager IP Addr:
```

c. If you are modifying a community string with a closed access mode and you want to add an IP address of a management workstation to it, enter the workstation’s IP address at the prompt. Otherwise, just press Return. A community string can have a maximum of eight IP addresses, but you can add only one at a time with this procedure. This prompt is displayed:

```
Enter Trap Receiver IP Addr:
```

d. If you want the switch to send traps to a trap receiver, enter the IP address of the receiver at this prompt. Otherwise, just press Return.

   The community string is modified and the Modify SNMP Configuration menu is displayed again.

e. Repeat this procedure to modify other community strings.

f. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

2 - Delete Attributes from Community
Use this option to delete an IP address of a management workstation or a trap receiver from a community string. To use this option, do the following:

a. From the Modify SNMP Community menu, type **2** to select Delete Attributes from Community. The following prompt is displayed:

```
Enter SNMP Community Name:
```

b. Enter the community string you want to modify. Community strings are case sensitive. This prompt is displayed:

```
Enter SNMP Manager IP Addr:
```

c. If you want to remove the IP address of a management workstation from the community string, enter the IP address at the prompt. Otherwise, just press Return. This prompt is displayed:

```
Enter Trap Receiver IP Addr:
```

d. If you want to remove the IP address of a trap receiver from the community string, enter the IP address at the prompt. Otherwise, just press Return.

e. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

3 - Set Community Access Mode
Use this option to change a community string's Read or Read/Write status. To use the selection, do the following:

a. From the Modify SNMP Community menu, type **3** to select Set Community Access Mode. The following prompt is displayed:

```
Enter SNMP Community Name:
```

b. Enter the community string you want to modify. Community strings are case sensitive. The following prompt is displayed:

```
Enter Access Mode [R-Read Only, W-Read/Write]:
```

c. Type **R** to change the string's status to Read only, or **W** for Read/Write. This confirmation prompt is displayed:

```
Do you want to change this Community Access Mode? (Y/
N): [Yes/No] ->
```

d. Type **Y** to change the string's access mode or **N** to cancel the change.

e. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

4 - Set Community Status
Use this option to enable or disable a community string. When disabled, no one can use the community string to access the switch. To use the selection, do the following:

a. From the Modify SNMP Community menu, type **4** to select Set Community Status. The following prompt is displayed:

```
Enter SNMP Community Name:
```

b. Enter the community string you want to modify. Community strings are case sensitive. The following prompt is displayed:

```
Enter Community Status [E-Enable, D-Disable]:
```

c. Type **E** to enable the community string or **D** to disable it. This confirmation prompt is displayed:

```
Do you want to change Community Status? (Y/N): [Yes/No] ->
```

d. Type **Y** to change the string's status or **N** to cancel the change.

e. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

5 - Set Community Open Status

Use this selection to change a string's open status. A string with an open status can be used by any network administrator. A string with a closed status can only be used from management workstations whose IP addresses are assigned to the community string. To use the option, do the following:

a. From the Modify SNMP Community menu, type **5** to select Set Community Open Status. The following prompt is displayed:

```
Enter SNMP Community Name:
```

b. Enter the community string you want to modify. Community strings are case sensitive. The following prompt is displayed:

```
Enter Open Access Status [Y-Yes, N-No]:
```

c. Type **Y** to assign the string an open status or **N** to assign it a closed status. This confirmation prompt is displayed:

```
Do you want to change Open Access Status? (Y/N): [Yes/No] ->
```

d. Type **Y** to change the string's open status or **N** to cancel the change.

e. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying the SNMP Community Strings

To display the attributes of all the SNMP community strings on the switch, use the following procedure:

1. From the Main Menu, type **5** to select System Administration.

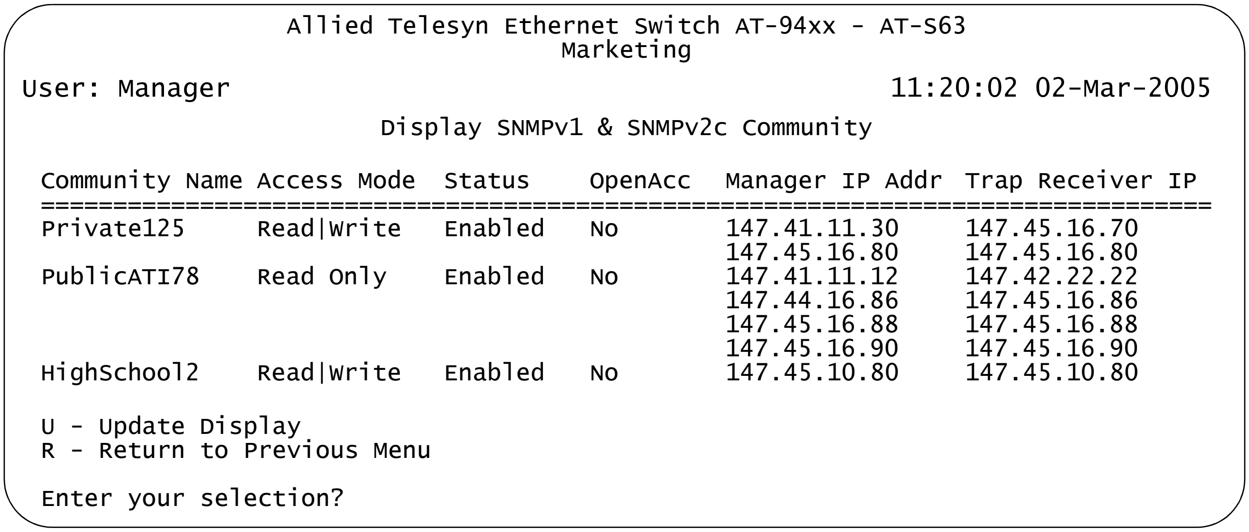
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **5** to select SNMP Configuration.

   The SNMP Configuration menu is shown in Figure 16 on page 79.

3. From the SNMP Configuration menu, type **4** to select Display SNMPv1 & SNMPv2c Community.

   The Display SNMPv1 & SNMPv2c Community menu is shown in Figure 19.



```
                 Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                   Marketing
User: Manager                                              11:20:02 02-Mar-2005
                          Display SNMPv1 & SNMPv2c Community

 Community Name Access Mode  Status    OpenAcc   Manager IP Addr  Trap Receiver IP
 ================================================================================
 Private125     Read|Write   Enabled   No        147.41.11.30     147.45.16.70
                                                 147.45.16.80     147.45.16.80
 PublicATI78    Read Only    Enabled   No        147.41.11.12     147.42.22.22
                                                 147.44.16.86     147.45.16.86
                                                 147.45.16.88     147.45.16.88
                                                 147.45.16.90     147.45.16.90
 HighSchool2    Read|Write   Enabled   No        147.45.10.80     147.45.10.80

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 19. Display SNMP Community Menu

For attribute definitions, refer to “SNMPv1 and SNMPv2c Overview” on page 76.

Chapter 5
Enhanced Stacking

This chapter explains the enhanced stacking feature. The sections in this chapter include:

Enhanced Stacking Overview

The enhanced stacking feature can make it easier for you to manage the AT-9400 Series switches in your network. It offers the following benefits:

- ❒ You can manage up to 24 switches from one local or remote management session. This eliminates the need of having to initiate a separate management session with each switch in your network.
- ❒ The switches can share the same IP address. This reduces the number of IP addresses that you need to assign to your network devices for remote management.
- ❒ Remotely managing a new switch in your network is simplified. You connect it to your network. After the switch is connected to the network, you can manage it immediately from any management station in your network.

Enhanced Stacking Guidelines

There are a few guidelines to keep in mind when implementing enhanced stacking for your network:

- ❒ An enhanced stack cannot span subnets.
- ❒ All of the switches in an enhanced stack must use the same management VLAN. For information about Management VLANs, refer to “Specifying a Management VLAN” on page 581.
- ❒ A subnet can contain more than one enhanced stack. You can create different enhanced stacks within a subnet by assigning the switches to different Management VLANs.
- ❒ An enhanced stack must have at least one master switch.
- ❒ The master switch can be any switch that supports enhanced stacking, such as an AT-8000 Series switch, an AT-8400 Series switch, or an AT-9400 Series switch.
- ❒ You should assign the master switch an IP address and subnet mask.

Note
No IP address is required if you intend to manage the enhanced stack solely through the RJ-45 serial terminal port on a master switch. However, remote management of a stack using Telnet, a web browser, or an SNMP application does require assigning an IP address and subnet mask to a master switch.

- ❒ You must set a master switch’s stacking status to master.
- ❒ The enhanced stacking feature uses the IP address 172.16.16.16. Do not assign this address to any device on your subnet if you intend to use the enhanced stacking feature.

There are three basic tasks to implement this feature on your network:

❒ You must select a switch in each subnet of your network to function as the master switch of the enhanced stack for that subnet.

The master switch can be any switch that supports enhanced stacking, such as an AT-8000 Series switch, an AT-8400 Series switch, or an AT-9400 Series switch. For networks that consist of more than one subnet, there must be at least one master switch in each subnet.

Allied Telesyn recommends that each enhanced stack have two master switches, each assigned a unique IP address. That way, should you remove one of the master switches from the network, such as for maintenance, you all still be able to remotely manage the switches in the stack using the other master switch.

❒ You should assign each master switch a unique IP address and a subnet mask.

A master switch should have a unique IP address and a subnet mask. The other switches in an enhanced stack, referred to as slave switches, do not need an IP address.

If an enhanced stack will have more than one master switch, you must assign each master switch a unique IP address.

Note
You can set the IP address manually or activate the BOOTP and DHCP services on a master switch and have the master switch obtain its IP information from a BOOTP or DHCP server on your network. Initially assigning an IP address or activating the BOOTP and DHCP services can only be performed through a local management session.

For instructions on how to set the IP address manually, refer to "Configuring the IP Address, Switch Name, and Other Basic Parameters" on page 46. For instructions on activating the BOOTP and DHCP services, refer to "Activating the BOOTP or DHCP Client Software" on page 49.

Note
No IP address is required if you intend to manage the enhanced stack solely through the RJ-45 serial terminal port on a master switch. However, remote management of a stack using Telnet, a web browser, or an SNMP application does require assigning an IP address and subnet mask to a master switch.

❒ Change the enhanced stacking status of the master switch to master.

This is explained in “Setting a Switch’s Enhanced Stacking Status” on page 93.

Figure 20 is an example of the enhanced stacking feature.

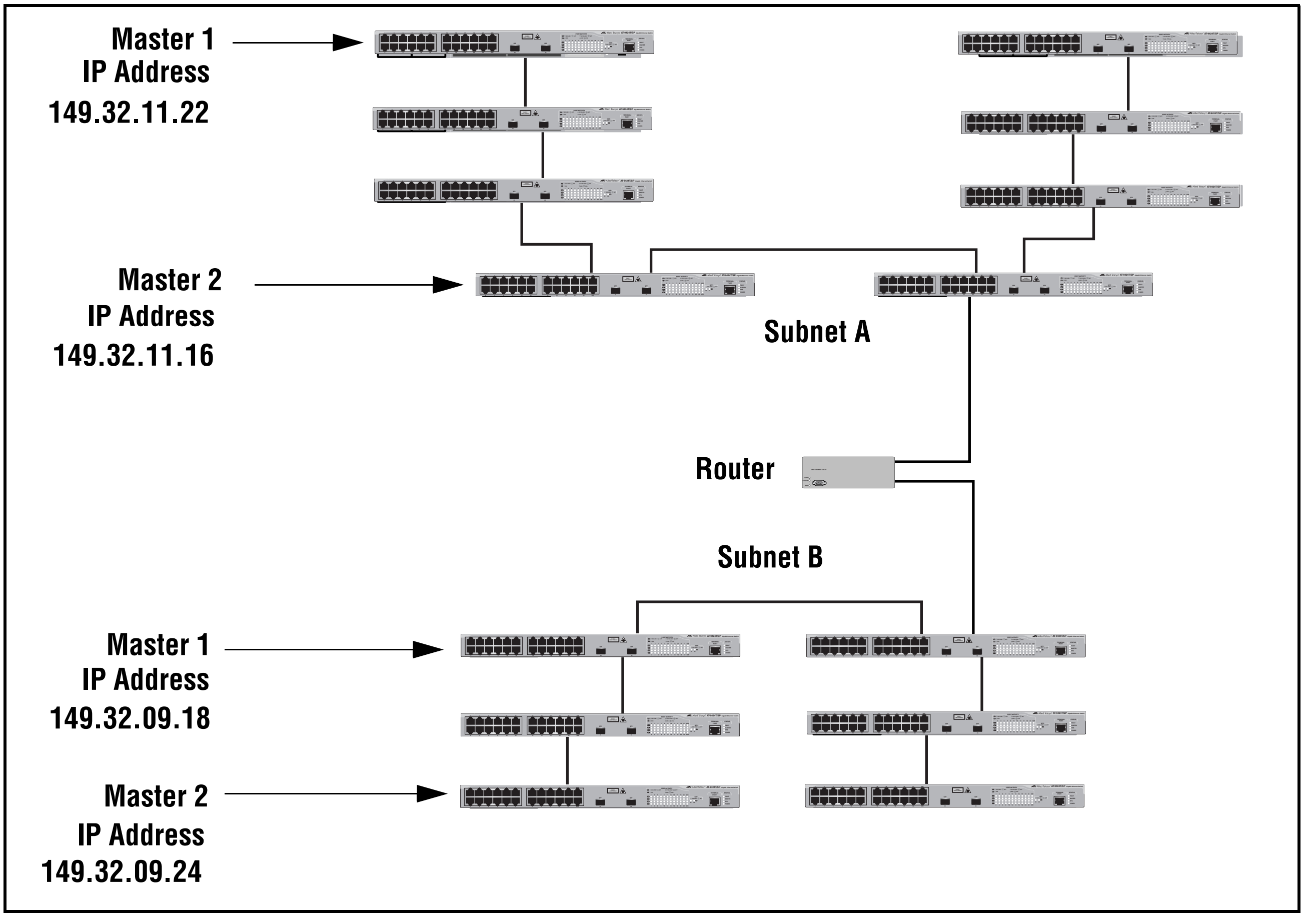


Figure 20. Enhanced Stacking Example

The example consists of a network of two subnets interconnected with a router. Two AT-9400 Series switches in each subnet have been selected as the master switches of their respective subnets, and each has been assigned a unique IP address.

To manage the switches of a subnet, you can start a local management session or a remote Telnet management session on one of the master switches in the subnet. You then have management access to all enhanced stacking switches in the same subnet.

Setting a Switch’s Enhanced Stacking Status

The enhanced stacking status of the switch can be master switch, slave switch, or unavailable. Each status is described below:

- Master switch - A master switch of a stack can be used to manage all the other switches in a subnet. After you establish a local or remote management session with the master switch, you can access and manage all the switches in the subnet.
- A master switch must have a unique IP address. You can manually assign a master switch an IP address or activate the BOOTP and DHCP services on the switch.
- Slave switch - A slave switch can be remotely managed through a master switch. It does not need an IP address or subnet mask.
- Unavailable - A switch with an unavailable stacking status cannot be remotely managed through a master switch. A switch with this designation can be managed locally. To be managed remotely, a switch with an unavailable stacking status must be assigned a unique IP address.

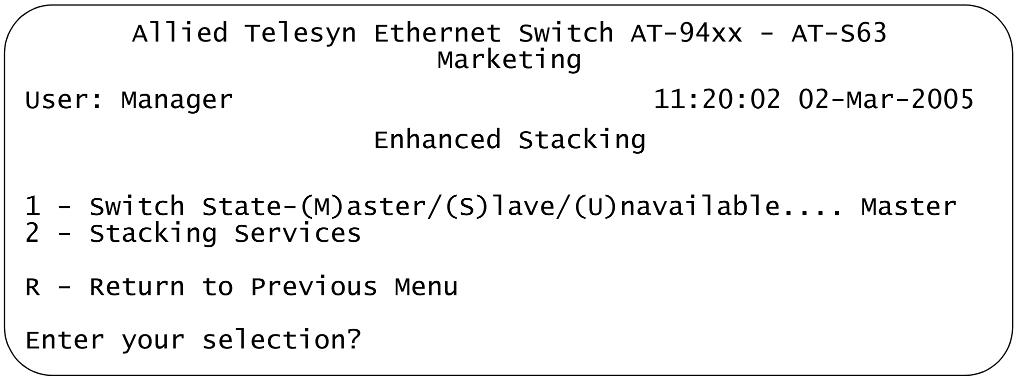
Note
The default setting for a switch is slave.

Note
You cannot change the stacking status of a switch accessed through enhanced stacking. To change the stacking status of a switch that does not have an IP address or subnet mask, such as a slave switch, you must use a local management session. If the switch has an IP address and subnet mask, such as a master switch, you can use either a local or a Telnet management session.

To adjust a switch’s enhanced stacking status, perform the following procedure:

1. From the Main Menu, type **8** to select Enhanced Stacking.

The Enhanced Stacking menu is shown in Figure 21.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                      Enhanced Stacking

1 - Switch State-(M)aster/(S)lave/(U)navailable.... Master
2 - Stacking Services

R - Return to Previous Menu

Enter your selection?
```

Figure 21. Enhanced Stacking Menu

The menu displays the current status of the switch at the end of selection “1 - Switch State.” For example, the switch’s current status in the figure above is master.

Note
Item 2, Stacking Services, is only displayed on master switches.

2. To change a switch’s stacking status, type **1** to select Switch State.

   The following prompt is displayed.

   ```
   Enter new setup (M/S/U) ->
   ```

3. Type **M** to change the switch to a master switch, **S** to make it a slave switch, or **U** to make the switch unavailable. Press Return.

   A change to the status is immediately activated on the switch.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Selecting a Switch in an Enhanced Stack

Before you perform a procedure on a switch in an enhanced stack, you should first check to be sure that you are performing it on the correct switch. If you assigned system names to your switches, this should be easy. The name of the switch being managed is always displayed at the top of every management menu.

When you start a local or remote management session on the master switch of an enhanced stack, you are by default addressing that particular switch. The management tasks that you perform affect only the master switch.

To manage a slave switch or another master switch in the stack, you need to select it from the AT-S63 management software.

To select a switch to manage in an enhanced stack, perform the following procedure:

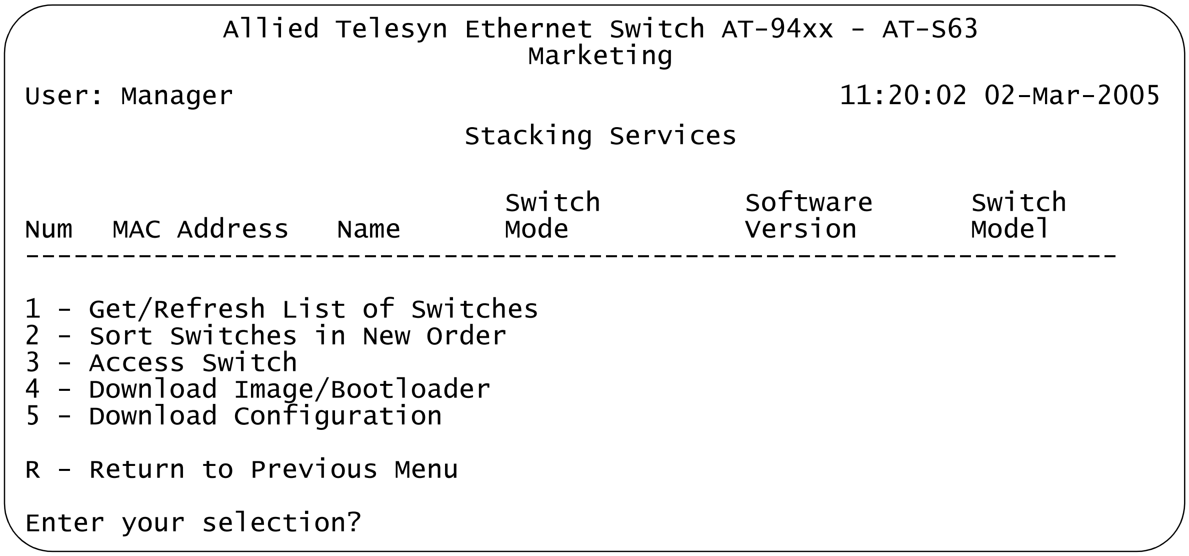
1. From the Main Menu, type **8** to select Enhanced Stacking.

   The Enhanced Stacking menu is shown in Figure 21 on page 94.

2. From the Enhanced Stacking menu, type **2** to select Stacking Services.

   Note
   Item 2, Stacking Services, is only displayed on master switches.

   The Stacking Services menu is shown in Figure 22.

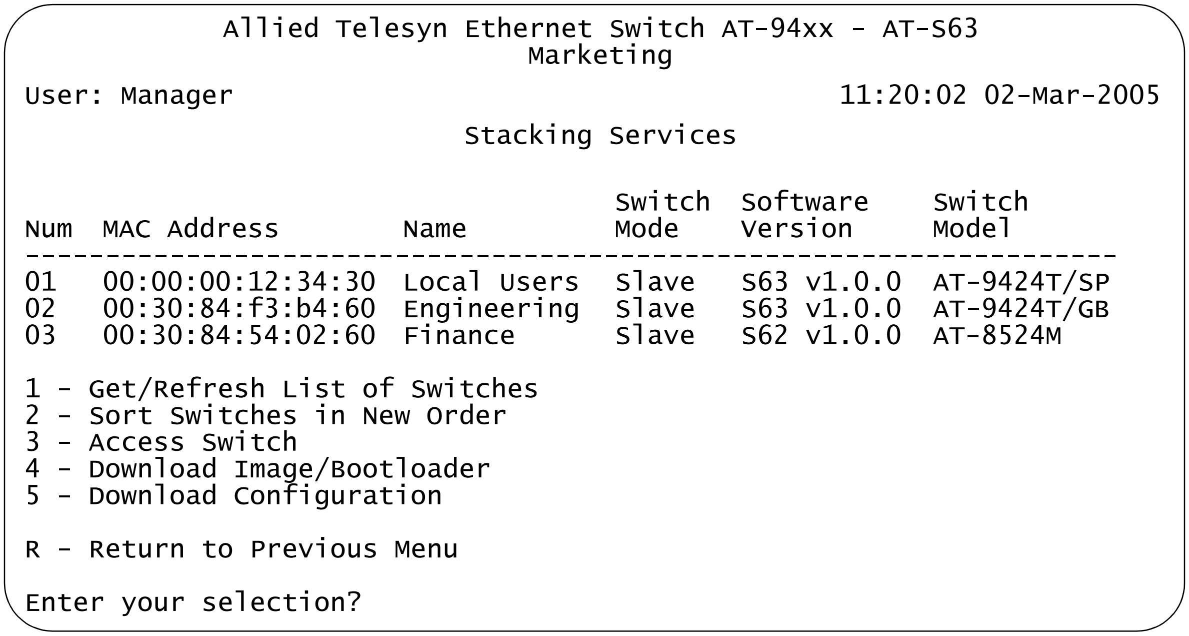


```
             Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                Marketing
User: Manager                                       11:20:02 02-Mar-2005
                             Stacking Services


                              Switch         Software      Switch
Num   MAC Address   Name      Mode           Version       Model
--------------------------------------------------------------------

1 - Get/Refresh List of Switches
2 - Sort Switches in New Order
3 - Access Switch
4 - Download Image/Bootloader
5 - Download Configuration

R - Return to Previous Menu

Enter your selection?
```

Figure 22. Stacking Services Menu

3. From the Stacking Services menu, type **1** to select Get/Refresh List of Switches.

   The master switch polls the subnet for all slave and master switches that are a part of the enhanced stack and displays a list of the switches in the Stacking Services menu, as shown in the example in Figure 23.



```
             Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                               Marketing
User: Manager                                    11:20:02 02-Mar-2005
                            Stacking Services

                                      Switch  Software    Switch
Num  MAC Address       Name           Mode    Version     Model
--------------------------------------------------------------------
01   00:00:00:12:34:30  Local Users    Slave   S63 v1.0.0  AT-9424T/SP
02   00:30:84:f3:b4:60  Engineering    Slave   S63 v1.0.0  AT-9424T/GB
03   00:30:84:54:02:60  Finance        Slave   S62 v1.0.0  AT-8524M

1 - Get/Refresh List of Switches
2 - Sort Switches in New Order
3 - Access Switch
4 - Download Image/Bootloader
5 - Download Configuration

R - Return to Previous Menu

Enter your selection?
```

Figure 23. Stacking Services Menu With List of Switches

   The master switch on which you started the management session is not included in the list, nor are any switches with an enhanced stacking status of Unavailable.

   By default, the switches are sorted in the menu by MAC address. You can sort the switches by name as well. To do this, select option 2, Sort Switches in New Order.

   Note
   Item 4, Download Image/Bootloader, downloads the AT-S63 image from a master switch to another AT-9400 Series switch in the subnet, as explained in “Downloading an AT-S63 Image File Switch to Switch” on page 212. Item 5, Download Configuration, allows you to download a configuration file from a master switch to another AT-9400 Series switch in the subnet, as explained in “Downloading a System File” on page 216.

4. To manage a new switch, type **3** to select Access Switch.

   A prompt similar to the following is displayed:

   ```
   Enter the switch number -> [1 to 24]
   ```

5. Type the number of the switch in the list you want to manage.

   A prompt is displayed if the switch has been assigned a password.

6. Enter the appropriate username and password for the switch.

   The Main Menu of the selected switch is displayed. You now can manage the switch. Any management tasks you perform effect only the selected switch.

Returning to the Master Switch

When you have finished managing a slave switch, return to the Main Menu of the slave switch and type **Q** for Quit. This returns you to the Stacking Services menu. After you see that menu, you are again addressing the master switch from which you started the management session.

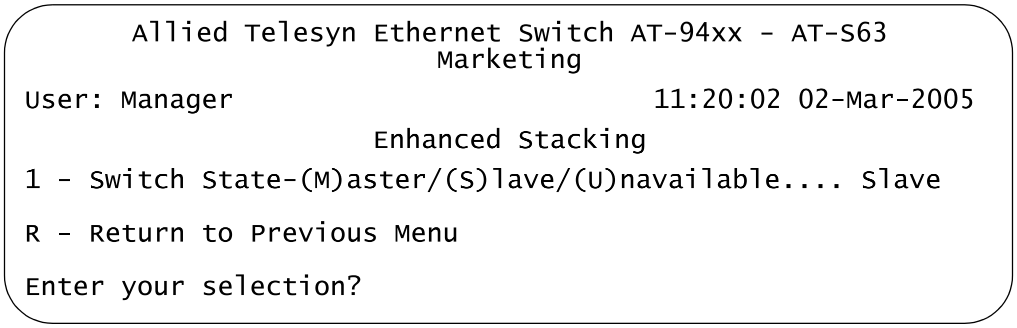
You can either select another switch in the list to manage or, if you want to manage the master switch, type **R** twice to return to the master switch's Main Menu.

Displaying the Enhanced Stacking Status

To view the stacking status of a switch in a stack, perform the following procedure:

1. From the Main Menu, type **8** to select Enhanced Stacking.

   The Enhanced Stacking menu is shown in Figure 24.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                          11:20:02 02-Mar-2005
                       Enhanced Stacking
1 - Switch State-(M)aster/(S)lave/(U)navailable.... Slave

R - Return to Previous Menu

Enter your selection?
```

Figure 24. Enhanced Stacking Menu

   The menu shows the enhanced stacking status of the switch you selected.

Chapter 6

Port Parameters

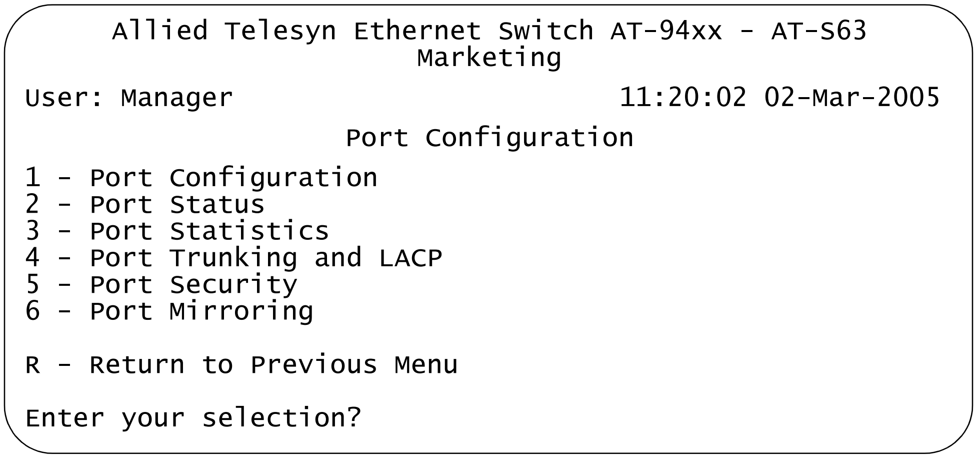
This chapter contains the procedures for viewing and changing the parameter settings for the individual ports on a switch, and contains the following procedures:

Configuring Port Parameters

To configure the most basic parameter settings for a port, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                    Port Configuration
1 - Port Configuration
2 - Port Status
3 - Port Statistics
4 - Port Trunking and LACP
5 - Port Security
6 - Port Mirroring

R - Return to Previous Menu

Enter your selection?
```

Figure 25. Port Configuration Menu

2. From the Port Configuration menu, type **1** to select Port Configuration.

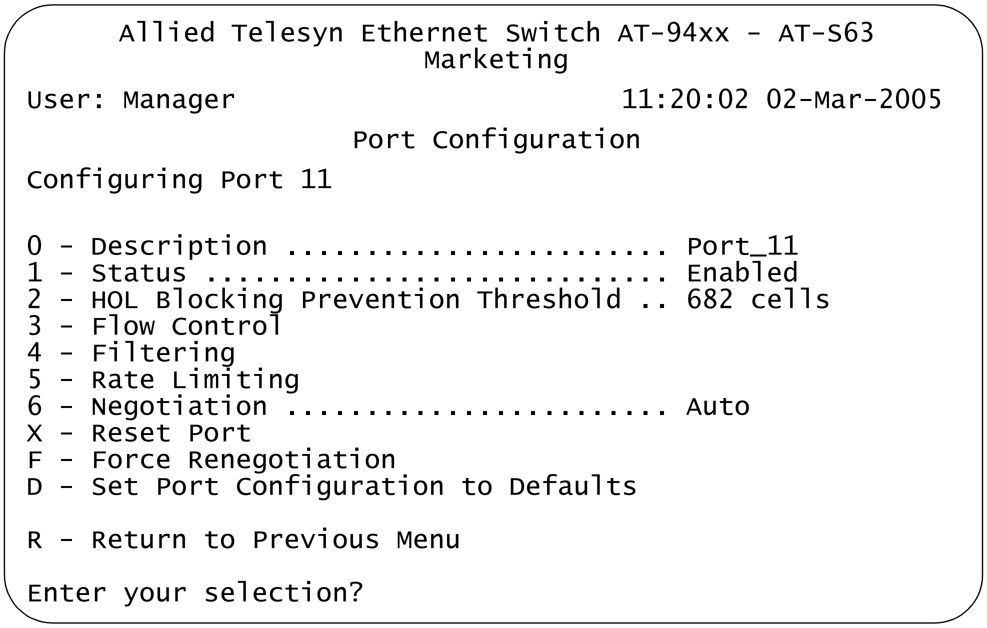
   The following prompt is displayed:

   ```
   Enter port-list ->
   ```

3. Enter the number of the port you want to configure. You can specify more than one port at a time. You can specify ports individually (for example, 5,7,22), as a range (for example, 18-23), or both (for example 1,5,14-22). You cannot specify nonconsecutive ports (for example, 5,7,9).

Note
To configure SFP or GBIC port 23 or 24 on an AT-9424 switch, the port must have a valid link to an end node. If no SFP or GBIC is installed or if it does not have a valid link, your configuration changes affect the corresponding twisted pair port, 23R or 24R. You cannot configure twisted pair port 23R or 24R if its corresponding SFP or GBIC port has a valid link to an end node.

The Port Configuration menu is shown in Figure 26.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                        11:20:02 02-Mar-2005
                      Port Configuration
Configuring Port 11

0 - Description ....................... Port_11
1 - Status ............................ Enabled
2 - HOL Blocking Prevention Threshold .. 682 cells
3 - Flow Control
4 - Filtering
5 - Rate Limiting
6 - Negotiation ....................... Auto
X - Reset Port
F - Force Renegotiation
D - Set Port Configuration to Defaults

R - Return to Previous Menu

Enter your selection?
```

Figure 26. Port Configuration (Port) Menu

Note
If you are configuring multiple ports and the ports have different settings, the Port Configuration menu displays the settings of the lowest numbered port. After you have configured the settings the port, all of its settings are copied to the other selected ports.

4. Adjust the following parameters as necessary.

Note
A change to a parameter is immediately activated on the port.

0 - Description
You use this option to assign a description to a port, from 1 to 15 alphanumeric characters. Spaces are allowed, but you should not use special characters, such as asterisks or exclamation points. (You cannot set a port description if you are configuring more than one port.)

1 - Status
You use this option to enable or disable a port. When disabled, a port does not forward frames to or from the node connected to the port.

You might want to disable a port and prevent packets from being forwarded if a problem occurs with the node or cable connected to the port. After the problem has been fixed, you can enable the port again to resume normal operation.

You might also want to disable a port that is not being used to secure it from unauthorized connections.

Possible settings for this parameter are:

Enabled - The port receives and forwards packets. This is the default setting.

Disabled - The port does not receive or forward packets.

Note
The procedures for implementing item 2, HOL Blocking Prevention, are described in “Configuring Head of Line Blocking” on page 107.

The procedures for item 3, Flow Control, are described in “Configuring Head of Line Blocking” on page 107.

To set up item 4, Filtering, go to “Configuring Filtering” on page 112.

Item 5, Rate Limiting, is described in “Setting Up Rate Limiting” on page 114.

6 - Negotiation
You use this option to configure a port for autonegotiation or to manually set a port’s speed and duplex mode. The default is Auto.

Note
When you set negotiation to Manual, items 7 (Speed), 8 (Duplex), and 9 (MDI Crossover) are displayed.

If you select Auto for autonegotiation, which is the default setting, the switch sets speed, duplex mode, and MDI crossover for the port automatically. The switch determines the highest possible common speed between the port and its end node and sets the port to that speed. This helps to ensure that the port and the end node are operating at the highest possible common speed.

Note the following items concerning the operation of autonegotiation on the switch port:

❒ In order for a switch port to successfully autonegotiate its duplex mode with an end node, the end node should also be using autonegotiation. Otherwise, a duplex mode mismatch can occur. A switch port using autonegotiation defaults to half-duplex if it detects that the end node is not using autonegotiation. This results in a mismatch if the end node is operating at a fixed duplex mode of full-duplex.

❒ To avoid this problem, when you connect an end node with a fixed duplex mode of full-duplex to a switch port, you should disable autonegotiation on the port and set the port's speed and duplex mode manually.

❒ When the port is set to autonegotiate, the MDI/MDI-X setting is locked at auto-MDI/MDI-X. The switch automatically determines the correct MDI/MDI-X setting. You cannot set MDI/MDI-X manually.

❒ When autonegotiation is disabled on a port, the auto-MDI/MDI-X feature on a port is also disabled, and the port defaults to the MDI-X configuration. Consequently, if you disable autonegotiation and set a port's speed and duplex mode manually, you might also need to set the port's MDI/MDI-X setting as well.

Note
Items 7, 8, and 9 are not available for SFP and GBIC ports 23 and 24 which are automatically set to 1000 Mbps, full-duplex, and auto-MDI/MDIX.

7 - Speed
This item is only available when Negotiation is set to Manual. Type 7 to toggle between two selections:

10 Mbps

100 Mbps

1000 Mbps is only available when you set selection 6, Negotiation, to Automatic.

8 - Duplex
This item is only available when Negotiation is set to Manual. The possible settings are full-duplex and half-duplex.

9 - MDI Crossover
This item is only available when Negotiation is set to Manual.

This selection sets the wiring configuration of the port. The configuration can be MDI or MDI-X.

The twisted pair ports on the switch feature auto-MDI/MDI-X. They configure themselves automatically as MDI or MDI-X when connected to an end node. This allows you to use either a straight-through or crossover twisted pair cable when connecting any network device to a port on the switch.

When a port is using autonegotiation to set its speed and duplex mode, the only available setting for this item is Auto. The port automatically sets its MDI/MDI-X setting.

But if you disable autonegotiation on a port and set a port's speed and duplex mode manually, the auto-MDI/MDI-X feature is also disabled. A port where autonegotiation has been disabled defaults to MDI-X.

Disabling autonegotiation may require that you manually configure a port’s MDI/MDI-X setting using this option or that you use a crossover cable.

Note
When a transceiver is inserted into an uplink slot and a link is established, that slot becomes a primary uplink port and the corresponding backup port, 23R or 24R, automatically transitions to redundant uplink status. The speed and duplex mode of the redundant port automatically transitions to Auto-Negotiate to match the speed of the primary uplink port and you cannot configure the MDI/MDIX crossover parameter.

The final three parameters on the Port Configuration menu are:

X - Reset Port
This item resets the selected port. For more information, see “Resetting a Port” on page 116.

F - Force Renegotiation
This item prompts the port to autonegotiate with the end node. For more information, see “Forcing Port Renegotiation” on page 117.

D - Set Port Configuration to Defaults
This item resets all port settings to the default values. For more information, see “Resetting the Port Configuration to the Defaults” on page 118.

5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring Head of Line Blocking

Head of line (HOL) blocking is a problem that occurs when a port on a switch becomes oversubscribed. An oversubscribed port is receiving more packets from other switch ports than it can transmit in a timely manner.

An oversubscribed port can prevent other ports from forwarding packets to each other because ingress packets on a port are buffered in a First In, First Out (FIFO) manner. If the head of an ingress queue consists of a packet destined for an oversubscribed port, the ingress queue is not able to forward any of its other packets to the egress queues of other ports.

A simplified version of the problem is illustrated in Figure 27. It shows four ports on a switch. Port D is receiving packets from two ports—50% of the ingress traffic on port A and 100% of the ingress traffic on port B. Not only is port A unable to forward packets to port D because the latter’s egress queues are filled with packets from port B, but it is also unable to forward traffic to port C because its ingress queue has frames destined to port D that it is unable to forward.

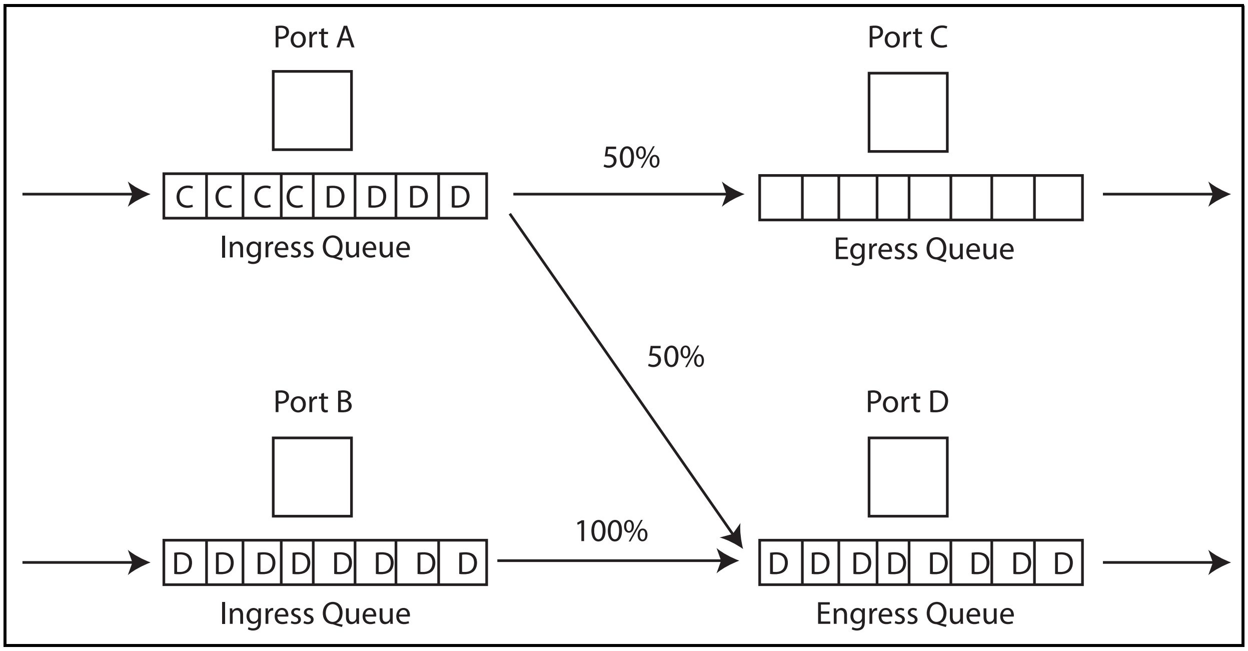


Figure 27. Head of Line Blocking

The HOL Limit parameter can help prevent this problem from occurring. This parameter sets a threshold on the utilization of a port’s egress queue. When the threshold for a port is exceeded, the switch signals other ports to discard packets to the oversubscribed port.

For example, referring to the figure above, when the utilization of the storage capacity of port D exceeds the threshold, the switch signals the other ports to discard packets destined for port D. Port A drops the D packets, enabling it to once again forward packets to port C.

The number that you enter for this value represents cells. A cell is 128 bytes. The range is 0 to 8191 cells. The default is 682.

To set up head of line blocking, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **1** to select Port Configuration.

   The following prompt is displayed:

   ```
   Enter port-list ->
   ```

3. Enter the number of the port you want to configure. To configure a range of ports, enter the first and last ports of the range, separated by a dash (for example, 4-8). You cannot specify nonconsecutive ports (for example, 5,7,9)

   The Port Configuration menu is shown in Figure 26 on page 103.

4. From the Port Configuration menu, type **2** to select HOL BLocking Prevention Threshold.

   The following prompt is displayed:

   ```
   Enter HOL Blocking Prevention Threshold (128 byte cells)
   : [1 to 8191] -> 682
   ```

5. Enter the threshold in cells. A cell equals 128 bytes. The range is 1 to 8191 cells and the default is 682.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring Flow Control and Back Pressure

A switch port uses flow control to control the flow of ingress packets from its end node. Flow control applies only to ports operating in full-duplex mode.

A port using *flow control* issues a special frame, referred to as a PAUSE frame, as specified in the IEEE 802.3x standard, to stop the transmission of data from an end node. When a port needs to stop an end node from transmitting data, it issues this frame. The frame instructs the end node to cease transmission. The port continues to issue PAUSE frames until it is again ready to receive data from the end node.

The default setting for flow control on a switch port is disabled.

Back pressure performs much the same function as flow control. Both are used by a port to control the flow of ingress packets. Flow control applies to ports operating in full-duplex; back pressure applies to ports operating in half-duplex mode.

When a twisted pair port on the switch operating in half-duplex mode needs to stop an end node from transmitting data, it forces a collision. A collision on an Ethernet network occurs when two end nodes attempt to transmit data using the same data link at the same time. A collision causes the end nodes to stop sending data.

When a switch port needs to stop a half-duplex end node from transmitting data, it forces a collision on the data link, which stops the end node. After the switch is ready to receive data again, the switch stops forcing collisions. This is called *back pressure*.

The default setting for back pressure on a switch port is disabled.

To set up flow control or back pressure, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **1** to select Port Configuration.

   The following prompt is displayed:

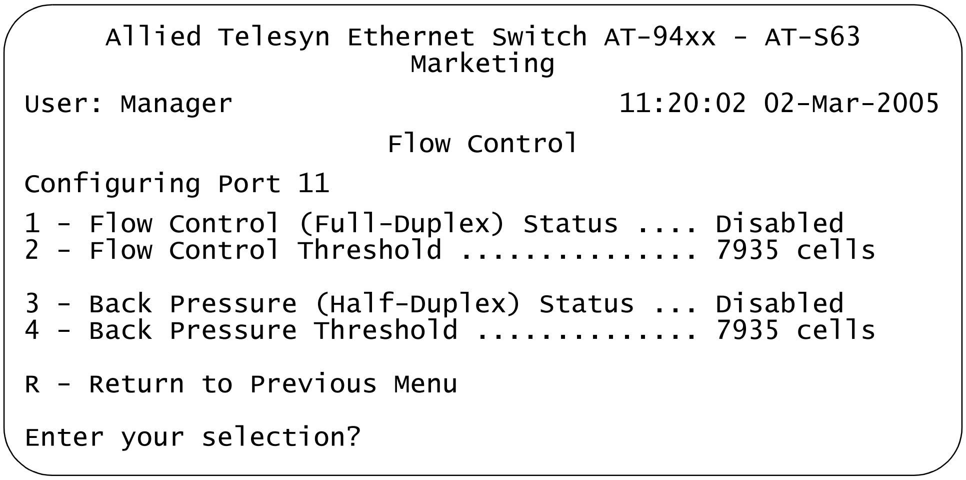
   ```
   Enter port-list ->
   ```

3. Enter the number of the port you want to configure. To configure a range of ports, enter the first and last ports of the range, separated by a dash (for example, 4-8). You cannot specify nonconsecutive ports (for example, 5,7,9)

The Port Configuration menu is shown in Figure 26 on page 103.

4. From the Port Configuration menu, type **3** to select Flow Control.

   The Flow Control menu is shown in Figure 28.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                        11:20:02 02-Mar-2005
                         Flow Control
Configuring Port 11
1 - Flow Control (Full-Duplex) Status .... Disabled
2 - Flow Control Threshold ............... 7935 cells

3 - Back Pressure (Half-Duplex) Status ... Disabled
4 - Back Pressure Threshold .............. 7935 cells

R - Return to Previous Menu

Enter your selection?
```

Figure 28. Flow Control Menu

5. Type **1** to select FLow Control (Full-Duplex) Status to enable or disable flow control. The possible settings are:

   Disabled -No flow control on the port. This is the default setting.

   Enabled - Flow control is activated. This setting is appropriate only when the end node connected to the port is also using flow control.

   Auto - The port uses flow control only if it detects that the end node is using it.

6. Type **2** to select Flow Control Threshold which specifies the threshold in cells. A cell equals 128 bytes. The range is 1 to 7935. The default is 7935 cells.

7. Type **3** to select Back Pressure (Half-Duplex) Status which enables or disables back pressure on a port. Possible settings are:

   Disabled - The port does not use back pressure. This is the default setting.

   Enabled - The port uses back pressure.

8. Type **4** to select Back Pressure Threshold. This selection specifies the maximum number of ingress packets that a port accepts within a 1 second period before initiating back pressure. The range is 1 to 57,344. The default is 8192.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring Filtering

If the performance of your network is affected by heavy traffic, you can use this parameter to limit the number of unknown unicast ingress and egress packets, unknown multicast ingress and egress packets, or broadcast ingress and egress packets a port receives. When you activate this feature on a port, the port discards all ingress or egress packets of the type you specify. The default setting for each type of packet filter is disabled.

To set up filtering, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **1** to select Port Configuration.

   The following prompt is displayed:

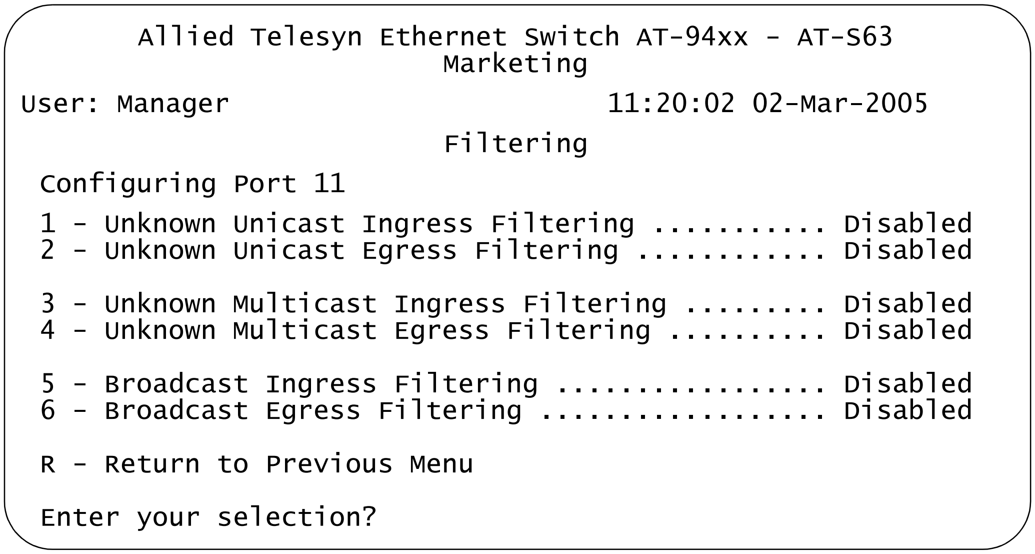
   ```
   Enter port-list ->
   ```

3. Enter the number of the port you want to configure.

   The Port Configuration menu is shown in Figure 26 on page 103.

4. From the Port Configuration menu, type **4** to select Filtering.

   The Filtering menu is shown in Figure 29.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                        11:20:02 02-Mar-2005
                           Filtering
 Configuring Port 11
 1 - Unknown Unicast Ingress Filtering ........... Disabled
 2 - Unknown Unicast Egress Filtering ............ Disabled

 3 - Unknown Multicast Ingress Filtering ......... Disabled
 4 - Unknown Multicast Egress Filtering .......... Disabled

 5 - Broadcast Ingress Filtering ................. Disabled
 6 - Broadcast Egress Filtering .................. Disabled

 R - Return to Previous Menu

 Enter your selection?
```

Figure 29. Filtering Menu

5. From the Filtering menu, type **1** to toggle Unknown Unicast Ingress Filtering between Disabled and Enabled.

6. Type **2** to toggle Unknown Unicast Egress Filtering between Disabled and Enabled.

7. Type **3** to toggle Unknown Multicast Ingress Filtering between Disabled and Enabled.

8. Type **4** to toggle Unknown Multicast Egress Filtering between Disabled and Enabled.

9. Type **5** to toggle Broadcast Ingress Filtering between Disabled and Enabled.

10. Type **6** to toggle Broadcast Egress Filtering between Disabled and Enabled.

11. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Setting Up Rate Limiting

The rate limiting feature allows you to set the maximum number of ingress packets the port accepts each second. Packets exceeding the threshold are discarded. You can enable rate limiting and set a rate independently for unknown unicast, multicast, and broadcast packets.

To set rate limiting, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **1** to select Port Configuration.

   The following prompt is displayed:

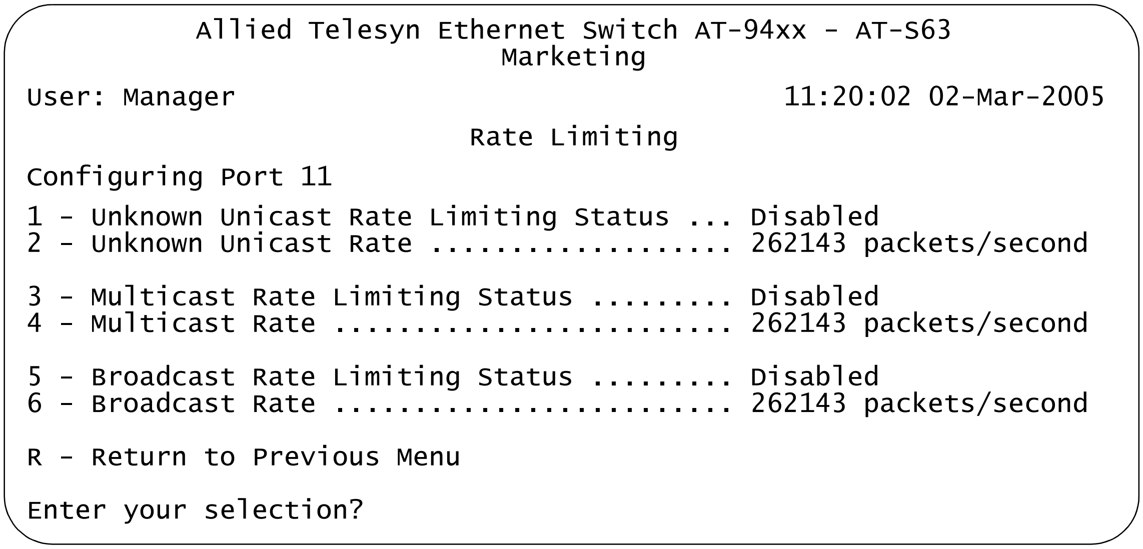
   ```
   Enter port-list ->
   ```

3. Enter the number of the port you want to configure.

   The Port Configuration menu is shown in Figure 26 on page 103.

4. From the Port Configuration menu, type **5** to select Rate Limiting.

   The Rate Limiting menu is shown in Figure 30.



```
          Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                             Marketing
User: Manager                                   11:20:02 02-Mar-2005
                            Rate Limiting
Configuring Port 11
1 - Unknown Unicast Rate Limiting Status ... Disabled
2 - Unknown Unicast Rate ................... 262143 packets/second

3 - Multicast Rate Limiting Status ......... Disabled
4 - Multicast Rate ......................... 262143 packets/second

5 - Broadcast Rate Limiting Status ......... Disabled
6 - Broadcast Rate ......................... 262143 packets/second

R - Return to Previous Menu

Enter your selection?
```

Figure 30. Rate Limiting Menu

5. From the Rate Limiting menu, type **1** to toggle Unknown Unicast Rate Limiting Status between Enabled and Disabled.

6. Type **2** to select Unknown Unicast Rate.

The following prompt is displayed:

```
Enter the Rate Limit (packets/second):[0 to 262143]->
```

7. Enter a number for the rate limit.

8. Type **3** to toggle Multicast Rate Limiting Status between Enabled and Disabled.

9. Type **2** to select Multicast Rate.

   The following prompt is displayed:

   ```
   Enter the Rate Limit (packets/second):[0 to 262143]->
   ```

10. Enter a number for the rate limit.

11. Type **3** to toggle Multicast Rate Limiting Status between Enabled and Disabled.

12. Type **4** to select Multicast Rate.

    The following prompt is displayed:

    ```
    Enter the Rate Limit (packets/second):[0 to 262143]->
    ```

13. Enter a number for the rate limit.

14. Type **5** to toggle Broadcast Rate Limit Status between Enabled and Disabled.

15. Type **6** to select Broadcast Rate.

    The following prompt is displayed:

    ```
    Enter the Rate Limit (packets/second):[0 to 263143]->
    ```

16. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Resetting a Port

Resetting a port is useful in situations where a port is having problems establishing a valid connection to its end node.

To reset a port, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **1** to select Port Configuration.

   The following prompt is displayed:

   ```
   Enter port-list ->
   ```

3. Enter the number of the port you want to reset. To reset a range of ports, enter the first and last ports of the range, separated by a dash (for example, 4-8). You cannot specify nonconsecutive ports (for example, 5,7,9)

   The Port Configuration menu is shown in Figure 26 on page 103.

4. From the Port Configuration menu, type **X** to select Reset Port.

Forcing Port Renegotiation

Port renegotiation prompts the port to autonegotiate with the end node. This option is useful if you believe that a port and end node are not operating at the same speed and duplex mode.

To force port renegotiation, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **1** to select Port Configuration.

   The following prompt is displayed:

   ```
   Enter port-list ->
   ```

3. Enter the number of the port you want to reset. To reset a range of ports, enter the first and last ports of the range, separated by a dash (for example, 4-8). You cannot specify nonconsecutive ports (for example, 5,7,9)

   The Port Configuration menu is shown in Figure 26 on page 103.

4. From the Port Configuration menu, type **F** to select Force Renegotiation.

Resetting the Port Configuration to the Defaults

You can return port settings to the default values.

To reset ports to the default settings, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **1** to select Port Configuration.

   The following prompt is displayed:

   ```
   Enter port-list ->
   ```

3. Enter the number of the port you want to reset. To reset a range of ports, enter the first and last ports of the range, separated by a dash (for example, 4-8). You cannot specify nonconsecutive ports (for example, 5,7,9)

   The Port Configuration menu is shown in Figure 26 on page 103.

4. From the Port Configuration menu, type **D** to select Set Port Configuration to Defaults.

Displaying Port Statistics

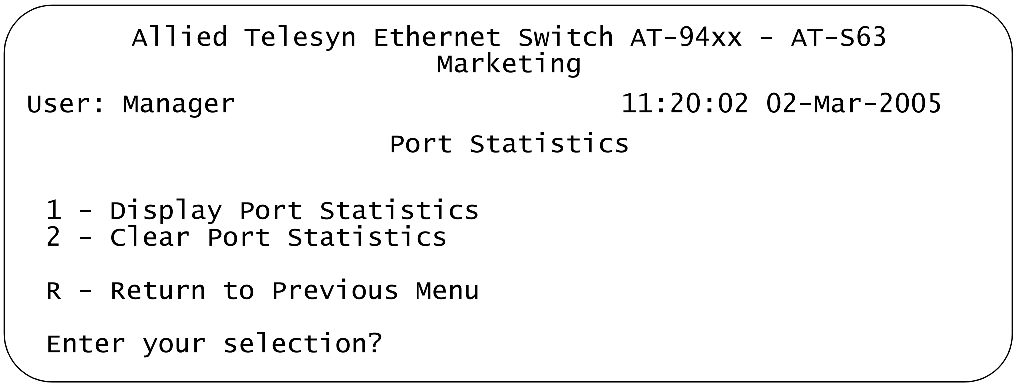
To display Ethernet port statistics, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **3** to select Port Statistics.

   The Port Statistics menu is shown in Figure 31.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                       11:20:02 02-Mar-2005
                       Port Statistics

 1 - Display Port Statistics
 2 - Clear Port Statistics

 R - Return to Previous Menu

 Enter your selection?
```

Figure 31. Port Statistics Menu

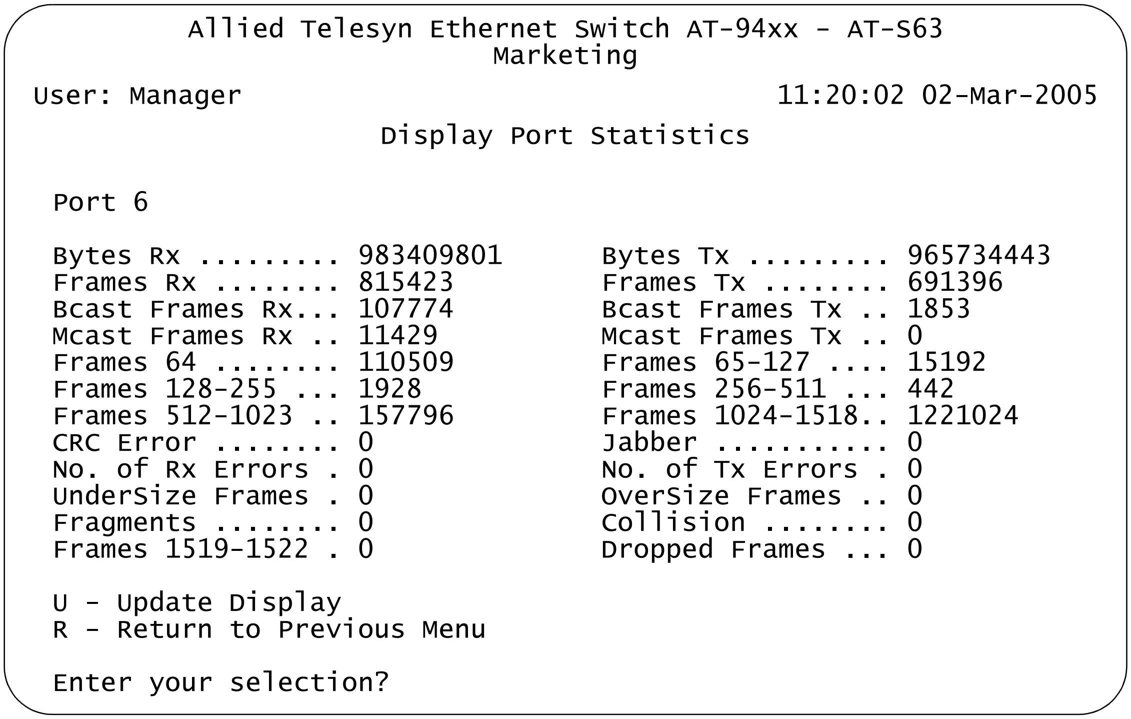
3. From the Port Statistics menu, type **1** to select Display Port Statistics.

   The following prompt is displayed:

   ```
   Enter port-list:
   ```

4. Enter the port whose statistics you want to view. You can specify more than one port at a time.

The Display Port Statistics menu is shown in Figure 32.



```
            Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                               Marketing
User: Manager                                    11:20:02 02-Mar-2005
                       Display Port Statistics


 Port 6

 Bytes Rx ......... 983409801      Bytes Tx ......... 965734443
 Frames Rx ........ 815423         Frames Tx ........ 691396
 Bcast Frames Rx... 107774         Bcast Frames Tx .. 1853
 Mcast Frames Rx .. 11429          Mcast Frames Tx .. 0
 Frames 64 ........ 110509         Frames 65-127 .... 15192
 Frames 128-255 ... 1928           Frames 256-511 ... 442
 Frames 512-1023 .. 157796         Frames 1024-1518.. 1221024
 CRC Error ........ 0              Jabber ........... 0
 No. of Rx Errors . 0              No. of Tx Errors . 0
 UnderSize Frames . 0              OverSize Frames .. 0
 Fragments ........ 0              Collision ........ 0
 Frames 1519-1522 . 0              Dropped Frames ... 0

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 32. Display Port Statistics Menu

The Display Port Statistics menu provides the following information:

Bytes Rx
Number of bytes received by the port.

Bytes Tx
Number of bytes transmitted from the port.

Frames Rx
Number of frames received by the port.

Frames Tx
Number of frames transmitted from the port.

Bcast Frames Rx
Number of broadcast frames received by the port.

Bcast Frames Tx
Number of broadcast frames transmitted from the port.

Mcast Frames Rx
Number of multicast frames received by the port.

Mcast Frames Tx
Number of multicast frames transmitted from the port.

Frames 64
Frames 65-127
Frames 128-255
Frames 256-511
Frames 512-1023
Frames 1024-1518
Frames 1519-1522
Number of frames transmitted from the port, grouped by size.

CRC Error
Number of frames with a cyclic redundancy check (CRC) error but with the proper length (64-1518 bytes) received on the port.

Jabber
Number of occurrences of corrupted data or useless signals appearing on the port.

No. of Rx Errors
Number of receive errors.

No. of Tx Errors
Number of transmit errors.

Undersize Frames
Number of frames that were less than the minimum length specified by IEEE 802.3 (64 bytes including the CRC) received on the port.

Oversize Frames
Number of frames exceeding the maximum specified by IEEE 802.3 (1518 bytes including the CRC) received on the port.

Fragments
Number of undersized frames, frames with alignment errors, and frames with frame check sequence (FCS) errors (CRC errors) received on the port.

Collision
Number of collisions that have occurred on the port.

Dropped Frames
Number of frames successfully received and buffered by the port, but discarded and not forwarded.

Clearing Port Statistics

To clear the Ethernet port statistics and reset them to “0”, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **3** to select Port Statistics.

   The Port Statistics menu is shown in Figure 31 on page 119.

3. Type **2** to select Clear Statistics.

   The statistics are reset to “0” and the statistics gathering starts again.

Displaying Port Status

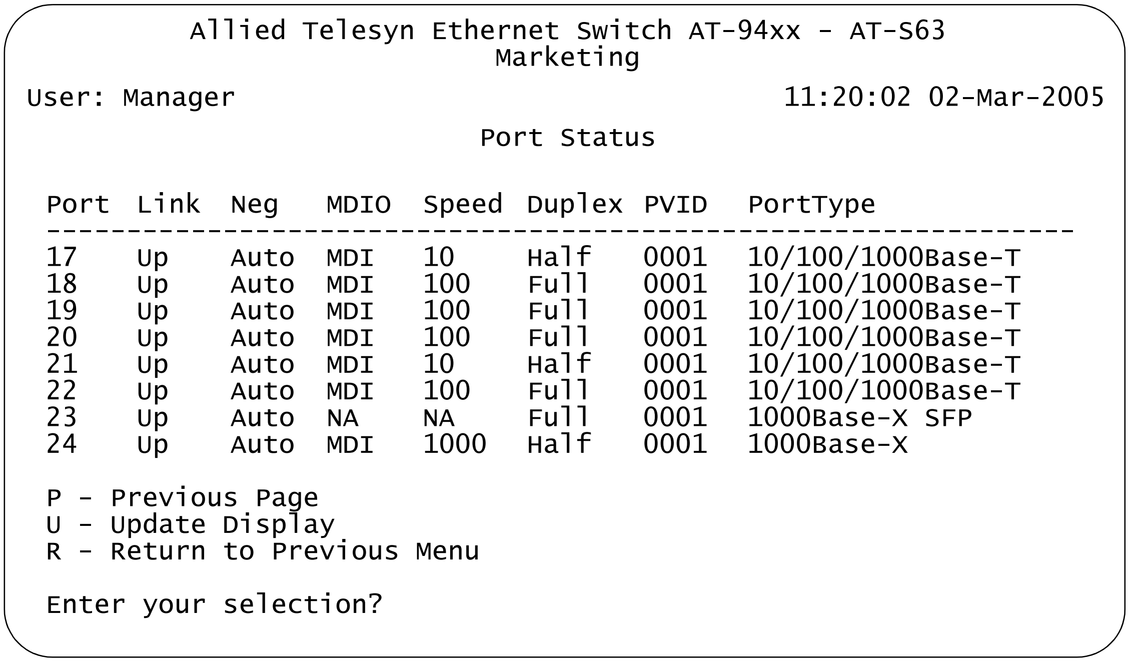
To display the current status of the ports on the switch, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **2** to select Port Status.

   An example of the Port Status menu is shown in Figure 33.



```
           Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing
User: Manager                                     11:20:02 02-Mar-2005
                             Port Status

 Port  Link  Neg   MDIO  Speed  Duplex  PVID   PortType
 -----------------------------------------------------------------
 17    Up    Auto  MDI   10     Half    0001   10/100/1000Base-T
 18    Up    Auto  MDI   100    Full    0001   10/100/1000Base-T
 19    Up    Auto  MDI   100    Full    0001   10/100/1000Base-T
 20    Up    Auto  MDI   100    Full    0001   10/100/1000Base-T
 21    Up    Auto  MDI   10     Half    0001   10/100/1000Base-T
 22    Up    Auto  MDI   100    Full    0001   10/100/1000Base-T
 23    Up    Auto  NA    NA     Full    0001   1000Base-X SFP
 24    Up    Auto  MDI   1000   Half    0001   1000Base-X

 P - Previous Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 33. Port Status Menu

Note
The speed, duplex mode, and flow control settings are blank for a port that has not established a link with its end node.

The Port Status menu displays a table that contains the following columns of information:

Port
The port number.

Link
The status of the link between the port and the end node connected to the port. The possible settings are:

Up - Indicates that a valid link exists between the port and the end node.

Down - Indicates that the port and the end node have not established a valid link.

Neg
The status of autonegotiation on the port. Possible values are:

Auto - Indicates that the port is using autonegotiation to set operating speed and duplex mode.

Manual - Indicates that the operating speed and duplex mode have been set manually.

MDIO
The operating configuration of the port. Possible values are Auto, MDI, MDI-X. The status Auto indicates that the port automatically determines the appropriate MDI or MDI-X setting.

Speed
The operating speed of the port. Possible values are:

10 - 10 Mbps

100 - 100 Mbps

1000 - 1000 Mbps (Gigabit Ethernet ports only)

Duplex
The duplex mode of the port. Possible values are half-duplex and full-duplex.

PVID
The VLAN identifier (VID) of the VLAN in which the port is an untagged member. This column does not include the VIDs of the VLANs where the port is a tagged member.

Port Type
The port type, based on the speed.

Chapter 7

Static and LACP Port Trunks

This chapter contains the procedures for creating, modifying, and deleting static and LACP port trunks. Sections in the chapter include:

Port Trunk Overview

A port trunk is an economical way for you to increase the bandwidth between the Ethernet switch and another networking device, such as a network server, router, workstation, or another Ethernet switch. A port trunk is a group of ports that have been grouped together to function as one logical path. A port trunk increases the bandwidth between the switch and the other network device and is useful in situations where a single physical link between the devices is insufficient to handle the traffic load.

The AT-9400 Series switch supports two types of port trunks:

- ❐ Static trunks
- ❐ Link Aggregate Control Protocol (LACP) IEEE 802.3ad trunks

Static Port Trunk Overview

A static port trunk consists of two to eight ports on the switch that function as a single virtual link between the switch and another device. A static port trunk improves performance by distributing the traffic across multiple ports between the devices and enhances reliability by reducing the reliance on a single physical link.

A static trunk is easy to configure. You simply designate the ports on the switch that are to be in the trunk and the management software on the switch automatically groups them together. The management software also gives you control over how the traffic is to be distributed over the trunk ports, as described in “Load Distribution Methods” on page 134.

The example in Figure 34 illustrates a static port trunk of four links between two AT-9400 Series switches.

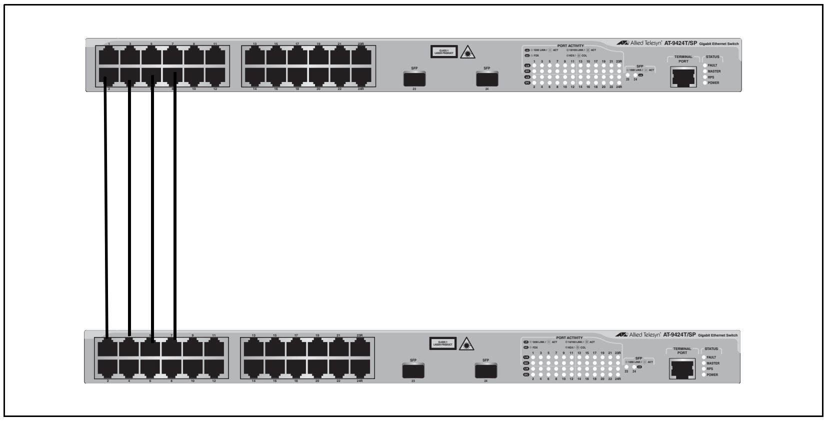


Figure 34. Static Port Trunk Example

Network equipment vendors tend to employ different techniques to implement static trunks. Consequently, a static trunk on one device might not be compatible with the same feature on a device from a different manufacturer. For this reason static trunks are typically employed only between devices from the same vendor. That is not to say that an Allied Telesyn layer 2 managed switch cannot form a static trunk with a device from another manufacturer; but there is the possibility that the implementations of static trunking on the two devices might not be compatible.

Also note that a static trunk does not provide for redundancy or link backup. If a port in a static trunk loses its link, the trunk’s total bandwidth is diminished. Though the traffic carried by the lost link is shifted to one of the remaining ports in the trunk, the bandwidth remains reduced until the lost link is reestablished or you reconfigure the trunk by adding another port to it.

Static Port Trunk Guidelines

Following are the guidelines for creating a static trunk:

- Allied Telesyn recommends using static port trunks between Allied Telesyn networking devices to ensure compatibility. While an Allied Telesyn device might be able to form a static trunk with a device from another equipment vendor, there is the possibility that the implementation of this feature on the two devices might not be compatible, resulting in undesired switch behavior.
- A static trunk can contain up to eight ports.
- The ports of a static trunk must be of the same medium type. They can be all twisted pair ports or all fiber optic ports.
- The ports of a trunk can be either consecutive (for example Ports 5-9) or nonconsecutive (for example, ports 4, 8, 11, 20).
- Before creating a port trunk, examine the speed, duplex mode, flow control, and back pressure settings of the lowest number port that will be in the trunk. Verify that its settings are correct for the device to which the trunk will be connected. When you create a static port trunk, the management software copies the current settings of the lowest numbered port in the trunk to the other ports, because all ports in a static trunk must have the same settings. For example, if you create a port trunk consisting of ports 5 to 8, the parameter settings for port 5 are copied to ports 6, 7, and 8 so that all the ports of the trunk have the same settings.
- After you have created a port trunk, do not change the speed, duplex mode, flow control, or back pressure of any port in the trunk without making the same change to the other ports.
- A port can belong to only one static trunk at a time.
- A port cannot be a member of a static trunk and an LACP trunk at the same time.
- The switch can support up to six static trunks when LACP is disabled and three static trunks when LACP is enabled.

- The ports of a static trunk must be untagged members of the same VLAN. A trunk cannot consist of untagged ports from different VLANs.
- The switch selects the lowest numbered port in the trunk to handle broadcast packets and packets of unknown destination. For example, a trunk of ports 11 to 15 would use port 11 for broadcast packets.

LACP Trunk Overview

An LACP (Link Aggregation Control Protocol) trunk is another type of port trunk. It performs the same function as a static trunk. It increases the bandwidth between two network devices by distributing the traffic load over multiple physical links.

The advantage of an LACP trunk over a static port trunk is its flexibility. While implementations of static trunking tend to be vendor specific, the AT-9400 Series implementation of LACP is compliant with the IEEE 802.3ad standard. This makes it interoperable with equipment from other vendors that also comply with the standard. Therefore, you can create a trunk between an Allied Telesyn device and networking devices from other manufacturers.

Another advantage is that ports in an LACP trunk can function in a standby mode. This adds redundancy and resiliency to the trunk. If a link in a static trunk goes down, the overall bandwidth of the trunk is reduced and restoring it requires reestablishing the link or manually modifying the trunk by adding another port to it. In contrast, an LACP trunk can activate ports in a standby mode when an active link fails. The automatic activation of standby ports allows the switch to maintain the maximum possible bandwidth of the trunk.

For example, assume you create an LACP trunk of ports 11 to 20 on a switch and the switch is using ports 11 to 18 as the active ports and ports 19 and 20 as reserve. If an active port loses its link, the switch automatically activates one of the two reserve ports to maintain maximum bandwidth of the trunk.

The main component of an LACP trunk is an *aggregator*. An aggregator is a group of ports on the switch. The ports in an aggregator are further grouped into one or more trunks, referred to as *aggregate trunks*.

An aggregate trunk can consist of any number of ports on a switch, but only a maximum of eight ports can be active at a time. If an aggregate trunk contains more ports than can be active at one time, the extra ports are placed in a standby mode. Ports in the standby mode do not pass network traffic, but they do transmit and accept LACP data unit (LACPDU) packets, which the switch uses to search for LACP-compliant devices.

Only ports on a switch that are part of an aggregator transmit LACPDU packets. If a switch port that is part of an aggregator does not receive LACPDU packets from its corresponding port on the other device, it assumes that the other port is not part of an LACP trunk. So instead it functions as a normal Ethernet port by forwarding network traffic.

However, it does continue to send LACPDU packets. If it begins to receive LACPDU packets, it automatically transitions to an active or standby mode as part of an aggregate trunk.

If a switch is to support more than one aggregate trunk, it may be necessary to place each trunk in a separate aggregator, while in other cases you may be able to create just one aggregator and let the switch discern the individual aggregate trunks for you, automatically. The determining factor is whether the trunks are going to the same or different devices. If the trunks are going to the same device, you need to create a different aggregator for each trunk. If they are going to different devices, then you can create just one aggregator and the switch can differentiate the aggregate trunks itself.

Here are a two examples. Figure 35 illustrates an AT-9400 Series switch with two LACP trunks, each containing three links. Because both aggregate trunks go to the same 802.3ad-compliant device, in this case another Fast Ethernet switch, each trunk requires a separate aggregator.

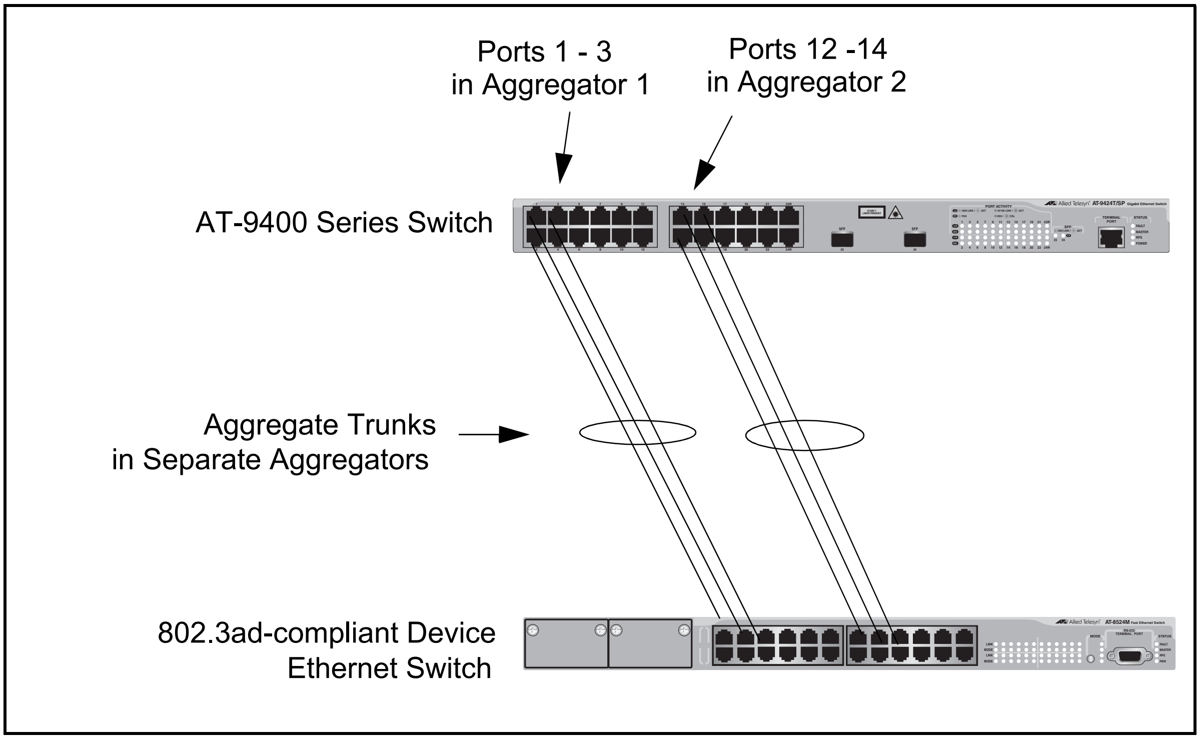


Figure 35. Example of Multiple Aggregators for Multiple Aggregate Trunks

Here is how the example looks in a table format.

Aggregator Description	**Aggregator Ports**	**Aggregate Trunk Ports**
Aggregator 1	1-3	1-3

Aggregator Description	Aggregator Ports	Aggregate Trunk Ports
Aggregator 2	12-14	12-14

Caution
The example cited here illustrates a loop in a network. Avoid network loops to prevent broadcast storms.

If the aggregate trunks go to different devices, you can create one aggregator and let the AT-9400 Series switch form the trunks for you automatically. This is illustrated in Figure 36. The ports of the two aggregate trunks on the AT-9400 Series switch are members of the same aggregator. It is the switch that determines that there are actually two separate aggregate trunks.

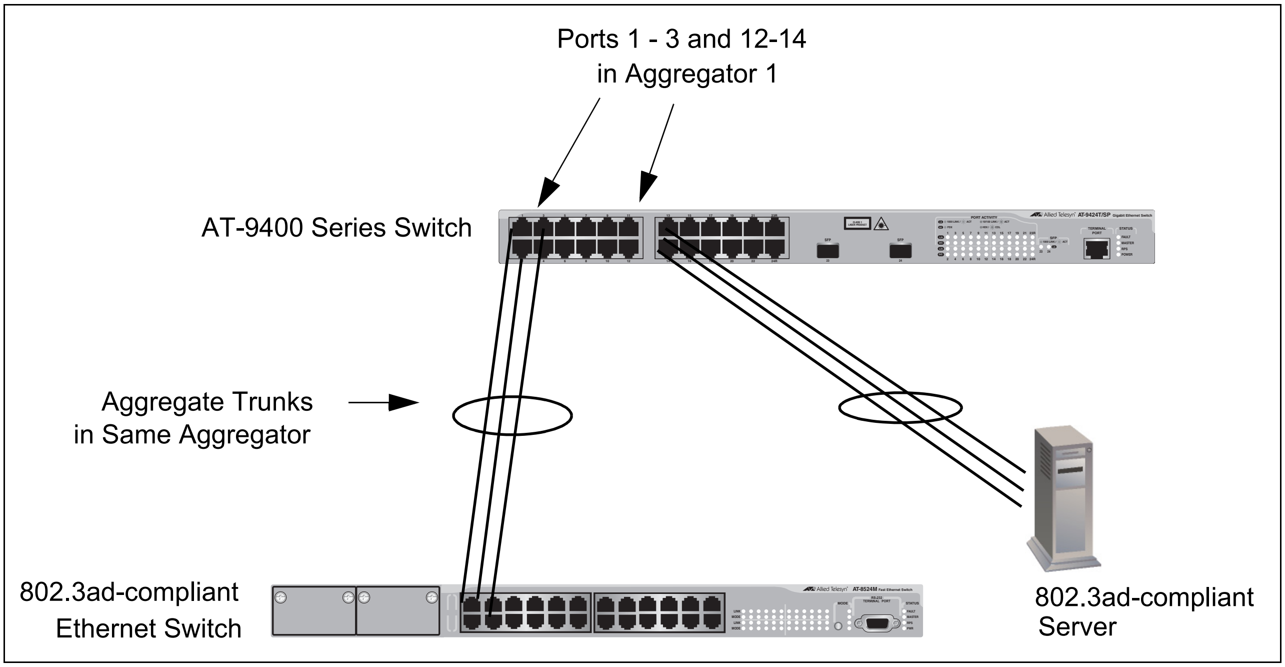


Figure 36. Example of an Aggregator with Multiple Trunks

Here is how this example looks in table format.

Aggregator Description	Aggregator Ports	Aggregate Trunk Ports
Aggregator 1	1-3, 12-14	1-3
		12-14

You could, if you wanted, create separate aggregators for the different aggregate trunks in the example above. But letting the switch make the determination for you whenever possible saves time later if you physically reassign ports to a different trunk connected to another device.

LACP System Priority

It is possible for two devices interconnected by an aggregate trunk to encounter a conflict when they form a trunk. For example, the two devices might not support the same number of active ports in an aggregate trunk or might not agree on which ports are to be active and which are to be in standby.

If a conflict does occur, the two devices need a mechanism for resolving the problem, a means by which they can decide whose LACP settings are to take precedence. That is the function of the system LACP priority value. A hexadecimal value of from 1 to FFFF, this parameter is used whenever the devices encounter a conflict creating a trunk. The lower the number, the higher the priority. The settings on the device with the higher priority take precedence over the settings on the other device. If both devices have the same system LACP priority value, the settings on the switch with the lowest MAC address take precedence.

This parameter can prove useful when connecting an aggregate trunk between an AT-9400 Series switch and another 802.3ad-compliant device that does not have the same LACP trunking capabilities. If the other device's capability is less than that of the AT-9400 Series switch, you should give that device the higher priority so that its settings are used by both devices when forming the trunk.

For example, an aggregate trunk of six links between an AT-9400 Series switch and an 802.3ad-compliant device that supported up to four active links at one time could possibly result in a conflict. The AT-9400 Series switch would try to use all six links as active, because it can handle up to eight active links in a trunk at one time, while the other device would want to use only four ports as active. By giving the other 802.3ad device the higher priority, the conflict is avoided because the AT-9400 Series switch uses only four active links. The other ports remain in standby mode.

Adminkey Parameter

The *adminkey* is a hexadecimal value from 1 to FFFF that identifies an aggregator. Each aggregator on a switch must have a unique adminkey. The adminkey is limited to a switch. Two aggregators on different switches can have the same adminkey without generating a conflict.

LACP Port Priority Parameter

The switch uses this parameter to determine which ports are to be active and which are to be in the standby mode in situations where the number of ports in the aggregate trunk exceeds the highest allowed number of active ports. This parameter can be adjusted on each port and is a hexadecimal value in a range of 1 to FFFF. The lower the number, the higher the priority. Ports with the highest priorities are designated as the active ports in an aggregate trunk.

For example, if both 802.3ad-compliant devices support up to eight active ports and there are a total of ten ports in the trunk, the eight ports with the lowest priority settings are designated as the active ports, and the others are placed in standby mode. If an active link goes down on a active port, the standby port with the highest priority is automatically activated to take its place.

The default value of a port's priority number is equal to its port number in hexadecimal. For example, the default values for ports 2 and 11 are 0002 and 000B, respectively.

The selection of the active links in an aggregate trunk is dynamic. It changes as links are added, removed, lost or reestablished. For example, if an active port loses its link and is replaced by another port in the standby mode, the reestablishment of the link on the originally active port causes it to return to the active state by virtue of its having a higher priority, while the port that replaced it is returned to the standby mode.

In the unusual event that you set this parameter to the same value for some or all of the ports of an aggregate trunk, the selection of active ports is based on port numbering. The lower the port number, the higher the priority.

Two conditions must be met in order for a port that is a member of an aggregate trunk to function in the standby mode. First, the number of ports in the trunk must exceed the highest allowed number of active ports and, second, the port must be receiving LACPDU packets from the other device. A port functioning in the standby mode does not forward network traffic, but it does continue to send LACPDU packets. If a port that is part of an aggregator does not receive LACPDU packets, it functions as a normal Ethernet port and forwards network packets along with LACPDU packets.

Load Distribution Methods

The load distribution method determines the manner in which the switch distributes the traffic across the active ports of an aggregate trunk. The method is assigned to an aggregator and applies to all aggregate trunks within it. If you want to assign different load distribution methods to different aggregate trunks, you must create a separate aggregator for each trunk. For further information, refer to "Load Distribution Methods" on page 134.

LACP Trunk Guidelines

Following are the guidelines for creating aggregators:

- LACP must be activated on both the switch and the other device.
- The other device must be 802.3ad-compliant.
- An aggregator can consist of any number of ports.
- The AT-9400 Series switch supports up to eight active ports in an aggregate trunk at a time.
- The switch supports a maximum of three aggregate trunks.
- The ports of an aggregate trunk must be of the same medium type: all twisted pair ports or all fiber optic ports.
- The ports of a trunk can be consecutive (for example ports 5-9) or nonconsecutive (for example, ports 4, 8, 11, 20).
- A port can belong to only one aggregator at a time.
- A port cannot be a member of an aggregator and a static trunk at the same time.
- The ports of an aggregate trunk must be untagged members of the same VLAN. (The switch's management software does not return an error message if you create an aggregator with ports that are members of different untagged VLANs. However, it does not add the ports to the aggregate trunk when establishing the trunk.)
- 10/100Base-TX twisted pair ports must be set to Auto-Negotiation or 100 Mbps, full-duplex mode. LACP trunking is not supported in half-duplex mode.
- 100Base-FX fiber optic ports must be set to full-duplex mode.
- You can create an aggregate trunk including transceivers with 1000Base-X fiber optic ports.
- Only those ports that are members of an aggregator transmit LACPDU packets.
- The load distribution method is applied at the aggregator level. If you want aggregate trunks to have different load distribution methods, you must create a separate aggregator for each trunk. For further information, refer to "Load Distribution Methods" on page 134.
- A port that is a member of an aggregator functions as part of an aggregate trunk only if it receives LACPDU packets from the remote device. If it does not receive LACPDU packets, it functions as a regular Ethernet port, forwarding network traffic while also continuing to transmit LACPDU packets.
- The port with the highest priority in an aggregate trunk carries broadcast packets and packets with an unknown destination.
- Prior to creating an aggregate trunk between an AT-9400 Series switch and another vendor's device, refer to the vendor's documentation to

determine the maximum number of active ports the device can support in a trunk. If the number is less than eight, the maximum number for the AT-9400 Series switch, you should probably assign it a higher system LACP priority than the AT-9400 Series switch. If it is more than eight, assign the AT-9400 Series switch the higher priority. This can avoid a possible conflict between the devices if some ports are placed in the standby mode when the devices create the trunk. For background information, refer to “LACP System Priority” on page 131.

- LACPDU packets are transmitted as untagged packets.

Load Distribution Methods

This section discusses the load distribution methods. It applies to both static and LACP port trunks.

One of the steps to creating a static or LACP port trunk is the selection of a load distribution method. This step determines how the switch distributes the traffic load across the ports in the trunk. The AT-S63 management software offers the following load distribution methods:

- Source MAC Address (Layer 2)
- Destination MAC Address (Layer 2)
- Source MAC Address / Destination MAC Address (Layer 2)
- Source IP Address (Layer 3)
- Destination IP Address (Layer 3)
- Source IP Address / Destination IP Address (Layer 3)

The load distribution methods examine the last three bits of a packet’s MAC or IP address and compare the bits against mappings assigned to the ports in the trunk. The port mapped to the matching bits is selected as the transmission port for the packet.

In cases where you select a load distribution that employs either a source or destination address but not both, only the last three bits of the designated address are used in selecting a transmission port in a trunk. If you select one of the two load distribution methods that employs both source and destination addresses, port selection is achieved through an XOR operation of the last three bits of both addresses.

As an example, assume you created a static or LACP aggregate trunk of Ports 7 to 14 on a switch. The table below shows the mappings of the switch ports to the possible values of the last three bits of a MAC or IP address.

Last 3 Bits	000 (0)	001 (1)	010 (2)	011 (3)	100 (4)	101 (5)	110 (6)	111 (7)
Trunk Ports	7	8	9	10	11	12	13	14

Assume you selected source MAC address as the load distribution method and that the switch needed to transmit over the trunk a packet with a source MAC address that ended in 9. The binary equivalent of 9 is 1001, making the last three bits of the address 001. An examination of the table above indicates that the switch would use Port 8 to transmit the frame because that port is mapped to the matching bits.

The same method is used for the two load distribution methods that employ both the source and destination addresses. Only here the last three bits of both addresses are combined by an XOR process to derive a single value which is then compared against the mappings of the bits to ports. The XOR rules are as follows:

0 XOR 0 = 0
0 XOR 1 = 1
1 XOR 0 = 1
1 XOR 1 = 0

As an example, assume that you had selected source and destination MAC addresses for the load distribution method in our previous example, and that a packet for transmission over the trunk had a source MAC address that ended in 9 and a destination address that ended in 3. The binary values would be:

9 = 1001
3 = 0011

Applying the XOR rules above on the last three bits would result in 010, or 2. A examination of the table above shows that the packet would be transmitted from port 9.

Port trunk mappings on an AT-9400 Series switch can consist of up to eight ports. This corresponds to the maximum number of ports allowed in a static trunk and the maximum number of active ports in an LACP trunk. (Inactive ports in an LACP trunk are not applied to the mappings until they transition to the active status.)

You can assign different load distribution methods to different static trunks on the same switch. The same is true for LACP aggregators. However, it should be noted that all aggregate trunks within an LACP aggregator must use the same load distribution method.

The load distribution methods assume that the final three bits of the source and/or destination addresses of the packets from the network nodes are varied enough to support adequate distribution of the packets over the trunk ports. A lack of variation can result in one or more ports in a trunk being used more than others, with the potential loss of a trunk's efficiency and performance.

Managing Static Port Trunks

The following procedures explain how to create, modify, and delete static port trunks:

❒ "Creating a Static Port Trunk," next

❒ "Modifying a Static Port Trunk" on page 139

❒ "Deleting a Static Port Trunk" on page 141

For background information, refer to "Static Port Trunk Overview" on page 126.

Creating a Static Port Trunk

This section contains the procedure for creating a static port trunk on a switch. Be sure to review the guidelines in "Port Trunk Overview" on page 126 before performing the procedure.

⚠ **Caution**
Do not connect the cables to the trunk ports on the switches until after you have configured the trunk with the management software. Connecting the cables before configuring the software will create a loop in your network topology. Data loops can result in broadcast storms and poor network performance.

Note
Before creating a port trunk, examine the speed, duplex mode, and flow control settings of the lowest numbered port that will be a part of the trunk. Check to be sure that the settings are correct for the end node to which the trunk will be connected. When you create the trunk, the AT-S63 management software copies the settings of the lowest numbered port in the trunk to the other ports so that all the settings are the same.

You should also check to be sure that the ports are untagged members of the same VLAN. You cannot create a trunk of ports that are untagged members of different VLANs.

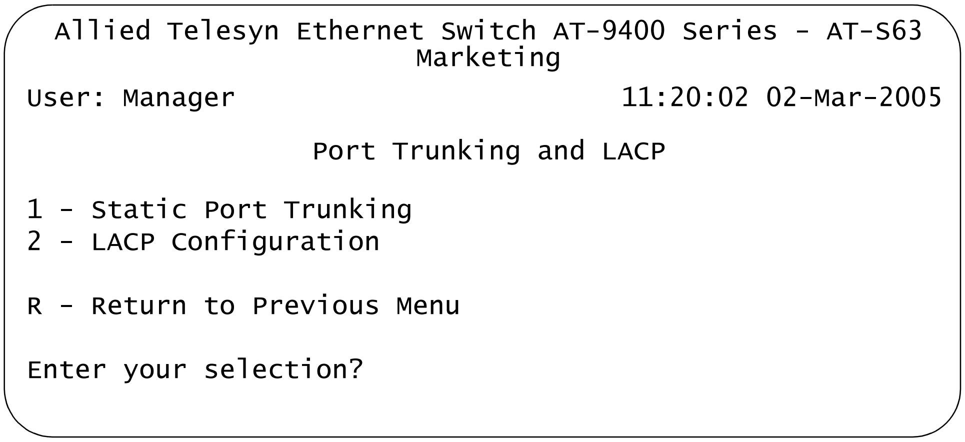
To create a port trunk, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **4** to select Port Trunking and LACP*.*

The Port Trunking and LACP menu is shown in Figure 37.

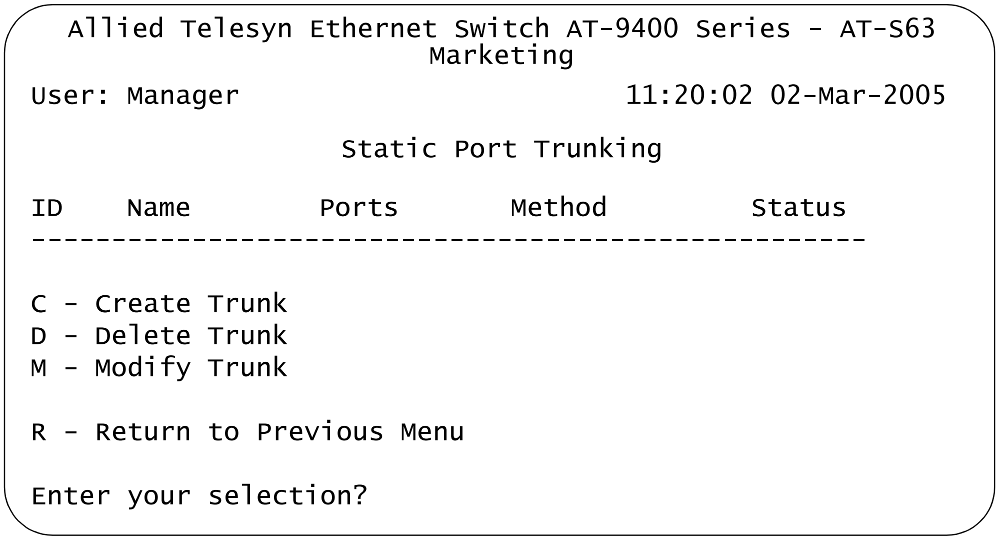


```
  Allied Telesyn Ethernet Switch AT-9400 Series - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005

                   Port Trunking and LACP

1 - Static Port Trunking
2 - LACP Configuration

R - Return to Previous Menu

Enter your selection?
```

Figure 37. Port Trunking and LACP Menu

3. From the Port Trunking and LACP menu, type **1** to select Static Port Trunking.

   The Static Port Trunking menu is shown in Figure 38.



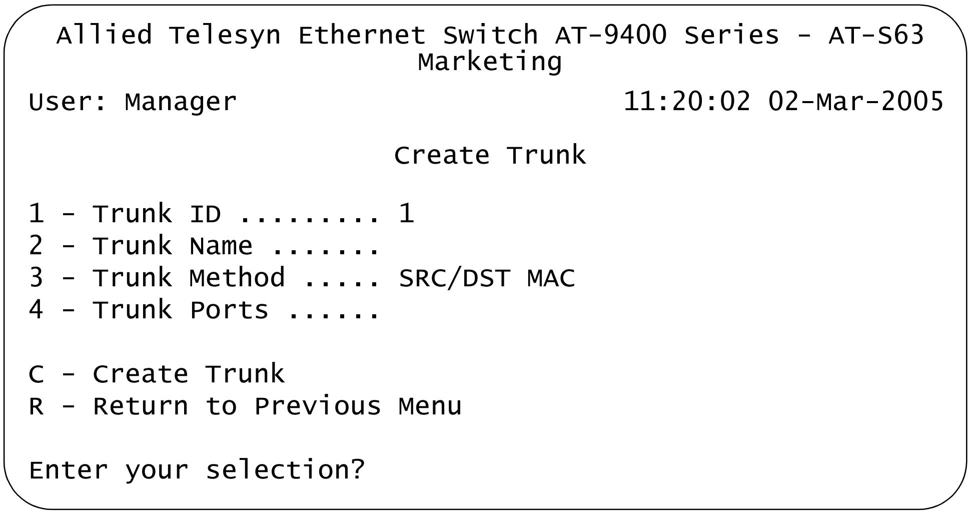
```
  Allied Telesyn Ethernet Switch AT-9400 Series - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005

                    Static Port Trunking

ID    Name        Ports       Method        Status
----------------------------------------------------

C - Create Trunk
D - Delete Trunk
M - Modify Trunk

R - Return to Previous Menu

Enter your selection?
```

Figure 38. Static Port Trunking Menu

   This menu lists the trunks that already exist on the switch.

4. Type **C** to select Create Trunk.

The Create Trunk menu is shown in Figure 39.



```
  Allied Telesyn Ethernet Switch AT-9400 Series - AT-S63
                       Marketing
User: Manager                       11:20:02 02-Mar-2005

                      Create Trunk

1 - Trunk ID ......... 1
2 - Trunk Name .......
3 - Trunk Method ..... SRC/DST MAC
4 - Trunk Ports ......

C - Create Trunk
R - Return to Previous Menu

Enter your selection?
```

Figure 39. Create Trunk Menu

5. Configure the following parameters as necessary:

1 - Trunk ID
Specifies the trunk ID. Enter an ID number for the trunk, from 1 to 6. A trunk must be assigned a unique ID number. The default value is the next unused ID number.

2 - Trunk Name
Specifies the trunk name. Enter a name for the trunk. The name can be up to 16 alphanumeric characters. No spaces or special characters, such as asterisks and exclamation points, are allowed. Each trunk must have a unique name.

3 - Trunk Method
Specifies the load distribution method. The possible settings are:

- SRC MAC - Source MAC address
- DST MAC - Destination MAC address
- SRC/DST MAC - Source address /destination MAC address
- SRC IP - Source IP address trunking
- DST IP - Destination IP address trunking
- SRC/DST IP - Source address /destination IP address

The default is SRC/DST MAC. For background information, refer to “Load Distribution Methods” on page 134.

4 - Port Range
Specifies the ports of the trunk. A trunk can contain up to eight ports. You can identify the ports individually (for example, 3,7,10), as a range (for example, 5-11), or both (for example, 2,4,11-14).

6. Type **C** to select Create Trunk.

   The port trunk is now active on the switch.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

8. Configure the ports on the remote switch for port trunking.

9. Connect the cables to the ports of the trunk on the switch.

   The port trunk is ready for network operations.

Modifying a Static Port Trunk

This section contains the procedure for modifying a static port trunk on the switch. Be sure to review the guidelines in "Static Port Trunk Guidelines" on page 127 before performing the procedure.

⚠ **Caution**
If you will be adding or removing ports from the trunk, you should disconnect all data cables from the ports of the trunk on the switch before performing the procedure. Adding or removing ports from a static port trunk without first disconnecting the cables may result in loops in your network topology, which can result in broadcast storms and poor network performance.

Note the following before performing this procedure:

❐ If you are adding a port and the port will be the lowest numbered port in the trunk, its parameter settings will overwrite the settings of the existing ports in the trunk. Therefore, you should check to see if its settings are appropriate prior to adding it.

❐ If you are adding a port and the port will not be the lowest numbered port in the trunk, its settings will be changed to match the settings of the existing ports in the trunk.

❐ If you are adding a port to a static trunk, you should check to be sure that the new port is an untagged member of the same VLAN as the other trunk ports. A trunk cannot contain ports that are untagged members of different VLANs.

To modify a port trunk, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **4** to select Port Trunking and LACP.

   The Port Trunking and LACP menu is shown in Figure 37 on page 137.

3. From the Port Trunking and LACP menu, type **1** to select Static Port Trunking.

   The Static Port Trunking menu is shown in Figure 38 on page 137.

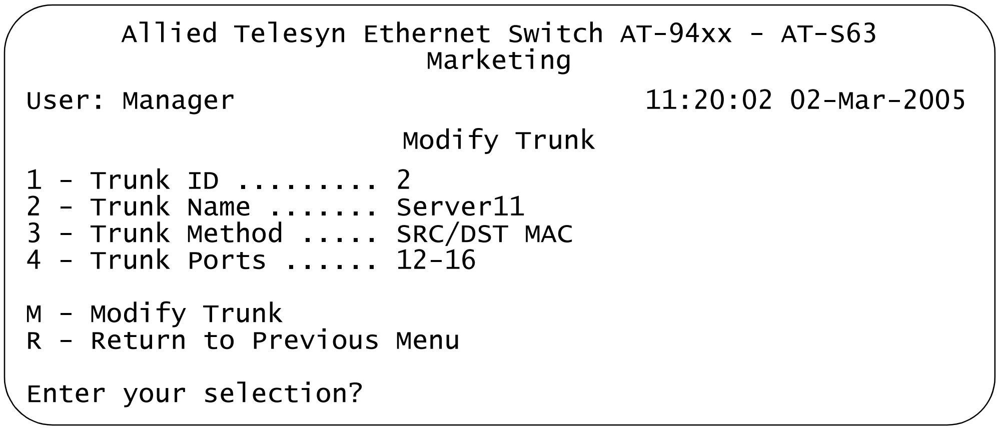
4. Type **M** to select Modify Trunk.

   The following prompt is displayed:

   ```
   Enter Trunk ID: [1 to 6] ->
   ```

5. Enter the ID number of the trunk you want to modify.

   The Modify Trunk menu is displayed. The menu displays the operating specifications of the selected trunk. An example is shown in Figure 40.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                             11:20:02 02-Mar-2005
                         Modify Trunk

1 - Trunk ID ......... 2
2 - Trunk Name ....... Server11
3 - Trunk Method ..... SRC/DST MAC
4 - Trunk Ports ...... 12-16

M - Modify Trunk
R - Return to Previous Menu

Enter your selection?
```

Figure 40. Modify Trunk Menu

Note
You cannot change a trunk’s ID number.

1 - Trunk ID
Specifies the trunk ID. Enter an ID number for the trunk, from 1 to 6. A trunk must be assigned a unique ID number. The default value is the next unused ID number.

2 - Trunk Name
Specifies the trunk name. Enter a name for the trunk. The name can be up to 16 alphanumeric characters. No spaces or special characters, such as asterisks and exclamation points, are allowed. Each trunk must have a unique name.

3 - Trunk Method
Specifies the load distribution method. The possible settings are:

- SRC MAC - Source MAC address
- DST MAC - Destination MAC address

- ❒ SRC/DST MAC - Source address /destination MAC address
- ❒ SRC IP - Source IP address trunking
- ❒ DST IP - Destination IP address trunking
- ❒ SRC/DST IP - Source address /destination IP address

The default is SRC/DST MAC. For background information, refer to “Load Distribution Methods” on page 134.

4 - Port Range
Specifies the ports of the trunk. A trunk can contain up to eight ports. You can identify the ports individually (for example, 3,7,10), as a range (for example, 5-11), or both (for example, 2,4,11-14).

6. Type **M** to select Modify Trunk.

   The modifications to the port trunk are activated on the switch.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

8. Reconnect the cables to the ports of the trunk on the switch.

   The modified port trunk is ready for network operations.

Deleting a Static Port Trunk

To delete a static port trunk from the switch, perform the following procedure:

Caution
Disconnect the cables from the port trunk on the switch before performing the following procedure. Deleting a port trunk without first disconnecting the cables can create loops in your network topology. Data loops can result in broadcast storms and poor network performance.

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Menu, type **4** to select Port Trunking and LACP.

   The Port Trunking and LACP menu is shown in Figure 37 on page 137.

3. From the Port Trunking and LACP menu, type **1** to select Static Port Trunking.

   The Static Port Trunking menu is shown in Figure 38 on page 137.

4. Type **D** to select Delete Trunk.

   The following prompt is displayed:

```
Enter Trunk ID: [1 to 6] ->
```

5. Enter the ID number of the trunk to be deleted.

   The following prompt is displayed:

   ```
   Are you sure you want to delete this trunk (Y/N) [Yes/No] ->
   ```

6. Type **Y** for yes to delete the port trunk or **N** for no to cancel this procedure.

   The port trunk is deleted from the switch.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Managing LACP Trunks

The following procedures explain how to create and manage LACP trunks:

- “Enabling or Disabling LACP,” next
- “Setting a LACP System Priority” on page 144
- “Creating an Aggregator” on page 145
- “Modifying an Aggregator” on page 147
- “Deleting an Aggregator” on page 149
- “Configuring LACP Port Parameters” on page 150
- “Displaying LACP Port or Aggregator Status” on page 151

For background information, refer to “LACP Trunk Overview” on page 128.

Enabling or Disabling LACP

This procedure explains how to enable or disable LACP on the switch. When you enable LACP, the switch begins to transmit LACPDU packets from ports assigned to aggregators. If ports in an aggregator receive LACPDU packets from a remote device, the switch creates aggregate trunks. If no aggregators are defined, no LACPDU packets are transmitted. When you disable LACP, any ports in existing aggregators stop sending LACPDU packets and function as regular Fast Ethernet ports.

Caution
Do not disable LACP if there are defined aggregators without first disconnecting all cables connected to the aggregate trunk ports. Otherwise, a network loop might occur, resulting in a broadcast storm and poor network performance.

To enable or disable LACP, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

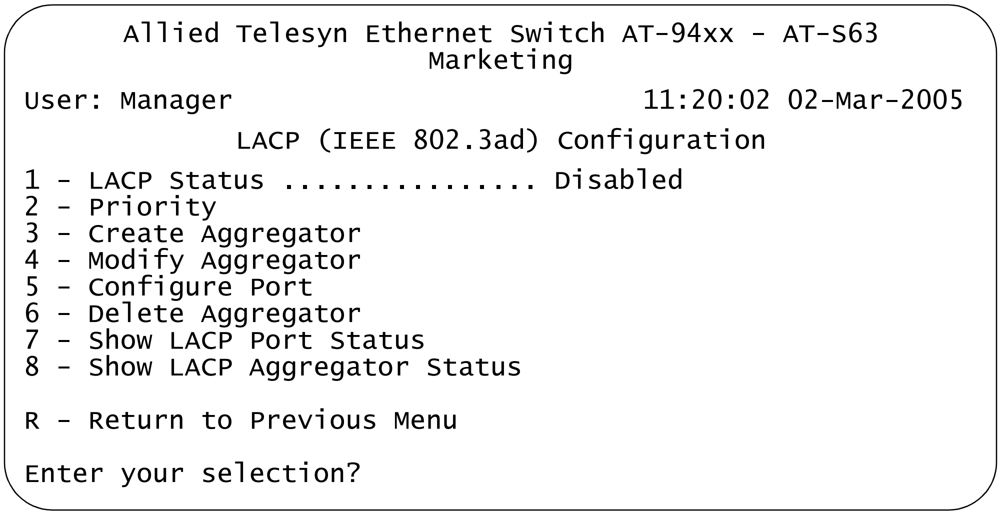
   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **4** to select Port Trunking and LACP.

   The Port Trunking and LACP menu is shown in Figure 37 on page 137.

3. Type **2** to select LACP Configuration.

The LACP (IEEE 8023ad) Configuration menu is shown in Figure 41.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                            11:20:02 02-Mar-2005
             LACP (IEEE 802.3ad) Configuration
1 - LACP Status ................ Disabled
2 - Priority
3 - Create Aggregator
4 - Modify Aggregator
5 - Configure Port
6 - Delete Aggregator
7 - Show LACP Port Status
8 - Show LACP Aggregator Status

R - Return to Previous Menu

Enter your selection?
```

Figure 41. LACP (IEEE 8023ad) Configuration Menu

4. Type **1** to toggle LACP Status between Disabled and Enabled. The default is disabled.

5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Setting a LACP System Priority

This procedure explains how to set the LACP system priority value on a switch. The switch uses this parameter if a conflict occurs when establishing an aggregate trunk with the other device. The LACP settings on the device with the higher priority take precedence over the settings on the other device. The lower the value, the higher the priority. A switch can have only one LACP system priority. For more information, refer to “LACP System Priority” on page 131.

To set the LACP system priority for the switch, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **4** to select Port Trunking and LACP.

   The Port Trunking and LACP menu is shown in Figure 37 on page 137.

3. Type **2** to select LACP Configuration.

   The LACP (IEEE 8023ad) Configuration menu is shown in Figure 41 on page 144.

4. Type **2** to select Priority.

   The following prompt is displayed:

   ```
   Enter Priority [0x1 - 0xFFFF]: [0x1 to 0xffff] -> 0x
   ```

5. Enter the new value is hexadecimal. The range is 1 to FFFF. The lower the value, the higher the priority. The prefix "0x" indicates that the number is hexadecimal.

   The new priority value takes effect immediately on the switch.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Creating an Aggregator

To create an aggregator, perform the following procedure:

> ⚠ **Caution**
> Do not connect the cables to the ports of the aggregator on the switch until after you have configured the aggregator with the management software and enabled LACP. Connecting the cables before configuring the software and activating the protocol will create a loop in your network topology. Data loops can result in broadcast storms and poor network performance.

> **Note**
> Before creating an aggregator, verify that the ports that will be members of the aggregator are set to Auto-Negotiation or 1000 Mbps, full-duplex. Aggregate trunks do not support half-duplex mode.

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **4** to select Port Trunking and LACP.

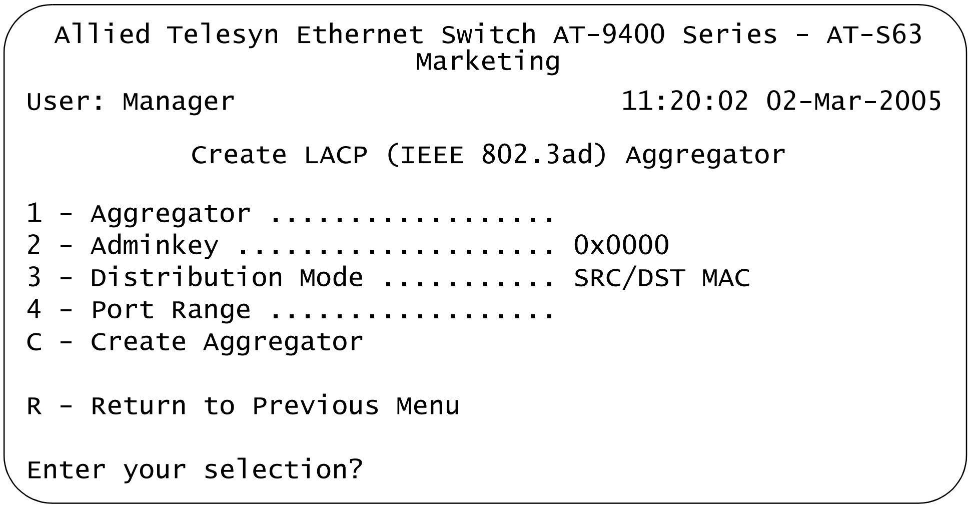
   The Port Trunking and LACP menu is shown in Figure 37 on page 137.

3. Type **2** to select LACP Configuration.

   The LACP (IEEE 8023ad) Configuration menu is shown in Figure 41 on page 144.

4. Type **3** to select Create Aggregator.

The Create LACP (IEEE 8023ad) Aggregator menu is shown in Figure 42.



```
 Allied Telesyn Ethernet Switch AT-9400 Series - AT-S63
                       Marketing
User: Manager                          11:20:02 02-Mar-2005

          Create LACP (IEEE 802.3ad) Aggregator

1 - Aggregator .................
2 - Adminkey ................... 0x0000
3 - Distribution Mode .......... SRC/DST MAC
4 - Port Range .................
C - Create Aggregator

R - Return to Previous Menu

Enter your selection?
```

Figure 42. Create LACP (IEEE 8023ad) Aggregator Menu

5. Configure the following parameters as necessary:

   1 - Aggregator
   Specifies a name for the aggregator. The name can be up to 20 alphanumeric characters. Spaces are allowed, but special characters, such as asterisks and exclamation points, are not. Each aggregator must have a unique name.

   2 - Adminkey
   Specifies a unique adminkey value for the aggregator. The value is entered in hexadecimal. The range is 1 to FFFF. For background information, refer to “Adminkey Parameter” on page 131.

   3 - Distribution Mode
   Sets the load distribution method. Possible settings are:

   - SRC MAC - Source MAC address
   - DST MAC - Destination MAC address
   - SRC/DST MAC - Source address /destination MAC address
   - SRC IP - Source IP address trunking
   - DST IP - Destination IP address trunking
   - SRC/DST IP - Source address /destination IP address

   The default is SRC/DST MAC. For background information, refer to “Load Distribution Methods” on page 134.

   4 - Port Range
   Specifies the aggregator ports. An aggregator can contain any number of ports on the switch. You can identify the ports individually (for

example, 3,7,10), as a range (for example, 5-11), or both (for example, 2,4,11-14).

6. After you configure the parameters, type **C** to select Create Aggregator.

   The aggregator is created on the switch.

7. If LACP is not enabled on the switch, perform the procedure “Enabling or Disabling LACP” on page 143 and activate the protocol.

8. Configure LACP on the other network device.

9. Connect the cables to the ports of the aggregator on both the switch and the other network device.

   The aggregator and its aggregate trunk(s) are now ready for network operations.

Caution
Do not connect the cables to the ports of the aggregator on the switch until after you have enabled LACP. Connecting the cables before activating the protocol will create a loop in your network topology. Data loops can result in broadcast storms and poor network performance.

10. Repeat this procedure to create additional aggregators, if needed.

11. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an Aggregator

This procedure explains how to modify an aggregator. You can change an aggregator’s name, adminkey, or load distribution method. You can also use this procedure to add or remove ports. To modify an aggregator, you need to know its name or adminkey key. It is recommended that you review the section “LACP Trunk Guidelines” on page 133 before modifying an aggregator.

Caution
If you will be adding or removing ports from the aggregator, you should disconnect all network cables from the ports of the aggregator on the switch before performing the procedure. Adding or removing ports without first disconnecting the cables can result in loops in your network topology, which can result in broadcast storms and poor network performance.

To modify an aggregator, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **4** to select Port Trunking and LACP.

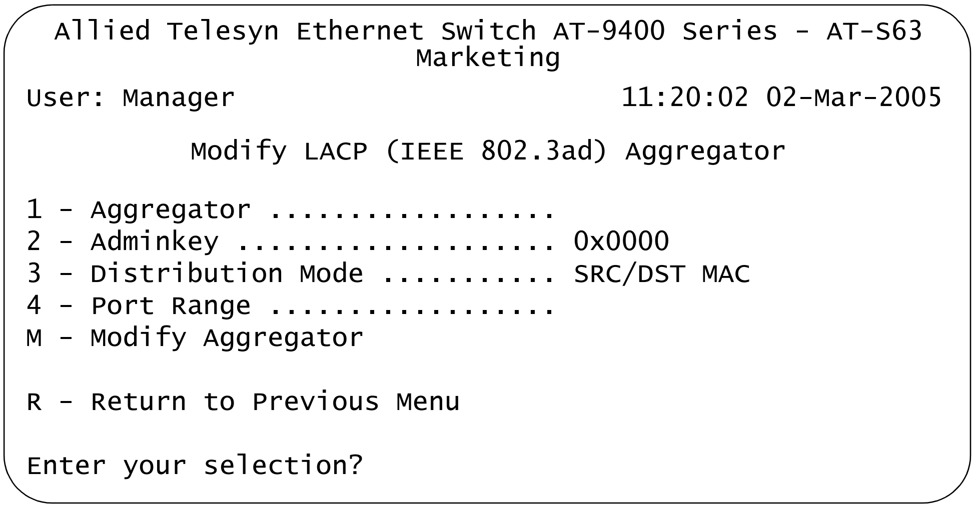
   The Port Trunking and LACP menu is shown in Figure 37 on page 137.

3. Type **2** to select LACP Configuration.

   The LACP (IEEE 8023ad) Configuration menu is shown in Figure 41 on page 144.

4. Type **4** to select Modify Aggregator.

   The Modify LACP (IEEE 8023ad) Aggregator menu is shown in Figure 43.



```
  Allied Telesyn Ethernet Switch AT-9400 Series - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005

          Modify LACP (IEEE 802.3ad) Aggregator

1 - Aggregator .................
2 - Adminkey ................... 0x0000
3 - Distribution Mode .......... SRC/DST MAC
4 - Port Range .................
M - Modify Aggregator

R - Return to Previous Menu

Enter your selection?
```

Figure 43. Modify LACP (IEEE 8023ad) Aggregator Menu

5. Type **1** to select Aggregator or **2** for Adminkey and, when prompted, enter the name or adminkey of the aggregator you want to modify. You can specify the aggregator by its name or adminkey number. The name is case-sensitive.

   After you enter the aggregator’s name or adminkey, the specifications of the aggregator are displayed in the menu.

6. Configure the following parameters as necessary:

   1 - Aggregator
   Specifies a name for the aggregator. The name can be up to twenty alphanumeric characters. Spaces are allowed, but special characters, such as asterisks and exclamation points, are not. Each aggregator must have a unique name.

2 - Adminkey
Specifies a unique adminkey value for the aggregator. The value is entered in hexadecimal. The range is 1 to FFFF. For background information, refer to “Adminkey Parameter” on page 131.

3 - Distribution Mode
Sets the load distribution method. Possible settings are:

❐ SRC MAC - Source MAC address

❐ DST MAC - Destination MAC address

❐ SRC/DST MAC - Source address /destination MAC address

❐ SRC IP - Source IP address trunking

❐ DST IP - Destination IP address trunking

❐ SRC/DST IP - Source address /destination IP address

The default is SRC/DST MAC. For background information, refer to “Load Distribution Methods” on page 134.

4 - Port Range
Specifies the aggregator ports. An aggregator can contain any number of ports on the switch. You can identify the ports individually (for example, 3,7,10), as a range (for example, 5-11), or both (for example, 2,4,11-14).

7. After configuring the parameters, type **M** to select Modify Aggregator.

   The aggregator is modified on the switch.

8. Reconnect the cables to the ports of the aggregator.

   The modified aggregator is now ready for network operations.

Deleting an Aggregator

This procedure deletes an aggregator from the switch. The ports that are members of the aggregator stop transmitting LACPDU packets after the aggregator is deleted.

⚠ **Caution**
Disconnect the cables from the ports of the aggregator before performing the following procedure. Deleting an aggregator without first disconnecting the cables can create loops in your network topology. Data loops can result in broadcast storms and poor network performance.

To delete an aggregator, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **4** to select Port Trunking and LACP.

   The Port Trunking and LACP menu is shown in Figure 37 on page 137.

3. Type **2** to select LACP Configuration.

   The LACP (IEEE 8023ad) Configuration menu is shown in Figure 41 on page 144.

4. Type **6** to select Delete Aggregator.

   The following prompt is displayed:

   ```
   Enter Aggregator Name [Max up to 20 alphanumeric
   characters]:
   ```

5. Enter the name of the aggregator you want to delete. The name is case-sensitive. You can delete only one aggregator at a time.

   ```
   Are you sure you want to delete this aggregator (Y/N) [Yes/No]
   ->
   ```

6. Type **Y** to delete the aggregator or **N** to cancel the procedure.

   If you entered Yes, the aggregator is deleted.

Configuring LACP Port Parameters

This procedure explains how to configure a port’s priority value. This parameter determines whether a port is active or in standby mode as part of an aggregate trunk. For further information, refer to “LACP Port Priority Parameter” on page 131. This procedure also shows how to assign a port to a different aggregator.

> **Note**
> To remove a port from an aggregator without assigning it to a different one, skip this procedure and instead perform “Modifying an Aggregator” on page 147. When modifying the aggregator, reenter its port list, omitting the port you want to remove.

To configure a port, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **4** to select Port Trunking and LACP.

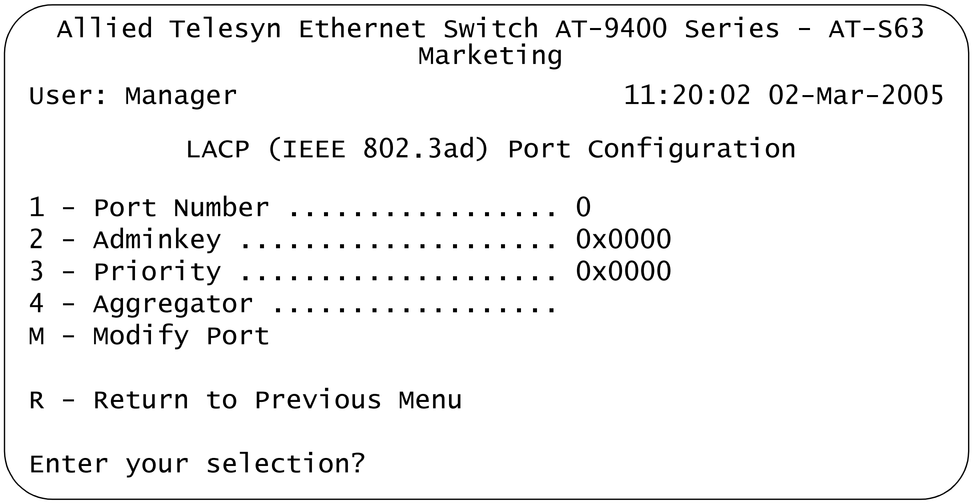
   The Port Trunking and LACP menu is shown in Figure 37 on page 137.

3. Type **2** to select LACP Configuration.

The LACP (IEEE 8023ad) Configuration menu is shown in Figure 41 on page 144.

4. Type **4** to select Modify Aggregator.

   The Modify LACP (IEEE 8023ad) Aggregator menu is shown in Figure 44.



```
 Allied Telesyn Ethernet Switch AT-9400 Series - AT-S63
                        Marketing
User: Manager                        11:20:02 02-Mar-2005

         LACP (IEEE 802.3ad) Port Configuration

1 - Port Number ................. 0
2 - Adminkey .................... 0x0000
3 - Priority .................... 0x0000
4 - Aggregator ..................
M - Modify Port

R - Return to Previous Menu

Enter your selection?
```

Figure 44. Modify LACP (IEEE 8023ad) Aggregator Menu

5. Type **1** to select Port Number and, when prompted, enter the port you want to configure. You can configure only one port at a time.

   The management software displays the port’s current aggregator settings. If the port is not a member of any aggregator, the parameters still display default values that are specific to the port and switch.

6. To set the port’s priority value, type **3** to Priority and enter the new value in hexadecimal. The range is 1 to FFFF. The default is the port number in hexadecimal.

7. To move the port to a different aggregator or to assign it to an aggregator if it is not currently a member of one, type either **2** to select Adminkey or **4** to select Aggregator and enter the adminkey value or name of the aggregator where you want to assign the port. You can specify only one aggregator and it must already exist on the switch.

8. Type **M** to select Modify Port.

Displaying LACP Port or Aggregator Status

To display LACP port or aggregator status, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **4** to select Port Trunking and LACP.

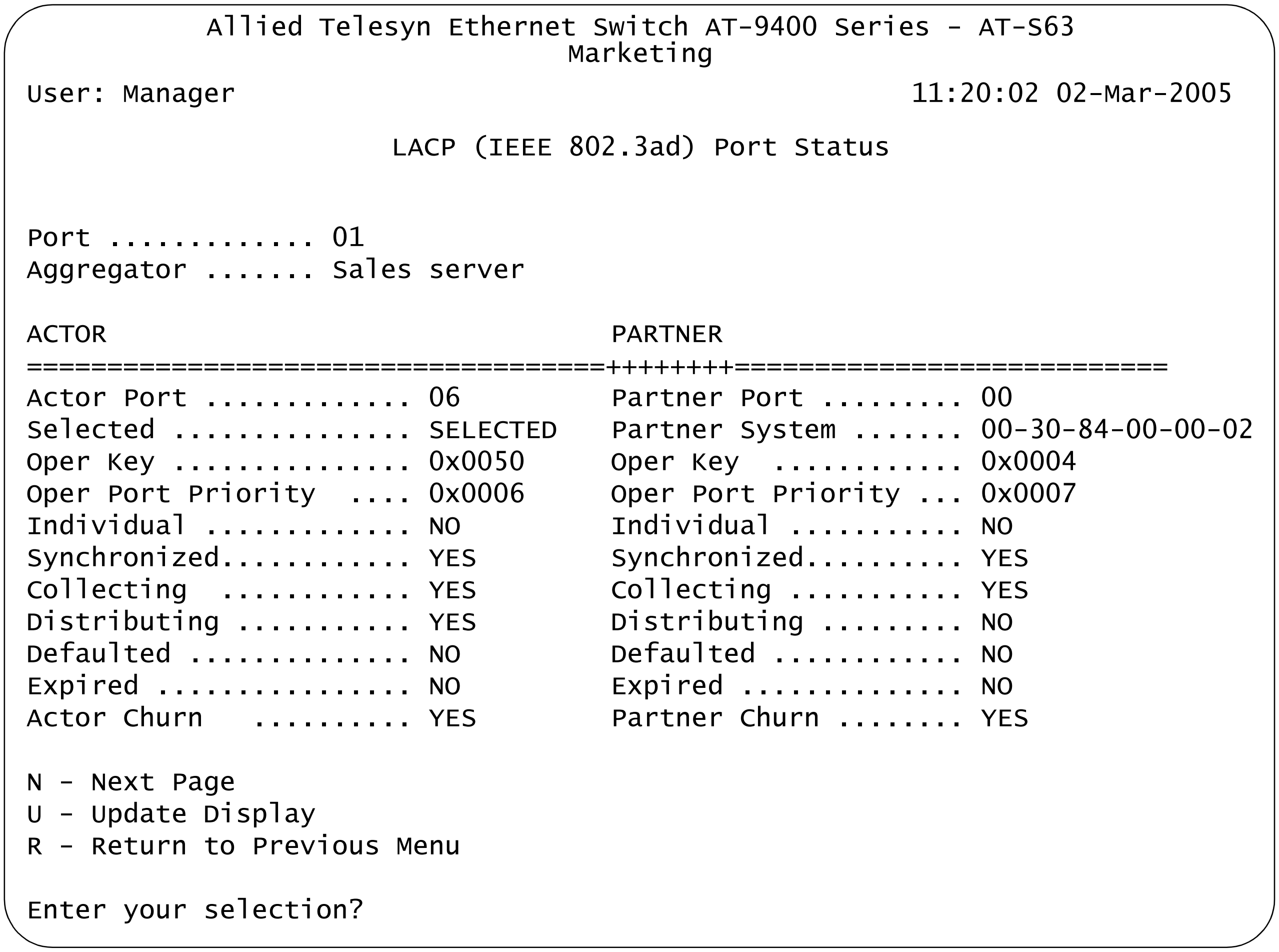
   The Port Trunking and LACP menu is shown in Figure 37 on page 137.

3. Type **2** to select LACP Configuration.

   The LACP (IEEE 8023ad) Configuration menu is shown in Figure 41 on page 144.

4. To view port status, type **7** to select Show LACP Port Status. To view aggregator status, type **8** to select Show LACP Aggregator Status.

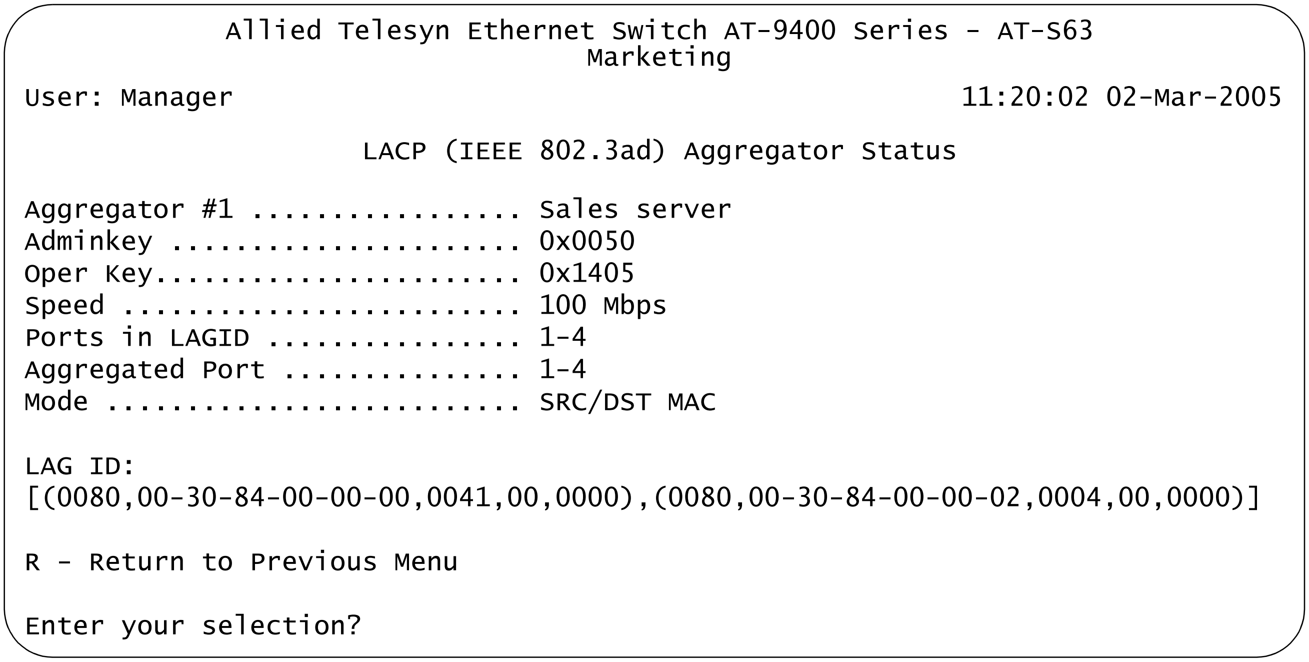
   Figure 45 is an example of the LACP (IEEE 802.3ad) Port Status menu. The information in this window is for viewing purposes only. For definitions, refer to the IEEE 802.3ad standard.



```
            Allied Telesyn Ethernet Switch AT-9400 Series - AT-S63
                                  Marketing
User: Manager                                          11:20:02 02-Mar-2005

                       LACP (IEEE 802.3ad) Port Status


Port ............. 01
Aggregator ....... Sales server

ACTOR                                PARTNER
====================================++++++++===========================
Actor Port ............. 06          Partner Port ......... 00
Selected ............... SELECTED    Partner System ....... 00-30-84-00-00-02
Oper Key ............... 0x0050      Oper Key  ............ 0x0004
Oper Port Priority  .... 0x0006      Oper Port Priority ... 0x0007
Individual ............. NO          Individual ........... NO
Synchronized............ YES         Synchronized.......... YES
Collecting  ............ YES         Collecting ........... YES
Distributing ........... YES         Distributing ......... NO
Defaulted .............. NO          Defaulted ............ NO
Expired ................ NO          Expired .............. NO
Actor Churn   .......... YES         Partner Churn ........ YES

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 45. LACP (IEEE 802.3ad Port Status Menu

Figure 46 is an example of the LACP (IEEE 802.3ad) Aggregator Status menu. The information is for viewing purposes only. An aggregator appears in the menu only if there is at least one active aggregate trunk between the switch and another network device.



```
              Allied Telesyn Ethernet Switch AT-9400 Series - AT-S63
                                   Marketing
User: Manager                                                11:20:02 02-Mar-2005

                    LACP (IEEE 802.3ad) Aggregator Status

Aggregator #1 .................. Sales server
Adminkey ....................... 0x0050
Oper Key........................ 0x1405
Speed .......................... 100 Mbps
Ports in LAGID ................. 1-4
Aggregated Port ................ 1-4
Mode ........................... SRC/DST MAC

LAG ID:
[(0080,00-30-84-00-00-00,0041,00,0000),(0080,00-30-84-00-00-02,0004,00,0000)]

R - Return to Previous Menu

Enter your selection?
```

Figure 46. LACP (IEEE 802.3ad) Aggregator Status Menu

If there are no active aggregate trunks on the switch, the following message is displayed:

```
No Aggregator with aggregatable Ports
```

Chapter 8

Port Mirroring

This chapter contains the procedures for creating and deleting a port mirror. Sections in the chapter include:

Port Mirroring Overview

The port mirroring feature allows you to unobtrusively monitor the traffic being received and transmitted on one or more ports on a switch by having the traffic copied to another switch port. You can connect a network analyzer to the port where the traffic is being copied and monitor the traffic on the other ports without impacting network performance or speed.

The port(s) whose traffic you want to mirror is called the *source port(s)*. The port where the traffic will be copied to is called the *destination port*.

Observe the following guidelines when you create a port mirror:

- You can select more than one source port at a time. However, the more ports you mirror, the less likely the destination port will be able to handle all the traffic. For example, if you mirror the traffic of six heavily active ports, the destination port is likely to drop packets, meaning that it will not provide an accurate mirror of the traffic of the six source ports.
- The source and destination ports must be located on the same switch.
- You can mirror either the ingress or egress traffic of the source ports, or both.

Note
When a transceiver is inserted into an uplink slot and a link is established, that slot becomes a primary uplink port and the corresponding backup port, 23R or 24R, automatically transitions to redundant uplink status. Any settings for port mirroring remain intact when the backup port makes the transition to a redundant uplink state.

Creating a Port Mirror

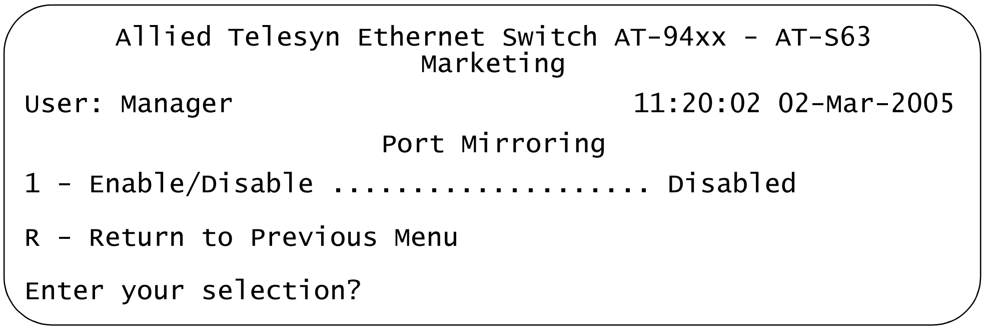
To create a port mirror, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **6** to select Port Mirroring.

   The Port Mirroring menu is shown in Figure 47.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                           11:20:02 02-Mar-2005
                         Port Mirroring
1 - Enable/Disable .................... Disabled

R - Return to Previous Menu

Enter your selection?
```

Figure 47. Port Mirroring Menu #1

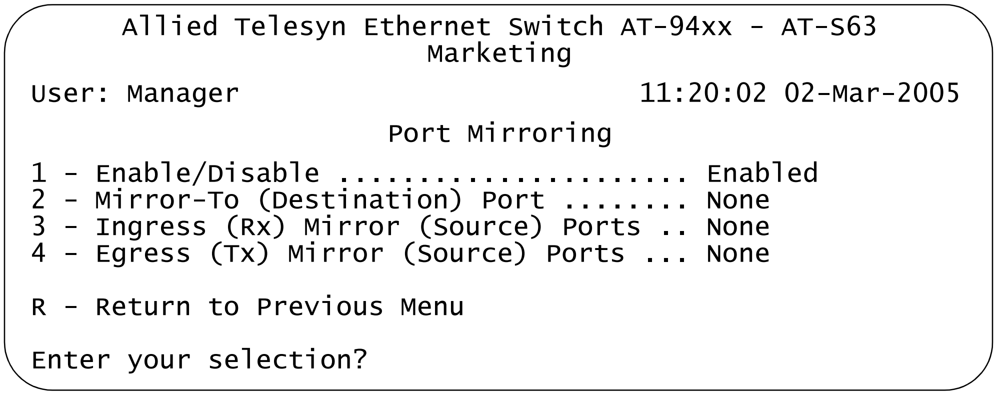
3. From the Port Mirroring menu, type **1** to select Enable/Disable.

   The following prompt is displayed.

   ```
   Enter Enable(E)/Disable(D):
   ```

4. Type **E** to enable the feature.

   New options are added to the Port Mirroring menu, as shown in Figure 48.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                           11:20:02 02-Mar-2005
                         Port Mirroring
1 - Enable/Disable ...................... Enabled
2 - Mirror-To (Destination) Port ........ None
3 - Ingress (Rx) Mirror (Source) Ports .. None
4 - Egress (Tx) Mirror (Source) Ports ... None

R - Return to Previous Menu

Enter your selection?
```

Figure 48. Port Mirroring Menu #2

5. Type **2** to select Mirror-To (Destination) Port.

   The following prompt is displayed:

   ```
   Mirror-To Port (0-24):
   ```

6. Enter the number of the port that functions as the destination port. This is the port where the traffic from the source ports will be copied to and where the network analyzer will be located. You can specify only one destination port.

7. If you want to mirror the ingress (received) traffic on one or more ports, type **3** to select Ingress(Rx) Mirror (Source Ports.

   The following prompt is displayed:

   ```
   Ingress Mirror Ports (1-24) (or None):
   ```

8. Enter the ports. You can identify the ports individually (for example, 3,7,10), as a range (for example, 5-11), or both (for example, 2,4,11-14). Entering “0” (zero) removes all ingress source ports.

9. If you want to mirror the egress (transmitted) traffic from one or more ports, type **4** to select Egress Mirror Port.

   The following prompt is displayed:

   ```
   Egress Mirror Ports (1-24) (or None):
   ```

10. Enter the ports. Entering “0” (zero) removes all egress source ports.

    Note
    If you want to monitor both the ingress and egress traffic of the source ports, you must specify the ports in both selection 3 and 4.

    The port mirror is now functional. Attach a network analyzer to the destination port to monitor the traffic on the source ports.

11. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Disabling a Port Mirror

To delete a port mirror, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **6** to select Port Mirroring.

   The Port Mirroring menu is shown in Figure 48 on page 157.

3. From the Port Mirroring Menu, type **1** to select Enable/Disable.

   The following prompt is displayed.

   ```
   Enter Enable(E)/Disable(D):
   ```

4. Type **D** to disable the feature.

   Port mirroring on the switch is now disabled. You can disconnect the network analyzer from the destination port and use the port for normal network operations.

Modifying a Port Mirror

To modify the port mirror, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **6** to select Port Mirroring.

   The Port Mirroring menu is shown in Figure 48 on page 157.

3. Type **2** to select Mirror-To (Destination) Port.

   The following prompt is displayed:

   ```
   Mirror-To Port (0-24):
   ```

4. Enter the number of the port that will function as the destination port. This is the port where the traffic from the source ports will be copied to and where the network analyzer will be located. You can specify only one destination port.

5. If you want to mirror the ingress (received) traffic on one or more ports, type **3** to select Ingress(Rx) Mirror (Source Ports.

   The following prompt is displayed:

   ```
   Ingress Mirror Ports (01-24) (0=None):
   ```

6. Enter the ports. You can identify the ports individually (for example, 3,7,10), as a range (for example, 5-11), or both (for example, 2,4,11-14). Entering “0” (zero) removes all ingress source ports.

7. If you want to mirror the egress (transmitted) traffic from one or more ports, type **4** to select Egress Mirror Port.

   The following prompt is displayed:

   ```
   Egress Mirror Ports (01-24) (0=None):
   ```

8. Enter the ports. Entering “0” (zero) removes all egress source ports.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying the Port Mirror

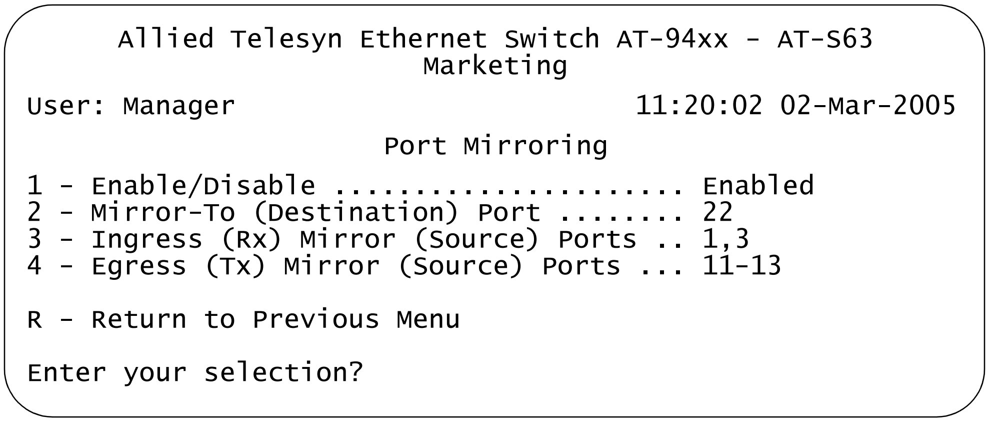
To display the port mirror, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **6** to select Port Mirroring.

   The Port Mirroring menu is shown in Figure 49.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                       Port Mirroring
1 - Enable/Disable ...................... Enabled
2 - Mirror-To (Destination) Port ........ 22
3 - Ingress (Rx) Mirror (Source) Ports .. 1,3
4 - Egress (Tx) Mirror (Source) Ports ... 11-13

R - Return to Previous Menu

Enter your selection?
```

Figure 49. Port Mirroring Menu

The Port Mirroring menu provides the following information about the port mirror:

Enable/Disable
The port mirroring status, Enabled or Disabled.

Mirror-To (Destination) Port
The port that functions as the destination port.

Ingress (Rx) Mirror (Source) Port
The port(s) where ingress (received) traffic is mirrored.

Egress (Tx) Mirror (Source) Port
The port(s) where egress (transmitted) traffic is mirrored.

Chapter 9

Networking Stack

The AT-S63 management software allows you to perform a few basic functions on the switch’s TCP/IP stack. The functions include viewing the switch’s Address Resolution Protocol (ARP) table and routing table. The switch uses these tables when you instruct it to perform a management function that requires interaction with another network device. You can also view the TCP connections table, which lists the active Telnet and web browser management sessions, and a global TCP table, which displays basic TCP status and statistics.

This chapter contains the following sections:

- “Managing the Address Resolution Protocol (ARP) Table” on page 164
- “Displaying the Route Table” on page 169
- “Displaying the TCP Connections” on page 171
- “Deleting a TCP Connection” on page 174
- “Displaying the TCP Global Information” on page 175

Managing the Address Resolution Protocol (ARP) Table

The switch has an Address Resolution Protocol (ARP) table for storing IP addresses of network devices and their corresponding MAC addresses. The switch uses the table whenever you issue a management command that requires the switch's AT-S63 management software to interact with another device on the network. An example would be if you instructed the switch to ping another network device or download a new AT-S63 image file or configuration file from a network server.

The value of the ARP table is that it eliminates the need of the switch to issue unnecessary ARP broadcast packets when performing some management functions. This can improve the switch's response time as well as reduce the number of broadcast packets on your network.

The table can hold up to 11 entries. There are two types of entries. One type is permanent. There is only one permanent entry. It is used by the switch for internal diagnostics and it can never be removed from the table.

The other type is a temporary entry, of which there can be up to ten. The switch adds a temporary entry whenever its management software interacts with another network device during a management function. When you enter a management command that contains an IP address not in the table, the switch sends out an ARP broadcast packet. When the remote device responds with its MAC address, the switch adds the device's IP address and MAC address as a new temporary entry to the table.

A temporary entry remains in the table only while active. An entry remains active so long as it is periodically used by the switch for management functions. If an entry is inactive for a specified period of time, referred to as ARP cache timeout, it is automatically removed from the table. This value is adjustable, as explained in "Setting the ARP Cache Timeout" on page 168. The default is 400 seconds. If the table becomes full, the management software continues to add new entries by deleting the oldest entries.

The management software allows you to view the contents of the table. You can also delete individual table entries or delete all the entries. These functions are explained in the following subsections:

- ❒ "Displaying the ARP Table" on page 165
- ❒ "Deleting an ARP Table Entry" on page 166
- ❒ "Resetting the ARP Table" on page 167
- ❒ "Setting the ARP Cache Timeout" on page 168

Note

The switch does not use the ARP table to move packets through its switching matrix. The switch refers to the table only when performing a management function that involves interaction with another network node.

Displaying the ARP Table

To display the ARP table, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

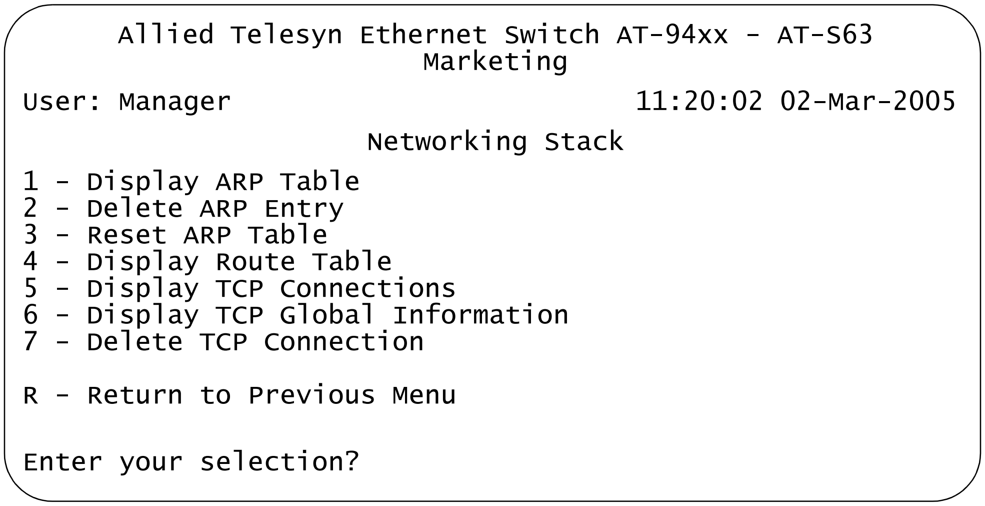
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **6** to select Networking Stack.

   The Networking Stack menu is shown in Figure 50.

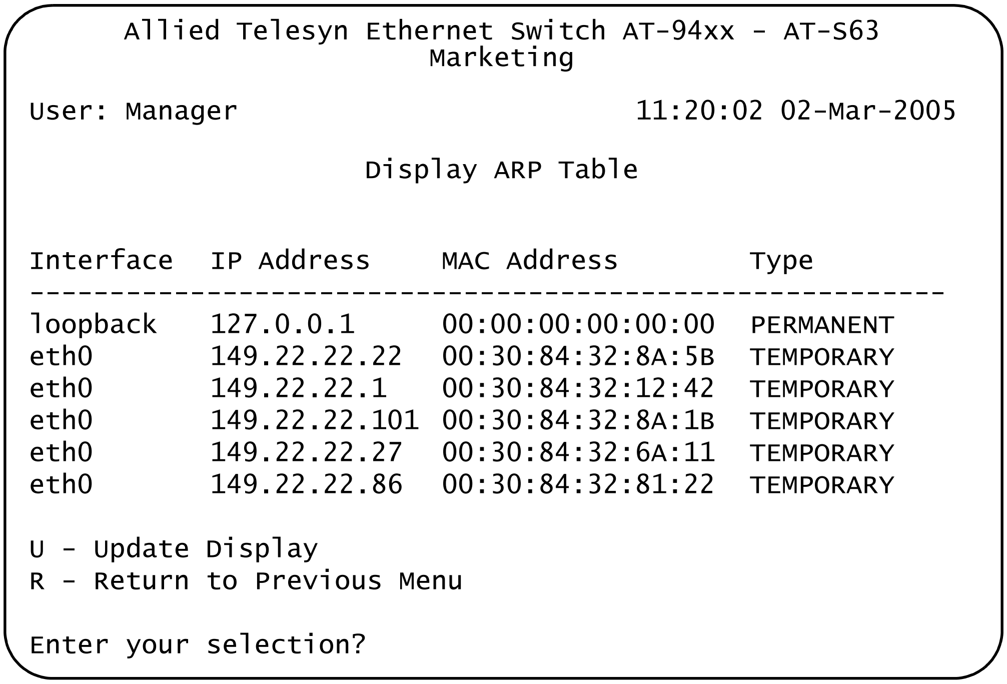


```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                         11:20:02 02-Mar-2005
                      Networking Stack
1 - Display ARP Table
2 - Delete ARP Entry
3 - Reset ARP Table
4 - Display Route Table
5 - Display TCP Connections
6 - Display TCP Global Information
7 - Delete TCP Connection

R - Return to Previous Menu


Enter your selection?
```

Figure 50. Networking Stack Menu

4. From the Networking Stack menu, type **1** to select Display ARP Table.

The Display ARP Table menu is shown in Figure 51.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing

User: Manager                         11:20:02 02-Mar-2005

                     Display ARP Table


Interface  IP Address     MAC Address       Type
----------------------------------------------------------
loopback   127.0.0.1      00:00:00:00:00:00  PERMANENT
eth0       149.22.22.22   00:30:84:32:8A:5B  TEMPORARY
eth0       149.22.22.1    00:30:84:32:12:42  TEMPORARY
eth0       149.22.22.101  00:30:84:32:8A:1B  TEMPORARY
eth0       149.22.22.27   00:30:84:32:6A:11  TEMPORARY
eth0       149.22.22.86   00:30:84:32:81:22  TEMPORARY

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 51. Display ARP Table Menu

The Display ARP Table menu displays a table that contains the following columns of information: The information in this table is for viewing purposes only.

Interface
The network interface of a table entry. The switch has two network interfaces. The “loopback” designation represents the interface used by the switch for internal diagnostics. The “eth0” designation represents the Ethernet network interface.

IP Address and
MAC Address
The IP addresses and their corresponding MAC addresses.

Type
The type of ARP entry. An entry can be permanent, meaning it can never be deleted from the table, or temporary. Only the “loopback” entry is permanent. All “eth0” entries are temporary.

Deleting an ARP Table Entry

To remove a dynamic or static ARP entry from the ARP cache, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **6** to select Networking Stack.

   The Networking Stack menu is shown in Figure 50 on page 165.

4. From the Networking Stack menu, type **2** to select Delete ARP Entry.

   The following prompt is displayed:

   ```
   Enter IP address of ARP entry to delete:
   ```

5. Enter the IP address of the entry you want to delete. You cannot delete the first entry in the table with the interface designation "loopback."

   The entry is immediately removed from the switch.

6. Repeat steps 4 and 5 to delete additional ARP table entries.

   You do not need to return to the main menu to save the changes made with this procedure.

7. Return to the Main Menu.

Resetting the ARP Table

To clear all entries from the ARP table, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **6** to select Networking Stack.

   The Networking Stack menu is shown in Figure 50 on page 165.

4. From the Networking Stack menu, type **3** to select Reset ARP Table.

   Note
   No confirmation prompt is displayed. All entries in the ARP table are immediately deleted, with the exception of the "loopback" entry, which cannot be deleted.

   The switch begins to add new entries to the table as it performs new management functions in conjunction with other network devices.

5. Return to the Main Menu.

Setting the ARP Cache Timeout

Inactive temporary entries in the ARP table are timed out according to the ARP cache timeout value. This parameter prevents the table from becoming full with inactive entries. The default setting is 400 seconds. To set this value, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **2** to select System Configuration.

   The System Configuration menu is shown in Figure 5 on page 47.

3. Type **A** to select ARP Cache Timeout.

   The following prompt is displayed:

   ```
   Enter your new value -> [1 to 260000] 400
   ```

4. Type a value between 1 and 260000 seconds and press Enter.

5. Return to the Main Menu.

Displaying the Route Table

The routing table is used by the switch when a remote node specified in a management command is not on the same physical network as the switch. The table contains the IP address of the next hop to reaching the remote network or device. For example, the switch might refer to the table if you instructed it to download a new AT-S63 image file from a network server that was on a different physical network.

To display the route table, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

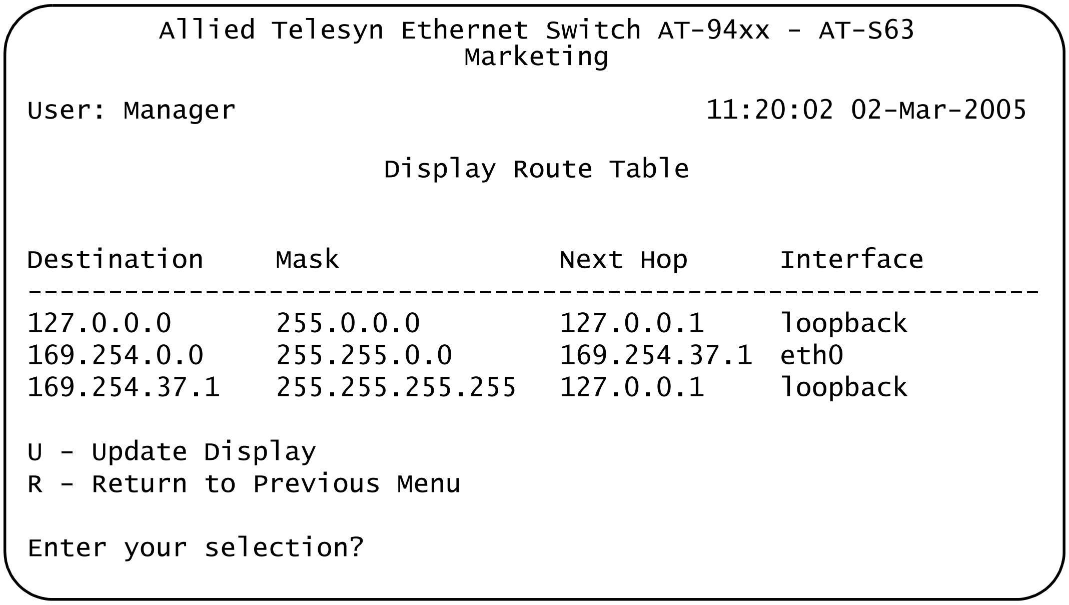
   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **6** to select Networking Stack.

   The Networking Stack menu is shown in Figure 50 on page 165.

4. From the Networking Stack menu, type 4 to select Display Route Table.

   The Display Route Table menu is shown in Figure 52.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing

User: Manager                                 11:20:02 02-Mar-2005

                        Display Route Table


Destination     Mask              Next Hop      Interface
--------------------------------------------------------------
127.0.0.0       255.0.0.0         127.0.0.1     loopback
169.254.0.0     255.255.0.0       169.254.37.1  eth0
169.254.37.1    255.255.255.255   127.0.0.1     loopback

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 52. Display Route Table Menu

The information in this menu is for viewing purposes only. The Display Route Table menu contains the following columns of information.

Destination
The IP address of a destination network, subnetwork, or end node.

Mask
A filter used to designate the active part of the destination IP address. A binary 1 in the mask indicates an active bit in the address while a binary 0 indicates that the corresponding bit in the address is not.

Next Hop
The IP address of the next intermediary device to reaching the destination network, subnetwork, or end node.

Interface
The interface on the switch where the next hop is located. The switch has two interfaces. The interface “loopback” is for internal diagnostics only. The other interface is “eth0.”

5. Return to the Main Menu.

Displaying the TCP Connections

The TCP connections table lists the active Telnet, SSH, and web browser management sessions on a switch and includes the IP addresses of the management stations. You can use the table to determine the number of remote, active management sessions open on a switch, as well as identify the management stations.

To display the TCP connections table, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

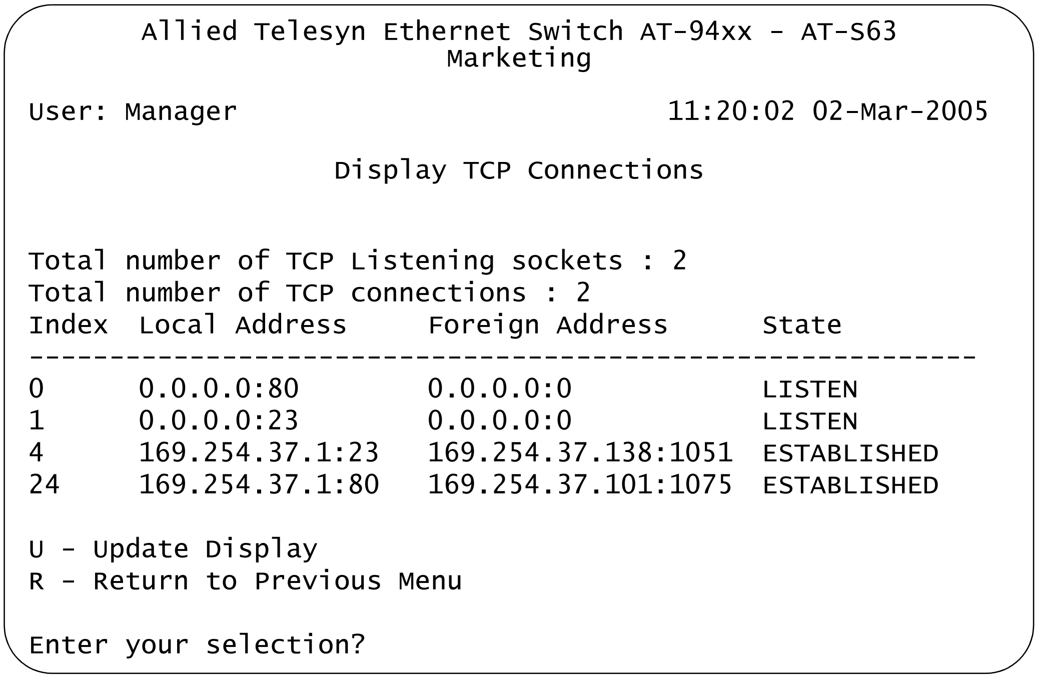
   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **6** to select Networking Stack.

   The Networking Stack menu is shown in Figure 50 on page 165.

4. From the Networking Stack menu, type **5** to select Display TCP Connections.

   An example of the Display TCP Connections menu is shown in Figure 53.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing

User: Manager                          11:20:02 02-Mar-2005

                    Display TCP Connections


Total number of TCP Listening sockets : 2
Total number of TCP connections : 2
Index  Local Address     Foreign Address      State
-----------------------------------------------------------
0      0.0.0.0:80        0.0.0.0:0            LISTEN
1      0.0.0.0:23        0.0.0.0:0            LISTEN
4      169.254.37.1:23   169.254.37.138:1051  ESTABLISHED
24     169.254.37.1:80   169.254.37.101:1075  ESTABLISHED

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 53. Display TCP Connections Menu

This menu is for viewing purposes only. The Display TCP Connections menu contains the following information:

Total Number of TCP Listening sockets
The number of active listening sockets. There can be a maximum of three listening sockets. One is for the Telnet server, another for SSH, and the last for the web browser server. If a server is disabled, its listening socket does not appear in the table.

Total Number of TCP connections
The number of active Telnet, SSH, and web browser connections to the switch.

Index
The internal socket ID number assigned to the connection.

Local Address
The IP address of the switch, followed by the TCP port number used by the switch for the connection. The two values are divided by a colon, as illustrated in Figure 54. The port number indicates the type of TCP connection. A port number of 23 indicates a Telnet connection, 22 an SSH connection, and 80 or 443 a web browser HTTP or HTTPS connection, respectively.

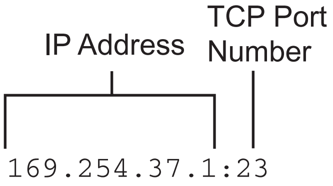


Figure 54. IP Address and TCP Port Number

Foreign Address
The IP address of the management workstation that initiated the connection, followed by the station’s TCP port number.

State
The state of the TCP connection. The TCP states are:

- LISTEN - Waiting for a connection request from any remote TCP and port.
- SYN-SENT - Waiting for a matching connection request after having sent a connection request.
- SYN-RECEIVED - Waiting for a confirming connection request acknowledgment after having both received and sent a connection request.
- ESTABLISHED - An open connection between the switch and the management workstation. This is the normal state for the data transfer portion of the connection.
- FIN-WAIT-1 - Waiting for a connection termination request from

the remote TCP, or an acknowledgment of the connection termination request previously sent.

- ❐ FIN-WAIT-2 - Waiting for a connection termination request from the remote TCP.
- ❐ CLOSE-WAIT - Waiting for a connection termination request from the local user.
- ❐ CLOSING - Waiting for a connection termination request acknowledgment from the remote TCP.
- ❐ LAST-ACK - Waiting for an acknowledgment of the connection termination request previously sent to the remote TCP which includes an acknowledgment of its connection termination request.
- ❐ TIME-WAIT - Waiting for enough time to pass to be sure the remote TCP received an acknowledgment of its connection termination request.
- ❐ CLOSED - No connection.

The entries for the listening sockets for the Telnet, SSH, and web browser servers are identified in the table with a TCP state of LISTEN. If you disable a server on the switch, its corresponding LISTEN entry is removed from the table. Disabling all the servers leaves the table empty. (The SSH server is disabled by default on the switch.)

The example in Figure 54 on page 172 shows that the Telnet and web browser servers are active on the switch. The table also includes two active TCP connections. Entry 4 is for a Telnet connection and entry 24 is for a web browser HTTP connection.

A web browser management session can have more than one TCP connection open at a time. The different connections are used to carry different packets of the management session.

You cannot change any of the information in this table. The only operating parameter on the switch that affects management TCP connections that you can adjust, other than enabling or disabling the servers, is the TCP port used by the web browser server. The default values are port 80 for HTTP and 443 for HTTPS. For instructions on how to change this setting, refer to “Configuring the Web Server” on page 687. The management software does not allow you to change the default port number of 23 for Telnet connections or 22 for SSH connections.

5. Return to the Main Menu.

Deleting a TCP Connection

This procedure explains how you can use the TCP connections table to end a Telnet, SSH, or web browser management session on a switch. This procedure is useful if a manager forgot to log out after ending a session or if you suspect that an unauthorized person is accessing the switch's management software.

Before performing this procedure, display the TCP table by performing the procedure "Displaying the TCP Connections" on page 171 and write down on paper the index number of the connection you want to end. A web browser management session can consist of more than one TCP connection.

You cannot delete the entries for the listening sockets for the Telnet, SSH, and web browser servers. To remove a listening socket entry from the table, disable the corresponding server.

To delete a TCP connection, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **6** to select Networking Stack.

   The Networking Stack menu is shown in Figure 50 on page 165.

4. From the Networking Stack menu, type 7 to select Delete TCP Connection.

   The following prompt is displayed:

   ```
   Enter the TCP Connection Index: [0 to 65535] ->
   ```

5. Enter the connection index number.

   To display the TCP connections and see the index numbers, refer to "Displaying the TCP Connections" on page 171.

6. Enter the index number of the connection you want to delete and press Enter. You can enter only one index number at a time.

   The connection is deleted and the table is refreshed.

7. Return to the Main Menu.

Displaying the TCP Global Information

The TCP Global Information table displays TCP status and statistics. To view the table, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

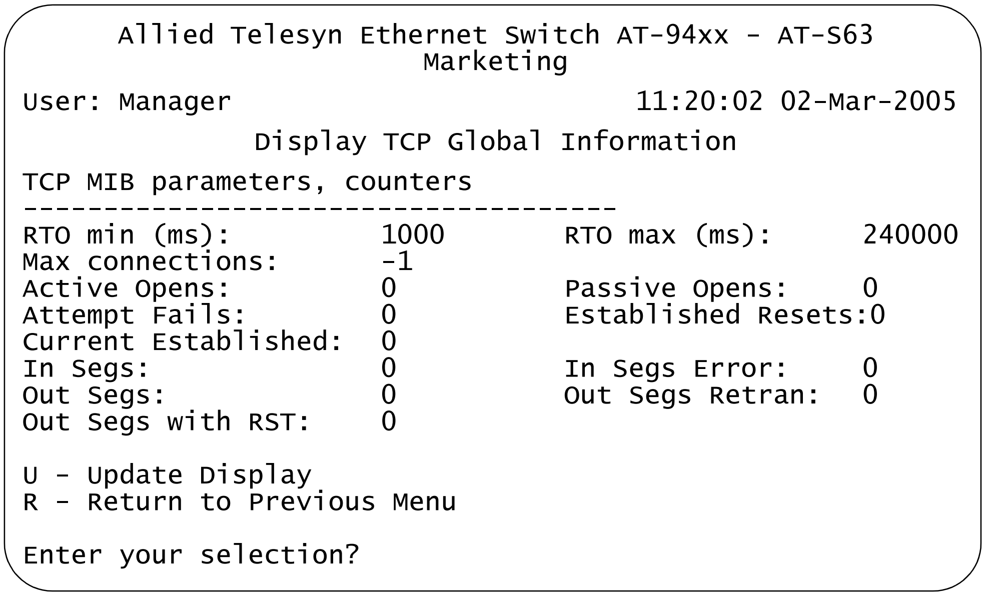
   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **6** to select Networking Stack.

   The Networking Stack menu is shown in Figure 50 on page 165.

4. From the Networking Stack menu, type 6 to select Display TCP Global Information.

   The Display TCP Global Information menu is shown in Figure 55.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                         11:20:02 02-Mar-2005
              Display TCP Global Information
TCP MIB parameters, counters
-------------------------------------
RTO min (ms):         1000      RTO max (ms):      240000
Max connections:      -1
Active Opens:         0         Passive Opens:     0
Attempt Fails:        0         Established Resets:0
Current Established:  0
In Segs:              0         In Segs Error:     0
Out Segs:             0         Out Segs Retran:   0
Out Segs with RST:    0

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 55. Display TCP Global Connections Menu

The Display TCP Global Connections menu contains the following items of information:

RTO min (ms) and RTO max (min)
Retransmit time algorithm parameters.

Max connections
The maximum number of TCP connections allowed.

Active Opens
The number of active TCP opens. Active opens initiate connections.

Passive Opens
The number of TCP passive opens. Passive opens are issued to wait for a connection from another host.

Attempt Fails
The number of failed connection attempts.

Established Resets
The number of connections established but have not been reset.

Current Established
The number of current connections.

In Segs
The number of segments received.

In Segs Error
The number of segments received with an error.

Out Segs
The number of segments transmitted.

Out Segs Retran
The number of segments retransmitted.

Out Segs with RST
The number of segments transmitted with the RST bit set.

5. Return to the Main Menu.

Section II

Advanced Operations

The chapters in this section provide information and procedures for advanced switch setup using the AT-S63 management software. The chapters include:

Chapter 10

File System

The chapter describes the AT-S63 file system, and how you can use the file system to copy, rename, and delete system files in flash memory or on a compact flash card. This chapter also explains how you can use the file system to select which boot configuration file you want the switch to use the next time the device is reset or power cycled.

This chapter contains the following sections:

File System Overview

The AT-S63 management software has a file system for storing system files in flash memory on the switch or on a compact flash card. You can view a list of files as well as copy, rename, and delete files. The following file types are supported by the AT-S63 file system:

❒ Configuration files

❒ Public keys

❒ Public certificates

❒ Certificate enrollment requests

For an explanation of a boot configuration file, refer to “Working with Boot Configuration Files” on page 183.

Public encryption keys, public certificates, and certificate enrollment request files are related to the Secure Sockets Layer (SSL) certificates feature described in Chapter 31, “Encryption Keys” on page 693 and Chapter 32, “PKI Certificates and SSL” on page 719. Refer to those chapters for background information on those files.

Note
The certificate file, certificate enrollment request file, and key file are supported only on the version of AT-S63 management software that features SSL and PKI security.

This chapter does not explain how to transfer a file from the AT-S63 file system to a management station or to an TFTP server. For those instructions, refer to Chapter 11, “File Downloads and Uploads” on page 205.

Note
The file system may contain one or more ENC.UKF files. These are encryption key pairs. These files cannot be deleted, copied, or exported from the file system. For instructions on deleting a key, refer to “Deleting an Encryption Key” on page 709.

Some AT-9400 Series switch models also contain a compact flash card slot.The AT-S63 management software supports file system operations on compact flash cards used in these systems including copying files from flash memory to the compact flash card and vice versa.

File Naming Conventions

The flash memory file system is a flat file system—directories are not supported. However, directories are supported on compact flash cards. In both types of storage, files are uniquely identified by a file name in the following format:

```
filename.ext
```

where:

- *filename* is a descriptive name for the file, and may be one to sixteen characters in length. Valid characters are lowercase letters (a–z), uppercase letters (A–Z), digits (0–9), and the following characters: ~ ’ @ # $ % ^ & ( ) _ - { }. Invalid characters are: ! * + = “| \ [ ] ; : ? / , < >.
- *ext* is a file name extension of three characters in length, preceded by a period (.). The extension is used by the switch to determine the file type.

Table 1. File Extensions and File Types

Extension	File Type
.cfg	Configuration file (or boot script)
.cer	Certificate file
.csr	Certificate enrollment request
.key	Key file

The following is an example of a valid file name for a boot configuration file:

```
standardconfig.cfg
```

The following is an example of an invalid file name for a file stored in flash memory:

```
sys/head_o.cfg
```

The backslash character (/) is not a valid character for files stored in flash memory because subdirectories are not supported in the flash memory system.

Using Wildcards to Specify Groups of Files

You can use the asterisk character (*) as a wildcard character in some fields to identify groups of files. In addition, a wildcard can be combined with other characters. The following are examples of valid wildcard expressions:

```
*.cfg
*.key
28*.cfg
```

Specifying the File Location

When you work with files on a switch that supports a compact flash card, the default file location for file system operations is flash memory. You can use the Copy File, Rename File, Delete File, View File, and List Files selections on the File Operations menu (see Figure 56 on page 184) to work with files in flash memory or on a compact flash card by specifying the file location. To specify the file location as flash memory, precede the file name with “flash:.,” For example:

```
flash:boot.cfg
```

To specify a file located on a compact flash card, precede the name with “cflash:,” for example:

```
cflash:switch12.cfg
```

If you do not specify a location, the default is flash memory.

Working with Boot Configuration Files

A boot configuration file contains a series of commands that configure the switch’s parameter settings when you power cycle or reset the device. The commands in the file recreate all the VLANs, port settings, spanning tree settings, port trunks, port mirrors, and so forth on the switch.

A switch can contain multiple boot configuration files, but only one can be active on a switch at a time. The active boot file is the file that is updated whenever you select the Save Configuration Changes option from the Main Menu.

You can create different boot configuration files and store them in the switch’s file system. For example, you might create a backup of a boot configuration file to protect against the loss of the file, or you might create different boot configuration files to see which works best on the switch and for your network. You can also copy boot configuration files onto different switches to save yourself the trouble of having to manually configure AT-9400 Series switches that are to have similar configurations. One way to do this with switches that support compact flash cards is to copy the configuration file from flash memory on the master switch onto the compact flash card. Then take the compact flash card to other switches and copy the configuration file from the compact flash card into the switch’s flash memory.

The procedures in this section explain how to create a boot configuration file, set the active boot configuration file, view the contents of a boot configuration file, and edit a file. The procedures are:

- “Creating a Boot Configuration File” on page 183
- “Setting the Active Boot Configuration File” on page 186
- “Viewing a Boot Configuration File” on page 187
- “Editing a Boot Configuration File” on page 188

To display a list of the boot configuration files that exist on the switch, see “Displaying System Files” on page 195.

Creating a Boot Configuration File

This section explains how to create a new boot configuration file on the switch. You might want to create a boot configuration file to download it onto another switch. Or, you might want to create a backup of your current configuration.

This process involves three procedures:

- “Creating a Boot Configuration File” on page 184
- “Configuring the Switch’s Parameter Settings” on page 185

- “Selecting the Active Boot Configuration File for the Switch” on page 186

Creating a Boot Configuration File

To create a boot configuration file, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

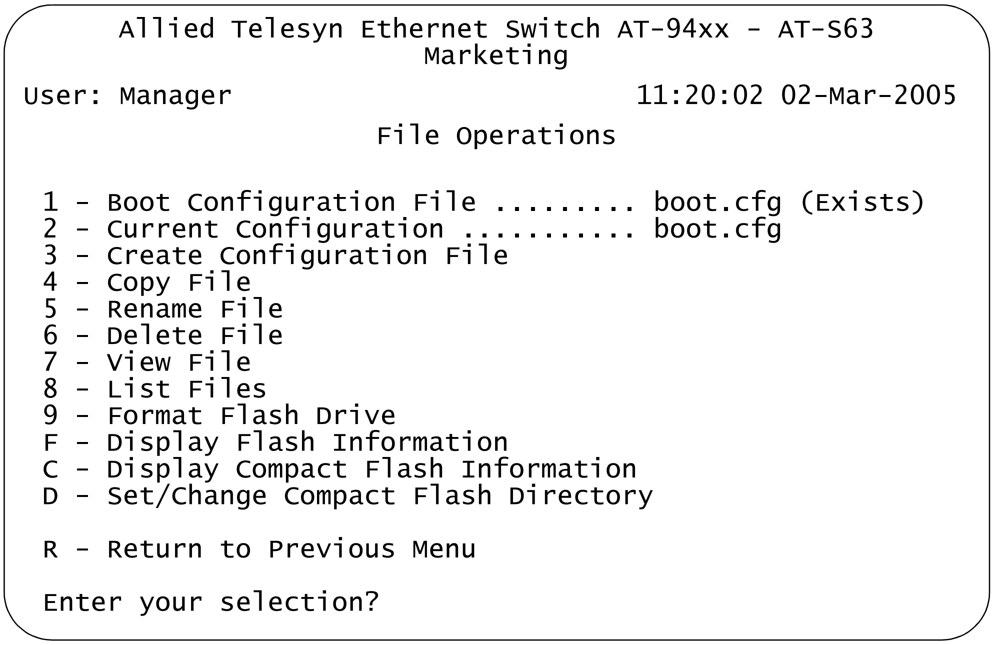
   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The File Operations menu is shown in Figure 56.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
                      File Operations

 1 - Boot Configuration File ......... boot.cfg (Exists)
 2 - Current Configuration ........... boot.cfg
 3 - Create Configuration File
 4 - Copy File
 5 - Rename File
 6 - Delete File
 7 - View File
 8 - List Files
 9 - Format Flash Drive
 F - Display Flash Information
 C - Display Compact Flash Information
 D - Set/Change Compact Flash Directory

 R - Return to Previous Menu

 Enter your selection?
```

Figure 56. File Operations Menu

Note
Item 9, Format Flash Drive, and item F, Display Flash Information, are described in “Working with Flash Memory” on page 199. Item C, Display Compact Flash Information and item D, Compact Flash Directory Configuration are described in “Working with the Compact Flash Card” on page 201.

4. From the File Operations menu, type **3** to select Create Configuration File.

   The following prompt is displayed:

   ```
   Enter the file name:
   ```

5. Enter a file name for the new boot configuration file.

   The file name can be up to 16 alphanumeric characters. Spaces are allowed. The filename must include the extension ".cfg". See "File Naming Conventions" on page 180.

   Note
   If a filename already exists, the system displays a message asking if you want to overwrite the existing file name.

   Note
   You cannot name a boot configuration file "default.cfg." This file name is reserved by the switch.

6. Type **1** to select Boot Configuration File.

   The following prompt is displayed:

   ```
   Enter the file name:
   ```

7. Enter the same file name that you entered in Step 5.

   This makes your new boot configuration file the active file on the switch. To save any changes that you made to the switch's parameter settings, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

   The file name is now displayed following selection 1 in the File Operations menu. The file name should be followed by "Exist", meaning that the file exists in the switch's file system. If "Not Found" is displayed instead, the file is created the next time you select Save Configuration Changes from the Main Menu.

Configuring the Switch's Parameter Settings

After you create a boot configuration file and designate it as the active boot configuration file on the switch, you should now configure the switch's parameter settings by making those changes that you want the new boot configuration file to contain. Then, save your changes to the boot configuration file by returning to the Main Menu and typing **S** to select Save Configuration Changes. Failure to save your changes means that the boot configuration file does not contain the new parameter settings.

Note
Only the active boot configuration file is changed when you select the Save Configuration Changes option in the Main Menu. No other boot configuration files that are stored on the switch are altered.

Selecting the Active Boot Configuration File for the Switch

You have now created the boot configuration file, made the necessary changes to the switch's parameter settings, and saved the changes. If you want the switch to use this new boot configuration file the next time you reset or power cycle the switch, no further steps are necessary. The new boot configuration file is already the active boot file on the device.

But if you want the switch to use a different file as the active boot configuration file, then perform the procedure in "Setting the Active Boot Configuration File" on page 186.

Setting the Active Boot Configuration File

This procedure selects the active boot configuration file on the switch. The switch uses the active boot configuration file to set its parameter settings the next time the unit is reset or power cycled. You can select a boot configuration file that you created on the switch or one that you downloaded onto the switch from another switch.

Note
The active boot configuration file is updated whenever you select the Save Configuration Changes from the Main Menu.

To select the active boot configuration file for the switch, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The File Operations menu is shown in Figure 56 on page 184.

4. From the File Operations menu, type **1** to select Boot Configuration File.

   The following prompt is displayed:

   ```
   Enter the file name:
   ```

5. Enter the file name of the boot configuration file that you want the switch to use the next time it is reset or power cycled.

   The file name is displayed following selection 1 in the File Operations menu. The file name should be followed by “Exist”, which means that the file exists in the switch’s file system. In the future, the switch uses the newly selected boot configuration file whenever you reset the unit, unless you designate another boot configuration file as the active boot file.

   Note
   If “Not Found” appears, the file does not exist. If you reboot the switch using a nonexistent boot configuration file, the switch is reset to its factory default settings.

6. To activate the parameter settings in the newly selected boot configuration file, reset or power cycle the switch.

Viewing a Boot Configuration File

Use the following procedure to view the contents of a boot configuration file. (To display the names of the boot configuration files on the switch, see “Displaying System Files” on page 195.)

To view the contents of a boot configuration file, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The File Operations menu is shown in Figure 56 on page 184.

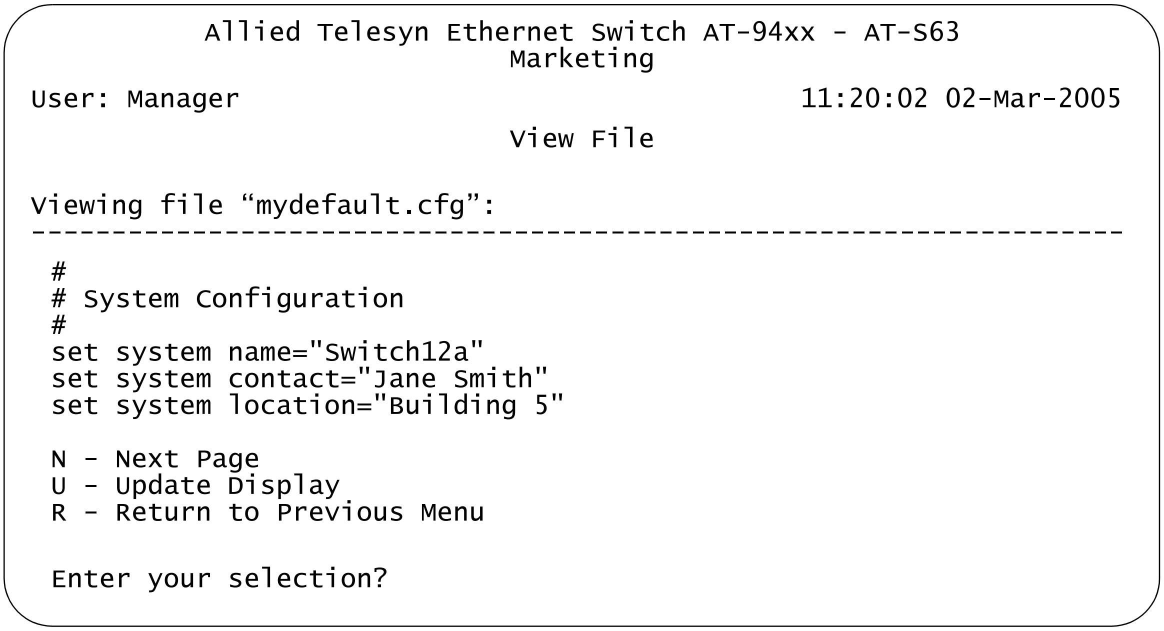
4. From the File Operations menu, type **7** to select View File.

   The following prompt is displayed:

   ```
   Enter file name:
   ```

5. Enter the name of the boot configuration file you want to view.

The contents of the boot configuration file are displayed in the View File menu. An example is shown in Figure 57.



```
          Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                             Marketing
User: Manager                                  11:20:02 02-Mar-2005
                             View File

Viewing file “mydefault.cfg”:
--------------------------------------------------------------------

 #
 # System Configuration
 #
 set system name="Switch12a"
 set system contact="Jane Smith"
 set system location="Building 5"

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 57. View File Menu with Sample Boot Configuration File

A boot configuration file contains any switch settings that differ from the AT-S63 default values. The parameter settings are shown in their command line equivalents. The switch executes the commands in the boot configuration file to configure its settings when it is reset or power cycled. For information on command line commands, refer to the *AT-S63 Management Software Command Line Interface User’s Guide*. The information in this menu is for viewing purposes only.

6. Type **N** for Next Page and **P** for Previous Page to scroll through the file.

Editing a Boot Configuration File

You can edit a boot configuration file using a text editor on your management station. To edit the file, you must first upload it from the switch to your management station. You cannot edit a boot configuration file directly on the switch. After you edit the file, you can download it to the switch and make it the active boot configuration file.

For instructions on how to upload a boot configuration file from a switch to your management station, refer to “Uploading a System File” on page 222. For instructions on how to download a boot configuration file from your management station back to the switch, refer to “Downloading a System File” on page 216. For instructions on how to designate an active boot configuration file, refer to “Setting the Active Boot Configuration File” on page 186.

The following are several guidelines for editing a boot configuration file:

❐ The text editor must be able to store the file as ASCII text. Do not insert special formatting codes, such as boldface or italics, into a boot configuration file.

❐ The boot configuration file must contain AT-S63 command line commands. You enter the commands you want the switch to perform when reset or power cycled. For a description of the commands, refer to the *AT-S63 Management Software Command Line Interface User's Guide*.

❐ A boot configuration file is divided into sections with each section devoted to the commands for a particular purpose. For example, the VLAN Configuration section should only contain commands for creating VLANs or for setting the VLAN mode.

❐ Each command must start flush left.

❐ To comment out a command so that the switch does not perform it, precede the command with the pound symbol (#).

❐ You should test the commands manually by entering them at a command line prompt before you insert them into a boot configuration file. This helps ensure that you understand the syntax and parameters of the commands and that the commands produce the desired results.

❐ To troubleshoot a boot configuration file, start a local management session with the switch and reset the device. Messages displayed on the screen during the boot up and boot configuration process indicate that the line in the boot configuration file that contains the error.

Copying a System File

To copy a system file, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The File Operations menu is shown in Figure 56 on page 184.

4. From the File Operations menu, type **4** to select Copy File.

   Note
   Selecting Copy File does not allow you to overwrite files.

   The following prompt is displayed:

   ```
   Enter the source file name:
   ```

   Note
   Files with the extension UKF are encryption key pairs. These files cannot be copied, renamed, or deleted from the file system. To delete a key pair from the switch, refer to “Deleting an Encryption Key” on page 709.

5. Enter the name of the file you want to copy. If the file is located on a compact flash card, precede the filename with “cflash:”

   The following prompt is displayed:

   ```
   Enter the destination file name:
   ```

6. Enter the new file name.

   You can enter a file name of up to 16 alphanumeric characters, followed by a 3 letter extension. You must keep the same extension. If the file is located on a compact flash card, precede the filename with “cflash:”

   The following message is displayed:

```
Please wait...
Press any key ...
```

7. Press any key to return to the File Operations menu.

Renaming a System File

To rename a system file, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The File Operations menu is shown in Figure 56 on page 184.

4. From the File Operations menu, type **5** to select Rename File.

   The following prompt is displayed:

   ```
   Enter the source file name:
   ```

   Note
   Files with the extension UKF are encryption key pairs. These files cannot be copied, renamed, or deleted from the file system. To delete a key pair from the switch, refer to “Deleting an Encryption Key” on page 709.

5. Enter the name of the file you want to rename. If the file is located on a compact flash card, precede the filename with “cflash:”

   The following prompt is displayed:

   ```
   Enter the destination file name:
   ```

   Note
   The source and destinations be on the same device, either flash memory or a compact flash card.

6. Enter the new name for the file.

   You can enter a file name of up to 16 alphanumeric characters, followed by a 3 letter extension. You must keep the same extension. If the file is located on a compact flash card, precede the filename with “cflash:”

   The following message is displayed:

```
Please wait...
Press any key ...
```

Press any key to return to the File Operations menu.

Deleting a System File

To delete a system file, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The File Operations menu is shown in Figure 56 on page 184.

4. From the File Operations menu, type **6** to select Delete File.

   The following prompt is displayed:

   ```
   Enter file name to be deleted:
   ```

   Note
   Files with the extension UKF are encryption key pairs. These files cannot be copied, renamed, or deleted from the file system. To delete a key pair from the switch, refer to "Deleting an Encryption Key" on page 709.

5. Enter the name of the file you want to delete. If the file is located on a compact flash card, precede the filename with "cflash:"

   The following prompt is displayed:

   ```
   Please wait...
   Press any key ...
   ```

6. Press any key to return to the File Operations menu.

   Note
   Deleting the boot configuration file that is acting as the active boot configuration file causes the switch to use its default settings the next time you reboot or power cycle the switch, unless you select another active boot configuration file. For instructions on how to change the active boot configuration file, see "Setting the Active Boot Configuration File" on page 186.

Displaying System Files

Use this procedure to display a list of the system files currently stored either in the flash memory of the switch or on a compact flash card. For information about shortcuts for specifying file names, see “File Naming Conventions” on page 180.

Listing All Files

To display a list of the system files stored in flash memory as well as on a compact flash card (if the switch supports this and a compact flash card is inserted in the slot), perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The File Operations menu is shown in Figure 56 on page 184.

4. From the File Operations Menu, type **8** to select List Files.

   The following prompt is displayed:

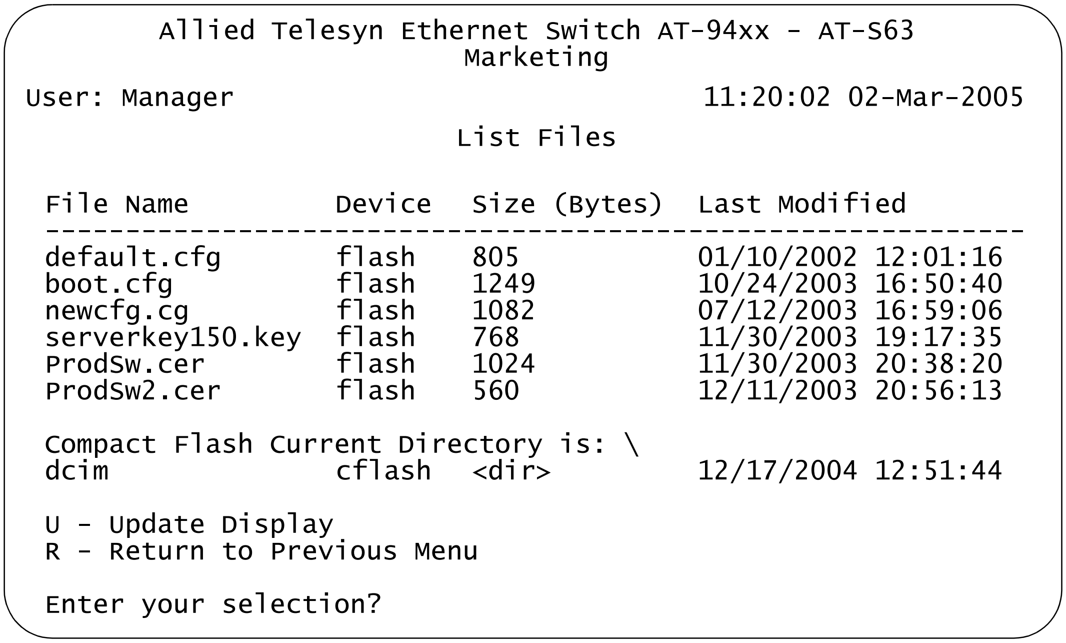
   ```
   Enter file name pattern to list:
   ```

5. Enter a boot configuration file name or pattern using the wildcard “*”. Below are examples of how to use the wildcard to display different files.

   To display a list of all the files stored both in flash memory and on a compact flash card in the same switch, enter:

   ```
   *.*
   ```

An example of this display is shown in Figure 58.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing

User: Manager                            11:20:02 02-Mar-2005
                          List Files


 File Name         Device   Size (Bytes)  Last Modified
 -------------------------------------------------------------
 default.cfg       flash    805           01/10/2002 12:01:16
 boot.cfg          flash    1249          10/24/2003 16:50:40
 newcfg.cg         flash    1082          07/12/2003 16:59:06
 serverkey150.key  flash    768           11/30/2003 19:17:35
 ProdSw.cer        flash    1024          11/30/2003 20:38:20
 ProdSw2.cer       flash    560           12/11/2003 20:56:13

 Compact Flash Current Directory is: \
 dcim              cflash   <dir>         12/17/2004 12:51:44

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 58. List Files Menu for Flash Memory and a Compact Flash Card

Note
If the switch does not support a compact flash card, only the files in flash memory are displayed. To display only the files in flash memory, precede the file name with “flash:”.

To display a list of the certificate files, enter:

```
*.cer
```

To display a list of the boot configuration files, enter:

```
*.cfg
```

To display a list of the key files, enter:

```
*.key
```

To display a list of the files that begin with the letter t, enter:

```
t*.*
```

The columns in the List Files table are described below. This information is for viewing purposes only.

File Name
Name of the system file.

Device
The device type, either "flash" for flash memory or "cflash" for compact flash card.

Size
Size of the file, in bytes.

Last Modified
The time the file was created or last modified, in the following date and time format: month/day/year hours:minutes:seconds.

Listing Files on the Compact Flash Card

To view the files on the compact flash card, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The File Operations menu is shown in Figure 56 on page 184.

4. From the File Operations Menu, type **8** to select List Files.

   The following prompt is displayed:

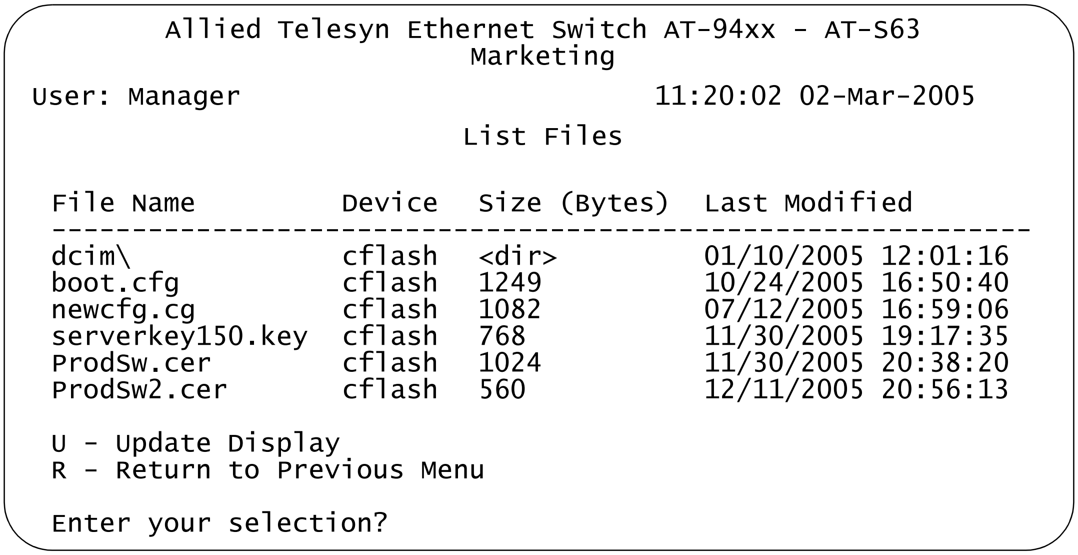
   ```
   Enter file name pattern to list:
   ```

5. To list the files only on the compact flash card, enter:

   cflash *.*

Note
You can also specify a particular file type, as described "File Naming Conventions" on page 180.

The system displays files on the compact flash card, as shown in Figure 59.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                          11:20:02 02-Mar-2005
                           List Files


 File Name         Device   Size (Bytes)  Last Modified
 -------------------------------------------------------------
 dcim\             cflash   <dir>         01/10/2005 12:01:16
 boot.cfg          cflash   1249          10/24/2005 16:50:40
 newcfg.cg         cflash   1082          07/12/2005 16:59:06
 serverkey150.key  cflash   768           11/30/2005 19:17:35
 ProdSw.cer        cflash   1024          11/30/2005 20:38:20
 ProdSw2.cer       cflash   560           12/11/2005 20:56:13

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 59. List Files Menu for a Compact Flash Card

Working with Flash Memory

An AT-9400 Series switch contains flash memory where the file system, which contains files such as the configuration file, and event log are stored.

Displaying Information about the Flash Memory

To display information about the flash memory, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

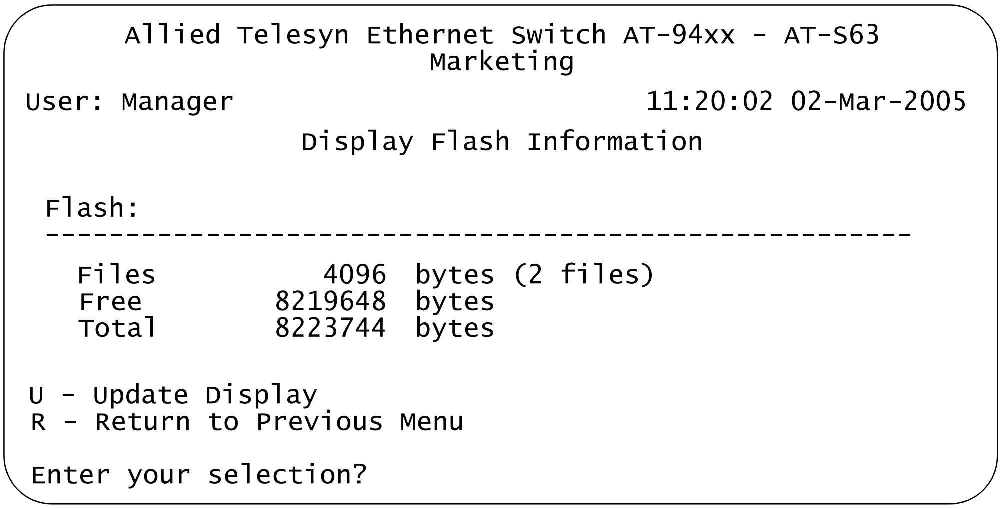
   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The FIle Operations menu is shown in Figure 56 on page 184.

4. From the File Operations menu, type **F** to select Display Flash Information.

   The Display Flash Information menu is shown in Figure 60.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                              11:20:02 02-Mar-2005
                 Display Flash Information

 Flash:
 -------------------------------------------------------

   Files          4096  bytes (2 files)
   Free        8219648  bytes
   Total       8223744  bytes

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 60. Display Flash Information Menu

Formatting the Flash Memory

When the file system in flash memory is full, you can make more room by formatting the flash memory. For information about displaying how much room is left in the flash memory, refer to “Displaying Information about the Flash Memory” on page 199.

Caution
When you format the flash memory, ALL files *including* the default configuration and boot files are lost. This includes encryption keys, certificates, configuration files, and all other special files. To remove selected files, use the procedure in “Deleting a System File” on page 194.

To format the flash memory, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The FIle Operations menu is shown in Figure 56 on page 184.

4. From the File Operations menu, type **9** to select Format Flash Drive.

   The following prompt is displayed:

   ```
   This command will format the flash drive and requires a
   switch reboot.
   Do you want to continue? [Yes/No] ->
   ```

5. To continue, type **Y** for Yes; to stop the formatting, type **N** for No.

   If you choose Y, the flash memory is formatted and the switch reboots.

Working with the Compact Flash Card

Some AT-9400 Series switches contain a compact flash card slot, into which you can put a compact flash card. You can then copy files such as configuration files onto the compact flash card, take the card to other switches that have compact flash card slots, and copy files from the compact flash card to that switch through a local connection. The compact flash card is also a medium onto which you can store system files as backups.

Displaying Compact Flash Card Information

To display information about the compact flash card, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

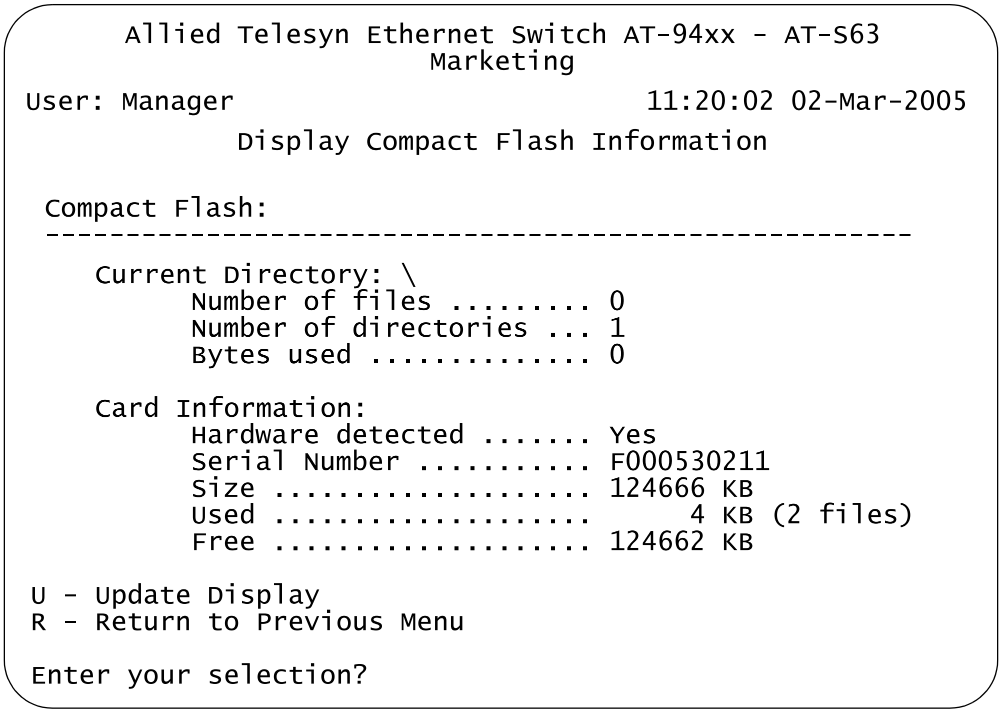
   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The FIle Operations menu is shown in Figure 56 on page 184.

4. From the File Operations menu, type **C** to select Display Compact Flash Information.

   The Display Compact Flash Information menu is shown in Figure 61.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
             Display Compact Flash Information

 Compact Flash:
 ------------------------------------------------------

    Current Directory: \
          Number of files ......... 0
          Number of directories ... 1
          Bytes used .............. 0

    Card Information:
          Hardware detected ....... Yes
          Serial Number ........... F000530211
          Size .................... 124666 KB
          Used ....................      4 KB (2 files)
          Free .................... 124662 KB

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 61. Display Compact Flash Information Menu

The Display Compact Flash Information menu provides the following information:

Current Directory
The currently selected directory. To change the directory, see "Changing the Directory" on page 203.

Number of files
The number of files in the current directory.

Number of directories
The number of directories on the compact flash card.

Bytes used
The number of bytes used in the current directory.

The Card Information section contains the following information:

Hardware detected
Whether or not a compact flash card is inserted in the slot.

Serial Number
The serial number of the compact flash card.

Size
The size in KB of the compact flash card.

Used
The amount of space that is currently used.

Free
The amount of space that is free.

Changing the Directory

To change from one directory to another on the compact flash card, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

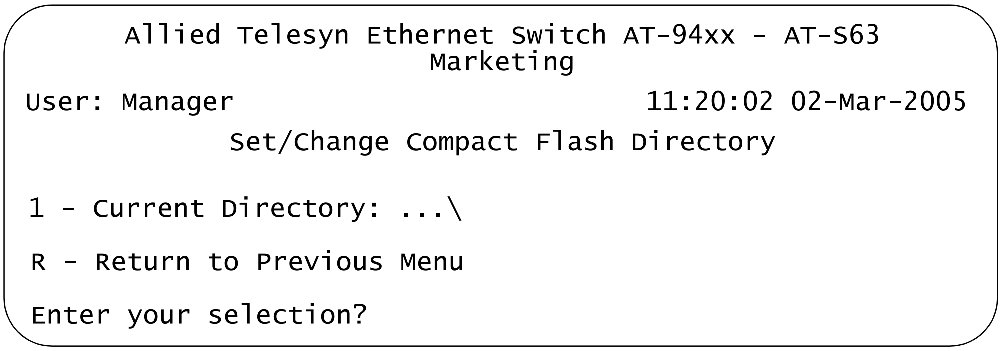
   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **1** to select File Operations.

   The FIle Operations menu is shown in Figure 56 on page 184.

4. From the File Operations menu, type **D** to select Set/Change Compact Flash Directory.

   The Set/Change Compact Flash Directory menu is shown in Figure 62.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                         11:20:02 02-Mar-2005
            Set/Change Compact Flash Directory

1 - Current Directory: ...\

R - Return to Previous Menu

Enter your selection?
```

Figure 62. Set/Change Compact Flash Directory Menu

5. From the Set/Change Compact Flash Directory menu, type **1** to select Current Directory.

   The following prompt is displayed:

   ```
   Enter the directory name to change to:
   ```

6. Type the directory name and press Enter.

Chapter 11
File Downloads and Uploads

This chapter contains the procedures for downloading a new AT-S63 image file onto the switch. This chapter also contains the procedures for uploading and downloading system files, such as a boot configuration file, from the file system in the switch. The procedures in this chapter are:

Note
For instructions on how to obtain the latest version of the AT-S63 management software, refer to “Management Software Updates” on page 26.

Downloading the AT-S63 Image File onto a Switch

This section contains two procedures for downloading a new AT-S63 image file onto the switch. They are:

- "Downloading the AT-S63 Image from a Local Management Session" on page 207
- "Downloading the AT-S63 Image from a Telnet Management Session" on page 210

Please note the following before you begin either procedure:

- You can download a new AT-S63 image file onto the switch from either a local or Telnet management session. You cannot perform this procedure from a web browser management session.
- You can use Xmodem or TFTP to download the image file from a local management session.
- You must use TFTP to download the image file from a Telnet management session.
- To use TFTP, there must be a node on your network that contains the TFTP server software, and the new AT-S63 image file must be stored on that node.
- If you are using TFTP, you should start the TFTP server before you begin the download procedure.
- The AT-S63 image file contains the bootloader for the switch. You cannot load the image file and bootloader separately.
- Installing a new AT-S63 software image does not change the current configuration of a switch (for instance, IP address, subnet mask, and virtual LANs). To return a switch to its default configuration values, refer to "Returning the AT-S63 Management Software to the Factory Default Values" on page 67.

Caution

The switch stops forwarding Ethernet traffic after it has downloaded the image file and begun to initialize the software. Some network traffic may be lost.

The following procedures assume that you have already obtained the new software from Allied Telesyn and stored it on the management station from which you will be performing the procedure, or on the TFTP server.

Downloading the AT-S63 Image from a Local Management Session

To download a new software image onto a switch from a local management session using Xmodem or TFTP, perform the following procedure:

1. Establish a local management session on the switch where you intend to download the new management software.

2. From the Main Menu, type **5** to select System Administration.

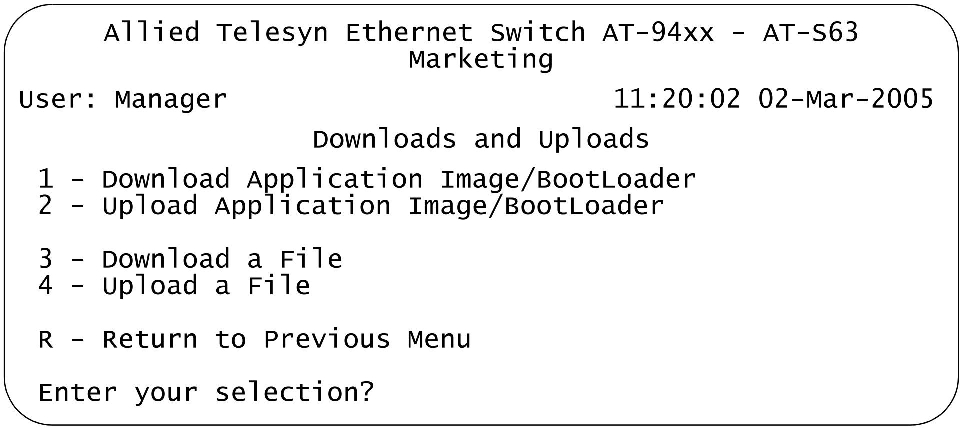
   The System Administration menu is shown in Figure 4 on page 46.

3. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

4. From the System Utilities menu, type **2** to select Downloads and Uploads.

   The Downloads and Uploads menu is shown in Figure 63.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                        11:20:02 02-Mar-2005
                  Downloads and Uploads
 1 - Download Application Image/BootLoader
 2 - Upload Application Image/BootLoader

 3 - Download a File
 4 - Upload a File

 R - Return to Previous Menu

 Enter your selection?
```

Figure 63. Downloads and Uploads Menu

> **Note**
> Options 3 and 4 are described in "Uploading a System File" on page 222.

5. From the Downloads and Uploads menu, type **1** to select Download Application Image/Bootloader.

   The following prompt is displayed:

   ```
   Download Method/Protocol [X-Xmodem, T-TFTP]:
   ```

6. To download the AT-S63 file using Xmodem, go to Step 7. To download the file using TFTP, do the following:

a. Type **T**.

   The following prompt is displayed:

   ```
   TFTP Server IP address:
   ```

b. Enter the IP address of the TFTP server.

   The following prompt is displayed:

   ```
   Remote File Name:
   ```

c. Enter the directory path and file name of the AT-S63 image file stored on the TFTP server.

   The following message is displayed:

   ```
   Getting the file from Remote TFTP Server - Please wait
   ...
   ```

d. If you have not already done so, start the TFTP server software.

   After the switch has downloaded the image file, the following message is displayed:

   ```
   File received successfully!
   ```

Note
The switch validates the file and then begins the initialization process of writing the image to flash. The switch does not forward any network traffic during the initialization process. After the management software is initialized, the switch automatically resets.

7. To download a file using Xmodem, type **X** at the prompt displayed in Step 5.

   The following prompt is displayed:

   ```
   You are going to invoke the Xmodem download utility.
   Do you wish to continue? [Yes/No]

   Note: Please select 1K Xmodem protocol for faster
   download.
   ```

Note
The transfer protocol must be Xmodem or 1K Xmodem.

8. Type **Y** for Yes.

   The prompt “Downloading” is displayed.

9. Begin the file transfer.

   Steps 10 through 13 illustrate how you download a file using the Hilgraeve HyperTerminal program.

10. From the HyperTerminal main window, select **Send File** from the **Transfer** menu, as shown in Figure 64.

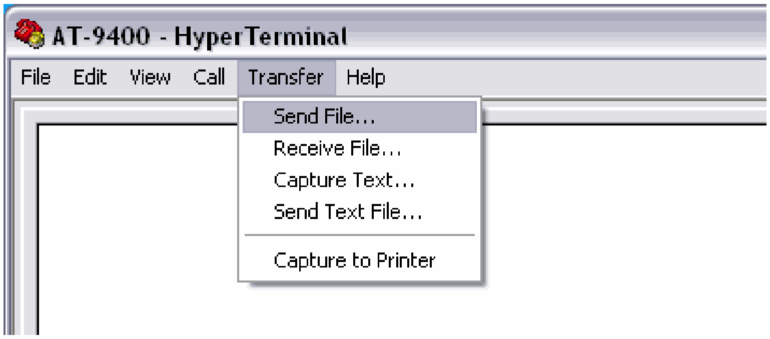
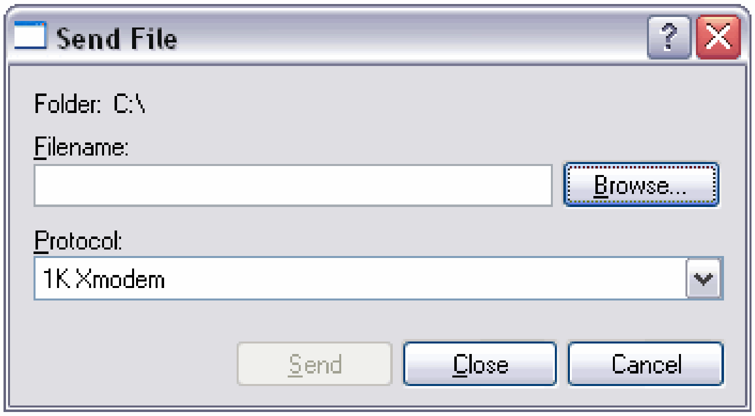


Figure 64. HyperTerminal Window

The Send File window is shown in Figure 65.



Folder: C:\

Filename:

Protocol: 1K Xmodem

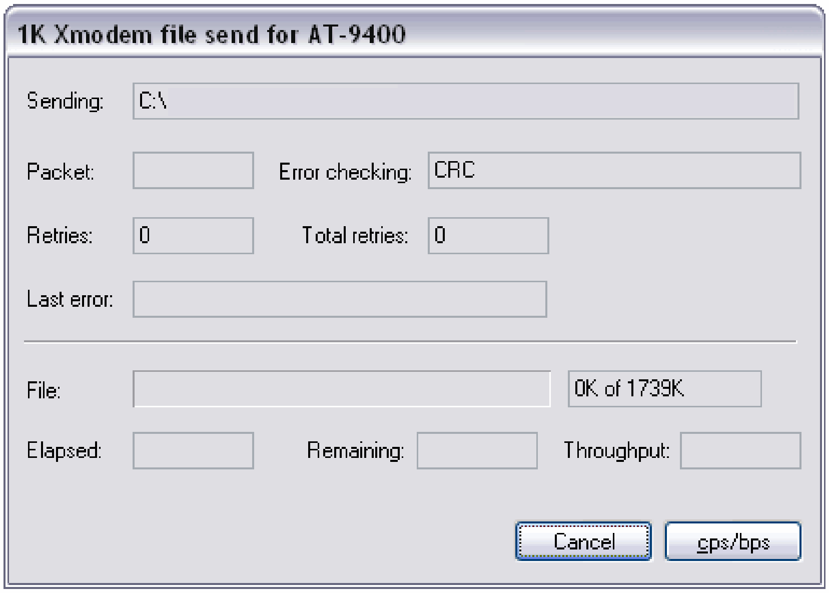
Figure 65. Send File Window

11. Click **Browse** and specify the location and file to be downloaded onto the switch.

12. Click in the Protocol field and select as the transfer protocol either Xmodem or, for a faster download, 1K Xmodem.

13. Click Send.

    The software immediately begins downloading onto the switch. The Xmodem File Send window in Figure 66 displays the current status of the software download. The download process takes several minutes to complete.



1K Xmodem file send for AT-9400

Sending: C:\

Packet:

Error checking: CRC

Retries: 0

Total retries: 0

Last error:

File:

0K of 1739K

Elapsed:

Remaining:

Throughput:

Figure 66. XModem File Send Window

Note
After the switch has downloaded the new image, it begins to initialize the software, a process that takes approximately one minute to complete. The switch does not forward any network traffic during the initialization process. After the management software is initialized, the switch automatically resets.

Downloading the AT-S63 Image from a Telnet Management Session

To download a new software image onto a switch from a Telnet management session using TFTP, perform the following procedure:

1. Establish a Telnet management session on the switch where you intend to download the new management software.

2. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

3. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

4. From the System Utilities menu, type **2** to select Downloads and Uploads.

The Downloads and Uploads menu is shown in Figure 63 on page 207.

5. From the Downloads and Uploads menu, type **1** to select Download Application Image/Bootloader.

   The following prompt is displayed:

   ```
   Only TFTP downloads are available for a Telnet access

   TFTP Server IP address:
   ```

6. Enter the IP address of the TFTP server.

   The following prompt is displayed:

   ```
   Remote File Name:
   ```

7. Enter the directory path and file name of the image file or configuration file that you want to download.

   The following message is displayed:

   ```
   Getting the file from Remote TFTP Server - Please wait
   ...
   ```

8. If you have not already done so, start the TFTP server software.

   After the switch has downloaded the image file, the following message is displayed:

   ```
   File received successfully!
   ```

Note
The switch validates the file and then begins the initialization process of writing the image to flash. The switch does not forward any network traffic during the initialization process. After the management software is initialized, the switch automatically resets.

Downloading an AT-S63 Image File Switch to Switch

The previous section contained procedures for downloading an AT-S63 software image onto a switch from a local or Telnet management session. The procedure in this section explains how to download an AT-S63 software image from one AT-9400 Series switch to another AT-9400 Series switch.

This procedure is useful in networks that contain a large number of AT-9400 Series switches. After you have updated the software on the master switch of an enhanced stack, you can instruct the master switch to automatically upgrade the other AT-9400 Series switches in the enhanced stack.

> **Note**
> You can perform this procedure from a local or Telnet management session.

To download a management software image from a master switch to other switches in the same enhanced stack, perform the following procedure:

1. From the Main Menu, type **9** to select Enhanced Stacking.

   The Enhanced Stacking menu is shown in Figure 21 on page 94.

2. From the Enhanced Stacking menu, type **2** to select Stacking Services.

   > **Note**
   > The “2 - Stacking Services” selection is available only on master switches.

   The Stacking Services menu is shown in Figure 22 on page 95.

3. From the Stacking Services menu, type **1** to select Get/Refresh List of Switches. The master switch polls the network for all enhanced stacking switches in the subnet and displays the switches in the Stacking Services menu.

4. Type **4** to select Download Image/Bootloader.

   The following prompt is displayed:

   ```
   Enter the list of switches ->
   ```

5. Enter the number (Num column in the menu) of the AT-9400 Series switch whose software you want to update. You can specify more than one switch at a time (for example, 2,4,5).

Note
You cannot download AT-S63 software onto any type of enhanced stacking switch other than AT-9400 Series switches.

The following prompt is displayed:

```
Do you want to show remote switch burning flash -> [Yes/
No]
```

6. You can respond with Yes or No to this prompt. It does not affect the download.

   The following prompt is displayed:

   ```
   Do you want confirmation before downloading each switch -
   > [Yes/No]
   ```

7. If you answer Yes to this prompt, the management software prompts you with a confirmation message before upgrading a switch. If you answer No, the management software does not display a confirmation prompt before downloading.

   The management software begins the download. The management software notifies you when the download is complete.

Caution
After a switch image file has been downloaded, the switch must decompress it and write it to flash, a process that takes several minutes to complete. Do not reset or power off the unit while it is decompressing the file. After the file has been decompressed, the switch automatically resets.

Downloading an AT-S63 Configuration File Switch to Switch

This procedure explains how to download the active boot configuration file on the master AT-9400 Series switch to another AT-9400 Series switch in an enhanced stack. For an explanation of the boot configuration file, refer to “Working with Boot Configuration Files” on page 183.

Note
You can perform this procedure from a local or Telnet management session.

To download the active boot configuration file on the master switch to another switch in an enhanced stack, perform the following procedure:

1. From the Main Menu, type **9** to select Enhanced Stacking.

   The Enhanced Stacking menu is shown in Figure 21 on page 94.

2. From the Enhanced Stacking menu, type **2** to select Stacking Services.

   Note
   The “2 - Stacking Services” selection is available only on master switches.

   The Stacking Services menu is shown in Figure 22 on page 95.

3. From the Stacking Services menu, type **1** to select Get/Refresh List of Switches. The master switch polls the network for all enhanced stacking switches in the subnet and displays the switches in the Stacking Services menu.

4. Type **5** to select Download Configuration.

   The following prompt is displayed:

   ```
   Enter the configuration file name ->
   ```

5. Enter a name for the configuration file. This is the name under which the file will be stored on the other switch. The name can be from one to sixteen characters and must include the suffix “.cfg”.

   After you have entered a name, the following prompt is displayed:

   ```
   Enter the list of switches ->
   ```

6. Enter the number (Num column in the menu) of the AT-9400 Series switch to which you want to download the configuration file. You can specify more than one switch at a time (for example, 2,4,5).

> **Note**
> You can download an AT-9400 Series configuration file only onto other AT-9400 Series switches. Do not attempt to download the file onto any other type of enhanced stacking switch.

The following prompt is displayed:

```
Do you want to show remote switch burning flash -> [Yes/
No]
```

7. You can respond with Yes or No to this prompt. It does not affect the download.

The following prompt is displayed:

```
Do you want confirmation before downloading each switch -
> [Yes/No]
```

8. If you answer Yes to this prompt, the management software prompts you with a confirmation message before downloading the file to a switch. If you answer No, the management software does not display a confirmation prompt before downloading.

The management software begins the download. The management software notifies you when the download is complete.

After the configuration file is downloaded to a switch, the AT-S63 management software places the file in its file system. To make the file the active boot configuration file on the switch, refer to "Setting the Active Boot Configuration File" on page 186.

Downloading a System File

This section contains the procedures for downloading a system file from a workstation or TFTP server into the switch's file system. You can download any of the following files:

- ❒ Boot configuration file
- ❒ Public encryption key
- ❒ CA certificate

Note
The CA certificate and key file are supported only on the version of AT-S63 management software that features SSL, PKI, and SSH security.

This section contains the following two procedures:

- ❒ "Downloading a System File from a Local Management Session" on page 217
- ❒ "Downloading a System File from a Telnet Management Session" on page 220

Please note the following before you begin either procedure:

⚠ **Caution**
Do not use this procedure to download an AT-S63 image file onto a switch. Doing so stores the image file in the switch's file system. The switch will not be able to use the image file and the file will take up most of the available space in the file system. To download an AT-S63 image file onto a switch, see "Downloading the AT-S63 Image File onto a Switch" on page 206 or "Downloading an AT-S63 Image File Switch to Switch" on page 212.

- ❒ You can download a system file from either a local or Telnet management session. You cannot perform this procedure from a web browser management session.
- ❒ You can use either Xmodem or TFTP to download a system file from a local management session.
- ❒ You must use TFTP to download a system file from a Telnet management session.
- ❒ To use TFTP, there must be a node on your network that contains TFTP server software.
- ❒ If you are using TFTP, you should start the TFTP server before you begin the download procedure.

Downloading a System File from a Local Management Session

To download a system file onto a switch from a local management session using Xmodem or TFTP, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

3. From the System Utilities menu, type **2** to select Downloads and Uploads.

   The Downloads and Uploads menu is shown in Figure 63 on page 207.

4. From the Downloads and Uploads menu, type **3** to select Download a File.

   The following prompt is displayed:

   ```
   Download Method/Protocol [X-Xmodem, T-TFTP]:
   ```

5. To download a system file using Xmodem, go to Step 7. To download a file using TFTP, do the following:

   a. Type **T**.

      The following prompt is displayed:

      ```
      TFTP Server IP address:
      ```

   b. Enter the IP address of the TFTP server.

      The following prompt is displayed:

      ```
      Remote File Name:
      ```

   c. Enter the directory path and file name of the system file on the TFTP server to be downloaded to the switch. You can specify only one system file.

      The following prompt is displayed:

      ```
      Local File Name:
      ```

   d. Enter a name for the system file. This is the name that the switch will store the file as in its file system.

      The following message is displayed:

      ```
      Getting the file from Remote TFTP Server - Please wait
      ...
      ```

e. If you have not already done so, start the TFTP server software.

After the switch has downloaded the system file, the following message is displayed:

```
File received successfully!
```

6. To download a file using Xmodem, type **X** at the prompt displayed in Step 5.

The following prompt is displayed:

```
Local File Name:
```

7. Enter a name for the system file. This is the name that the switch will store the file as in its file system.

The following prompt is displayed:

```
You are going to invoke the Xmodem download utility.
Do you wish to continue? [Yes/No]

Note: Please select 1K Xmodem protocol for faster
download.
```

Note
The transfer protocol must be Xmodem or 1K Xmodem.

8. Type **Y** for Yes.

The prompt “Downloading” is displayed.

9. Begin the file transfer of the system file using the terminal emulator program.

Steps 11 through 14 illustrate how to download a system file using the Hilgraeve HyperTerminal program.

10. From the HyperTerminal main window, select **Send File** from the **Transfer** menu, as shown in Figure 64.

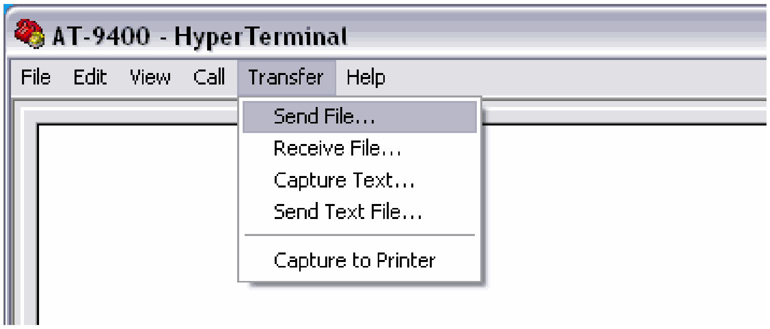
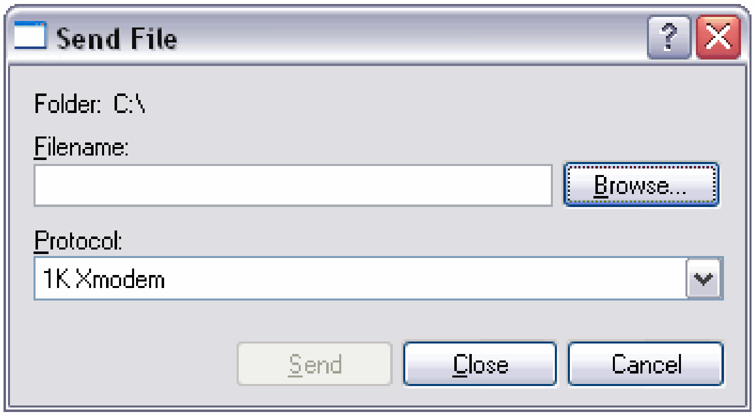


Figure 67. HyperTerminal Window

The Send File window is shown in Figure 65.



Folder: C:\

Filename:

Protocol: 1K Xmodem

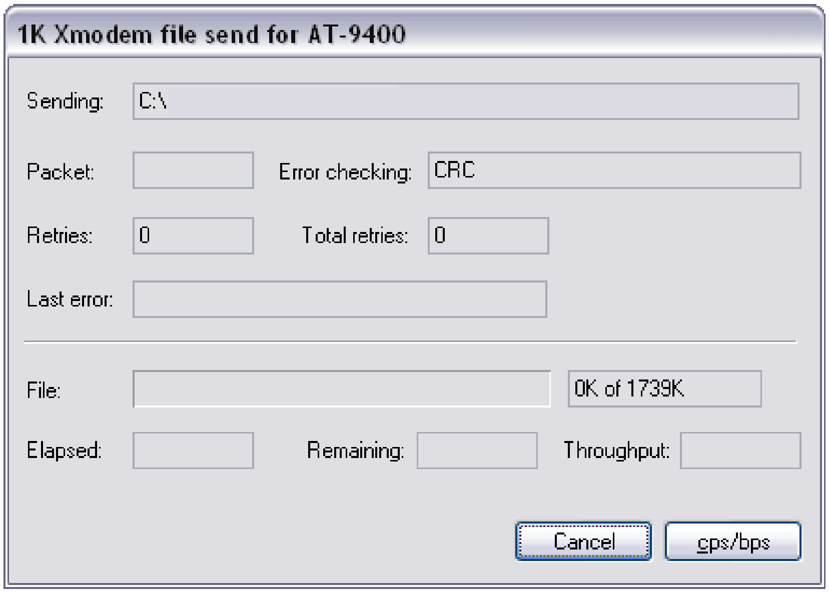
Figure 68. Send File Window

11. Click **Browse** and specify the location and system file to be downloaded onto the switch.

12. Click in the Protocol field and select as the transfer protocol either Xmodem or, for a faster download, 1K XModem.

13. Click Send.

    The file immediately begins downloading onto the switch. The Xmodem File Send window in Figure 66 displays the current status of the download.



Sending: C:\

Packet:

Error checking: CRC

Retries: 0

Total retries: 0

Last error:

File: 0K of 1739K

Elapsed:

Remaining:

Throughput:

Figure 69. XModem File Send Window

The download is complete when the Downloads and Uploads menu is redisplayed.

Downloading a System File from a Telnet Management Session

To download a system file onto a switch from a Telnet management session using TFTP, perform the following procedure:

1. Establish a Telnet management session on the switch where you intend to download the new file.

2. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

3. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

4. From the System Utilities menu, type **2** to select Downloads and Uploads.

   The Downloads and Uploads menu is shown in Figure 63 on page 207.

   > **Note**
   > Options 3 and 4 in the menu are described in “Uploading a System File” on page 222.

5. From the Downloads and Uploads menu, type **3** to select Download a File.

   The following prompt is displayed:

   ```
   Only TFTP downloads are available for a Telnet access

   TFTP Server IP address:
   ```

6. Enter the IP address of the TFTP server.

   The following prompt is displayed:

   ```
   Remote File Name:
   ```

7. Enter the directory path and file name of the system file you want to download.

   The following message is displayed:

   ```
   Getting the file from Remote TFTP Server - Please wait
   ...
   ```

8. If you have not already done so, start the TFTP server software.

After the switch has downloaded the system file, the following message is displayed:

```
File received successfully!
```

Uploading a System File

You use the procedures in this section to upload a system file from a switch to a computer or TFTP server. A system file can be any of the following:

- Boot configuration file
- Public key
- PKI certificate
- Certificate enrollment request

Note
The certificate file, certificate enrollment request file, and key file are supported only on the version of AT-S63 management software that features SSL and PKI security.

This section contains the following two procedures:

- "Uploading a System File from a Local Management Session" on page 222
- "Uploading a System File from a Telnet Management Session" on page 225

Please note the following before you begin either procedure:

- You can upload a system file from either a local or Telnet management session. You cannot perform this procedure from a web browser management session.
- You can use either Xmodem or TFTP to upload a file from a local management session.
- You must use TFTP to upload a file from a Telnet management session.
- To use TFTP, there must be a node on your network that contains TFTP server software.
- If you are using TFTP, you should start the TFTP server before you begin the upload procedure.

Uploading a System File from a Local Management Session

To upload a system file to a workstation from a Telnet management session using Xmodem or TFTP, perform the following procedure:

1. Establish a local management session on the switch where you want to upload the system file.
2. From the Main Menu, type **5** to select System Administration.

The System Administration menu is shown in Figure 4 on page 46.

3. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

4. From the System Utilities menu, type **2** to select Downloads and Uploads.

   The Downloads and Uploads menu is shown in Figure 63 on page 207.

5. From the Downloads and Uploads menu, type **4** to select Upload a File.

   The following prompt is displayed:

   ```
   Upload Method/Protocol [X-Xmodem, T-TFTP]:
   ```

6. To upload a system file using Xmodem, go to Step 7. To upload a file using TFTP, do the following:

   a. Type **T**.

      The following prompt is displayed:

      ```
      TFTP Server IP address:
      ```

   b. Enter the IP address of the TFTP server.

      The following prompt is displayed:

      ```
      Remote File Name:
      ```

   c. Enter the directory path where you want the system file stored on the TFTP server and a name for the file.

      The following message is displayed:

      ```
      Local File Name:
      ```

   d. Enter the name of the system file on the switch that you want to upload to the TFTP server. You can specify only one file. You cannot use wildcards in the file name.

      The following message is displayed:

      ```
      Sending the file to Remote TFTP Server - Please wait
      ...
      ```

      After the switch has uploaded the system file, the following message is displayed:

      ```
      File sent successfully!
      ```

The file is now stored on the TFTP server. You can now download the file onto another AT-9400 Series switch in your network.

7. To upload a file using Xmodem, type **X** at the prompt displayed in Step 5.

   The following message is displayed:

   ```
   Local File Name:
   ```

8. Enter the name of the system file on the switch that you want to upload to your computer. You can specify only one file. You cannot use wildcards in the file name.

   The following prompt is displayed:

   ```
   You are going to invoke the Xmodem download utility.
   Do you wish to continue? [Yes/No]

   Note: Please select 1K Xmodem protocol for faster
   download.
   ```

   Note
   The transfer protocol must be Xmodem or 1K Xmodem.

9. Type **Y** for Yes.

   The following message is displayed:

   ```
   Use Hyper Terminal's 'Transfer/Receive File' option to
   select Protocol

   Note: Please select '1K Xmodem' protocol for faster
   upload...
   ```

10. Begin the file transfer.

    Steps 11 through 14 illustrate how you would upload a file using the Hilgraeve HyperTerminal program.

11. From the HyperTerminal main window, select **Receive File** from the **Transfer** menu, as shown in Figure 70.

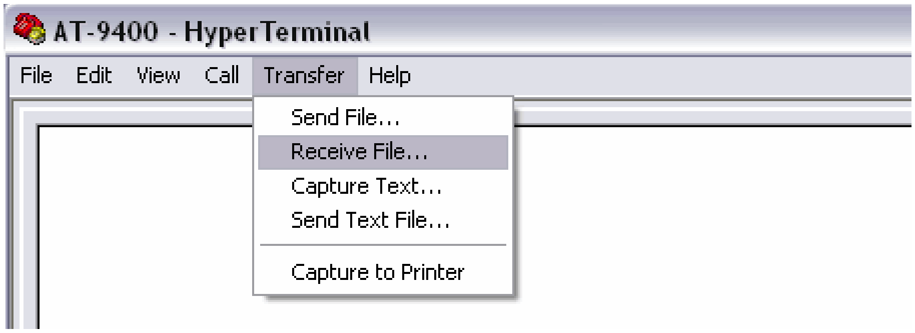
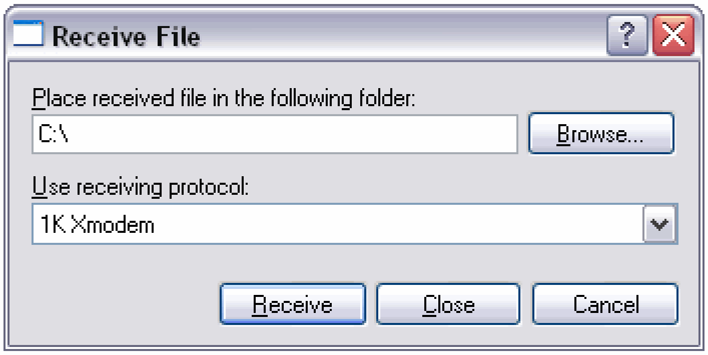


Figure 70. HyperTerminal Window

The Receive File window is shown in Figure 71.



Place received file in the following folder:
C:\
Use receiving protocol:
1K Xmodem

Figure 71. Receive File Window

12. Click **Browse** and specify the location on your computer where you want the system file stored.

13. Click in the Protocol field and select as the transfer protocol either Xmodem or, for a faster download, 1K XModem.

14. Click Receive.

    The switch uploads the file from the switch to your computer.

Uploading a System File from a Telnet Management Session

To upload a system file from the switch using a Telnet management session and TFTP, perform the following procedure:

1. Establish a Telnet management session on the switch containing the system file you want to upload to the TFTP server.

2. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

3. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is shown in Figure 7 on page 53.

4. From the System Utilities menu, type **2** to select Downloads and Uploads.

   The Downloads and Uploads menu is shown in Figure 63 on page 207.

5. From the Downloads and Uploads menu, type **4** to select Upload a File.

   The following prompt is displayed:

   ```
   Only TFTP uploads are available for a Telnet access
   ```

   ```
   TFTP Server IP address:
   ```

6. Enter the IP address of the TFTP server.

   The following prompt is displayed:

   ```
   Remote File Name:
   ```

7. Enter the directory path where you want the system file stored on the TFTP server along with a name for the file.

   The following message is displayed:

   ```
   Local File Name:
   ```

8. Enter the name of the system file on the switch that you want to upload to the TFTP server. You can specify only one file. You cannot use wildcards in the file name.

   The following message is displayed:

   ```
   Sending the file to Remote TFTP Server - Please wait ...
   ```

   After the switch has uploaded the system file, the following message is displayed:

   ```
   File sent successfully!
   ```

   The file is now stored on the TFTP server. You can now download the file onto another AT-9400 Series switch in your network.

Chapter 12

Event Log

This chapter describes the event log that allows you to view information about switch activity, and how to configure the switch to send the events to a syslog server. Sections in the chapter include:

Event Log Overview

A managed switch is a complex piece of computer equipment that includes both hardware and software. Multiple software features operate simultaneously, interoperating with each other and processing large amounts of network traffic. It is often difficult to determine exactly what is happening when a switch appears not to be operating normally, or what happened when the problem occurred.

A network manager's major task is to monitor the system functions and to deal with problems as they arise. One method for doing this is to view the event messages that are generated by the switch and sent to the event log. These events can provide vital information about system activity on an AT-9400 Series switch that helps you identify and solve system problems. The event log includes the following information:

- The time and date of an event
- The severity of an event
- The AT-S63 software module that generated the event
- A description of the event

There are two ways that you can view a switch's event messages. The first method is to view an event log. An AT-9400 Series switch has two event logs. The first is located in temporary memory and can store up to 4,000 entries. The events in this log are purged whenever you reset or power cycle the switch. The second log is located in permanent memory and has a maximum storage capacity of 2,000 entries. Events in this log are retained even when the switch is reset or power cycled. You can view either log to display the events of the switch since the unit was last reset. But to view the events that preceded a system reset, you must view the permanent event log.

The second method is to have the switch send its events to a syslog server. The syslog server functions as a central repository that stores events from many network devices simultaneously.

In order for a switch to send its events to a syslog server, you must define the syslog output. The syslog output includes the IP address of the syslog server along with other information such as the types of event messages you want the switch to send to the syslog server. You can create up to 19 output definitions on a switch. For instructions, refer to "Configuring Log Outputs" on page 241.

Note

The event logs, even when disabled, log all AT-S63 initialization events that occur when the switch is reset or power cycled. Any switch events that occur after AT-S63 initialization are entered into the logs only if you enable the event log feature. The default setting for the event log feature is enabled.

Working with the Event Log

This section contains the following procedures:

- ❒ "Enabling or Disabling the Event Logs," next
- ❒ "Displaying an Event Log" on page 232
- ❒ "Modifying the Event Log Full Action" on page 237
- ❒ "Clearing an Event Log" on page 238
- ❒ "Saving an Event Log to a File" on page 238

Enabling or Disabling the Event Logs

This procedure explains how to enable or disable the event logs on the switch. If you disable the logs, the AT-S63 management software does not store events in its logs and does not send events to any syslog servers. The default setting for the logs is enabled.

Note
Allied Telesyn recommends setting the switch's date and time if you enable the event log. Otherwise, entries sent to the log or to a syslog server will not have the correct time and date. For instructions, refer to "Setting the System Time" on page 58.

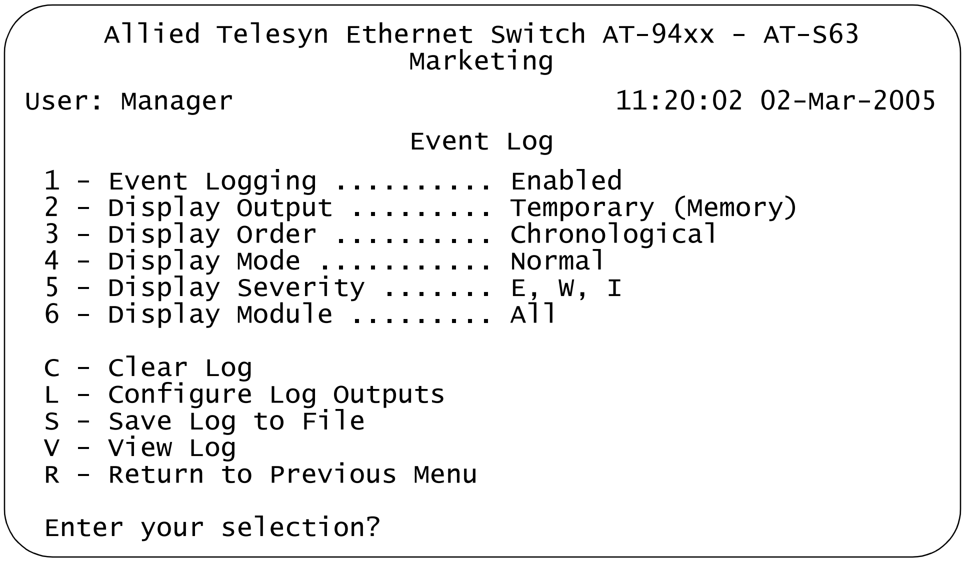
To enable or disable the event logs, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **8** to select Event Log.

The Event Log menu is shown in Figure 72.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
                        Event Log
 1 - Event Logging .......... Enabled
 2 - Display Output ......... Temporary (Memory)
 3 - Display Order .......... Chronological
 4 - Display Mode ........... Normal
 5 - Display Severity ....... E, W, I
 6 - Display Module ......... All

 C - Clear Log
 L - Configure Log Outputs
 S - Save Log to File
 V - View Log
 R - Return to Previous Menu

 Enter your selection?
```

Figure 72. Event Log Menu

3. To enable or disable event logging, type **1** to toggle Event Logging between the two options:

   Enabled
   The switch immediately begins to add events to the logs and send events to any defined syslog outputs. This is the default.

   Disabled
   The switch does not store events in the logs and does not send events to any syslog servers.

   Note
   You cannot individually disable or enable the temporary and permanent event logs.

   Note
   When the event log feature is disabled and the switch is rebooted, initialization events are still logged even though the Event Log feature is disabled. The Event Logging option determines whether further events are logged.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

   To display the events in the log, go to the next procedure.

Displaying an Event Log

Each time that you want to view the event log, you must choose how and what you want displayed. The event log settings are not saved.

To specify the type of events you want to display in the event log, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **8** to select Event Log.

   The Event Log menu is shown in Figure 72 on page 231.

3. To determine the source for the events, type **2** to select Display Output and toggle between two options:

   Temporary (Memory)
   Displays the events stored in temporary memory. This selection stores approximately 4,000 events. If the switch has been running for some time without a reset or power cycle, select Temporary. This is the default.

   Permanent (NVS)
   Displays events stored in nonvolatile memory, which stores no more than 2,000 events. If the switch was recently reset or power cycled and you want to view the events that occurred prior to the reset, select Permanent.

4. To select the order of the events in the event log, type **3** to select Display Order and toggle between two options:

   Chronological
   Displays the events in the order from the oldest event to the most recent event. This is the default.

   Reverse Chronological
   Displays the events in from the most recent event to the oldest event.

5. To select the format of the event log, type **4** to select Display Mode and toggle between two options:

   Normal
   Displays the time, module, severity, and description for each event. This is the default. An example of Normal mode is shown in Figure 73 on page 235.

   Full
   Displays the same information as Normal, plus the file name, line number, and event ID. An example of Full mode is shown in Figure 74 on page 236.

6. To display events of a selected severity, type **5** to select Display Severity.

   The following prompt is displayed:

   ```
   Enter Severity levels to display (ALL, E - Error, W -
   Warning, I - Information, D - Debug) ->
   ```

   The possible options are:

   ALL
   All messages of the following types are displayed. This is the default.

   E - Error
   Only error messages are displayed. Error messages indicate that the switch operation is severely impaired.

   W - Warning
   Only warning messages are displayed. These messages indicate that an issue may require manager attention.

   I - Information
   Only informational messages are displayed. Informational messages display useful information that you can ignore during normal operation.

   D - Debug
   Debug messages provide detailed high-volume information that is intended only for technical support personnel.

   You can select more than one severity at a time, separated by a comma, for example, E,W.

7. To display events of a particular AT-S63 software module, type **7** to select Event Module.

   The list of modules is displayed

8. Enter a list of modules separated by a comma—for example, “system, stp, ptrunk.”

   Table 2 shows the list of modules.

Table 2. AT-S63 Modules

Module Name	Description
ALL	All modules
ACL	Port access control list
CFG	Switch configuration
CLASSIFIER	Classifiers used by ACL and QoS

Table 2. AT-S63 Modules (Continued)

Module Name	Description
CLI	Command line interface commands
DOS	Denial of service defense
ENCO	Encryption keys
ESTACK	Enhanced stacking
EVTLOG	Event log
FILE	File system
GARP	GARP GVRP
HTTP	Web server
IGMPSNOOP	IGMP snooping
IP	System IP configuration, DHCP, and BOOTP
LACP	Link Aggregation Control Protocol
MAC	MAC address table
MGMTACL	Management access control list
PACCESS	802.1x port-based access control
PCFG	Port configuration
PKI	Public Key Infrastructure
PMIRR	Port mirroring
PSEC	Port security (MAC address-based)
PTRUNK	Port trunking
QOS	Quality of Service
RADIUS	RADIUS authentication protocol
RPS	Redundant power supply
RRP	RRP snooping
RTC	Real time clock
SNMP	SNMP
SSH	Secure Shell protocol
SSL	Secure Sockets Layer protocol
STP	Spanning Tree, Rapid Spanning, and Multiple Spanning Tree protocols

Table 2. AT-S63 Modules (Continued)

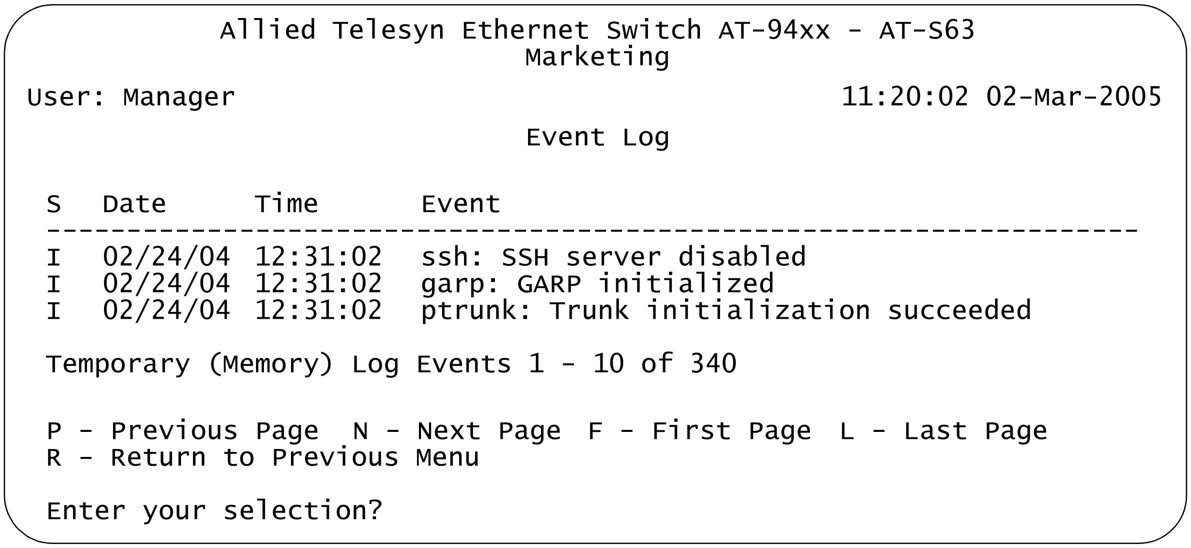
Module Name	Description
SYSTEM	Hardware status; Manager and Operator log in and log off events.
TACACS	TACACS+ authentication protocol
Telnet	Telnet
TFTP	TFTP
Time	System time and SNTP
VLAN	Port-based and tagged VLANs, and multiple VLAN modes
WATCHDOG	Watchdog timer

To select specific modules, type the names separated by commas. The module names are not case sensitive. For example:

stp, psec

9. To display the event log with the settings you have chosen, type **V** to select View Log

Figure 73 shows an example of an event log in Normal mode.



```
            Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing
User: Manager                                       11:20:02 02-Mar-2005
                              Event Log

 S   Date     Time      Event
 --------------------------------------------------------------------
 I   02/24/04  12:31:02  ssh: SSH server disabled
 I   02/24/04  12:31:02  garp: GARP initialized
 I   02/24/04  12:31:02  ptrunk: Trunk initialization succeeded

 Temporary (Memory) Log Events 1 - 10 of 340

 P - Previous Page  N - Next Page  F - First Page  L - Last Page
 R - Return to Previous Menu

 Enter your selection?
```

Figure 73. Event Log Example Displayed in Normal Mode

The events are displayed in a table. The columns in the table shown in normal display mode are described below:

S (Severity)
The event’s severity. The severity codes and their corresponding severity level and description are shown in Table 3.

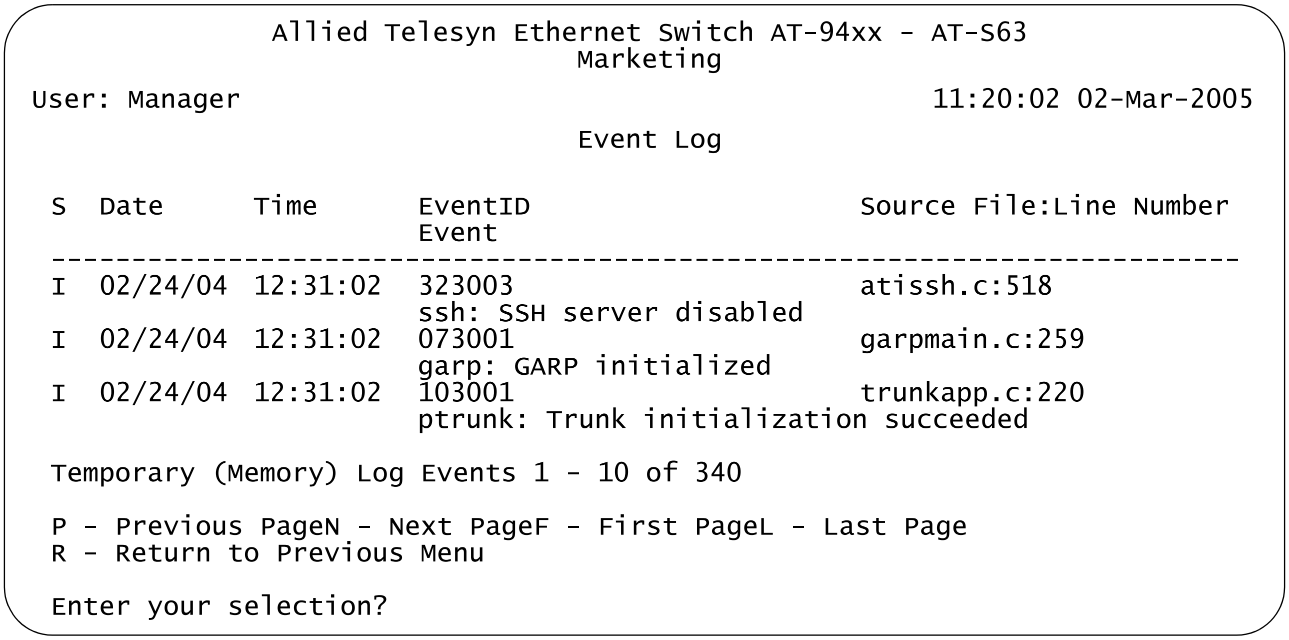
Table 3. Event Severity Levels

Severity Code	Severity Level	Description
E	Error	Switch operation is severely impaired.
W	Warning	An issue that may require network manager attention.
I	Information	Useful information that can be ignored during normal operation.
D	Debug	Messages intended for technical support and software development.

Date/Time
The date and time the event occurred.

Event
This item contains two parts. The first part is the name of the module within the AT-S63 management software that generated the event. The second part is a description of the event.

When you display the events in full mode, more information is included. Figure 74 shows the same portion of the event log in Figure 73 on page 235 but displayed in full mode.



```
               Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                  Marketing
User: Manager                                           11:20:02 02-Mar-2005
                                  Event Log

 S  Date      Time      EventID                     Source File:Line Number
                        Event
 ---------------------------------------------------------------------------
 I  02/24/04  12:31:02  323003                      atissh.c:518
                        ssh: SSH server disabled
 I  02/24/04  12:31:02  073001                      garpmain.c:259
                        garp: GARP initialized
 I  02/24/04  12:31:02  103001                      trunkapp.c:220
                        ptrunk: Trunk initialization succeeded

 Temporary (Memory) Log Events 1 - 10 of 340

 P - Previous PageN - Next PageF - First PageL - Last Page
 R - Return to Previous Menu

 Enter your selection?
```

Figure 74. Event Log Example Displayed in Full Mode

In addition to the information displayed in Normal mode, the Full mode also displays additional columns in the table, as described below:

Event ID
A unique, random number assigned to each event.

Source File:Line Number
The AT-S63 software source file name and the line number in that source file that produced the event.

10. Type the following to scroll through the event log:

- **P** - Previous page
- **N** - Next page
- **F** - First page
- **L** - Last page

To clear the current event log, go to "Clearing an Event Log" on page 238.

Modifying the Event Log Full Action

To modify the action taken when the event log becomes full, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **8** to select Event Log.

   The Event Log menu is shown in Figure 72 on page 231.

3. From the Event Log menu, type **2** to select Modify Log Output.

> **Note**
> This selection applies only to the default event logs, 0 and 1.

   The following prompt is displayed:

```
Enter output ID to modify [0 to 20] ->
```

4. Type **0** to select the permanent log, or **1** to select the temporary log.

   The following prompt is displayed:

```
Enter new log full action (1-Wrap on Full, 2-Halt on
Full) ->
```

5. Make a selection from the following options:

1 - Wrap on Full
When the event log reaches its maximum capacity, old entries are deleted when new entries are added. This is the default.

2- Halt on Full
When the event log reaches its maximum capacity, the log stops adding new entries.

6. Return to the Main Menu.

Clearing an Event Log

You can clear the event log to remove old events and start fresh. To clear the event log, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **8** to select Event Log.

   The Event Log menu is shown in Figure 72 on page 231.

3. From the Event Log menu, type **C** to select Clear Log.

   The following prompt is displayed:

   ```
   Enter output to clear (T=Temporary, P=Permanent) ->
   ```

4. To clear the temporary event log, type T. To clear the permanent event log, type P.

Saving an Event Log to a File

You can save an event log to a file to review later. The file is saved as an ASCII file so that you can also email the file to someone else for troubleshooting.

To save the event log to a file, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **8** to select Event Log.

   The Event Log menu is shown in Figure 72 on page 231.

3. Configure options 3 to 7 in the Event Log menu to specify which log and entries you want saved.

4. From the Event Log menu, type **S** to select Save Log to File.

5. To save the log file type **Y** for Yes, or to cancel the process, type **N** for No.

If you type Y, the following prompt is displayed:

```
Enter file name (*.log) ->
```

6. Type a name for the file with a `.log` file name extension.

   The following message is displayed:

   ```
   Saving log to file.
   ```

   When the save process is complete, the word “Complete” is displayed, followed by another prompt:

   ```
   Press any key to continue.
   ```

7. Press any key.

   The log file is saved in the switch's file system as an ASCII file.

8. To review the log file, type **R** to return to the System Administration menu.

9. From the System Administration menu, type **9** to select System Utilities.

   The System Utilities menu is displayed, as shown in Figure 7 on page 53.

10. From the System Utilities menu, type **1** to select File Operations.

    The File Operations menu is displayed, as shown in Figure 56 on page 184.

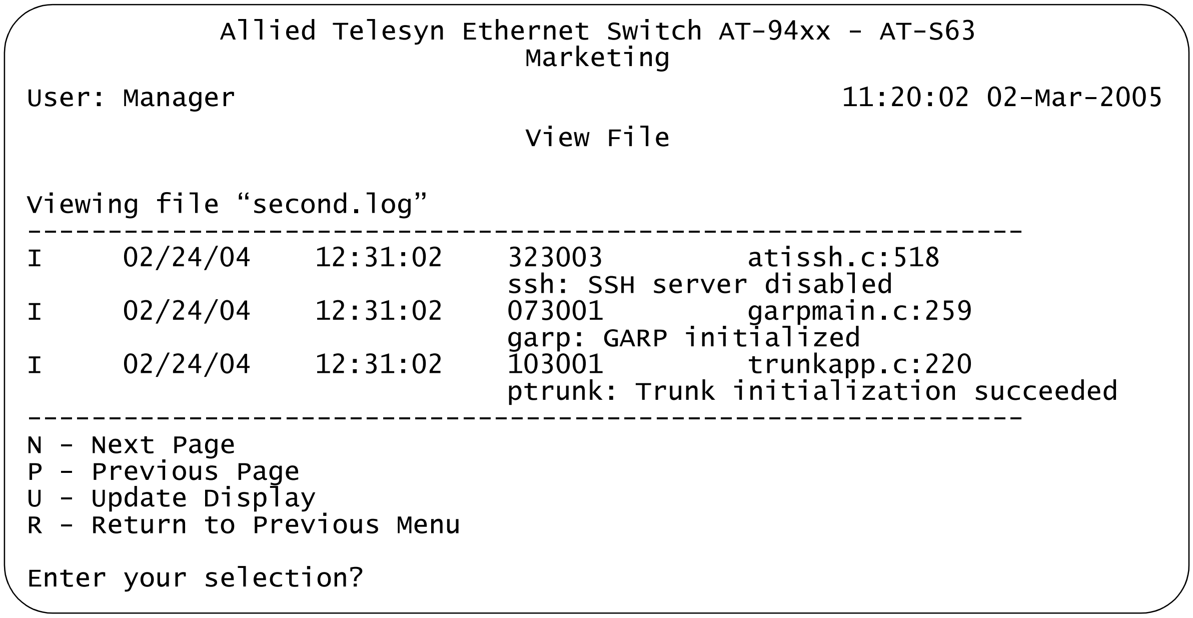
11. From the File Operations menu, type **7** to select View File.

    The following prompt is displayed:

    ```
    Enter file name to view:
    ```

12. Type the file name with the `.log` file name extension and press Return.

A sample log file saved in full mode is shown in Figure 75.



```
            Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                               Marketing
User: Manager                                      11:20:02 02-Mar-2005
                               View File

Viewing file “second.log”
--------------------------------------------------------------
I     02/24/04    12:31:02    323003         atissh.c:518
                              ssh: SSH server disabled
I     02/24/04    12:31:02    073001         garpmain.c:259
                              garp: GARP initialized
I     02/24/04    12:31:02    103001         trunkapp.c:220
                              ptrunk: Trunk initialization succeeded
--------------------------------------------------------------
N - Next Page
P - Previous Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 75. Sample Log File View

13. To upload the file to your management station, refer to “Uploading a System File” on page 222.

Configuring Log Outputs

As explained in "Event Log Overview" on page 228, there are two methods you can use to view the events generated by the switch. One method is to view one of the switch's event logs. The drawback to this method is that you must establish a management session with the switch before you can view the logs and you can view the log of only one switch at a time.

The other way to view events is to configure the switch to send its events to a syslog server. A syslog server can store the events of many network devices simultaneously. Therefore, network management is easier because you can go to one location to see all the events.

Observe the following guidelines when you use this feature:

❒ You can define up to 19 log output definitions.

❒ The event log on the switch must be enabled in order for the switch to send events. For instructions, refer to "Enabling or Disabling the Event Logs" on page 230.

❒ The switch must have an IP address and subnet mask. This rule applies to slave switches, which typically do not have an IP address, as well as to master switches. If you want a slave switch to send its events to a syslog server, you must assign it an IP address and a subnet mask.

❒ The syslog server must communicate with the switch through the switch's management VLAN. The AT-S63 management software uses the management VLAN to watch for and transmit management packets. The default management VLAN is Default_VLAN.

Configuring the switch to send its events to a syslog server involves creating a log output definition. The log output contains the IP address of the syslog server along with other information such as what types of messages you want the switch to send.

This section contains the following procedures:

❒ "Creating a Log Output Definition," next

❒ "Modifying a Log Output" on page 247

❒ "Deleting a Log Output" on page 248

❒ "Displaying the Log Output Definition Details" on page 249

Creating a Log Output Definition

To create a log output definition, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

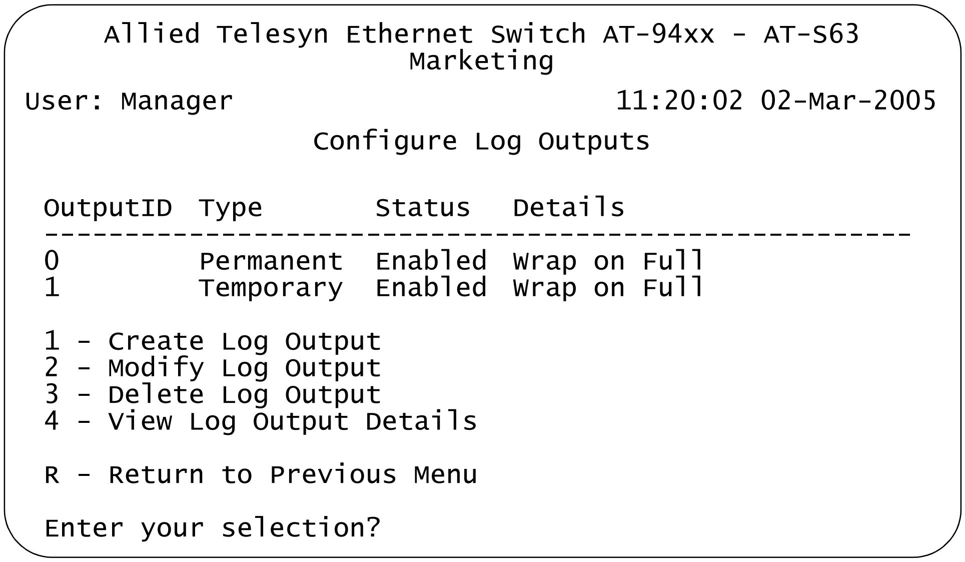
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **8** to select Event Log.

   The Event Log menu is shown in Figure 72 on page 231.

3. From the Event Log menu, type **L** to select Configure Log Outputs.

   The Configure Log Outputs menu, with a list of any log outputs that have already been created, is shown in Figure 76.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
                   Configure Log Outputs

 OutputID  Type       Status   Details
 ------------------------------------------------------
 0         Permanent  Enabled  Wrap on Full
 1         Temporary  Enabled  Wrap on Full

 1 - Create Log Output
 2 - Modify Log Output
 3 - Delete Log Output
 4 - View Log Output Details

 R - Return to Previous Menu

 Enter your selection?
```

Figure 76. Configure Log Outputs Menu

   Output 0 is the event log in permanent memory and Output 1 is the log in temporary memory.

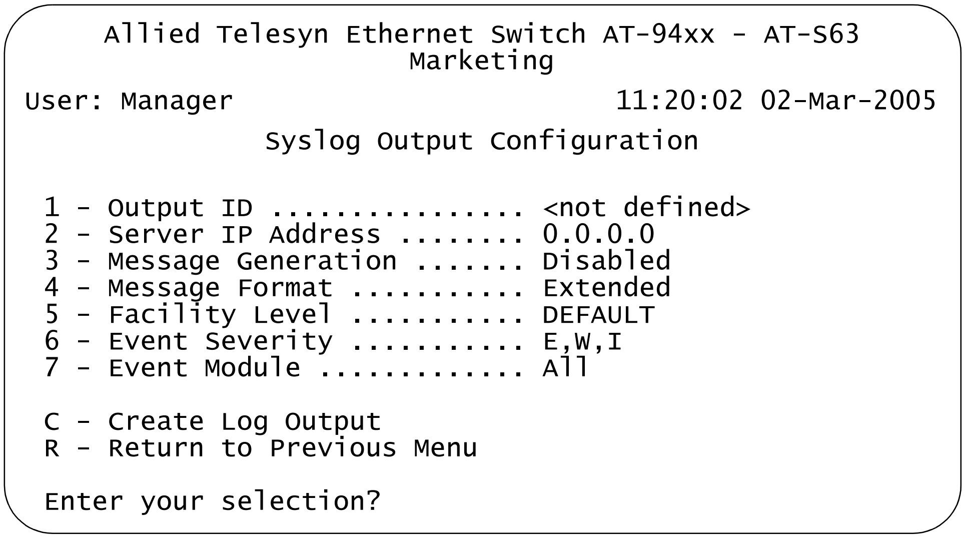
4. From the Configure Log Outputs menu, type **1** to select Create Log Output.

   The following prompt is displayed:

   ```
   Enter output type (1-SYSLOG) ->
   ```

5. Enter **1** for Syslog, the only available selection.

The Syslog Output Configuration menu is displayed, as shown in Figure 77.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
               Syslog Output Configuration

 1 - Output ID ................ <not defined>
 2 - Server IP Address ........ 0.0.0.0
 3 - Message Generation ....... Disabled
 4 - Message Format ........... Extended
 5 - Facility Level ........... DEFAULT
 6 - Event Severity ........... E,W,I
 7 - Event Module ............. All

 C - Create Log Output
 R - Return to Previous Menu

 Enter your selection?
```

Figure 77. Syslog Output Configuration Menu

6. From the Syslog Output Configuration menu, type **1** to select Output ID.

   The following prompt is displayed:

   ```
   Enter new output ID [2 to 20] ->2
   ```

7. Type a number between 2 and 20 and press Enter. The output definition is identified in the Configure Log Outputs menu by this number. The default is the next available number. You cannot use a number that is already assigned.

8. Type **2** to select Server IP Address.

   The following prompt is displayed:

   ```
   Enter server IP address:
   ```

9. Type the IP address of the syslog server.

10. Type **3** to toggle Message Generation between the following options:

    Enabled
    Enables the syslog output definition. When enabled, the switch sends events to the specified syslog server.

    Disabled
    Disables the syslog output definition. When disabled, which is the default, the switch does not send events to the syslog server.

11. Type **4** to toggle Message Format between the following options:

    Normal
    Sends the severity, module, and description for each event.

    Extended
    Sends the same information as Normal along with the date, time, and switch's IP address. This is the default.

12. Type **5** to select Facility Level.

    The following prompt is displayed:

    ```
    Enter Facility level (0-DEFAULT, 1-LOCAL1, 2-LOCAL2, 3-
    LOCAL3, 4-LOCAL4, 5-LOCAL 5, 6-LOCAL6, 7-LOCAL7) ->  [0
    to 7] ->
    ```

    This parameter adds a facility level to the entries when they are sent to the syslog server. The facility level is a way for you to add a numerical code to each entry to help you group entries on the syslog server according to the module of switch that produced them. This grouping helps you determine which event belong to which device when a syslog server is collecting events from several network devices. You can specify only one facility level.

    There are two approaches for using this parameter. The first approach is to use the 0-DEFAULT setting which is based on the functional groupings defined in the RFC 3164 standard. The numerical codes that are applicable to the AT-S63 management software and its modules are shown in Table 4.

Table 4. Applicable RFC 3164 Numerical Code and AT-S63 Module Mappings

Numerical Code	RFC 3164 Facility	AT-S63 Module
4	Security and authorization messages	Security modules: - PSEC - PACCESS - ENCO - PKI - SSH - SSL - MGMTACL - DOS Authentication modules: - SYSTEM - RADIUS - TACACS+

Table 4. Applicable RFC 3164 Numerical Code and AT-S63 Module Mappings (Continued)

Numerical Code	RFC 3164 Facility	AT-S63 Module
9	Clock daemon	Time- based modules: - TIME (system time and SNTP) - RTC
22	Local use 6	Physical interface and data link modules: - PCFG - PMIRR - PTRUNK - STP - VLAN
23	Local use 7	SYSTEM events related to major exceptions.
16	Local use 0	All other modules and events.

For example, the setting of DEFAULT assigns all port mirroring events a code of 22 and all encryption key events a code of 4.

Your other option is to assign the same numerical code to all events from a switch using one of the following facility level settings:

❐ 1 - LOCAL1

❐ 2 - LOCAL2

❐ 3 - LOCAL3

❐ 4 - LOCAL4

❐ 5 - LOCAL5

❐ 6 - LOCAL6

❐ 7 - LOCAL7

Each setting represents a predefined RFC 3164 numerical code. The code mappings are listed in Table 5.

Table 5. Numerical Code and Facility Level Mappings

Numerical Code	Facility Level Setting
17	LOCAL1
18	LOCAL2
19	LOCAL3

Table 5. Numerical Code and Facility Level Mappings (Continued)

Numerical Code	Facility Level Setting
20	LOCAL4
21	LOCAL5
22	LOCAL6
23	LOCAL7

For example, selecting LOCAL2 as the facility level assigns the numerical code of 18 to all events sent by the switch to the syslog server.

13. To include events of a selected severity, type **6** to select Event Severity.

    The following prompt is displayed:

    ```
    Enter Severity levels to display (ALL, E - Error, W -
    Warning, I - Information, D - Debug) ->
    ```

    The possible options are:

    ALL
    All messages of the following types are displayed. This is the default.

    E - Error
    Only error messages are displayed. Error messages indicate that the switch operation is severely impaired.

    W - Warning
    Only warning messages are displayed. These messages indicate that an issue may require manager attention.

    I - Information
    Only informational messages are displayed. Informational messages display useful information that you can ignore during normal operation.

    D - Debug
    Debug messages provide detailed high-volume information that is intended only for technical support personnel.

    You can select more than one severity at a time, separated by a comma, for example, E,W.

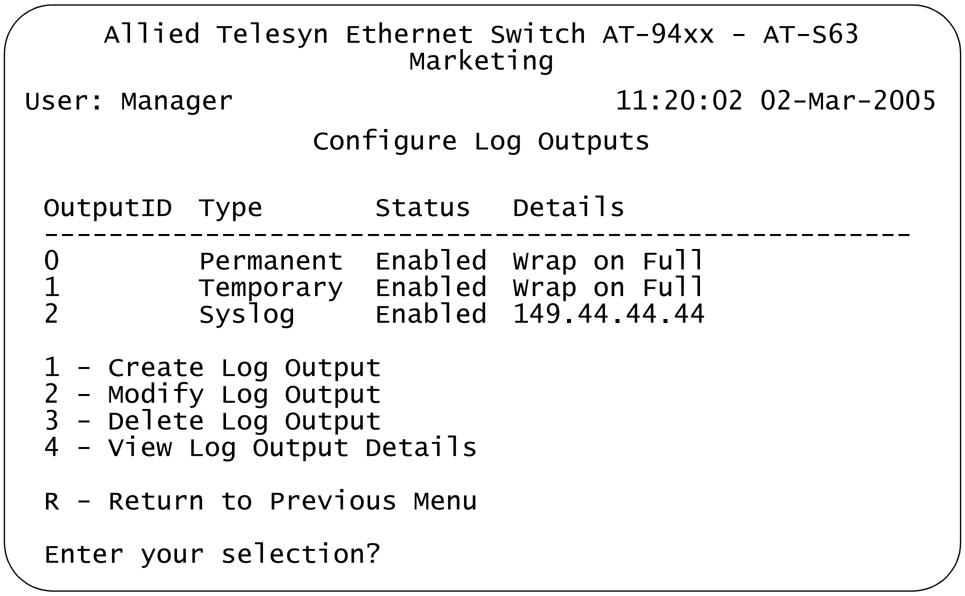
14. To send events generated by a particular AT-S63 software module, type **7** to select Event Module.

    The list of modules is displayed, as shown in Table 2, “AT-S63 Modules” on page 233. The default is All.

15. Enter a list of modules separated by a comma—for example, “system, stp, ptrunk.”

16. Type **C** to create the log output you defined.

    The switch immediately begins to send events to the sever, if you enabled the definition when you created it, and adds the new syslog server definition to the Configure Log Outputs menu. An example of the menu with a definition is shown in



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                       11:20:02 02-Mar-2005
                   Configure Log Outputs

 OutputID  Type       Status   Details
 ------------------------------------------------------
 0         Permanent  Enabled  Wrap on Full
 1         Temporary  Enabled  Wrap on Full
 2         Syslog     Enabled  149.44.44.44

 1 - Create Log Output
 2 - Modify Log Output
 3 - Delete Log Output
 4 - View Log Output Details

 R - Return to Previous Menu

 Enter your selection?
```

Figure 78. Configure Log Outputs Menu with Syslog Output Definitions

17. Return to the Main Menu.

Modifying a Log Output

To modify a log output definition you have already created, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **8** to select Event Log.

   The Event Log menu is shown in Figure 72 on page 231.

3. From the Event Log menu, type **L** to select Configure Log Outputs.

   The Configure Log Outputs menu is shown in Figure 76 on page 242.

4. From the Configure Log Outputs menu, type **2** to select Modify Log Output.

   The following prompt is displayed:

```
Enter output ID to modify [0 to 20] ->
```

5. Enter the number of the log output that you want to modify.

   The Syslog Output Configuration menu is displayed, as shown in Figure 77 on page 243.

6. *Refer to "Creating a Log Output Definition" on page 241 for information about the output selections.*

7. When you complete the modifications, type **M** to select Modify Log Output.

   The Configure Log Outputs menu as shown in Figure 76 on page 242 is redisplayed.

8. Return to the Main Menu.

Deleting a Log Output

To delete a log output definition you have already created, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **8** to select Event Log.

   The Event Log menu is shown in Figure 72 on page 231.

3. From the Event Log menu, type **L** to select Configure Log Outputs.

   The Configure Log Outputs menu is shown in Figure 76 on page 242.

4. From the Configure Log Outputs menu, type **3** to select Modify Log Output.

   The following prompt is displayed:

   ```
   Enter output ID to delete [0 to 20] ->
   ```

5. Enter the number of the log output that you want to delete.

   The following prompt is displayed:

   ```
   Are you sure you want to delete output ID x? [Yes/No] ->
   ```

6. Enter **Y** for Yes or **N** for No and press Enter.

   If you enter Y, the output ID you selected is deleted.

7. Return to the Main Menu.

Displaying the Log Output Definition Details

To view the settings of a log output definition you have already created, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **8** to select Event Log.

   The Event Log menu is shown in Figure 72 on page 231.

3. From the Event Log menu, type L to select Configure Log Outputs.

   The Configure Log Outputs menu is shown in Figure 76 on page 242.

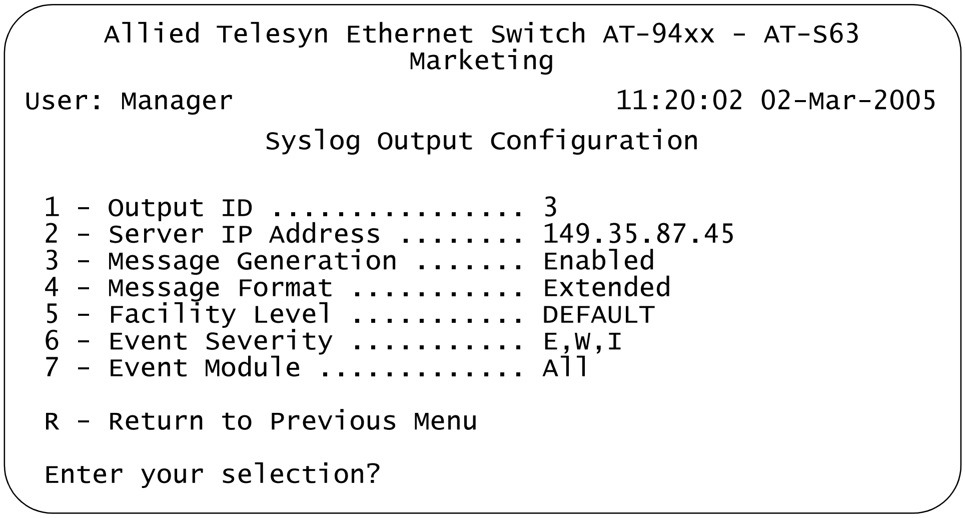
4. From the Configure Log Outputs menu, type **4** to select View Log Output Details.

   The following prompt is displayed:

   ```
   Enter output ID to view [0 to 20] ->
   ```

5. Enter the number of the log output that you want to view.

   The Syslog Output Configuration menu for the selected output is displayed, as shown in Figure 79.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                Syslog Output Configuration

 1 - Output ID ............... 3
 2 - Server IP Address ........ 149.35.87.45
 3 - Message Generation ....... Enabled
 4 - Message Format ........... Extended
 5 - Facility Level ........... DEFAULT
 6 - Event Severity ........... E,W,I
 7 - Event Module ............. All

 R - Return to Previous Menu

 Enter your selection?
```

Figure 79. Syslog Output Configuration Menu for Selected Output ID

   To modify the log output configuration, refer to "Modifying a Log Output" on page 247.

6. Return to the Main Menu.

Chapter 13

Classifiers

This chapter explains classifiers and how you can create classifiers to define traffic flows. The sections in this chapter include:

Classifier Overview

A classifier defines a *traffic flow*. A traffic flow consists of packets that share one or more characteristics. A traffic flow can range from being very broad to very specific. An example of the former might be all IP traffic while an example of the latter could be packets with specific source and destination MAC addresses.

A classifier contains a set of criteria you configure to match the traffic flow you want the classifier to define. Examples of the variables include source and destination MAC addresses, source and destination IP addresses, IP protocols, source and destination TCP and UDP ports numbers, and so on. You can also specify more than one criteria within a classifier to make the definition of the traffic flow more specific. Some of the variables you can mix-and-match, but there are restrictions, as explained later in this section in the descriptions of the individual variables.

By itself, a classifier does not perform any action or produce any result because it lacks instructions on what a port should do when it receives a packet that belongs to the defined traffic flow. Rather, the action is established outside the classifier. As a result, you will never use a classifier by itself.

One of the AT-S63 features that uses a classifier is an access control list (ACL), explained in Chapter 14, “Access Control Lists” on page 269. An ACL filters ingress packets on a port by controlling which packets a port will accept and reject. You can use this feature to improve the security of your network or enhance network performance by creating network paths or links dedicated to carrying specific types of traffic.

When you create an ACL you must specify the traffic flow you want the ACL to control. You do that by creating one or more classifiers and adding the classifiers to the ACL. The action that the port takes when an ingress packet matches the traffic flow specified by a classifier is contained in the ACL itself. The action will be to either accept packets of the traffic flow or discard them.

The other feature that uses classifiers is Quality of Service (QoS) policies. You can use this feature to regulate the various traffic flows that pass through the switch. For instance, you might raise or lower their user priority values or increase or decrease their allotted bandwidths.

As with an ACL, you specify the traffic flow of interest by creating one or more classifiers and applying them to a QoS policy. The action to be taken by a port when it receives a packet that corresponds to the prescribed flow is dictated by the QoS policy, as explained in Chapter 16, “Quality of Service” on page 297.

In summary, a classifier is a list of variables that define a traffic flow. You apply a classifier to an ACL or a QoS policy to define the traffic flow you want the ACL or QoS policy to affect or control.

Classifier Criteria

The components of a classifier are defined in the following subsections.

Destination MAC Address (Layer 2)
Source MAC Address (Layer 2)

You can identify a traffic flow by specifying the source and/or destination MAC address. For instance, you might create a classifier for a traffic flow destined to a particular destination node, or from a specific source node to a specific destination node, all identified by their MAC addresses.

The management software does not support a classifier based on a range of MAC addresses. Each source and destination MAC address must be considered as a separate traffic flow, requiring its own classifier.

Ethernet 802.2 and Ethernet II Frame Types (Layer 2)

You can create a classifier that filters packets based on Ethernet frame type and whether a packet is tagged or untagged within a frame type. (A tagged Ethernet frame contains within it a field that specifies the ID number of the VLAN to which the frame belongs. Untagged packets lack this field.) Options are:

- Ethernet II tagged packets
- Ethernet II untagged packets
- Ethernet 802.2 tagged packets
- Ethernet 802.2 untagged packets

802.1p Priority Level (Layer 2)

A tagged Ethernet frame, as explained in “Tagged VLAN Overview” on page 556, contains within it a field that specifies its VLAN membership. Such frames also contain a user priority level used by the switch to determine the Quality of Service to apply to the frame and which egress queue on the egress port a packet should be stored in. The three bit binary number represents eight priority levels, 0 to 7, with 0 the lowest priority and 7 the highest. Figure 80 illustrates the location of the user priority field within an Ethernet frame.

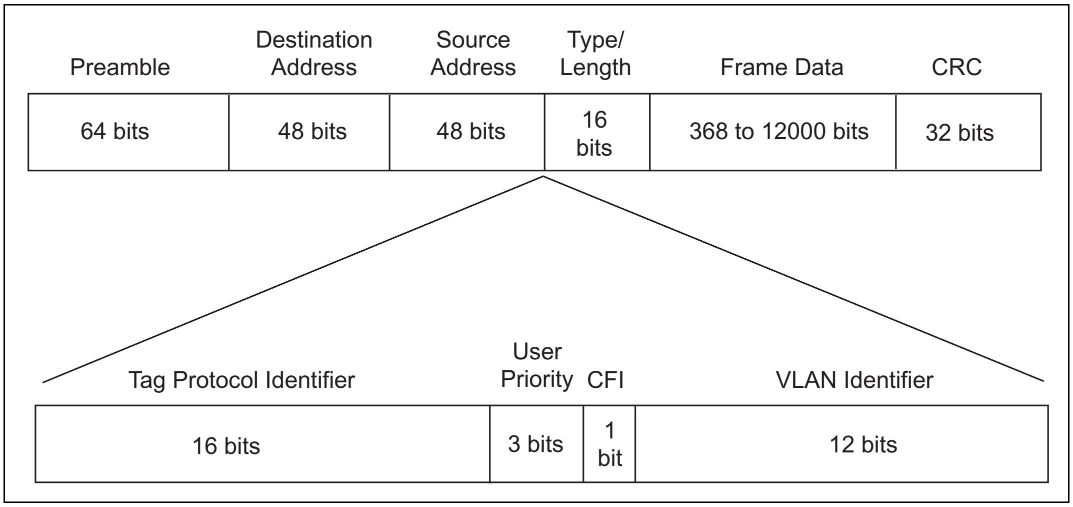


Figure 80. User Priority and VLAN Fields within an Ethernet Frame

You can identify a traffic flow of tagged packets using the user priority value. A classifier for such a traffic flow would instruct a port to watch for tagged packets containing the specified user priority level.

The priority level criteria can contain only one value, and the value must be from 0 (zero) to 7. Multiple classifiers are required if a port is to watch for several different traffic flows of different priority levels.

VLAN ID (Layer 2)

A tagged Ethernet frame also contains within it a field of 12 bits that specifies the ID number of the VLAN to which the frame belongs. The field, illustrated in Figure 80, can be used to identify a traffic flow.

A classifier can contain only one VLAN ID. To create a port ACL or QoS policy that applies to several different VLAN IDs, multiple classifiers are required.

Protocol (Layer 2)

Traffic flows can be identified by any of the following Layer 2 protocols:

- IP
- ARP
- RARP
- Protocol Number

Observe the following guideline when using this variable:

- When selecting a Layer3 or Layer 4 variable, this variable must be left blank or set to IP.
- If you choose to specify a protocol by its number, you can enter the value in decimal or hexadecimal format. If you choose the latter, precede the number with the prefix "0x".

IP ToS (Type of Service) (Layer 3)

Type of Service (ToS) is a standard field in IP packets. It is used by applications to indicate the priority and Quality of Service for a frame. The range of the value is 0 to 7. The location of the field is shown in Figure 81.

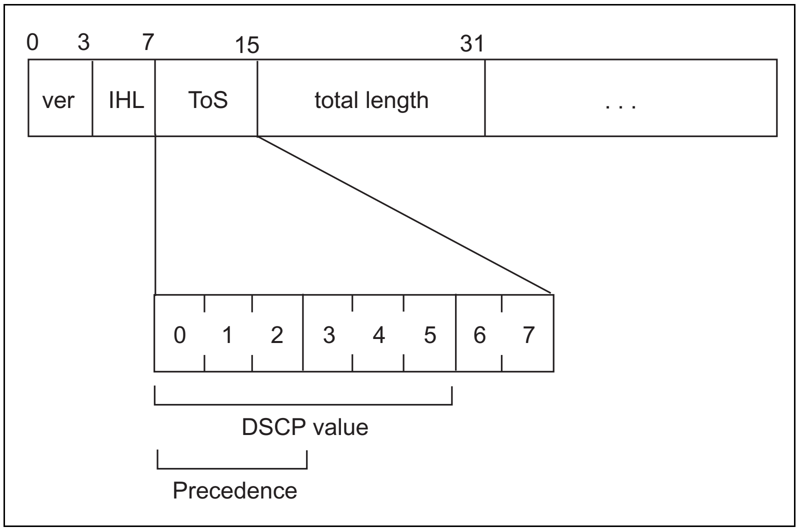


Figure 81. ToS field in an IP Header

Observe these guidelines when using this criterion:

- The Protocol variable must be left blank or set to IP.
- You cannot specify both an IP ToS value and an IP DSCP value in the same classifier.

IP DSCP (DiffServ Code Point) (ToS) (Layer 3)

The Differentiated Services Code Point (DSCP) tag indicates the class of service to which packets belong. The DSCP value is written into the TOS field of the IP header, as shown in Figure 81 on page 255. Routers within the network use this DSCP value to classify packets, and assign QoS appropriately. When a packet leaves the DiffServ domain, the DSCP value can be replaced with a value appropriate for the next DiffServ domain.The range of the value is 0 to 63.

Observe these guidelines when using this criterion:

- The Protocol variable must be left blank or set to IP.

- You cannot specify both an IP ToS value and an IP DSCP value in the same classifier.

IP Protocol (Layer 3)

You can define a traffic flow by the following Layer 3 protocols:

- TCP
- UDP
- ICMP
- IGMP
- IP protocol number

If you choose to specify a Layer 3 protocol by its number, you can enter the value in decimal or hexadecimal format. It you choose the latter, precede the number with the prefix “0x”.

Source IP Addresses (Layer 3)
Source IP Mask (Layer 3)

You can define a traffic flow by the source IP address contained in IP packets. The address can be of a subnet or a specific end node.

You do not need to enter a source IP mask if you are filtering on the IP address of a specific end node. A mask is required, however, when you filter on a subnet. A binary “1” indicates the switch should filter on the corresponding bit of the IP address, while a “0” indicates that it should not. For example, the Class C subnet address 149.11.11.0/24 would have the mask “255.255.255.0.”

Observe this guideline when using these criteria:

- The Protocol variable must be left blank or set to IP.

Destination IP Addresses (Layer 3)
Destination IP Mask (Layer 3)

You can also define a traffic flow based on the destination IP address of a subnet or a specific end node.

You do not need to enter a destination IP mask if you are filtering on the IP address of a specific end node. A mask is required, however, when filtering on a subnet. Identical to the source IP mask, a binary “1” indicates the switch should filter on the corresponding bit of the IP address, while a “0” indicates that it should not. For example, the Class C subnet address 149.11.11.0/24 would have the mask “255.255.255.0.”

Observe this guideline when using these criteria:

- The Protocol variable must be left blank or set to IP.

TCP Source Ports (Layer 4)
TCP Destination Ports (Layer 4)

Traffic flows can be identified by source and/or destination TCP port numbers, which are contained within the header of an IP frame. Observe the following guidelines when using these criteria:

- The Protocol variable must be left blank or set to IP.
- The IP Protocol variable must be left blank or set to TCP.
- A classifier cannot contain criteria for both TCP and UDP ports. You may specify one in a classifier, but not both.

UDP Source Ports (Layer 4)
UDP Destination Ports (Layer 4)

Traffic flows can be identified by source and/or destination UDP port numbers contained within the header of IP frames. Observe the following guidelines when using these criteria:

- The Protocol variable must be left blank or set to IP.
- The IP Protocol variable must be left blank or set to UDP.
- A classifier cannot contain criteria for both TCP and UDP ports. You may specify only one in a classifier.

TCP Flags

A traffic flow can be based on the following TCP flags:

- URG - Urgent
- ACK - Acknowledgement
- RST - Reset
- PSH - Push
- SYN - Synchronization
- FIN - Finish

Observe the following guidelines when using this criterion:

- The Protocol variable must be left blank or set to IP.
- The IP Protocol variable must be left blank or set to TCP.
- A classifier cannot contain both a TCP flag and a UDP source and/or destination port.

Classifier Guidelines

Follow these guidelines when creating a classifier:

- ❒ Each classifier represents a separate traffic flow.
- ❒ The variables within a classifier are linked by AND. The more variables specified within a classifier, the more specific it becomes in terms of the flow you are defining. For instance, specifying both a source IP address and a TCP destination port within the same classifier defines a traffic flow that relates to IP packets containing both the designated source IP address and TCP destination port. However, there are some restrictions to which variables can be used together in the same classifier. For the restrictions, refer to “Classifier Criteria” on page 253.
- ❒ The same classifier can be used for both an ACL and a QoS policy.
- ❒ You can apply the same classifier to more than one ACL or QoS policy.
- ❒ A classifier without any defined variables filters all packets.
- ❒ You cannot create two classifiers that have the same settings. There can be only one classifier for any given type of traffic flow.
- ❒ The switch can store up to 256 classifiers.
- ❒ You cannot modify a classifier if it belongs to an ACL or QoS policy that has already been assigned to a port. You must first remove the port assignments from the ACL or policy and reassign them after you have modified the classifier.

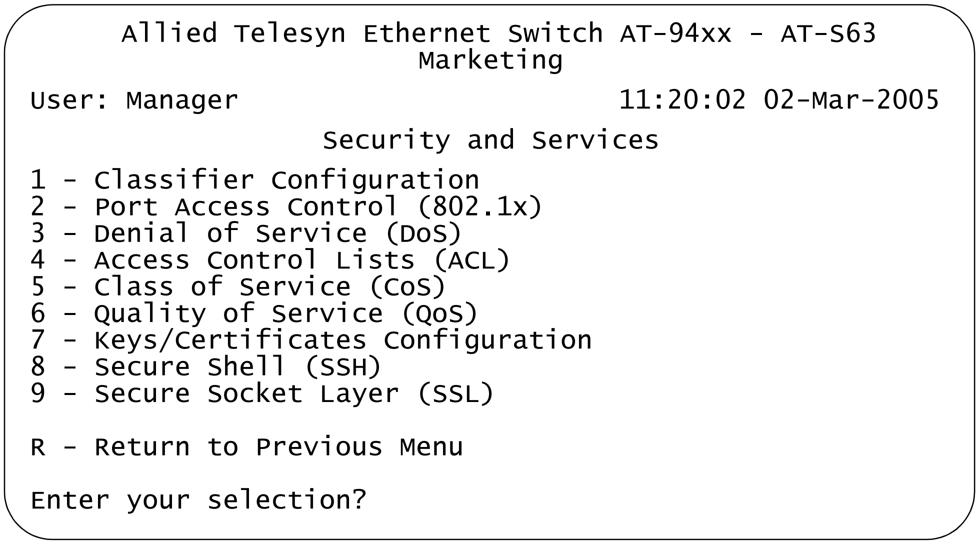
Creating a Classifier

This section contains the procedure for creating a classifier. As explained in "Classifier Overview" on page 252, a classifier contains a series of variables for defining a traffic flow. This same procedure is used whether the classifier is intended for an ACL or a QoS policy.

To create a classifier, perform the following procedure

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82.

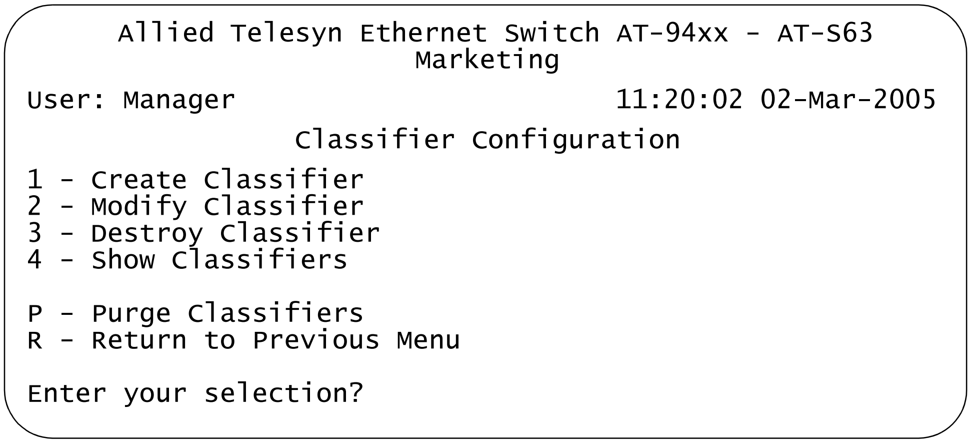


```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                       11:20:02 02-Mar-2005
                 Security and Services
1 - Classifier Configuration
2 - Port Access Control (802.1x)
3 - Denial of Service (DoS)
4 - Access Control Lists (ACL)
5 - Class of Service (CoS)
6 - Quality of Service (QoS)
7 - Keys/Certificates Configuration
8 - Secure Shell (SSH)
9 - Secure Socket Layer (SSL)

R - Return to Previous Menu

Enter your selection?
```

Figure 82. Security and Services Menu

2. From the Security and Services menu, type **1** to select Classifier Configuration.

The Classifier Configuration menu is shown in Figure 83.

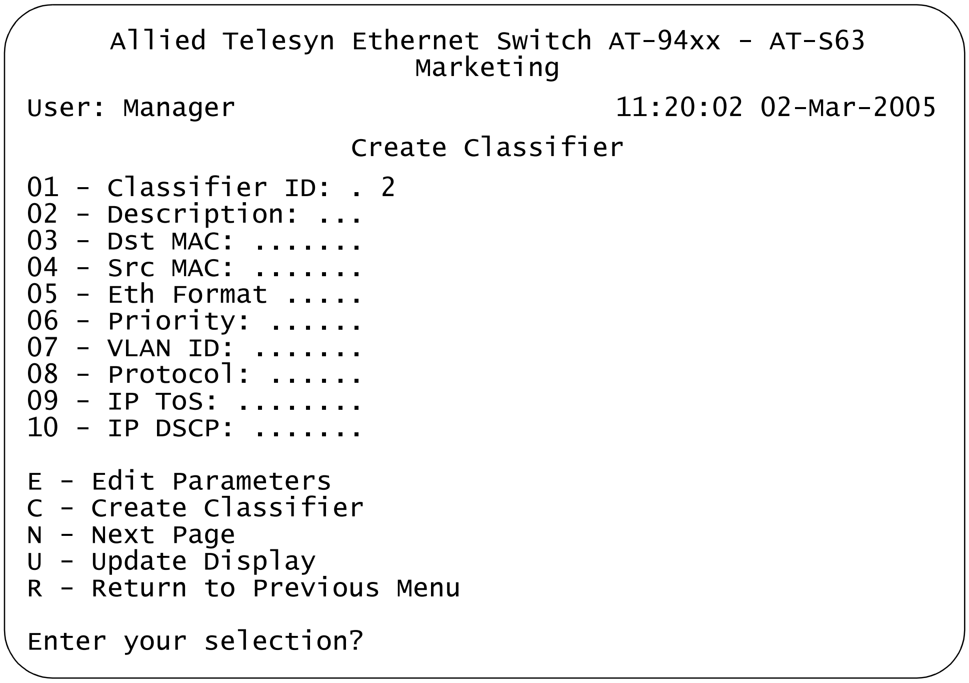


```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                       11:20:02 02-Mar-2005
                  Classifier Configuration
1 - Create Classifier
2 - Modify Classifier
3 - Destroy Classifier
4 - Show Classifiers

P - Purge Classifiers
R - Return to Previous Menu

Enter your selection?
```

Figure 83. Classifier Configuration Menu

3. From the Classifier Configuration menu, type **1** to select Create Classifier.

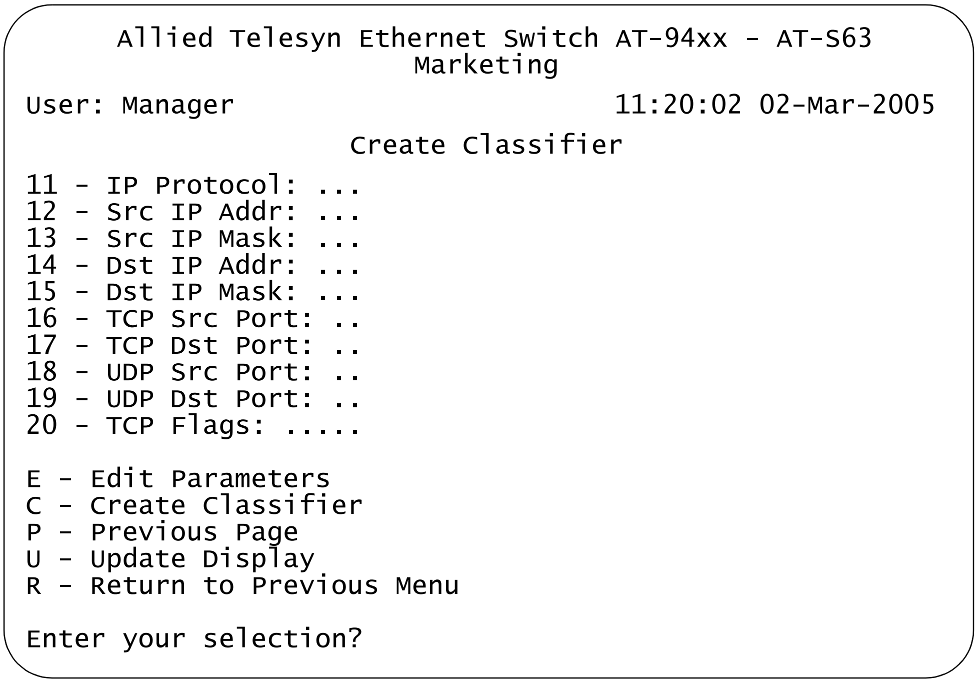
   The Create Classifier menu (page 1) is shown in Figure 84.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                       11:20:02 02-Mar-2005
                     Create Classifier
01 - Classifier ID: . 2
02 - Description: ...
03 - Dst MAC: .......
04 - Src MAC: .......
05 - Eth Format .....
06 - Priority: ......
07 - VLAN ID: .......
08 - Protocol: ......
09 - IP ToS: ........
10 - IP DSCP: .......

E - Edit Parameters
C - Create Classifier
N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 84. Create Classifier Menu (Page 1)

This is the first page of the classifier variables. To view the remaining variables, type **N** to select Next Page. The Create Classifier menu (page 2) is shown in Figure 85.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                    Create Classifier
11 - IP Protocol: ...
12 - Src IP Addr: ...
13 - Src IP Mask: ...
14 - Dst IP Addr: ...
15 - Dst IP Mask: ...
16 - TCP Src Port: ..
17 - TCP Dst Port: ..
18 - UDP Src Port: ..
19 - UDP Dst Port: ..
20 - TCP Flags: .....

E - Edit Parameters
C - Create Classifier
P - Previous Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 85. Create Classifier Menu (Page 2)

4. To set a variable, type **E** to select Edit Parameters.

   The following prompt is displayed.

   ```
   Enter parameter ID to edit: [1 to 19] ->1
   ```

5. Enter the number of the variable you want to configure. You can configure only one parameter at a time.

   Note
   Item 1 allows you to assign the classifier an ID number. Each classifier must have a unique number. The range is 1 to 9999. The default is the lowest available number.

   Item 2 allows you to assign a description to a classifier. You should assign a description to each classifier. A description helps you identify the different classifiers on the switch. A description can be up to fifteen alphanumeric characters, including spaces. An example of a description is “IP traffic flow”.

6. Adjust the new value for the variable.

Refer to “Classifier Overview” on page 252 for definitions of the variables.

7. Repeat steps 5 and 6 to adjust any other variables necessary to define the traffic flow for this classifier.

8. After configuring the necessary variables, type **C** to select Create Classifier.

   The switch creates the classifier. If any of the settings are incompatible, the system displays an error message. Refer to the variable definitions in “Classifier Criteria” on page 253 for assistance in resolving compatibility issues.

9. To create more classifiers, repeat this procedure starting with step 3.

10. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

11. To add classifiers to an ACL, refer to “Creating an ACL” on page 277. To add classifiers to a QoS policy, refer to “Managing Flow Groups” on page 313.

Modifying a Classifier

In order to modify a classifier, you need to know its ID number. If you are unsure of the ID number of the classifier you want to modify, refer to “Displaying Classifiers” on page 266.

You cannot modify a classifier if it belongs to an ACL or QoS policy that has already been assigned to a port. You must first remove the port assignments from the ACL or policy before you can modify the classifier.

To modify a classifier, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **1** to select Classifier Configuration.

   The Classifier Configuration menu is shown in Figure 83 on page 260.

3. From the Classifier Configuration menu, type **2** to select Modify Classifier.

   The prompt similar to the following is displayed:

   ```
   Available Classifier(s): 1-12
   Enter Classifier ID :  [1 to 9999] -> 1
   ```

4. Enter the ID number of the classifier you want to modify.

   The Modify Classifier window is displayed. This window is identical to the Create Classifier menus, shown in Figure 84 on page 260 and Figure 85 on page 261.

5. Edit the variables as needed.

   When modifying a classifier, note the following:

   - You cannot change a classifier’s ID number.
   - To delete a value from a variable so as to leave it blank, select the criterion and then use the backspace key to delete its default value.

6. Once you have adjusted the variables, type **M** to select Modify Classifier.

   A change to a classifier is immediately activated. If any of the settings are incompatible, the system displays an error message. Refer to the variable definitions in “Classifier Criteria” on page 253 for assistance in resolving any compatibility issues.

7. To modify other classifiers, repeat this process starting with step 3.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

9. To add the modified classifier to an ACL, refer to “Creating an ACL” on page 277 or “Modifying an ACL” on page 280. To add it to a QoS policy, refer to “Managing Flow Groups” on page 313.

Deleting a Classifier

This procedure deletes a classifier from the switch. To delete a classifier, you need to know its ID number. If you are unsure of the ID number of the classifier you want to delete, refer to “Displaying Classifiers” on page 266.

> **Note**
> You cannot delete a classifier if it belongs to an ACL or QoS policy.You must first remove the port assignments from its ACL or policy assignments before you can delete the classifier.

To delete a classifier, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **1** to select Classifier Configuration.

   The Classifier Configuration menu is shown in Figure 83 on page 260.

3. From the Classifier Configuration menu, type **3** to select Destroy Classifier.

   The following prompt is displayed:

   ```
   Enter Classifier ID :  [1 to 9999] -> 1
   ```

4. Enter the ID number of the classifier you want to delete.

   The details of the specified classifier are displayed. Use this window to verify that you are deleting the correct classifier.

5. If this is the correct classifier, type **D** to select Destroy Classifier.

   The classifier is deleted from the switch.

6. To delete additional classifiers, repeat this procedure starting with step 3.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying Classifiers

To display the classifiers on a switch, do the following:

1. From the Main Menu, type **7** to select Security and Services.

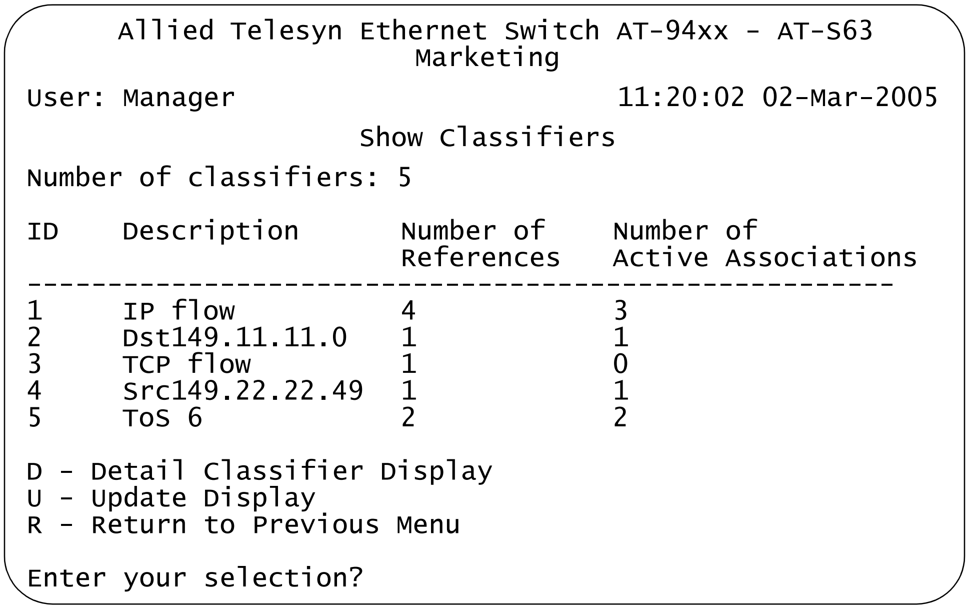
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **1** to select Classifier Configuration.

   The Classifier Configuration menu is shown in Figure 83 on page 260.

3. From the Classifier Configuration menu, type **4** to select Show Classifiers.

   An example of the Show Classifiers menu is shown in Figure 86.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                           11:20:02 02-Mar-2005
                       Show Classifiers
Number of classifiers: 5

ID    Description      Number of    Number of
                       References   Active Associations
------------------------------------------------------
1     IP flow          4            3
2     Dst149.11.11.0   1            1
3     TCP flow         1            0
4     Src149.22.22.49  1            1
5     ToS 6            2            2

D - Detail Classifier Display
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 86. Show Classifiers Menu

The Show Classifiers menu displays the current classifiers in a table with the following columns of information:

ID
The classifier’s ID number.

Description
The description of the classifier.

Number of References
The number of active and inactive ACL and QoS policy assignments

for the classifier. An active ACL or QoS policy has been assigned to a switch port while an inactive ACL or policy has not been assigned to a port. If this number is 0 (zero), the classifier has not been assigned to any ACLs or policies.

Number of Active Associations
The number of active ACLs and QoS policy assignments for the classifier. An active ACL or policy has been assigned to a switch port.

You can use this number together with the Number of References to determine the number of inactive ACLs and policies for a classifier. For example, if Number of References for a classifier is 5 and the Number of Active Associations is 3, two of the ACL or QoS policy assignments for the classifier have not been assigned to a switch port.

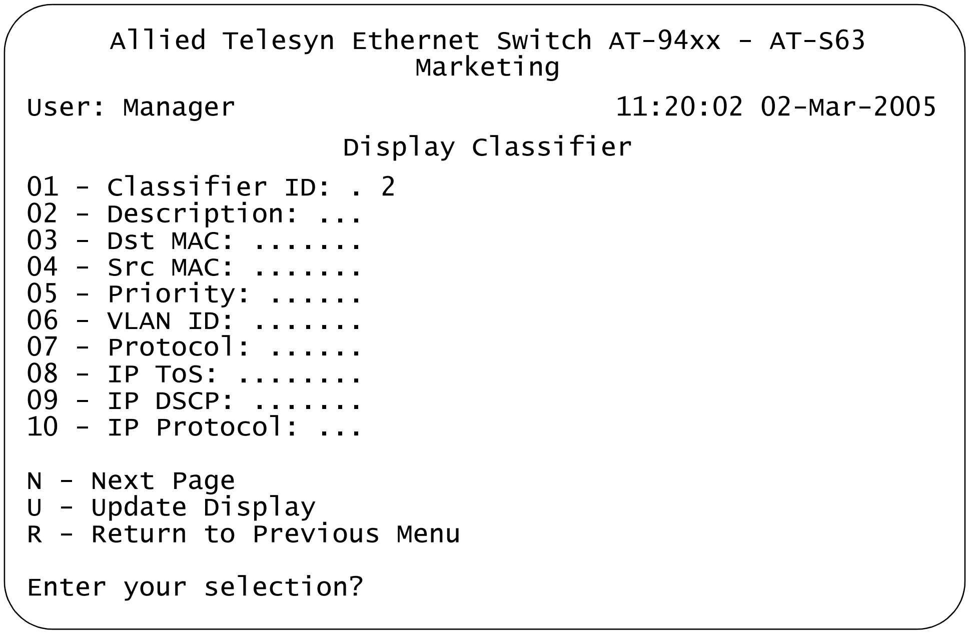
4. To view the details of a classifier, type **D** to select Detail Classifier Display.

   The following prompt is displayed:

   ```
   Enter Classifier ID :  [1 to 9999] -> 1
   ```

5. Enter the ID number of the classifier you want to display.

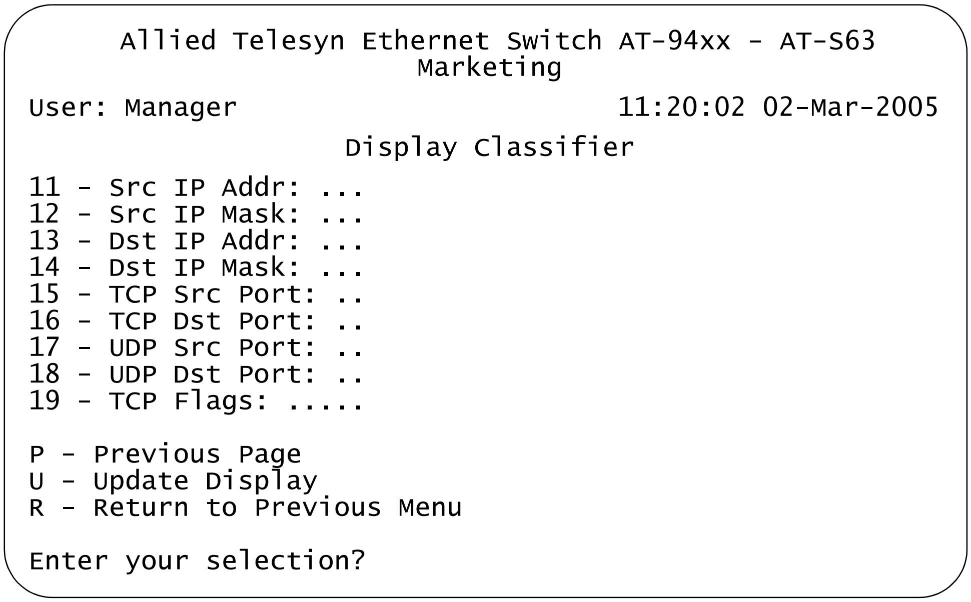
   The first page of the Display Classifier menu is shown in



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing

User: Manager                         11:20:02 02-Mar-2005
                    Display Classifier

01 - Classifier ID: . 2
02 - Description: ...
03 - Dst MAC: .......
04 - Src MAC: .......
05 - Priority: ......
06 - VLAN ID: .......
07 - Protocol: ......
08 - IP ToS: ........
09 - IP DSCP: .......
10 - IP Protocol: ...

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 87. Display Classifier Menu (Page 1)

The second page of the Display Classifier menu is shown in



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
                    Display Classifier
11 - Src IP Addr: ...
12 - Src IP Mask: ...
13 - Dst IP Addr: ...
14 - Dst IP Mask: ...
15 - TCP Src Port: ..
16 - TCP Dst Port: ..
17 - UDP Src Port: ..
18 - UDP Dst Port: ..
19 - TCP Flags: .....

P - Previous Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 88. Display Classifier Menu (Page 2)

Chapter 14

Access Control Lists

This chapter explains access control lists (ACL) and how you can use this feature to improve network security and performance. This chapter contains the following sections:

Access Control List (ACL) Overview

An ACL is a tool for managing network traffic. You can use this feature to control which ingress packets a port will accept and which it will reject.

One of the benefits of this the feature is that it can add to network security. An ACL can protect parts of a network from unauthorized access by allowing only permitted traffic to enter the port. An ACL can explicitly state which traffic is permitted to enter a switch port and which is to be discarded.

ACLs can also enhance network performance by creating data links dedicated to carrying specific types of traffic, while banning all other traffic. This provides the permitted traffic a higher priority by virtue of having its own dedicated network path.

This feature can also be used to achieve load-balancing by creating dedicated links for different types or categories of traffic. This too can result in enhanced network performance by distributing different types of network traffic across multiple physical links.

Note
This feature is not related to the management ACL feature, described in Chapter 35, “Management Access Control Lists” on page 775. They perform different functions and are configured in different ways.

The heart of an ACL is a classifier. A classifier, as explained “Classifier Overview” on page 252, defines packets that share a common trait. Packets that share a trait are referred to as a traffic flow. A traffic flow can be very broad, such as all IP packets, or very specific, such as packets from a specific end node destined for another specific node. You specify the traffic using different criteria, such as source and destination MAC addresses or protocol.

When you create an ACL, you are asked to specify the classifier that defines the traffic flow you want to permit or deny on a port.

There are two kinds of ACLs based on the two actions that an ACL can perform. One is called a permit ACL. Packets that meet the criteria in a permit ACL are accepted by a port.

The second type of ACL is a deny ACL. This type of ACL will deny entry to packets that meet the criteria of its classifiers, unless the packet also meets the criteria of a permit ACL on the same port, in which case the packet is accepted. This is because a permit ACL overrides a deny ACL.

Here is an overview of how the process works.

1. When an ingress packet arrives on a port, it is checked against the criteria in the classifiers of all the ACLs, both permit and deny, assigned to the port.

2. If the packet matches the criteria of a permit ACL, the port immediately accepts it, even if the packet also matches a deny ACL assigned to the same port, because a permit ACL always overrides a deny ACL.

3. If a packet meets the criteria of a deny ACL but not any permit ACLs on the port, then the packet is discarded.

4. Finally, if a packet does not meet the criteria of any ACLs on a port, it is accepted by the port.

Parts of an ACL

To create an ACL, you need to provide the following information:

- Name - An ACL needs a name. The name should reflect the type of traffic flow the ACL will be filtering and, perhaps, also the action. An example might be "HTTPS flow - permit." The more specific the name, the easier it will be for you to identify the different ACLs.
- Action - An ACL can have one of two actions: permit or deny. An action of permit means that the ingress packets matching the criteria in the classifiers are to be accepted by the switch port. An action of deny means any ingress packets meeting the criteria are to be discarded, provided that the packets do not match any permit ACLs on the port.
- Classifiers - An ACL needs one or more classifiers to define the traffic flow whose packets you want the port to accept or reject. Each classifier defines a different traffic flow. An ACL can have more than one classifier to filter multiple traffic flows.
- Port Lists - Finally, you need to specify the ports to which an ACL is to be assigned.

Guidelines

Following are rules to observe when it comes to using ACLs:

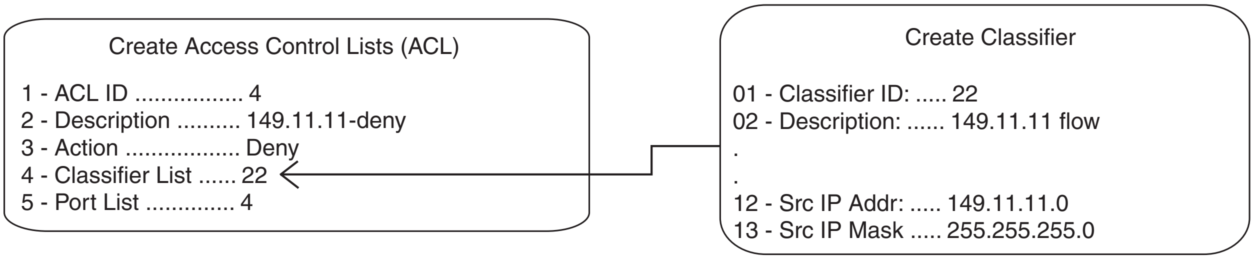
- A port can have multiple permit and deny ACLs.
- An ACL must have at least one classifier.
- An ACL can be assigned to more than one switch port.
- An ACL filters ingress traffic, but not egress traffic.
- The action of a ACL can be either permit or deny. A permit ACL overrides a deny ACL on the same port.
- It does not matter the order in which you add ACLs to a port. A packet is compared against all the ACLs assigned to a port.

- ❐ A classifier can be assigned to multiple ACLs. However, a classifier cannot be assigned more than once to a port. Put another way, ACLs that have the same classifier cannot be assigned to the same port.
- ❐ The switch can store up to 64 ACLs.

Examples

This section contains several examples of ACLs.

In this example, port 4 has been assigned one ACL, a deny ACL for the subnet 149.11.11.0. This ACL prevents the port from accepting any traffic originating from that subnet. Since this is the only ACL applied to the port, all other traffic is accepted. As explained earlier, a port automatically accepts all packets that do not meet the criteria of the classifiers assigned to its ACLs.

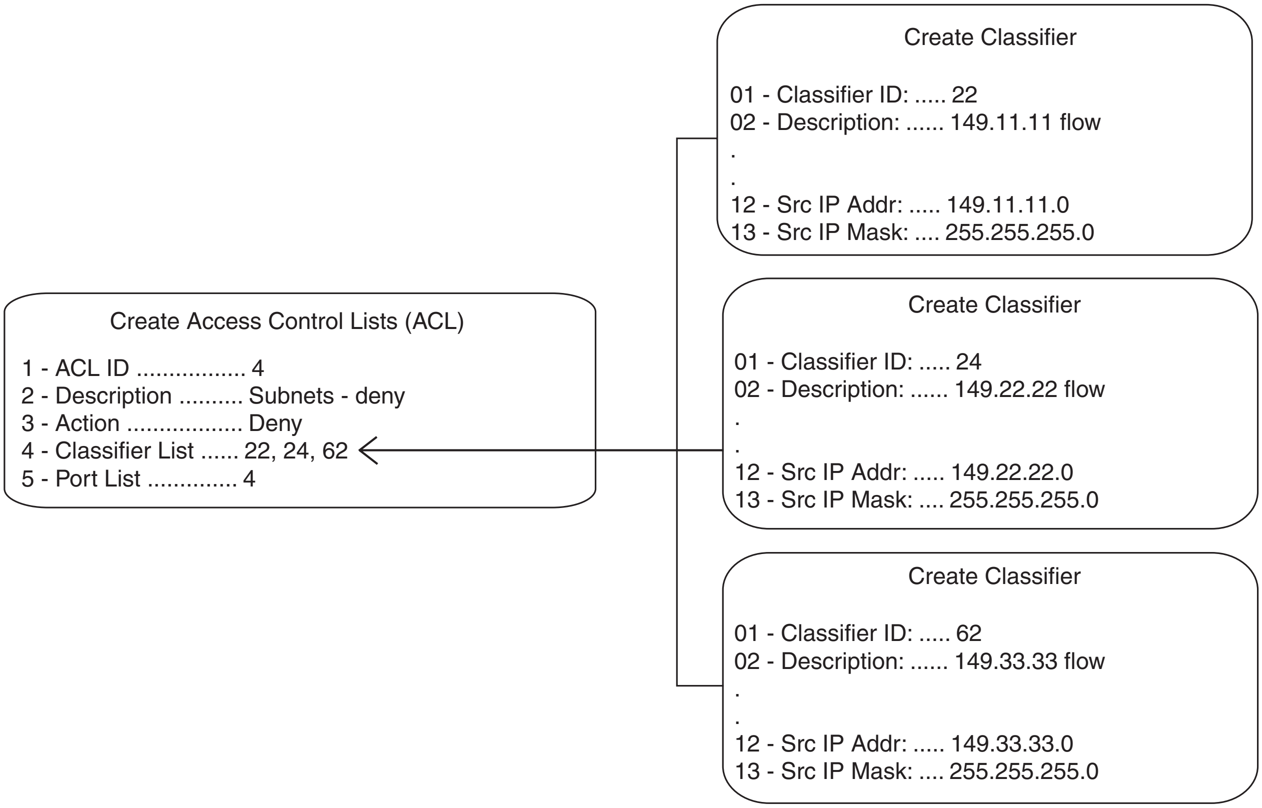


```
Create Access Control Lists (ACL)

1 - ACL ID ................. 4
2 - Description .......... 149.11.11-deny
3 - Action .................. Deny
4 - Classifier List ...... 22
5 - Port List .............. 4
```

```
Create Classifier

01 - Classifier ID: ..... 22
02 - Description: ...... 149.11.11 flow
.
.
12 - Src IP Addr: ..... 149.11.11.0
13 - Src IP Mask ..... 255.255.255.0
```

Figure 89. ACL Example 1

To deny traffic from several subnets on the same port, you can create multiple classifiers and apply them to the same ACL. This example denies traffic on port 4 from three subnets using three classifiers, one for each subnet, assigned to the same ACL.



Create Access Control Lists (ACL)

1 - ACL ID 4
2 - Description .... Subnets - deny
3 - Action .... Deny
4 - Classifier List 22, 24, 62
5 - Port List 4

Create Classifier

01 - Classifier ID: 22
02 - Description: ...... 149.11.11 flow
.
.
12 - Src IP Addr: 149.11.11.0
13 - Src IP Mask: 255.255.255.0

Create Classifier

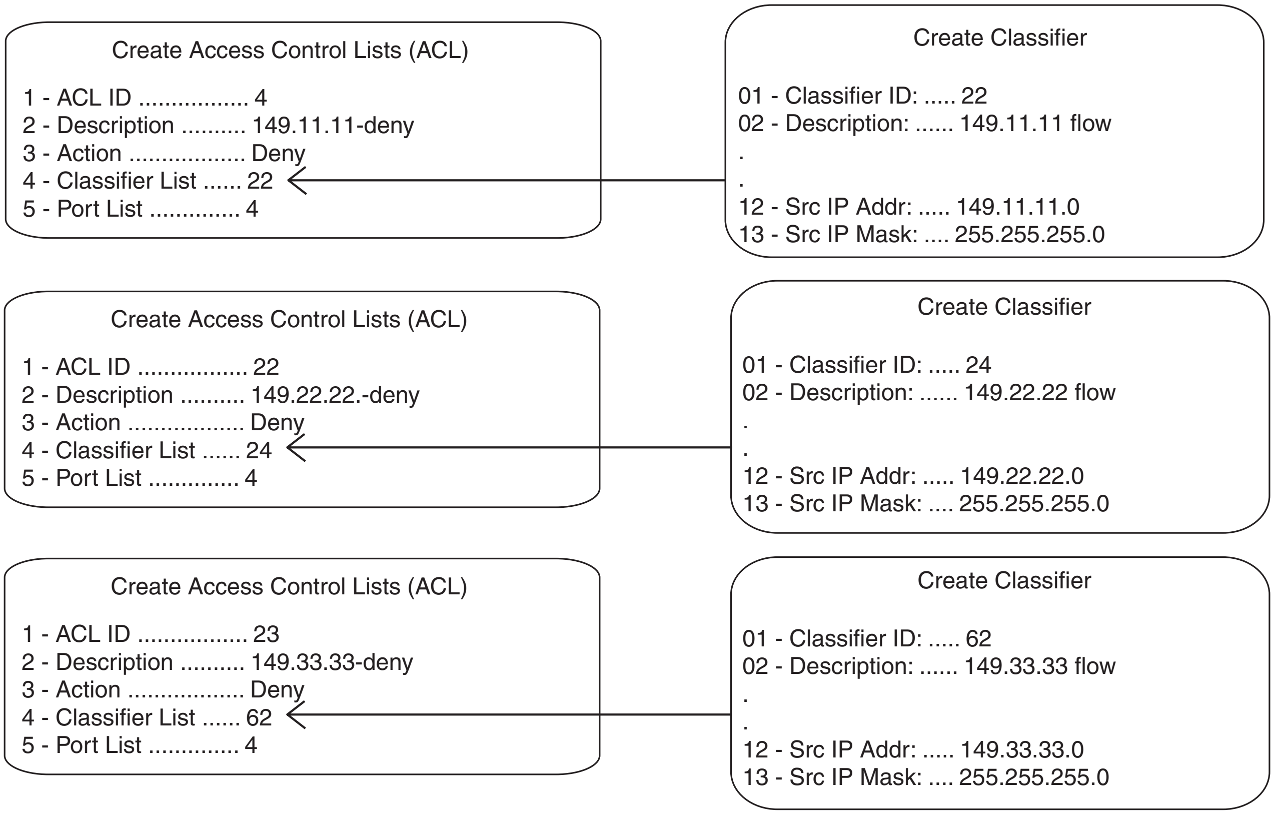
01 - Classifier ID: 24
02 - Description: ...... 149.22.22 flow
.
.
12 - Src IP Addr: 149.22.22.0
13 - Src IP Mask: 255.255.255.0

Create Classifier

01 - Classifier ID: 62
02 - Description: ...... 149.33.33 flow
.
.
12 - Src IP Addr: 149.33.33.0
13 - Src IP Mask: 255.255.255.0

Figure 90. ACL Example 2

You can achieve the same result by assigning each classifier to a different ACL and assigning the ACLs to the same port, as in this example, again for port 4.



```
Create Access Control Lists (ACL)

1 - ACL ID ................. 4
2 - Description .......... 149.11.11-deny
3 - Action .................. Deny
4 - Classifier List ...... 22
5 - Port List .............. 4
```

```
Create Classifier

01 - Classifier ID: ..... 22
02 - Description: ...... 149.11.11 flow
.
.
12 - Src IP Addr: ..... 149.11.11.0
13 - Src IP Mask: .... 255.255.255.0
```

```
Create Access Control Lists (ACL)

1 - ACL ID ................. 22
2 - Description .......... 149.22.22.-deny
3 - Action .................. Deny
4 - Classifier List ...... 24
5 - Port List .............. 4
```

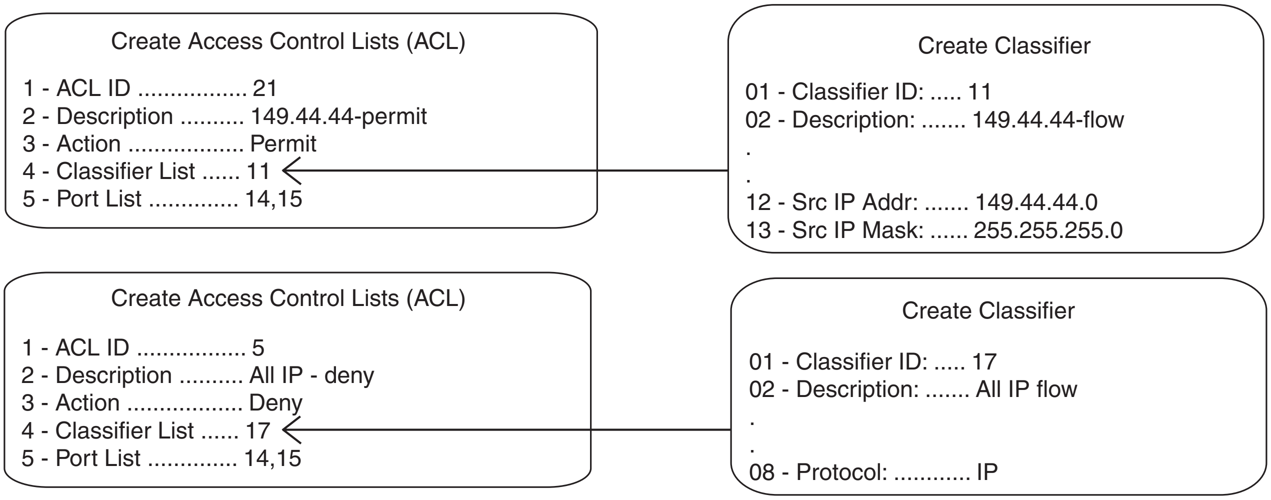
```
Create Classifier

01 - Classifier ID: ..... 24
02 - Description: ...... 149.22.22 flow
.
.
12 - Src IP Addr: ..... 149.22.22.0
13 - Src IP Mask: .... 255.255.255.0
```

```
Create Access Control Lists (ACL)

1 - ACL ID ................. 23
2 - Description .......... 149.33.33-deny
3 - Action .................. Deny
4 - Classifier List ...... 62
5 - Port List .............. 4
```

```
Create Classifier

01 - Classifier ID: ..... 62
02 - Description: ...... 149.33.33 flow
.
.
12 - Src IP Addr: ..... 149.33.33.0
13 - Src IP Mask: .... 255.255.255.0
```

Figure 91. ACL Example 3

In this example, the traffic on ports 14 and 15 is restricted to packets from the source subnet 149.44.44.0. All other IP traffic is denied. Classifier ID 11, which specifies the traffic flow to be permitted by the ports, is assigned to an ACL with an action of permit. Classifier ID 17 specifies all IP traffic and is assigned to an ACL whose action is deny. Since a permit ACL overrides a deny ACL, the port will accept the traffic from the 149.44.44.0 subnet even though that traffic also happens to meet the criteria of the deny ACL.



```
Create Access Control Lists (ACL)

1 - ACL ID ................. 21
2 - Description .......... 149.44.44-permit
3 - Action .................. Permit
4 - Classifier List ...... 11
5 - Port List .............. 14,15
```

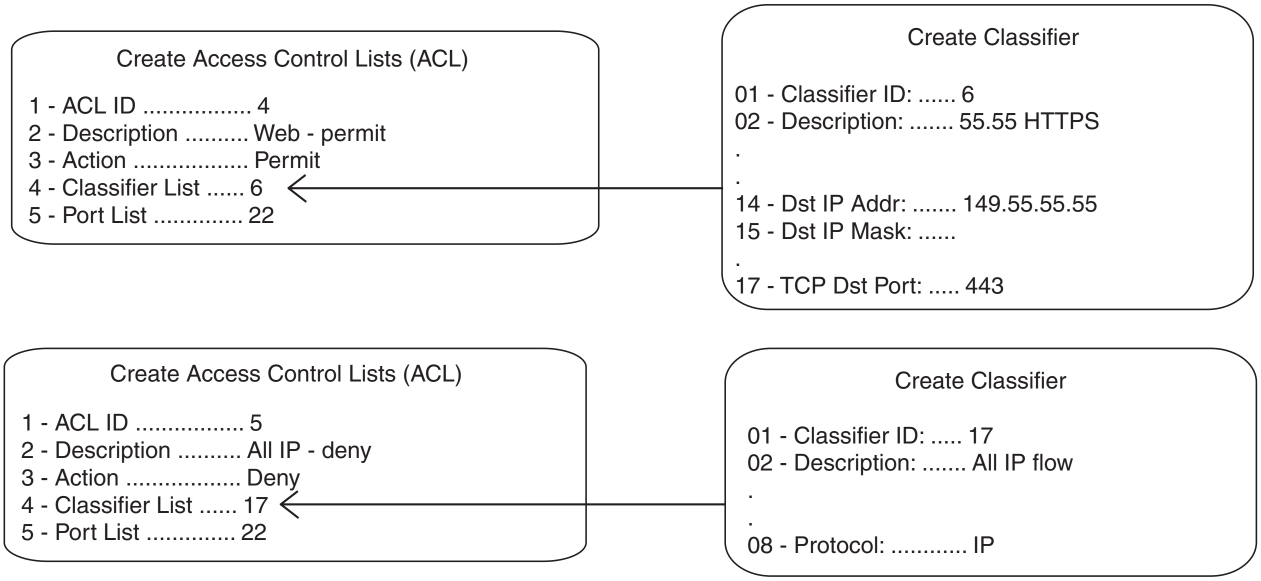
```
Create Classifier

01 - Classifier ID: ..... 11
02 - Description: ....... 149.44.44-flow
.
.
12 - Src IP Addr: ....... 149.44.44.0
13 - Src IP Mask: ...... 255.255.255.0
```

```
Create Access Control Lists (ACL)

1 - ACL ID ................. 5
2 - Description .......... All IP - deny
3 - Action .................. Deny
4 - Classifier List ...... 17
5 - Port List .............. 14,15
```

```
Create Classifier

01 - Classifier ID: ..... 17
02 - Description: ....... All IP flow
.
.
08 - Protocol: ............ IP
```

Figure 92. ACL Example 4

This example limits the traffic on port 22 to HTTPS web traffic intended for the end node with the IP address 149.55.55.55, while rejecting all other IP traffic. (The Dst IP Mask field in classifier 6 is left empty because you do not need to specify a mask for the source or destination IP address of an end node. If you want to include a mask, it would be 255.255.255.255.)



```
Create Access Control Lists (ACL)

1 - ACL ID ................. 4
2 - Description .......... Web - permit
3 - Action .................. Permit
4 - Classifier List ...... 6
5 - Port List .............. 22
```

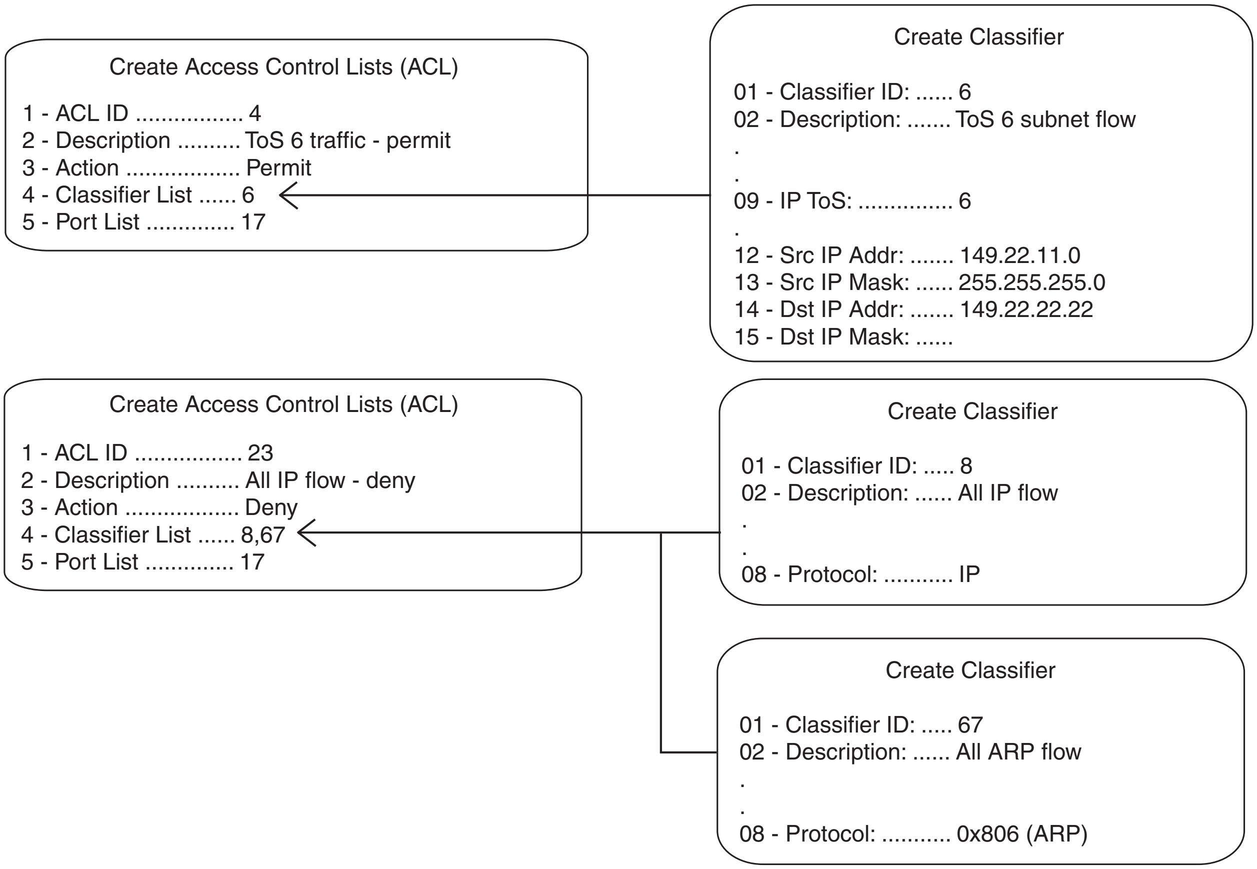
```
Create Classifier

01 - Classifier ID: ...... 6
02 - Description: ....... 55.55 HTTPS
.
.
14 - Dst IP Addr: ....... 149.55.55.55
15 - Dst IP Mask: ......
.
17 - TCP Dst Port: ..... 443
```

```
Create Access Control Lists (ACL)

1 - ACL ID ................. 5
2 - Description .......... All IP - deny
3 - Action .................. Deny
4 - Classifier List ...... 17
5 - Port List .............. 22
```

```
Create Classifier

01 - Classifier ID: ..... 17
02 - Description: ....... All IP flow
.
.
08 - Protocol: ............ IP
```

Figure 93. ACL Example 5

The next example limits the ingress traffic on port 17 to IP packets from the subnet 149.22.11.0 and a Type of Service setting of 6, destined to the end node with the IP address 149.22.22.22. All other IP traffic including ARP packets are prohibited.



Create Access Control Lists (ACL)

1 - ACL ID 4
2 - Description .... ToS 6 traffic - permit
3 - Action .... Permit
4 - Classifier List 6
5 - Port List 17

Create Classifier

01 - Classifier ID: 6
02 - Description: .... ToS 6 subnet flow
.
.
09 - IP ToS: 6
.
12 - Src IP Addr: 149.22.11.0
13 - Src IP Mask: 255.255.255.0
14 - Dst IP Addr: 149.22.22.22
15 - Dst IP Mask: ......

Create Access Control Lists (ACL)

1 - ACL ID 23
2 - Description .... All IP flow - deny
3 - Action .... Deny
4 - Classifier List 8,67
5 - Port List 17

Create Classifier

01 - Classifier ID: 8
02 - Description: ...... All IP flow
.
.
08 - Protocol: .... IP

Create Classifier

01 - Classifier ID: 67
02 - Description: ...... All ARP flow
.
.
08 - Protocol: .... 0x806 (ARP)

Figure 94. ACL Example 6

Creating an ACL

This procedure explains how to create an ACL. In order to perform this procedure, you need to know the ID numbers of the classifiers that you want to assign to the ACL. To view classifier ID numbers, refer to "Displaying Classifiers" on page 266.

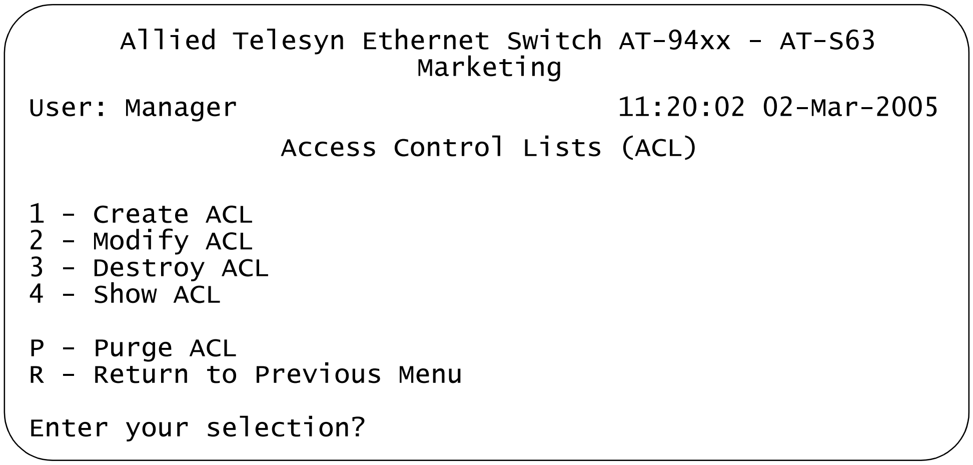
To create an ACL, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **4** to select Access Control Lists.

   The Access Control Lists (ACL) menu is shown in Figure 95.

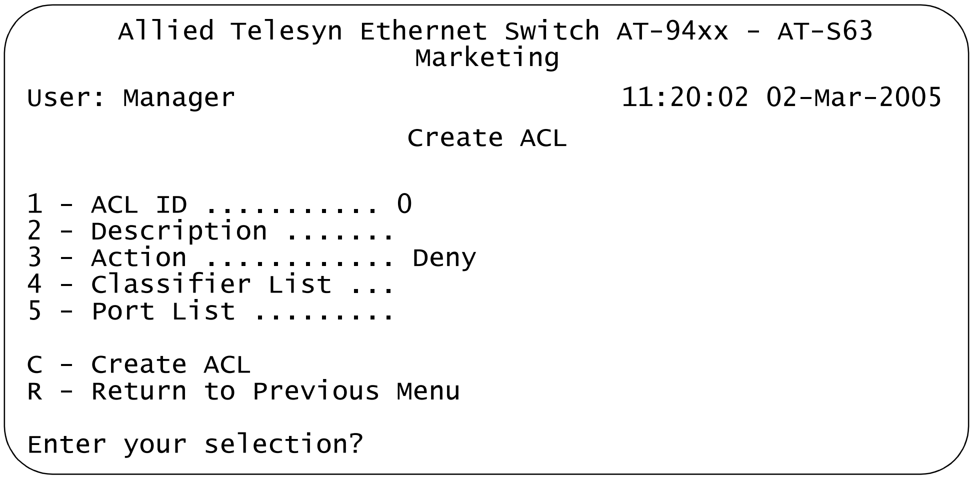


```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                        11:20:02 02-Mar-2005
               Access Control Lists (ACL)

1 - Create ACL
2 - Modify ACL
3 - Destroy ACL
4 - Show ACL

P - Purge ACL
R - Return to Previous Menu

Enter your selection?
```

Figure 95. Access Control Lists (ACL) Menu

3. From the Access Control Lists (ACL) menu, type **1** to select Create ACL.

The Create ACL menu is shown in Figure 96.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                        Create ACL

1 - ACL ID ........... 0
2 - Description .......
3 - Action ............ Deny
4 - Classifier List ...
5 - Port List .........

C - Create ACL
R - Return to Previous Menu

Enter your selection?
```

Figure 96. Create ACL Menu

4. Type **1** to select ACL ID and, when prompted, enter an ID number for the ACL. Every ACL on the switch must have a unique ID number. The range is 0 to 255. The default is the lowest unused number. This parameter is required.

5. Type **2** to select Description and enter a description for the ACL. A description can be up to 31 alphanumeric characters. Spaces are allowed. This parameter is optional, though recommended. Assigning the ACLs different names will make it easier for you to identify them.

6. Type **3** to select Action.

   The following prompt is displayed:

   ```
   Enter Value [0 - Deny, 1 - Permit] : [0 to 1] -> 0
   ```

7. Type **0** if you want the ACL to discard ingress packets that meet the criteria in the classifiers to be assigned to the ACL or **1** if the packets are to be accepted. The default setting is Deny.

8. Type **4** to select Classifier List from the Create ACL menu and, when prompted, enter the classifiers to be assigned to the ACL. The prompt includes the ID numbers of the classifiers on the switch. You can assign more than one classifier to an ACL. Multiple classifiers are separated by a comma (for example, 4,7,2). The order in which you specify the classifiers is not important.

   When entering classifiers, keep in mind the action that you specified for this ACL in step 7. The action and the traffic flows defined by the classifiers should correspond. For instance, an ACL with an action of permit should be assigned those classifiers that define the traffic flow you want the ports to accept.

9. Type **5** to select Port List and, when prompted, enter the ports where you want to assign the ACL. You can assign an ACL to just one port or to more than one port. When entering multiple ports, the ports can be listed individually (e.g., 2,5,7), as a range (e.g., 8-12) or both (e.g., 1-4,6,8).

10. Type **C** to select Create ACL.

    The ACL is created on the switch and immediately activated on the specified ports.

11. To create additional ACLs, repeat this procedure starting with step 3.

12. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an ACL

This procedure explains how to modify an ACL. In order to perform this procedure, you need to know the ID number of the ACL. To display ACL ID numbers, refer to “Displaying ACLs” on page 285. If you plan to add classifiers to the ACL, you also need to know the ID numbers of the classifiers. To view classifier ID numbers, refer to “Displaying Classifiers” on page 266.

To modify an ACL, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **4** to select Access Control Lists.

   The Access Control Lists (ACL) menu is shown in Figure 95 on page 277.

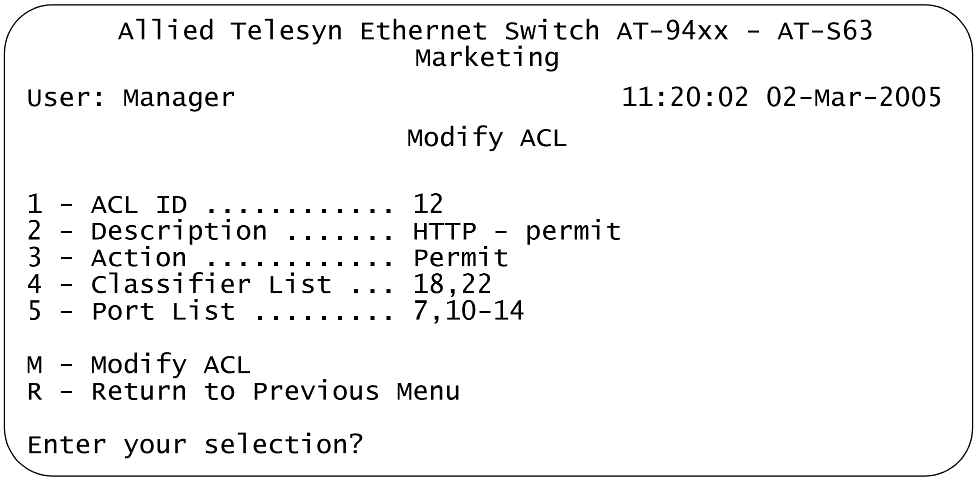
3. From the Access Control Lists (ACL) menu, type **2** to selection Modify ACL.

   The following prompt is displayed:

   ```
   Available ACL(s): 0-15
   Enter ACL ID :  [0 to 255] -> 0
   ```

4. Enter the ID number of the ACL you want to modify. You can modify only one ACL at a time.

   The Modify ACL window is displayed with the specifications of the selected ACL. An example of the window is shown in Figure 97.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                         Modify ACL

1 - ACL ID ............ 12
2 - Description ....... HTTP - permit
3 - Action ............ Permit
4 - Classifier List ... 18,22
5 - Port List ......... 7,10-14

M - Modify ACL
R - Return to Previous Menu

Enter your selection?
```

Figure 97. Modify ACL Menu

You cannot change an ACL's ID number.

5. To change the description of the ACL, type **2** to select Description and enter a new description for the ACL. The description can be up to 31 alphanumeric characters. Spaces are allowed. This parameter is optional, though recommended. Assigning each ACL a name will make it easier for you to identify them.

6. To change the ACL's action, type **3** to select Action.

   The following prompt is displayed:

   ```
   Enter Value [0-Deny, 1-Permit] : [0 to 1] -> 0
   ```

7. Type **0** if you want the ACL to discard ingress packets that meet the criteria in the classifiers to be assigned to the ACL or **1** if the packets are to be accepted. The default setting is Deny.

8. To change the classifiers assigned to the ACL, type **4** to select Classifier List and, when prompted, enter the classifiers. The prompt includes the ID numbers of the classifiers on the switch. You can assign more than one classifier to an ACL. Multiple classifiers are separated by a comma (for example, 2,4,7). The order in which you specify the classifiers is not important.

   When entering classifiers, keep in mind the action you specified for this ACL in step 7. The action and the traffic flows defined by the classifiers should correspond. For instance, an ACL with an action of permit should be assigned those classifiers that define the traffic flow you want ports to accept.

9. To change the ports to which the ACL is assigned, type **5** to select Port List and, when prompted, enter the ports where you want to assign the ACL. You can assign an ACL to more than one port. Ports can be listed individually (e.g., 2,5,7), as a range (e.g., 8-12) or both (e.g., 1-4,6,8).

10. Type **M** to select Modify ACL.

    The ACL is modified on the switch. Modifications take affect immediately.

11. To modify additional ACLs, repeat this procedure starting with step 3.

12. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting an ACL

This procedure deletes an ACL from the switch. To perform this procedure, you need to know the ID number of the ACL. To display ACL ID numbers, refer to “Displaying ACLs” on page 285.

To delete an ACL, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **4** to select Access Control Lists.

   The Access Control Lists (ACL) menu is shown in Figure 95 on page 277.

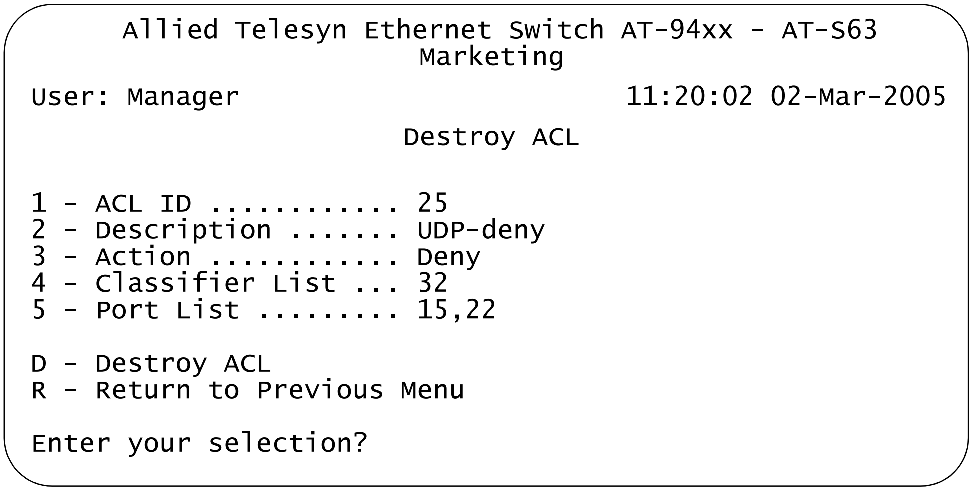
3. From the Access Control Lists (ACL) menu, type **3** to selection Destroy ACL.

   The following prompt is displayed:

   ```
   Available ACL(s): 0-15
   Enter ACL ID :  [0 to 255] -> 0
   ```

4. Enter the ID number of the ACL you want to modify. You can modify only one ACL at a time.

   The Destroy ACL window is displayed with the specifications of the selected ACL. You can use this window to confirm that you are deleting the correct ACL. An example of the window is shown in Figure 98.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                        11:20:02 02-Mar-2005
                      Destroy ACL

1 - ACL ID ............ 25
2 - Description ....... UDP-deny
3 - Action ............ Deny
4 - Classifier List ... 32
5 - Port List ......... 15,22

D - Destroy ACL
R - Return to Previous Menu

Enter your selection?
```

Figure 98. Destroy ACL Menu

5. To delete the ACL, type **D** to select Destroy ACL. To cancel the procedure, type **R** to select Return to Previous Menu.

   A deleted ACL is immediately removed from the switch.

6. To delete additional ACLs, repeat this procedure starting with step 3.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting All ACLs

This procedure deletes all ACLs from the switch.

To delete all ACLs, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.
2. From the Security and Services menu, type **4** to select Access Control Lists.

   The Access Control Lists (ACL) menu is shown in Figure 95 on page 277.
3. From the Access Control Lists (ACL) menu, type **P** to selection Purge ACLs.

⚠ **Caution**
No confirmation prompt is displayed. All ACLs are immediately deleted from the switch.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying ACLs

To display the ACLs on a switch, perform this procedure:

1. From the Main Menu, type **7** to select Security and Services.

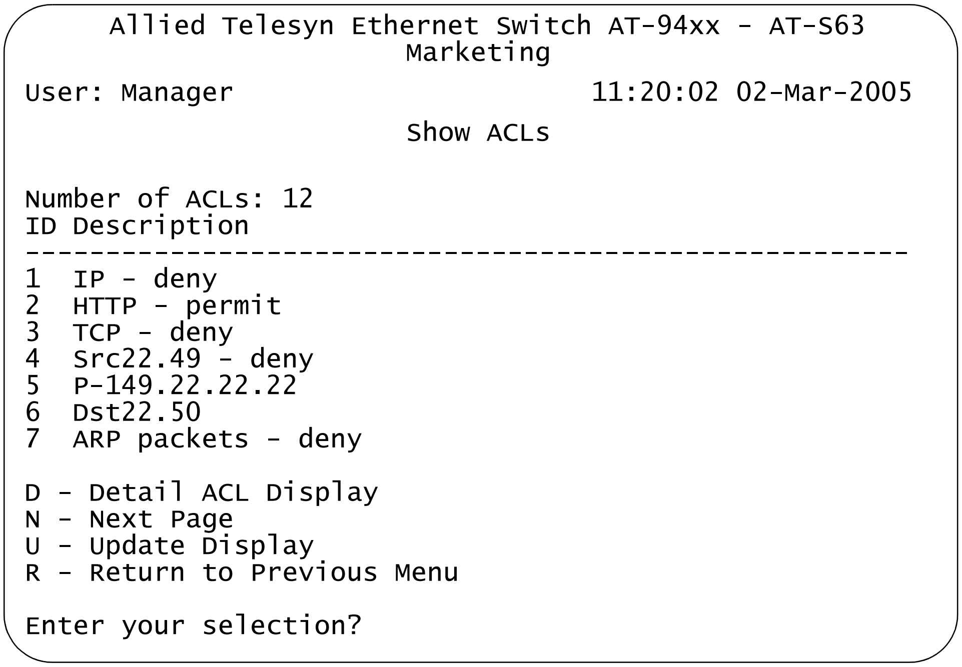
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **4** to select Access Control Lists.

   The Access Control Lists (ACL) menu is shown in Figure 95 on page 277.

1. From the Access Control Lists (ACL) menu, type **4** to selection Show ACLs.

   An example of the Show ACLs window is illustrated in Figure 99.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
                         Show ACLs


Number of ACLs: 12
ID Description
-------------------------------------------------------
1  IP - deny
2  HTTP - permit
3  TCP - deny
4  Src22.49 - deny
5  P-149.22.22.22
6  Dst22.50
7  ARP packets - deny

D - Detail ACL Display
N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 99. Show Classifiers Menu

2. To view the details of a ACL, type **D** to select Detail Classifier Display.

   The following prompt is displayed:

   ```
   Enter ACL ID :  [0 to 250] -> 0
   ```

3. Enter the ID number of the ACL you want to display. The details of the selected ACL are displayed.

Chapter 15
Denial of Service Defense

This chapter contains procedures for configuring the switch to protect against denial of service (DoS) attacks. Sections in the chapter include:

Denial of Service Overview

The AT-S63 management software can help protect your switch against the following types of denial of service attacks.

- SYN Flood Attack
- SMURF Attack
- Land Attack
- Teardrop Attack
- Ping of Death Attack
- IP Options Attack

The following subsections briefly describe each type of attack and the mechanism employed by the AT-S63 management software to protect your network.

Note
Be sure to read the following descriptions before you implement a DoS defense on a switch. Some defense mechanisms are CPU intensive and can impact switch behavior.

SYN Flood Attack

In this type of attack, an attacker sends a large number of TCP connection requests (TCP SYN packets) with bogus source addresses to the victim. The victim responds with acknowledgements (SYN ACK packets), but because the original source addresses are bogus, the victim node does not receive any replies. If the attacker sends enough requests in a short enough period, the victim may freeze operations when the number of requests exceeds the capacity of its connections queue.

To defend against this form of attack, a switch port monitors the number of ingress TCP connection requests it receives. If a port receives more than 60 requests per second, the following occurs.

- The switch sends an SNMP trap to the management stations
- The port discards all ingress TCP-SYN packets for one minute. However, the port continues to allow existing TCP connections to go through.

This defense mechanism does not involve the switch’s CPU. You can activate it on as many ports as you want without it impacting switch performance.

SMURF Attack

This DoS attack is instigated by an attacker sending a ICMP Echo (Ping) request containing a broadcast address as the destination address and the address of the victim as the source of the ICMP Echo (Ping) request.

This overwhelms the victim with a large number of ICMP Echo (Ping) replies from the other network nodes.

A switch port defends against this form of attack by examining the destination addresses of ingress ICMP Echo (Ping) request packets and discarding those that contain a broadcast address as a destination address.

Implementing this defense requires that you provide an IP address of a node on your network and a subnet mask. The switch uses the two to determine the broadcast address of your network.

This defense mechanism does not involve the switch's CPU. You can activate it on as many ports as you want without having it negatively impact switch performance.

Land Attack

In this attack, an attacker sends a bogus IP packet where the source and destination IP addresses are the same. This leaves the victim thinking that it is sending a message to itself.

The most direct approach for defending against this form of attack is for the AT-S63 management software to check the source and destination IP addresses in the IP packets, searching for and discarding those with identical source and destination addresses. But this requires too much processing by the switch's CPU, and would adversely impact switch performance.

Instead, the switch examines the IP packets that are entering or leaving your network. IP packets generated within your network and containing a local IP address as the destination address are not allowed to leave the network, but IP packets generated outside the network but containing a local IP address as the source address are not allowed into the network.

In order for this defense mechanism to work, you need to specify an uplink port. This is the port on the switch that is connected to the device, such as a DSL router, that leads outside your network. You can specify only one uplink port.

The switch uses the uplink port to gauge whether packets generated outside your network should be allowed to enter, and whether packets generated within your network should be allowed to leave.

Note
If none of the ports on a switch are connected to a device that leads outside your network, you should not use this defense mechanism.

Following is a simplified overview of how the process takes place. This example assumes that you have activated the feature on port 4 and that you have specified port 1 as the uplink port. The steps below review what happens when an ingress IP packet arrives on port 4:

1. When port 4 receives an ingress IP packet with a destination MAC address learned on uplink port 1, it examines the packet's destination IP addresses before forwarding the packet.

2. If the destination IP address is local to the network, port 4 does not forward the packet to uplink port 1 because the port assumes that there is no reason for the packet to leave the network. Instead, it discards the packet.

3. If the destination IP address is not local to the network, port 4 forwards the packet to uplink port 1.

Below is a review of how the process takes place when an ingress IP packet arrives on uplink port 1 that is destined for port 4:

1. Whenever uplink port 1 receives an ingress IP packet with a destination MAC address that was learned on port 4, it examines the packet's source IP address before forwarding the packet.

2. If the source IP address is local to the network, uplink port 1 does not forward the packet to port 4 because it assumes that a packet with a source IP address that is local to the network should not be entering the network from outside the network.

3. If the source IP address is not local to the network, port 1 forwards the packet to port 4.

Following are some guidelines for using this defense:

- If you choose to use it, Allied Telesyn recommends activating it on all ports on the switch, including the uplink port.
- You can specify only one uplink port.

This form of defense is not CPU intensive. Activating it on all ports should not affect switch behavior.

Teardrop Attack

An attacker sends an IP packet in several fragments with a bogus offset value, used to reconstruct the packet, in one of the fragments to a victim. The victim is unable to reassemble the packet, possibly causing it to freeze operations.

The defense mechanism for this type of attack has all ingress IP traffic received on a port sent to the switch's CPU. The CPU samples related, consecutive fragments, checking for fragments with invalid offset values.

If one is found, the following occurs:

- The switch sends an SNMP trap to the management stations.

- ❐ The switch port discards the fragment with the invalid offset and, for a one minute period, discards all ingress fragmented IP traffic.

Because the CPU only samples the ingress IP traffic, this defense mechanism may catch some, though not necessarily all, of this form of attack.

⚠ **Caution**
This defense is extremely CPU intensive; use with caution. Unrestricted use can cause a switch to halt operations if the CPU becomes overwhelmed with IP traffic. To prevent this, Allied Telesyn recommends activating this defense on only the uplink port and one other switch port at a time.

Ping of Death Attack

The attacker sends an oversized, fragmented ICMP Echo (Ping) request (greater than 65,535 bits) to the victim, which, if lacking a policy for handling oversized packets, may freeze.

To defend against this form of attack, a switch port searches for the last fragment of a fragmented ICMP Echo (Ping) request and examines its offset to determine if the packet size is greater than 63,488 bits. If it is, the fragment is forwarded to the switch's CPU for final packet size determination. If the switch determines that the packet is oversized, the following occurs:

- ❐ The switch sends an SNMP trap to the management stations.
- ❐ The switch port discards the fragment and, for one minute, discards all fragmented ingress ICMP Echo (Ping) requests.

Note
This defense mechanism requires some involvement by the switch's CPU, though not as much as the Teardrop defense. This does not impact the forwarding of traffic between the switch ports, but it can affect the handling of CPU events, such as the processing of IGMP packets and spanning tree BPDUs. For this reason, Allied Telesyn recommends limiting the use of this defense, activating it only on those ports where an attack is most likely to originate.

Also note that an attacker can circumvent the defense by sending a stream of ICMP Echo (Ping) requests with a size of 63,488 to 65,534 bits. A large number of requests could overwhelm the switch's CPU.

IP Options Attack

In the basic scenario of an IP attack, an attacker sends packets containing bad IP options. There are several types of IP option attacks and the AT-S63 management software does not distinguish between them.

Rather, the defense mechanism counts the number of ingress IP packets containing IP options received on a port. If the number exceeds 20 packets per second, the switch considers this a possible IP options attack and does the following occurs:

- It sends an SNMP trap to the management stations.
- The switch port discards all ingress packets containing IP options for one minute.

This defense mechanism does not involve the switch's CPU. You can activate it on as many ports as you want without it impacting switch performance.

Note
This defense does not actually check IP packets for bad IP options; it can only alert you to a *possible* attack.

Denial of Service Defense Guidelines

Below are guidelines to observe when using this feature:

- A switch port can support more than one DoS defense at a time.
- The Teardrop and the Ping of Death defenses are CPU intensive. Use these defenses with caution.
- Some defenses allow you to specify a mirror port where offending traffic is copied.

Configuring Denial of Service Defense

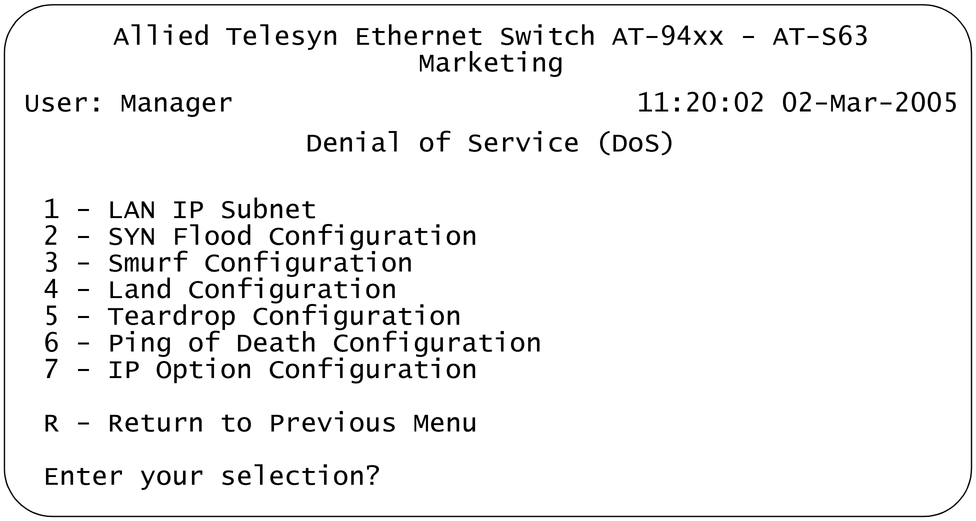
To configure DoS defense, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security Configuration menu, type **2** to select Denial of Service (DoS).

   The Denial of Service (DoS) menu is shown in Figure 100.



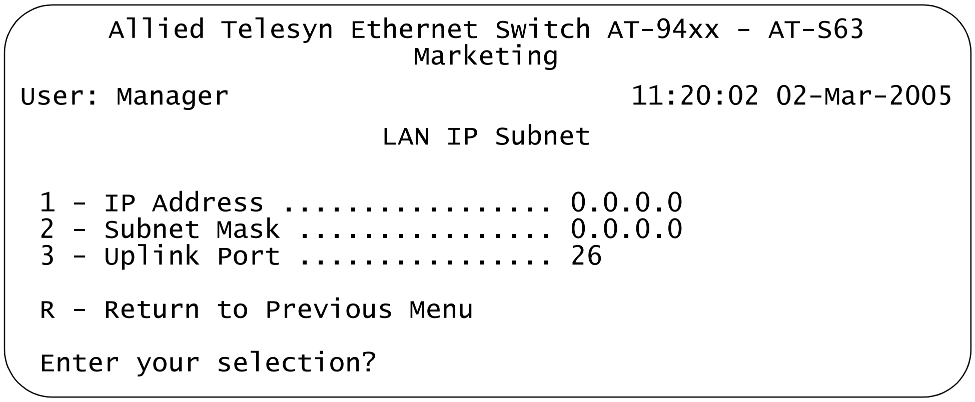
```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
                 Denial of Service (DoS)

 1 - LAN IP Subnet
 2 - SYN Flood Configuration
 3 - Smurf Configuration
 4 - Land Configuration
 5 - Teardrop Configuration
 6 - Ping of Death Configuration
 7 - IP Option Configuration

 R - Return to Previous Menu

 Enter your selection?
```

Figure 100. Denial of Service (DoS) Menu

3. If you are implementing the SMURF or Land defense, you must provide the IP address of a node connected to the switch and a subnet mask. For the Land defense, you must also specify an uplink port. To do this, complete the following steps. Otherwise, go to step 4.

   a. Type **1** to select LAN IP Subnet.

The LAN IP Subnet menu is shown in Figure 101.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                        11:20:02 02-Mar-2005
                     LAN IP Subnet

 1 - IP Address ................ 0.0.0.0
 2 - Subnet Mask ............... 0.0.0.0
 3 - Uplink Port ............... 26

 R - Return to Previous Menu

 Enter your selection?
```

Figure 101. LAN IP Subnet Menu

b. Type **1** to select IP Address.

   The following prompt is displayed:

   ```
   Enter the IP Address for the LAN:
   ```

   Enter the IP address of one of the devices connected to the switch, preferably the lowest IP address.

c. Type **2** to select Subnet Mask.

   The following prompt is displayed:

   ```
   Enter the Subnet Mask for the LAN:
   ```

   Enter the mask. A binary “1” indicates the switch should filter on the corresponding bit of the IP address, while a “0” indicates that it should not. As an example, assume that the devices connected to a switch are using the IP address range 149.11.11.1 to 149.11.11.50. The mask would be 0.0.0.63.

d. If you are activating the Land defense, type **3** to select Uplink Port.

   The following prompt is displayed:

   ```
   Enter the Uplink Port for the LAN [0 to 24]:
   ```

   Enter the number of the port connected to the device (e.g., DSL router) that leads outside your network. You can specify only one uplink port.

e. Type **R** to return to the Denial of Service (DoS) Configuration menu and continue with the next step.

4. Type the number of the DoS attack that you want to protect against.

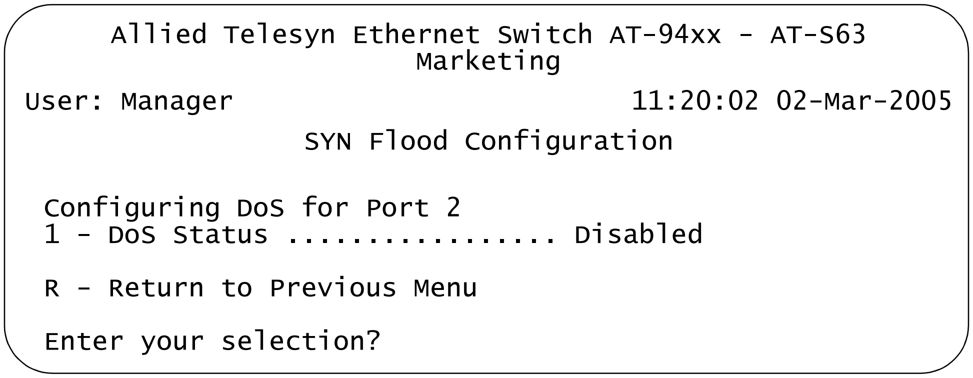
The following prompt is displayed:

```
Enter port-list:
```

5. Enter the port(s) where you want to activate the defense.

> **Note**
> If you plan to use the Teardrop defense, Allied Telesyn recommends activating it on only the uplink port and one other port. The defense is CPU intensive and can overwhelm the switch's CPU.

A menu is displayed containing either one or two options, depending on the DoS defense you selected. An example of the menu is shown in Figure 102.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
                  SYN Flood Configuration

 Configuring DoS for Port 2
 1 - DoS Status ................. Disabled

 R - Return to Previous Menu

 Enter your selection?
```

Figure 102. SYN Flood Configuration Menu

6. Adjust the following parameters as necessary.

   1 - DoS Status
   Enables and disables the selected DoS defense on the selected ports. The default is disabled.

   2 - Mirror Port
   This option is displayed for the Land, Tear Drop, Ping of Death, and IP options. You can use this option to copy offending traffic to another port on the switch. You can specify only one mirror port. Specifying a mirror port is not required.

7. Repeat this procedure starting with Step 3 to configure other DoS defenses.

8. Return to the Main Menu and type **S** to select Save Configuration Changes.

Chapter 16

Quality of Service

This chapter describes Quality of Service (QoS). Sections in the chapter include:

Quality of Service Overview

Quality of Service enables you to prioritize traffic and/or limit the bandwidth available to it. The concept of QoS is a departure from the original networking protocols, which treated all traffic on the Internet or within a LAN in the same manner. Without QoS, every traffic type is equally likely to be dropped if a link becomes oversubscribed. This approach is now inadequate in many networks, because traffic levels have increased and networks transport time-critical applications such as streams of video and data. QoS also enables service providers to easily supply different customers with different amounts of bandwidth.

Configuring Quality of Service involves two separate stages:

- Classifying traffic into flows, according to a wide range of criteria.

  Classification is performed by the switch’s packet classifiers, described in Chapter 13, “Classifiers” on page 251.

- Acting on these traffic flows.

Quality of Service is a broadly used term that encompasses as a minimum both Layer 2 and Layer 3 in the OSI model. QoS is typically demonstrated by how the switch accomplishes the following:

- Assigns priority to incoming frames, if they do not carry priority information
- Maps prioritized frames to traffic classes, or maps frames to traffic classes based upon other criteria
- Maps traffic classes to egress queues, or maps prioritized frames to egress queues
- Provides maximum bandwidth limiting for traffic classes, egress queues and/or ports
- Schedules frames in egress queues for transmission (for example, empty queues in strict priority or samples each queue)
- Relabels the priority of frames
- Determines which frames to drop if the network becomes congested
- Reserves memory for switching/routing or QoS operation (e.g. reserving buffers for egress queues, or buffers to store packets with particular characteristics)

> **Note**
> QoS is only performed on packets that are switched at wire speed. This includes IP, IP multicast, IPX, and Layer 2 traffic within VLANs.

The QoS functionality described in this chapter sorts packets into various flows, according to the QoS policy that applies to the port the traffic is received on. The switch then allocates resources to direct this traffic according to bandwidth or priority settings in the policy. A policy contains traffic classes, flow groups, and classifiers. Therefore, to configure QoS, you:

- ❒ Create *classifiers* to sort packets into traffic flows.
- ❒ Create *flow groups* and add classifiers to them. Flow groups are groups of classifiers which group together similar traffic flows. You can apply QoS prioritization to flow groups and/or replace the traffic's DiffServ Code Point.
- ❒ Create *traffic classes* and add flow groups to them. Traffic classes are groups of flow groups and are central to QoS. You can apply bandwidth limits and QoS prioritization to traffic classes, and/or replace the traffic's DiffServ Code Point.
- ❒ Create *policies* and add traffic classes to them. Policies are groups of traffic classes. A policy defines a complete QoS solution for a port or group of ports.
- ❒ Associate policies with ports.

Note
The steps listed above are in a conceptually logical order, but the switch cannot check a policy for errors until the policy is attached to a port. To simplify error diagnosis, define your QoS configuration on paper first, and then enter it into the management software starting with classifiers.

Policies, traffic classes, and flow groups are created as individual entities. When a traffic class is added to a policy, a logical link is created between the two entities. Destroying the policy unlinks the traffic class, leaving the traffic class in an unassigned state. Destroying a policy does not destroy any of the underlying entities. Similarly, destroying a traffic class unlinks flow groups, and destroying flow groups unlinks classifiers.

Classifiers

Classifiers identify a particular traffic flow, and range from general to specific. (See Chapter 13, "Classifiers" on page 251 for more information.) Note that a single classifier should not be used in different flows that will end up, through traffic classes, assigned to the same policy. A classifier should only be used once per policy. Traffic is matched in the order of classifiers. For example, if a flow group has classifiers 1, 3, 2 and 5, that is the order in which the packets are matched.

Flow Groups

Flow groups group similar traffic flows together, and allow more specific QoS controls to be used, in preference to those specified by the traffic class. Flow groups consist of a small set of QoS parameters and a group of classifiers. After a flow group has been added to a traffic class it cannot be added to another traffic class. A traffic class may have many flow groups. Traffic is matched in the order of the flow groups. For example, if a traffic class has flow groups 1, 3, 2 and 5, this is the order in which the packets are matched.

QoS controls at the flow group level provide a QoS hierarchy. Non-default flow group settings are always used, but if no setting is specified for a flow group, the flow group uses the settings for the traffic class to which it belongs. For example, you can use a traffic class to limit the bandwidth available to web and FTP traffic combined. Within that traffic class, you can create two different flow groups with different priorities, to give web traffic a higher priority than FTP. Web traffic would then be given preferential access to bandwidth, but would be limited to the bandwidth limit of the traffic class.

Traffic Classes

Traffic classes are the central component of the QoS solution. They provide most of the QoS controls that allow a QoS solution to be deployed. A traffic class can be assigned to only one policy. Traffic classes consist of a set of QoS parameters and a group of QoS *flow groups*. Traffic can be prioritized, marked (IP TOS or DSCP field set), and bandwidth limited. Traffic is matched in the order of traffic class. For example, if a policy has traffic classes 1, 3, 2 and 5, this is the order in which the packets are matched.

Policies

QoS policies consist of a collection of user defined traffic classes. A policy can be assigned to more than one port, but a port may only have one policy.

QoS controls are applied to ingress traffic on ports. Therefore, to control a particular type of traffic, an appropriate QoS policy must be attached to each port that type of traffic ingresses. In most situations, the same policy can be applied to all ports, and to classify according to an egress port.

Note that the switch can only perform error checking of parameters and parameter values for the policy and its traffic classes and flow groups when the policy is set on a port.

QoS Policy Guidelines

Following is a list of QoS policy guidelines:

- A classifier may be assigned to many flow groups. However, assigning a classifier more than once within the same policy may lead to undesirable results. A classifier may be used successfully in many different policies.
- A flow group must be assigned at least one classifier but may have many classifiers.
- A flow group may only be assigned to one traffic class.
- A traffic class may have many flow groups.
- A traffic class may only be assigned to one policy.

- A policy may have many traffic classes.
- A policy may be assigned to many ports.
- A port may only have one policy.
- You can create a policy without assigning it to a port, but the policy will be inactive.
- A policy must have at least one action defined in the flow group, traffic class, or the policy itself. A policy without an action is invalid.
- The switch can store up to 64 flow groups.
- The switch can store up to 64 traffic classes.
- The switch can store up to 64 policies.

Packet Processing

You can use the switch’s QoS tools to perform any combination of the following functions on a packet flow:

- Limiting bandwidth
- Prioritizing packets to determine the level of precedence the switch will give to the packet for processing
- Replacing the VLAN tag User Priority to enable the next switch in the network to process the packet correctly
- Replacing the TOS precedence or DSCP value to enable the next switch in the network to process the packet correctly.

Bandwidth Allocation

Bandwidth limiting is configured at the level of traffic classes, and encompasses the flow groups contained in the traffic class. Traffic classes can be assigned maximum bandwidths, specified in kbps, Mbps, or Gbps.

Packet Prioritization

The switch has eight Class of Service (CoS) egress queues, numbered from 0 to 7. Queue 7 has the highest priority. When the switch becomes congested, it gives high priority queues precedence over lower-priority queues. When the switch has information about a packet’s priority, it sends the packet to the appropriate queue. You can specify the queue where the switch sends traffic, how much precedence each queue has, and whether priority remapping is written into the packet’s header for the next hop to use.

Prioritizing packets cannot improve your network’s performance when bandwidth is over-subscribed to the point that egress queues are always full. If one type of traffic is causing the congestion, you can limit its bandwidth. Other solutions are to increase bandwidth or decrease traffic.

You can set a packet’s priority by configuring a priority in the flow group or traffic class to which the packet belongs. The packet is put in the appropriate CoS queue for that priority. If the flow group and traffic class do not include a priority, the switch can determine the priority from the VLAN tag User Priority field of incoming tagged packets. The packet is put in the appropriate CoS queue for its VLAN tag User Priority field. If neither the traffic class / flow group priority nor the VLAN tag User Priority is set, the packet is sent to the default queue, queue 1.

Both the VLAN tag User Priority and the traffic class / flow group priority setting allow eight different priority values (0-7). These eight priorities are mapped to the switch's eight CoS queues. The switch's default mapping is shown in Table 6 on page 339. Note that priority 0 is mapped to CoS queue 1 instead of CoS queue 0 because tagged traffic that has never been prioritized has a VLAN tag User Priority of 0. If priority 0 was mapped to CoS queue 0, this default traffic goes to the lowest queue, which is probably undesirable. This mapping also makes it possible to give some traffic a lower priority than the default traffic.

Replacing Priorities

The traffic class or flow group priority (if set) determines the egress queue a packet is sent to when it egresses the switch, but by default has no effect on how the rest of the network processes the packet. To permanently change the packet's priority, you need to replace one of two priority fields in the packet header:

❒ The User Priority field of the VLAN tag header. Replacing this field relabels VLAN-tagged traffic, so that downstream switches can process it appropriately. Replacing this field is most useful outside DiffServ domains.

❒ The DSCP value of the IP header's TOS byte (Figure 81 on page 255). Replacing this field may be required as part of the configuration of a DiffServ domain. See "DiffServ Domains" on page 303 for information on using the QoS policy model and the DSCP value to configure a DiffServ domain.

VLAN Tag User Priorities

Within a flow group or traffic class, the VLAN tag User Priority value of incoming packets can be replaced with the priority specified in the flow group or traffic class. Replacement occurs before the packet is queued, so this priority also sets the queue priority.

DSCP Values

There are three methods for replacing the DSCP byte of an incoming packet. You can use these methods together or separately. They are described in the order in which the switch performs them.

❒ The DSCP value can be overwritten at ingress, for all traffic in a policy.

❒ The DSCP value in the packet can be replaced at the traffic class or flow group level.

❒ You can use these two replacements together at the edge of a DiffServ domain, to initialize incoming traffic.

❒ The DSCP value in a flow of packets can replaced if the bandwidth allocated to that traffic class is exceeded. This option allows the next switch in the network to identify traffic that exceeded the bandwidth allocation.

DiffServ Domains

Differentiated Services (DiffServ) is a method of dividing IP traffic into classes of service, without requiring that every router in a network remember detailed information about traffic flows. DiffServ operates within a *DiffServ domain*, a network or subnet that is managed as a single QoS unit. Packets are classified according to user-specified criteria at the edge of the network, divided into classes, and assigned the required class of service. Then packets are marked with a Differentiated Services Code Point (DSCP) tag to indicate the class of service to which they belong. The DSCP value is written into the TOS field of the IP header. Routers within the network then use this DSCP value to classify packets and assign QoS appropriately. When a packet leaves the DiffServ domain, the DSCP value can be replaced with a value appropriate for the next DiffServ domain.

A simple example of this process is shown in Figure 103, for limiting the amount of bandwidth used by traffic from a particular IP address. In the domain shown, this bandwidth limit is supplied by the class of service represented by a DSCP value of 40. In the next DiffServ domain, this traffic is assigned to the class of service represented by a DSCP value of 3.

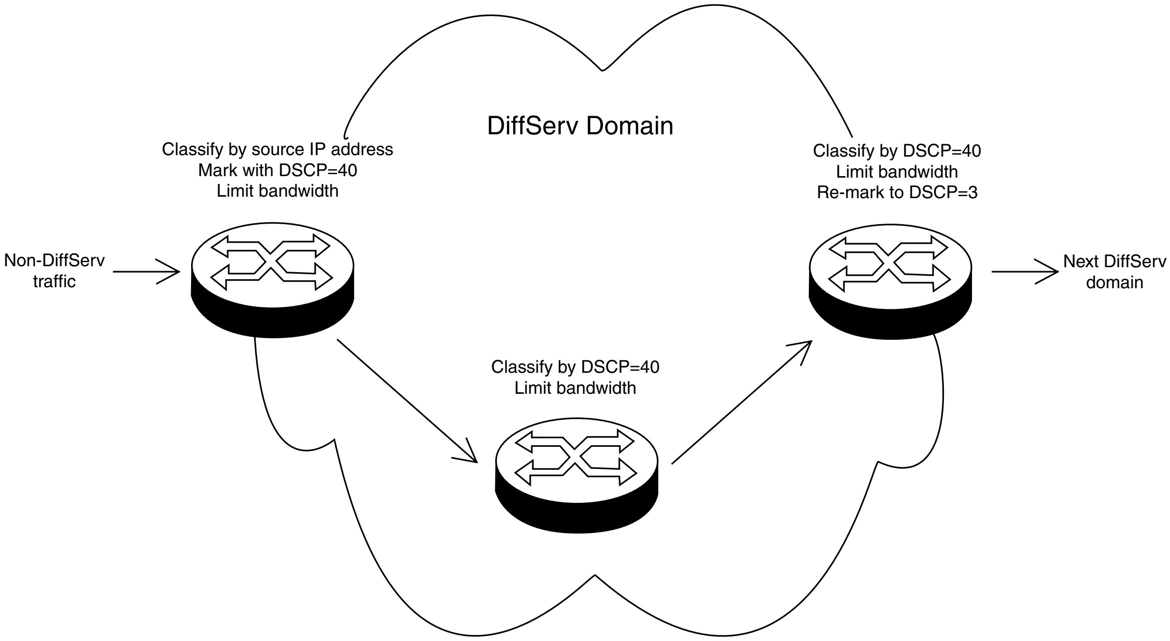


Figure 103. DiffServ Domain Example

To use the QoS tool set to configure a DiffServ domain:

1. As packets come into the domain at edge switches, replace their DSCP value, if required.

   ❒ Classify the packets according to the required characteristics. For available options, see Chapter 13, "Classifiers" on page 251.

   ❒ Assign the classifiers to flow groups and the flow groups to traffic classes, with a different traffic class for each DiffServ code point grouping within the DiffServ domain.

- ❐ Give each traffic class the priority and/or bandwidth limiting controls that are required for that type of packet within this part of the domain.
- ❐ Assign a DSCP value to each traffic class, to be written into the TOS field of the packet header.

2. On switches and routers within the DiffServ domain, classify packets according to the DSCP values that were assigned to traffic classes on the edge switches.

   - ❐ Assign the classifiers to flow groups and the flow groups to traffic classes, with a different traffic class for each DiffServ code point grouping within the DiffServ domain.
   - ❐ Give each traffic class the priority and/or bandwidth limiting controls that are required for that type of packet within this part of the domain. These QoS controls need not be the same for each switch.

3. As packets leave the DiffServ domain, classify them according to the DSCP values.

   - ❐ Assign the classifiers to flow groups and the flow groups to traffic classes, with a different traffic class for each DiffServ code point grouping within the DiffServ domain.
   - ❐ Give each traffic class the priority and/or bandwidth limiting controls required for transmission of that type of packet to its next destination, in accordance with any Service Level Agreement (SLA) with the providers of that destination.
   - ❐ If necessary, assign a different DSCP value to each traffic class, to be written into the TOS field of the packet header, to match the DSCP or TOS priority values of the destination network.

Examples

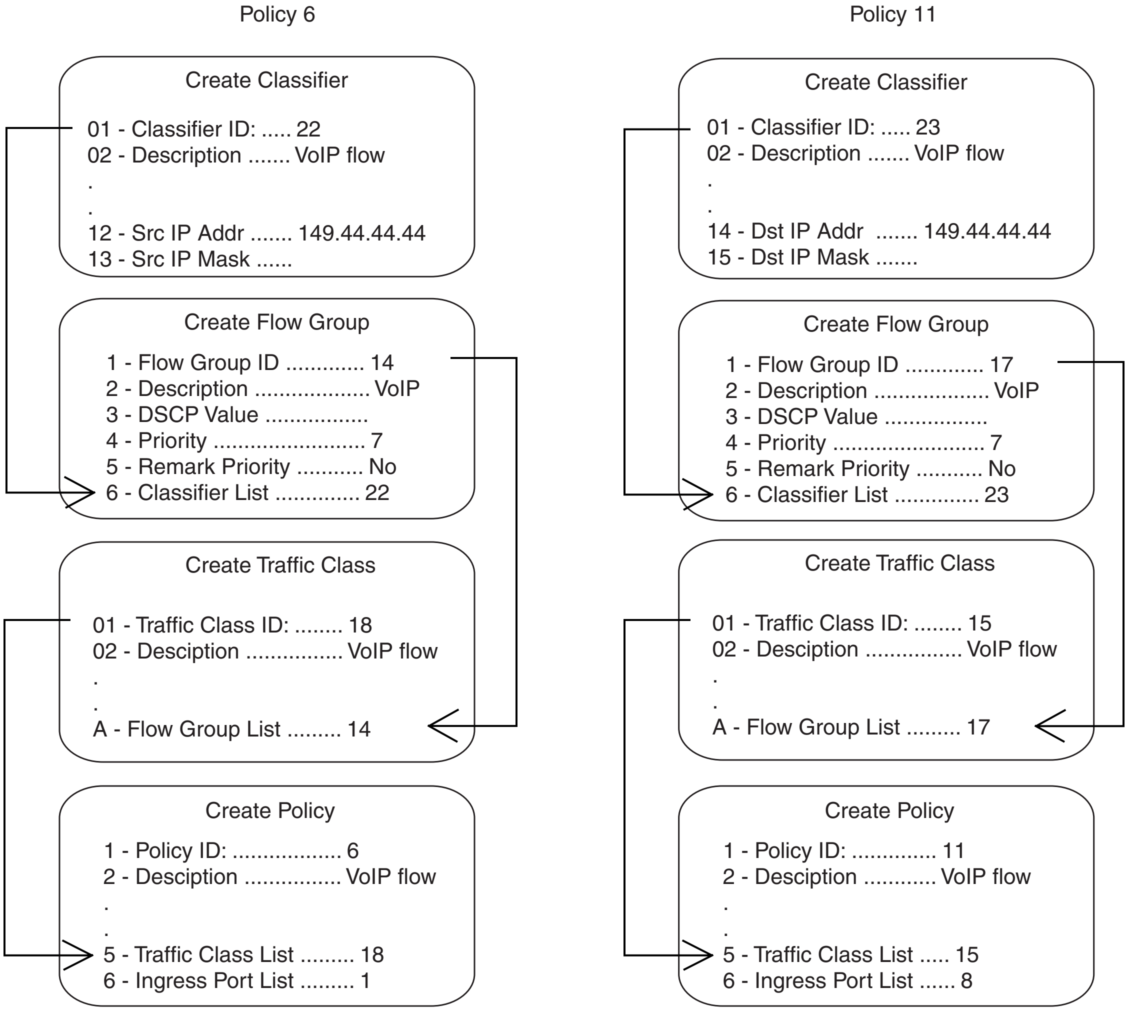
The following examples demonstrate how to implement QoS in three situations:

- ❒ “Voice Applications,” next
- ❒ “Video Applications” on page 308
- ❒ “Critical Database” on page 310

Voice Applications

Voice applications typically require a small but consistent bandwidth. They are sensitive to *latency* (interpacket delay) and *jitter* (delivery delay). Voice applications can be set up to have the highest priority.

This example creates two policies that ensure low latency for all traffic sent by and destined to a voice application located on a node with the IP address 149.44.44.44. The policies raise the priority level of the packets to 7, the highest level. Policy 6 is for traffic from the application that enter the switch on port 1. Policy 11 is for traffic arriving on port 8 going to the application. The components of the policies are shown in Figure 104.



Policy 6

Create Classifier

01 - Classifier ID: 22
02 - Description .... VoIP flow
.
.
12 - Src IP Addr 149.44.44.44
13 - Src IP Mask ......

Create Flow Group

1 - Flow Group ID 14
2 - Description .... VoIP
3 - DSCP Value ....
4 - Priority 7
5 - Remark Priority .... No
6 - Classifier List 22

Create Traffic Class

01 - Traffic Class ID: 18
02 - Desciption .... VoIP flow
.
.
A - Flow Group List 14

Create Policy

1 - Policy ID: 6
2 - Desciption .... VoIP flow
.
.
5 - Traffic Class List 18
6 - Ingress Port List 1

Policy 11

Create Classifier

01 - Classifier ID: 23
02 - Description .... VoIP flow
.
.
14 - Dst IP Addr 149.44.44.44
15 - Dst IP Mask ....

Create Flow Group

1 - Flow Group ID 17
2 - Description .... VoIP
3 - DSCP Value ....
4 - Priority 7
5 - Remark Priority .... No
6 - Classifier List 23

Create Traffic Class

01 - Traffic Class ID: 15
02 - Desciption .... VoIP flow
.
.
A - Flow Group List 17

Create Policy

1 - Policy ID: 11
2 - Desciption .... VoIP flow
.
.
5 - Traffic Class List 15
6 - Ingress Port List 8

Figure 104. QoS Voice Application Example

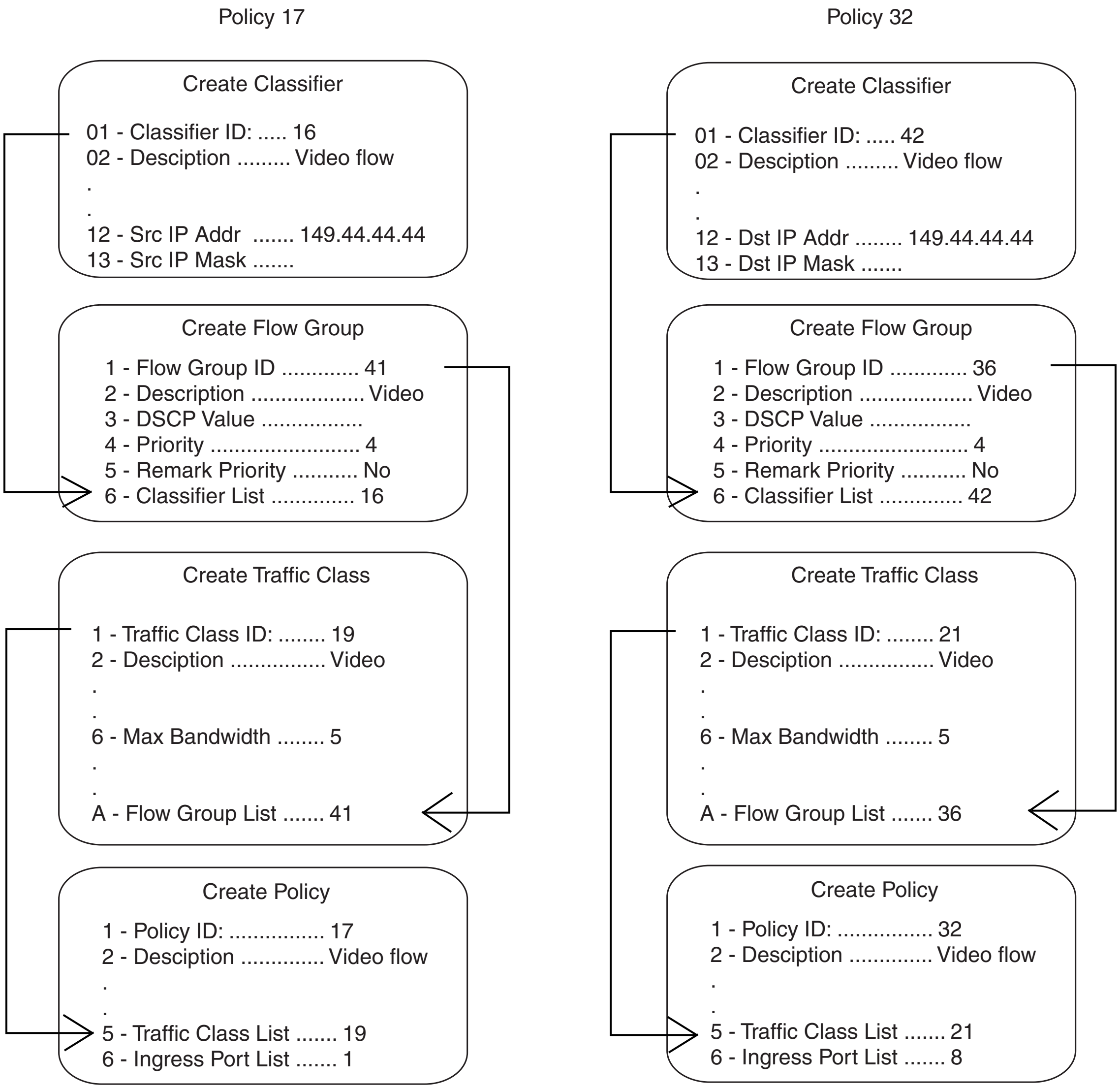
The parts of the policies are:

- Classifier - Defines the traffic flow by specifying the IP address of the node with the voice application. The classifier for Policy 6 specifies the address as a source address because this classifier is part of a policy for packets coming from the application. The classifier for Policy 11 specifies the address as a destination address because this classifier is part of a policy for packets going to the application.
- Flow Group - Specifies the new priority level of 7 for the packets. In this example, the packets leave the switch with the same priority level they had when they entered. The new priority level is relevant only as the packets traverse the switch. To alter the packets so that they leave containing the new level, you would change option 5, Remark Priority, to Yes.
- Traffic Class - No action is taken by the traffic class, other than to specify the flow group. Traffic class has a priority setting that you can use to override the priority level of packets, just as in a flow group. If you enter a priority value in both places, the setting in the flow group overrides the setting in the traffic class.
- Policy - Specifies the traffic class and the port to which the policy is to be assigned. Policy 6 is applied to port 1 because this is where the application is located. Policy 11 is applied to port 8 because this is where traffic going to the application will be received.

Video Applications

Video applications typically require a larger bandwidth than voice applications. Video applications can be set up to have a high priority and buffering, depending on the application.

This example creates policies with low latency and jitter for video streams (for example, net conference calls). The policies in Figure 105 assign the packets a priority level of 4 and limit the bandwidth to 5 Mbps. The node containing the application has the IP address 149.44.44.44. Policy 17 is assigned to port 1, where the application is located, and Policy 32 is assigned to port 8 where packets destined to the application enter the switch.



Policy 17

Create Classifier

01 - Classifier ID: 16
02 - Desciption .... Video flow
.
.
12 - Src IP Addr 149.44.44.44
13 - Src IP Mask ....

Create Flow Group

1 - Flow Group ID 41
2 - Description .... Video
3 - DSCP Value ....
4 - Priority 4
5 - Remark Priority .... No
6 - Classifier List 16

Create Traffic Class

1 - Traffic Class ID: 19
2 - Desciption .... Video
.
.
6 - Max Bandwidth 5
.
.
A - Flow Group List 41

Create Policy

1 - Policy ID: 17
2 - Desciption .... Video flow
.
.
5 - Traffic Class List 19
6 - Ingress Port List 1

Policy 32

Create Classifier

01 - Classifier ID: 42
02 - Desciption .... Video flow
.
.
12 - Dst IP Addr 149.44.44.44
13 - Dst IP Mask ....

Create Flow Group

1 - Flow Group ID 36
2 - Description .... Video
3 - DSCP Value ....
4 - Priority 4
5 - Remark Priority .... No
6 - Classifier List 42

Create Traffic Class

1 - Traffic Class ID: 21
2 - Desciption .... Video
.
.
6 - Max Bandwidth 5
.
.
A - Flow Group List 36

Create Policy

1 - Policy ID: 32
2 - Desciption .... Video flow
.
.
5 - Traffic Class List 21
6 - Ingress Port List 8

Figure 105. QoS Video Application Example

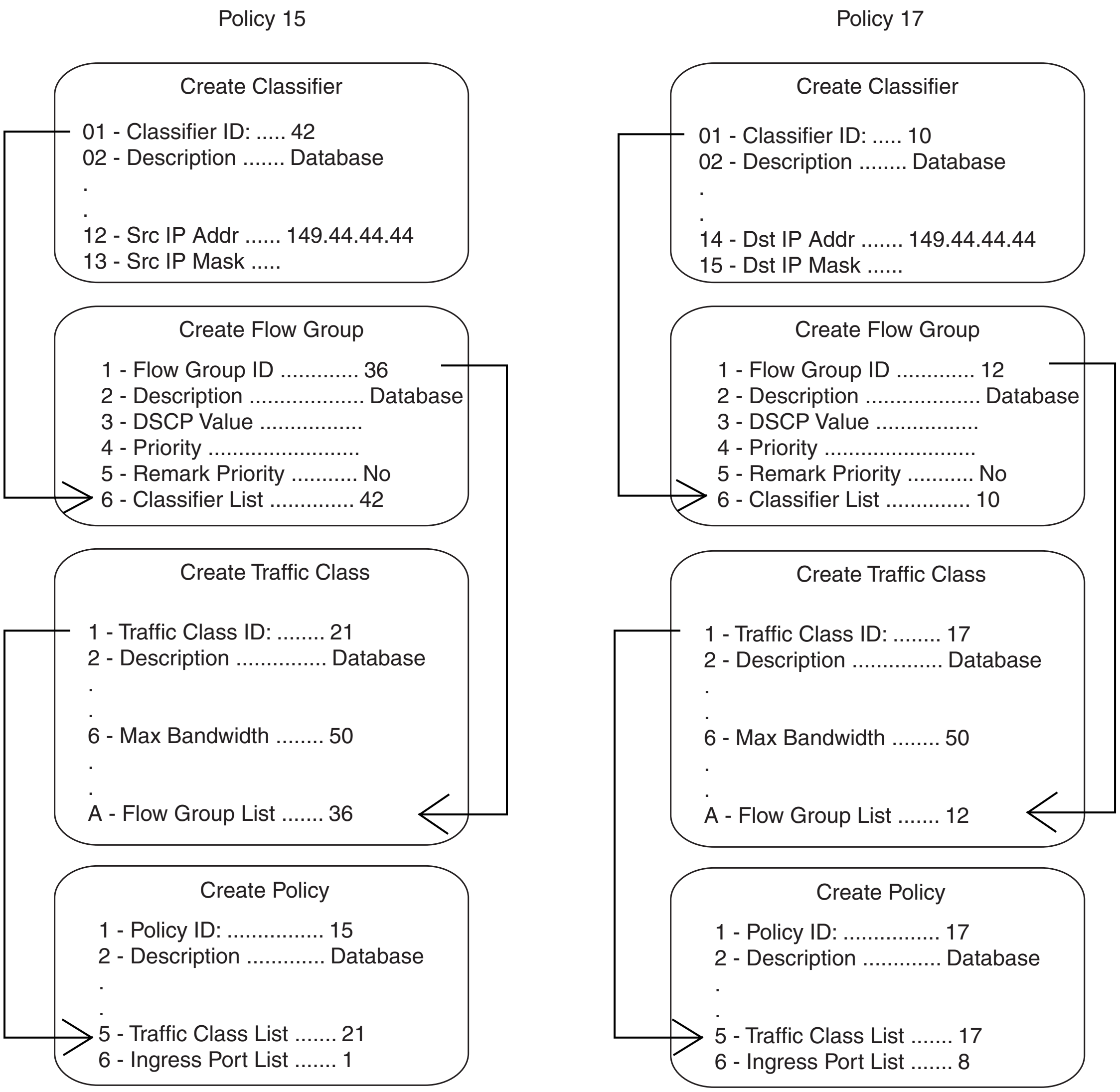
The parts of the policies are:

- ❒ Classifier - Specifies the IP address of the node with a video application. The classifier for Policy 17 specifies the address as a source address since this classifier is part of a policy concerning packets coming from the application. The classifier for Policy 32 specifies the address as a destination address because this classifier is part of a policy concerning packets going to the application.
- ❒ Flow Group - Specifies the new priority level of 4 for the packets. As with the previous example, the packets leave the switch with the same priority level they had when they entered. The new priority level is relevant only while the packets traverse the switch. To alter the packets so that they leave containing the new level, you would change option 5, Remark Priority, to Yes.
- ❒ Traffic Class - The packet stream is assigned a maximum bandwidth of 5 Mbps. Bandwidth assignment can only be made at the traffic class level.
- ❒ Policy - Specifies the traffic class and the port where the policy is to be assigned.

Critical Database

Critical databases typically require a high bandwidth. They also typically require less priority than either voice or video.

The policies in Figure 106 assign 50 Mbps bandwidth, with no change to priority, to traffic going to and from a database. The database is located on a node with the IP address 149.44.44.44 on port 1 of the switch.



Policy 15

Create Classifier
01 - Classifier ID: 42
02 - Description .... Database
.
.
12 - Src IP Addr 149.44.44.44
13 - Src IP Mask .....

Create Flow Group
1 - Flow Group ID 36
2 - Description .... Database
3 - DSCP Value ....
4 - Priority ....
5 - Remark Priority .... No
6 - Classifier List 42

Create Traffic Class
1 - Traffic Class ID: 21
2 - Description .... Database
.
.
6 - Max Bandwidth 50
.
.
A - Flow Group List 36

Create Policy
1 - Policy ID: 15
2 - Description .... Database
.
.
5 - Traffic Class List 21
6 - Ingress Port List 1

Policy 17

Create Classifier
01 - Classifier ID: 10
02 - Description .... Database
.
.
14 - Dst IP Addr 149.44.44.44
15 - Dst IP Mask ......

Create Flow Group
1 - Flow Group ID 12
2 - Description .... Database
3 - DSCP Value ....
4 - Priority ....
5 - Remark Priority .... No
6 - Classifier List 10

Create Traffic Class
1 - Traffic Class ID: 17
2 - Description .... Database
.
.
6 - Max Bandwidth 50
.
.
A - Flow Group List 12

Create Policy
1 - Policy ID: 17
2 - Description .... Database
.
.
5 - Traffic Class List 17
6 - Ingress Port List 8

Figure 106. QoS Critical Database Example

Policy Component Hierarchy

The purpose of this example is to illustrate the hierarchy that exists among the components of a QoS policy and how that hierarchy needs to be taken into account when assigning new priority and DSCP values. A new priority can be set at the flow group and traffic class levels, while a new DSCP value can be set at all three levels—flow group, traffic class and policy. The basic rules are:

- A new setting in a flow group takes precedence over a corresponding setting in a traffic class or policy.
- A new setting in a traffic class takes precedence over a corresponding setting in a policy.
- A new setting in a policy is used only if there is no corresponding setting in a flow group or traffic class.

This concept is illustrated in Figure 107 on page 312. It shows a policy for a series of traffic flows consisting of subnets defined by their destination IP addresses. New DSCP values for the traffic flows are established at different levels within the policy.

Traffic flows 149.11.11.0 and 149.22.22.0, defined by classifiers 1 and 2, are attached to a flow group, traffic class, and policy that contain new DSCP values. Because a setting in a flow group takes precedence over that of a traffic class or policy, the value in the flow group is used. The result is that the DSCP value in the two traffic flows is changed to 10.

The flow group for traffic flows 149.33.33.0 and 149.44.44.0, defined in classifiers 3 and 4, does not contain a new DSCP value. Therefore, the new value in the traffic class is used, in this case 30. The policy also has a DSCP setting, but it is not used for these traffic flows because a new DSCP setting in a traffic class takes precedence over that of a policy.

Finally, the new DSCP value for traffic flows 149.55.55.0 and 149.66.66.0, defined in classifiers 5 and 6, is set at the policy level to a value of 55 because the flow group and traffic class do not specify a new value.

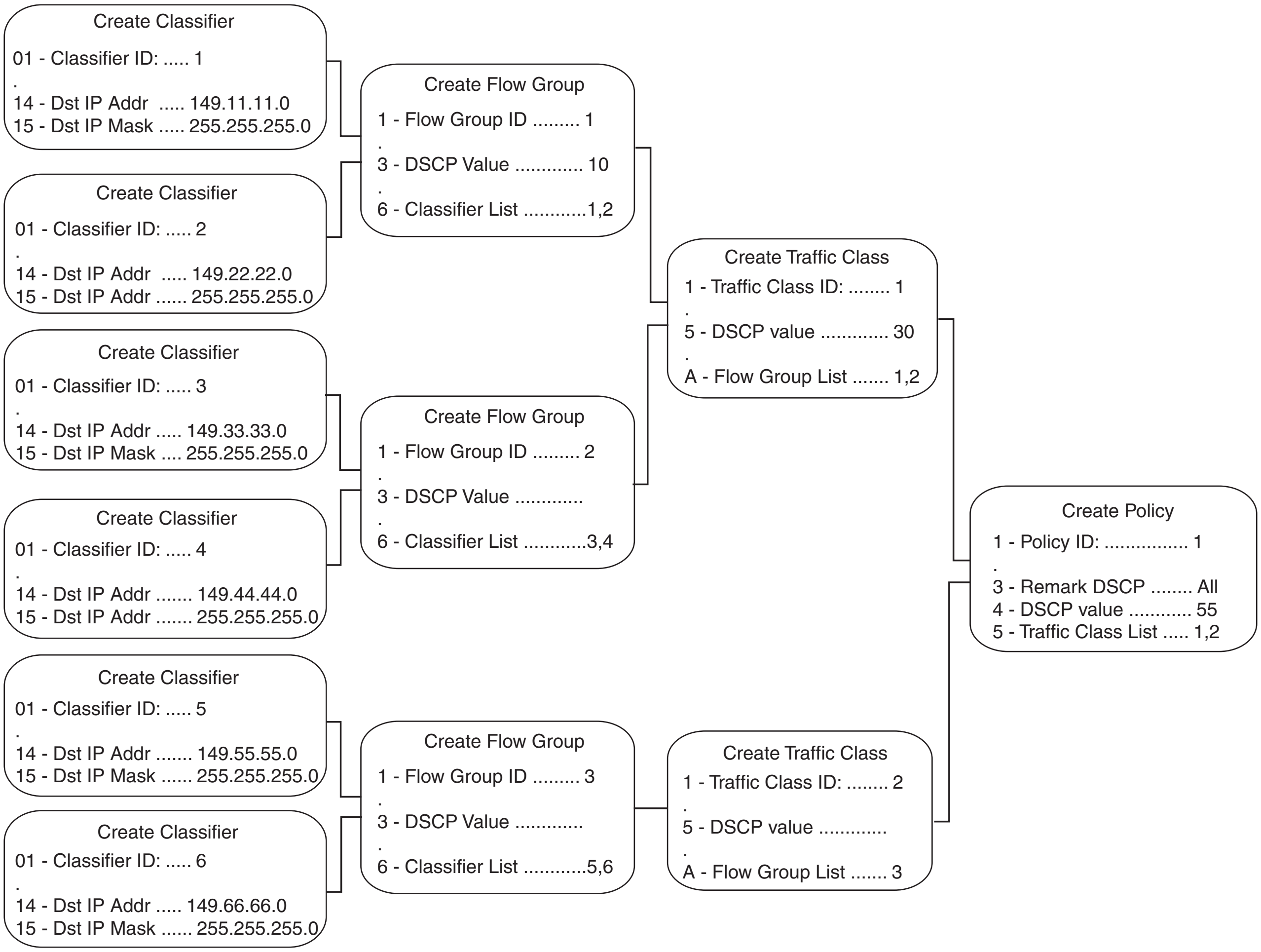

Create Classifier
01 - Classifier ID: 1
.
14 - Dst IP Addr 149.11.11.0
15 - Dst IP Mask 255.255.255.0
Create Classifier
01 - Classifier ID: 2
.
14 - Dst IP Addr 149.22.22.0
15 - Dst IP Addr 255.255.255.0
Create Classifier
01 - Classifier ID: 3
.
14 - Dst IP Addr 149.33.33.0
15 - Dst IP Mask 255.255.255.0
Create Classifier
01 - Classifier ID: 4
.
14 - Dst IP Addr 149.44.44.0
15 - Dst IP Addr 255.255.255.0
Create Classifier
01 - Classifier ID: 5
.
14 - Dst IP Addr 149.55.55.0
15 - Dst IP Mask 255.255.255.0
Create Classifier
01 - Classifier ID: 6
.
14 - Dst IP Addr 149.66.66.0
15 - Dst IP Mask 255.255.255.0
Create Flow Group
1 - Flow Group ID 1
.
3 - DSCP Value 10
.
6 - Classifier List 1,2
Create Flow Group
1 - Flow Group ID 2
.
3 - DSCP Value ....
.
6 - Classifier List 3,4
Create Flow Group
1 - Flow Group ID 3
.
3 - DSCP Value ....
.
6 - Classifier List 5,6
Create Traffic Class
1 - Traffic Class ID: 1
.
5 - DSCP value 30
.
A - Flow Group List 1,2
Create Traffic Class
1 - Traffic Class ID: 2
.
5 - DSCP value ....
.
A - Flow Group List 3
Create Policy
1 - Policy ID: 1
.
3 - Remark DSCP .... All
4 - DSCP value 55
5 - Traffic Class List 1,2

Figure 107. Policy Component Hierarchy Example

Managing Flow Groups

This section contains the following procedures:

- "Creating a Flow Group," next
- "Modifying a Flow Group" on page 315
- "Deleting a Flow Group" on page 317
- "Displaying Flow Groups" on page 318

Creating a Flow Group

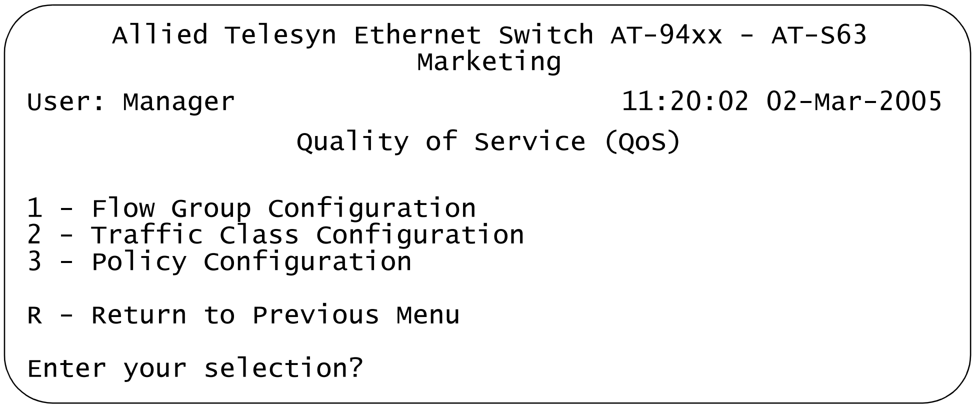
To create a flow group, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

   The Quality of Service (QoS) menu is shown in Figure 108.

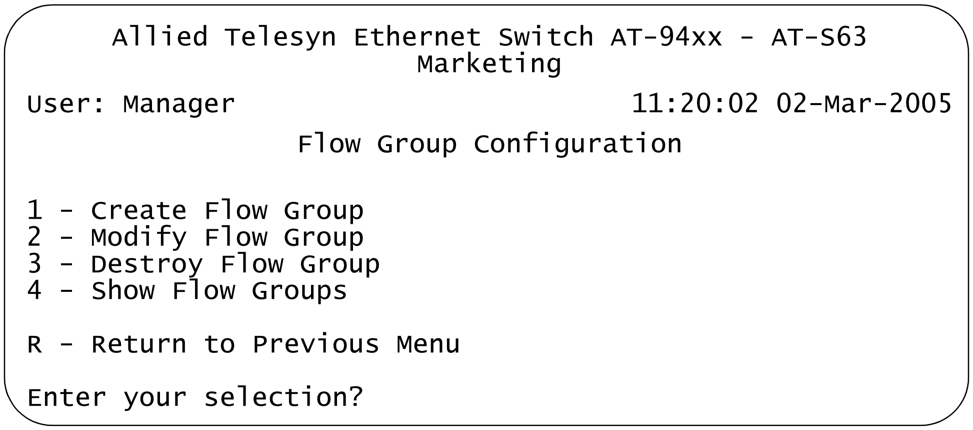


```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                Quality of Service (QoS)

1 - Flow Group Configuration
2 - Traffic Class Configuration
3 - Policy Configuration

R - Return to Previous Menu

Enter your selection?
```

Figure 108. Quality of Service (QoS) menu

3. From the Quality of Service (QoS) menu, type **1** to select Flow Group Configuration.

The Flow Group Configuration menu is shown in Figure 109.

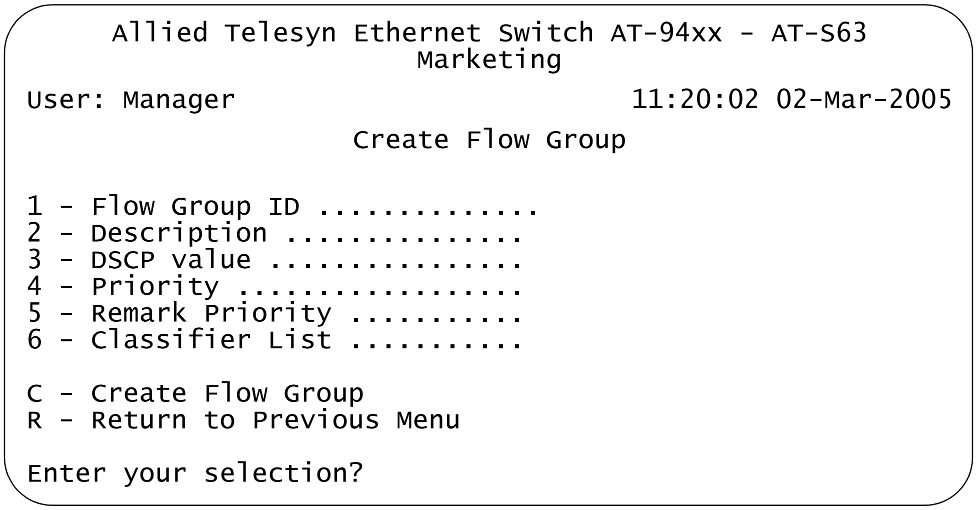


```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
                  Flow Group Configuration


1 - Create Flow Group
2 - Modify Flow Group
3 - Destroy Flow Group
4 - Show Flow Groups

R - Return to Previous Menu

Enter your selection?
```

Figure 109. Flow Group Configuration Menu

4. From the Flow Group Configuration menu, type **1** to select Create Flow Group.

   The Create Flow Group menu is shown in Figure 110.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
                     Create Flow Group


1 - Flow Group ID .............
2 - Description ...............
3 - DSCP value ................
4 - Priority ..................
5 - Remark Priority ...........
6 - Classifier List ...........

C - Create Flow Group
R - Return to Previous Menu

Enter your selection?
```

Figure 110. Create Flow Group Menu

5. Configure the following parameters as desired:

   1 - Flow Group ID
   Specifies an ID number for the flow group. Each flow group on the switch must have a unique number. The range is 0 to 1023. The default is 0. This parameter is required.

   2 - Description
   Specifies a description for the flow group. The description can be from 1 to 15 alphanumeric characters including spaces. This parameter is

optional, but recommended. Names can help you identify the groups on the switch.

3 - DSCP value
Specifies a replacement value to write into the DSCP (TOS) field of the packets. The range is 0 to 63.

A new DSCP value can be set at all three levels: flow group, traffic class, and policy. A DSCP value specified in a flow group overrides a DSCP value specified at the traffic class or policy level.

4 - Priority
Specifies a new user priority value for the packets. The range is 0 to 7. If you specify a new user priority value here and in Traffic Class, the value here overrides the value in Traffic Class. If you want the packets to retain the new value when they exit the switch, change option 5, Remark Priority, to Yes.

5 - Remark Priority
Replaces the user priority value in the packets with the new value specified in option 4, Priority, if set to Yes. If set to No, which is the default, the packets retain their preexisting priority level.

6 - Classifier List
Specifies the classifiers to be assigned to the policy. The specified classifiers must already exist. Separate multiple classifier IDs with commas (e.g., 4,11,13).

6. After configuring the parameters, type **C** to select Create Flow Group.

7. To create another flow group, repeat this procedure starting with step 4. To assign the flow group to a traffic class, go to "Managing Traffic Classes" on page 320.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a Flow Group

To modify a flow group, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **1** to select Flow Group Configuration.

The Flow Group Configuration menu is shown in Figure 109 on page 314.

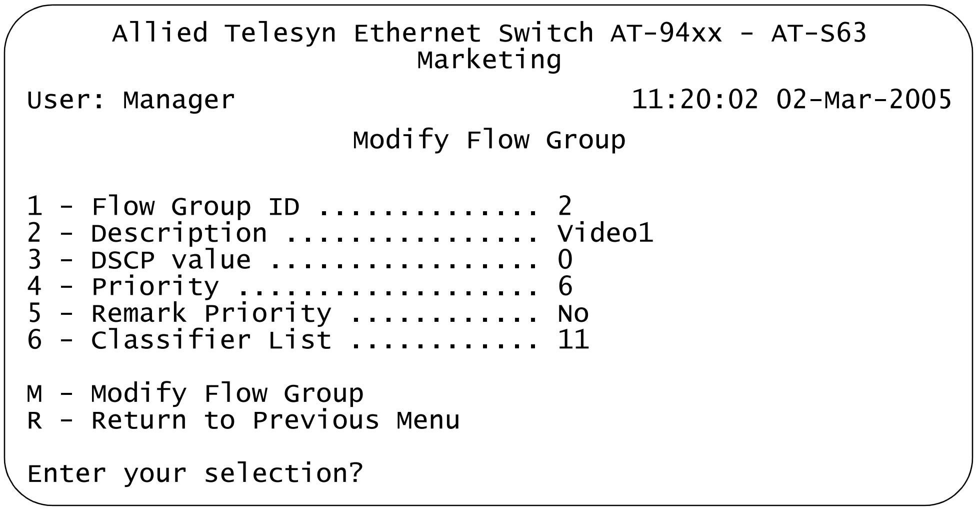
4. From the Flow Group Configuration menu, type **2** to select Modify Flow Group.

   The following prompt is displayed:

   ```
   Available Flow Group(s): 0-10
   Enter Flow Group ID :  [0 to 1023] -> 0
   ```

5. Enter the ID number of the flow group you want to modify. You can modify only one flow group at a time.

   The Modify Flow Group menu is shown in Figure 111.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                           11:20:02 02-Mar-2005
                     Modify Flow Group

1 - Flow Group ID .............. 2
2 - Description ................ Video1
3 - DSCP value ................. 0
4 - Priority ................... 6
5 - Remark Priority ............ No
6 - Classifier List ............ 11

M - Modify Flow Group
R - Return to Previous Menu

Enter your selection?
```

Figure 111. Modify Flow Group Menu

6. Modify the settings as needed.

   When you modify a flow group, note the following:

   - You cannot change the flow group ID number.
   - To delete a value from a variable so as to leave it blank, select the variable and then use the backspace key to delete its default value.
   - Specifying an invalid value for a parameter that already has a value causes the parameter to revert to its default value.

7. Type **M** to select Modify Flow Group.

8. To modify another flow group, repeat this procedure starting with step 4. To assign the flow group to a traffic class, go to “Managing Traffic Classes” on page 320.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting a Flow Group

To delete a flow group, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **1** to select Flow Group Configuration.

   The Flow Group Configuration menu is shown in Figure 109 on page 314.

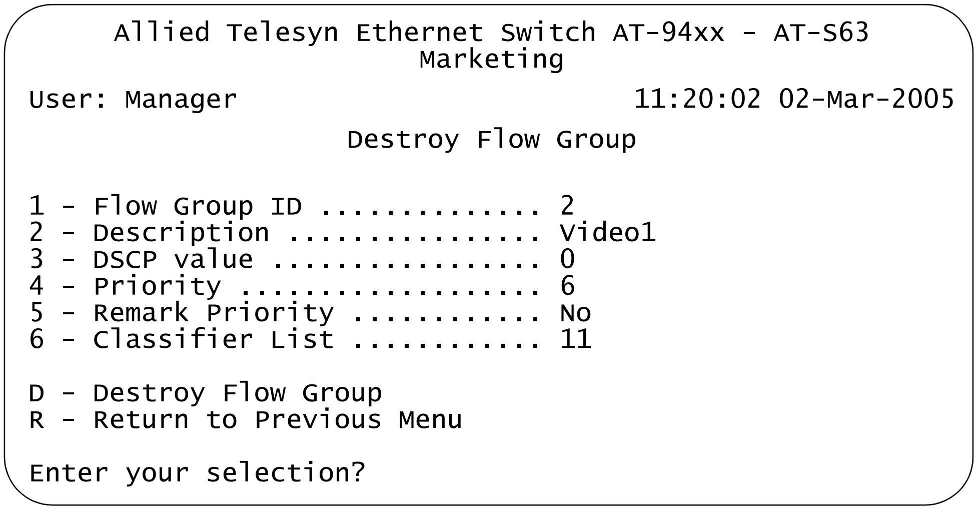
4. From the Flow Group Configuration menu, type **3** to select Destroy Flow Group.

   The following prompt is displayed:

```
Available Flow Group(s): 0-10
Enter Flow Group ID :  [0 to 1023] -> 0
```

5. Enter the ID number of the flow group you want to delete. You can delete only one flow group at a time.

   The Destroy Flow Group menu is shown in Figure 112.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                           11:20:02 02-Mar-2005
                      Destroy Flow Group

1 - Flow Group ID ............. 2
2 - Description ................ Video1
3 - DSCP value ................. 0
4 - Priority ................... 6
5 - Remark Priority ............ No
6 - Classifier List ............ 11

D - Destroy Flow Group
R - Return to Previous Menu

Enter your selection?
```

Figure 112. Destroy Flow Group Menu

6. Type **D** to delete the flow group.

   The flow group is deleted from the switch. The group is removed from any traffic classes to which it is assigned.

7. To delete another flow group, repeat this procedure starting with step 4.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying Flow Groups

To display flow groups, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

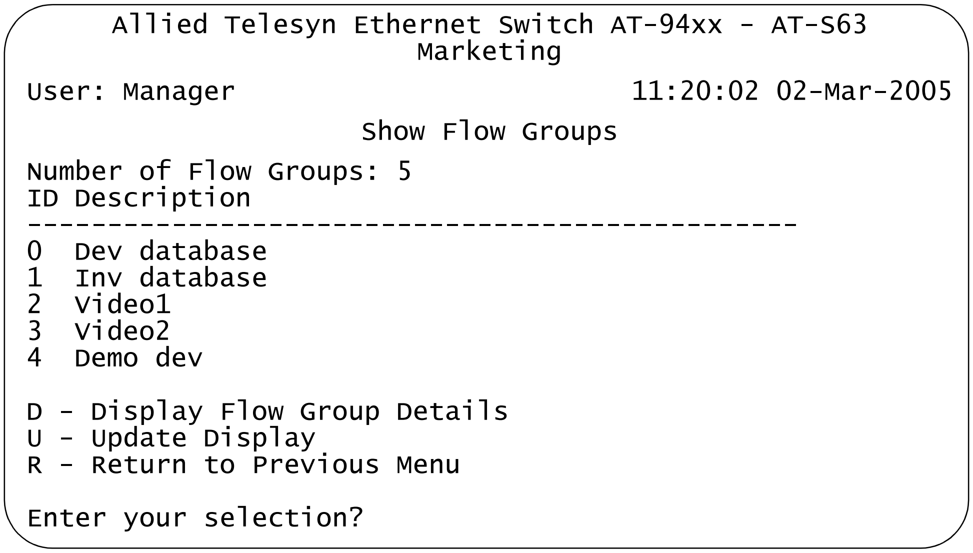
   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **1** to select Flow Group Configuration.

   The Flow Group Configuration menu is shown in Figure 109 on page 314.

4. From the Flow Group Configuration menu, type **4** to select Show Flow Groups.

   The Show Flow Groups menu is shown in Figure 113.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                     Show Flow Groups
Number of Flow Groups: 5
ID Description
------------------------------------------------
0  Dev database
1  Inv database
2  Video1
3  Video2
4  Demo dev

D - Display Flow Group Details
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 113. Show Flow Groups Menu

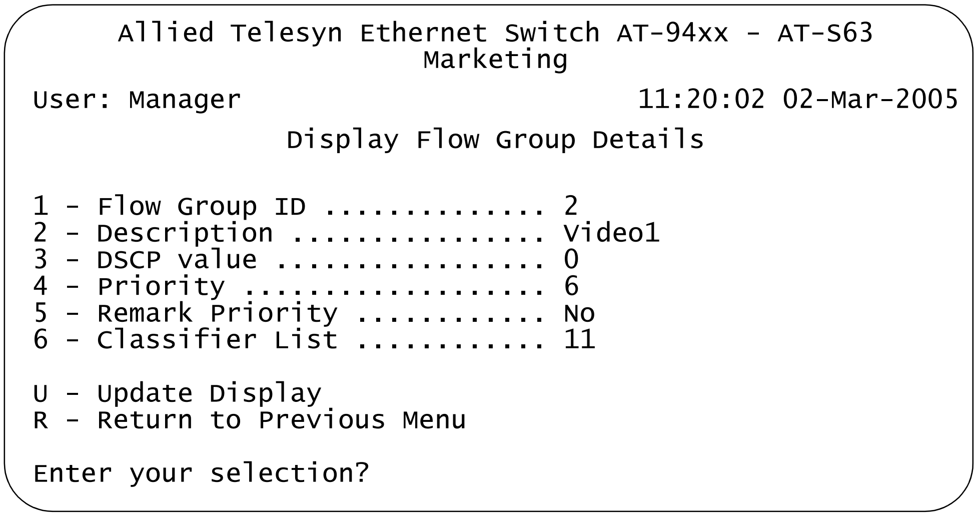
5. To display the specifics of a flow group, type **D** to select Display Flow Group Details.

   The following prompt is displayed:

   ```
   Available Flow Group(s): 0-10
   Enter Flow Group ID :  [0 to 1023] -> 0
   ```

6. Enter the ID number of the flow group you want to view. You can display only one flow group at a time.

   The Display Flow Group Details menu is shown in Figure 114.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
                Display Flow Group Details

1 - Flow Group ID ............. 2
2 - Description ................ Video1
3 - DSCP value ................. 0
4 - Priority ................... 6
5 - Remark Priority ............ No
6 - Classifier List ............ 11

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 114. Display Flow Group Detail Menu

The Display Flow Group Details menu provides the following information:

Flow Group ID
The flow group ID number.

Description
The flow group description.

DSCP value
The replacement value to write into the DSCP (TOS) field of the packets.

Priority
The new user priority value for the packets.

Remark Priority
Replaces the user priority value in the packets with the Priority value.

Classifier List
The classifiers assigned to the policy.

Managing Traffic Classes

This section contains the following procedures:

- "Creating a Traffic Class," next
- "Modifying a Traffic Class" on page 324
- "Deleting a Traffic Class" on page 325
- "Displaying Traffic Classes" on page 327

Creating a Traffic Class

To create a traffic class, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

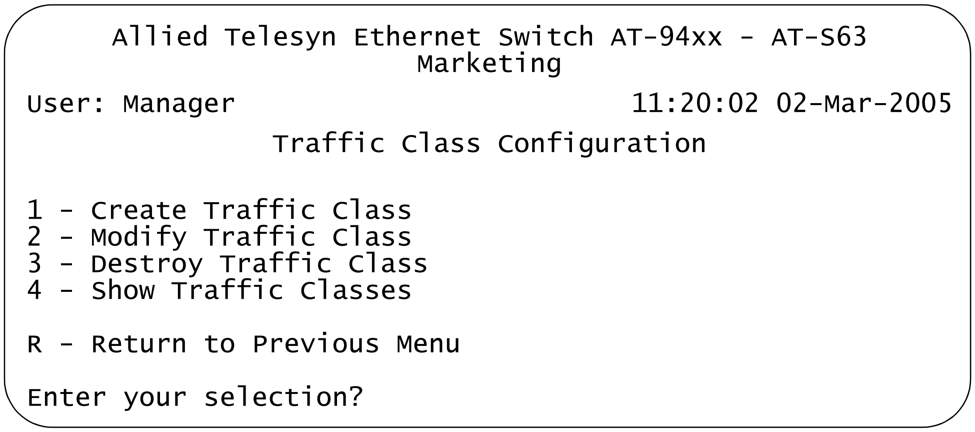
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **2** to select Traffic Class Configuration.

   The Traffic Class Configuration menu is shown in Figure 115.

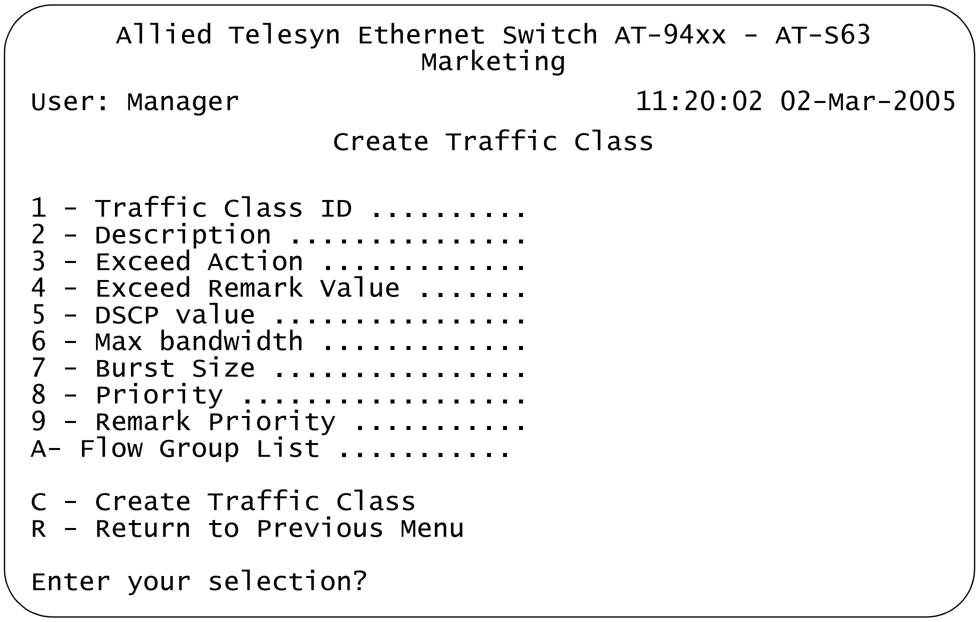


```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                         11:20:02 02-Mar-2005
               Traffic Class Configuration

1 - Create Traffic Class
2 - Modify Traffic Class
3 - Destroy Traffic Class
4 - Show Traffic Classes

R - Return to Previous Menu

Enter your selection?
```

Figure 115. Traffic Class Configuration Menu

4. From the Traffic Class Configuration menu, type **1** to select Create Traffic Class.

The Create Traffic Class menu is shown in Figure 116.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                   Create Traffic Class

1 - Traffic Class ID .........
2 - Description ..............
3 - Exceed Action ............
4 - Exceed Remark Value ......
5 - DSCP value ...............
6 - Max bandwidth ............
7 - Burst Size ...............
8 - Priority .................
9 - Remark Priority ..........
A- Flow Group List ..........

C - Create Traffic Class
R - Return to Previous Menu

Enter your selection?
```

Figure 116. Create Traffic Class Menu

5. Configure the following parameters as desired:

1 - Traffic Class ID
Specifies an ID number for the traffic class. Each traffic class on the switch must be assigned a unique number. The range is 0 to 511. The default is 0. This parameter is required.

2 - Description
Specifies a description for the traffic class. The description can be from 1 to 15 alphanumeric characters. Spaces are allowed. This parameter is optional, but recommended. Names can help you identify the traffic classes on the switch.

3 - Exceed Action
Specifies the action to be taken if the traffic of the traffic class exceeds the maximum bandwidth, specified in option 6. There are two possible exceed actions, drop and remark. If drop is selected, traffic exceeding the bandwidth is discarded. If remark is selected, the packets are forwarded after replacing the DSCP value with the new value specified in option 4, Exceed Remark Value. The default is drop.

4 - Exceed Remark Value
Specifies the DSCP replacement value for traffic that exceeds the maximum bandwidth. This value takes precedence over the DSCP value set with option 5, DSCP Value. The default is 0.

5 - DSCP value
Specifies a replacement value to write into the DSCP (TOS) field of the packets. The range is 0 to 63.

A new DSCP value can be set at all three levels: flow group, traffic class, and policy. A DSCP value specified in a flow group overrides a DSCP value specified at the traffic class or policy level. A DSCP value specified at the traffic class level is used only if no value has been specified at the flow group level. It will override any value set at the policy level.

6 - Max Bandwidth
Specifies the maximum bandwidth available to the traffic class. This parameter determines the maximum rate at which the ingress port accepts data belonging to this traffic class before either dropping or remarking occurs, depending on option 3, Exceed Action. If the sum of the maximum bandwidth for all traffic classes on a policy exceeds the (ingress) bandwidth of the port to which the policy is assigned, the bandwidth for the port takes precedence and the port discards packets before they can be classified. The range is 0 to 1016 Mbps.

The value for this parameter is rounded up to the nearest Mbps value when this traffic class is assigned to a policy on a 10/100 port, and up to the nearest 8 Mbps value when assigned to a policy on a gigabit port (for example, on a gigabit port, 1 Mbps is rounded to 8 Mbps, and 9 is rounded to 16).

Note
If this option is set to 0 (zero), all traffic that matches that traffic class is dropped. However, a access control list can be created to match the traffic that is marked for dropping, or a subset of it, and given an action of permit, to override this. This functionality can be used to discard all but a certain type of traffic. For more information about configuring access control lists, see Chapter 14, “Access Control Lists” on page 269.

7 - Burst Size
Specifies the size of a token bucket for the traffic class. The token bucket is used in situations where you have set a maximum bandwidth for a class, but where traffic activity may periodically exceed the maximum. A token bucket can provide a buffer for those periods where the maximum bandwidth is exceeded.

Tokens are added to the bucket at the same rate as the traffic class’ maximum bandwidth, set with option 6, Max Bandwidth. For example, a maximum bandwidth of 50 Mbps adds tokens to the bucket at that rate.

If the amount of traffic flow matches the maximum bandwidth, no traffic is dropped because the number of tokens added to the bucket matches the number being used by the traffic. However, no unused tokens will accumulate in the bucket. If the traffic increases, the excess traffic will be discarded since no tokens are available for handling the increase.

If the traffic is below the maximum bandwidth, unused tokens will accumulate in the bucket since the actual bandwidth falls below the specified maximum. The unused tokens will be available for handling excess traffic should the traffic exceed the maximum bandwidth. Should an increase in traffic continue to the point where all the unused tokens are used up, packets will be discarded.

Unused tokens accumulate in the bucket until the bucket reaches maximum capacity, set by this parameter. When the maximum capacity of the bucket is reached, no extra tokens are added. The range is 4 to 512 Kbps.

Note
To use this parameter you must specify a maximum bandwidth using item 6 - Max Bandwidth. Specifying a token bucket size without also specifying a maximum bandwidth serves no function.

8 - Priority
Specifies the priority value in the IEEE 802.1p tag control field that traffic belonging to this traffic class is assigned. Priority values range from 0 to 7 with 0 being the lowest priority and 7 being the highest priority. Incoming frames are mapped into one of four Class of Service (CoS) queues based on the priority value.

If you want the packets to retain the new value when they exit the switch, change option 9, Remark Priority, to Yes.

If you specify a new user priority value here and in Flow Group, the value in Flow Group overwrites the value here.

9 - Remark Priority
Replaces the user priority value in the packets with the new value specified in option 4, Priority, if set to Yes. If set to No, which is the default, the packets retain their preexisting priority level when they leave the switch.

A- Flow Group List
Specifies the flow groups to be assigned to the traffic class. The specified flow groups must already exist. Separate multiple IDs with commas (e.g., 4,11,13).

6. After configuring the parameters, type **C** to select Create Traffic Class.

7. To create another traffic class, repeat this procedure starting with step 3. To assign the traffic class to a policy, go to "Managing Policies" on page 330.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a Traffic Class

To modify a traffic class, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **2** to select Traffic Class Configuration.

   The Traffic Class Configuration menu is shown in Figure 115 on page 320.

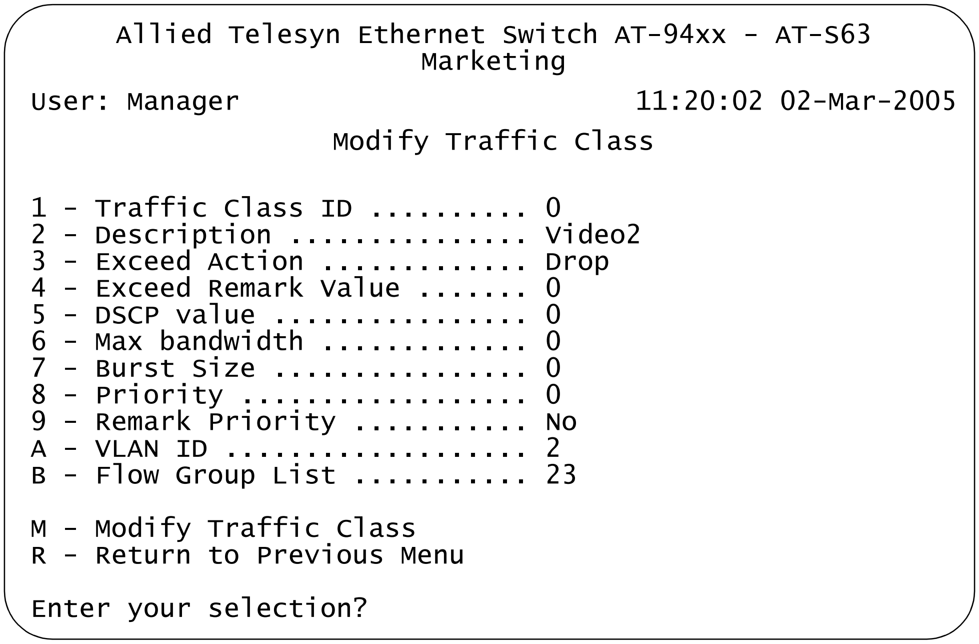
4. From the Traffic Class Configuration menu, type **2** to select Modify Traffic Class.

   The following prompt is displayed:

   ```
   Available Traffic Class(es): 0-7
   Enter Traffic Class ID :  [0 to 511] -> 0
   ```

5. Enter the ID number of the traffic class you want to modify. You can modify only one traffic class at a time.

The Modify Traffic Class menu is shown in Figure 117.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                           11:20:02 02-Mar-2005
                     Modify Traffic Class

1 - Traffic Class ID .......... 0
2 - Description ............... Video2
3 - Exceed Action ............. Drop
4 - Exceed Remark Value ....... 0
5 - DSCP value ................ 0
6 - Max bandwidth ............. 0
7 - Burst Size ................ 0
8 - Priority .................. 0
9 - Remark Priority ........... No
A - VLAN ID ................... 2
B - Flow Group List ........... 23

M - Modify Traffic Class
R - Return to Previous Menu

Enter your selection?
```

Figure 117. Modify Traffic Class Menu

6. Modify the settings as needed. For parameter definitions, refer to “Creating a Traffic Class” on page 320.

   When you modify a traffic class, note the following:

   - You cannot change the traffic class ID number.
   - To delete a value from a variable so as to leave it blank, select the variable and then use the backspace key to delete its default value.
   - Specifying an invalid value for a parameter that already has a value causes the parameter to revert to its default value.

7. Type **M** to select Modify Traffic Class.

8. To modify another traffic class, repeat this procedure starting with step 4. To assign the traffic class to a policy, go to “Managing Policies” on page 330.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting a Traffic Class

To delete a traffic class, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **2** to select Traffic Class Configuration.

   The Traffic Class Configuration menu is shown in Figure 115 on page 320.

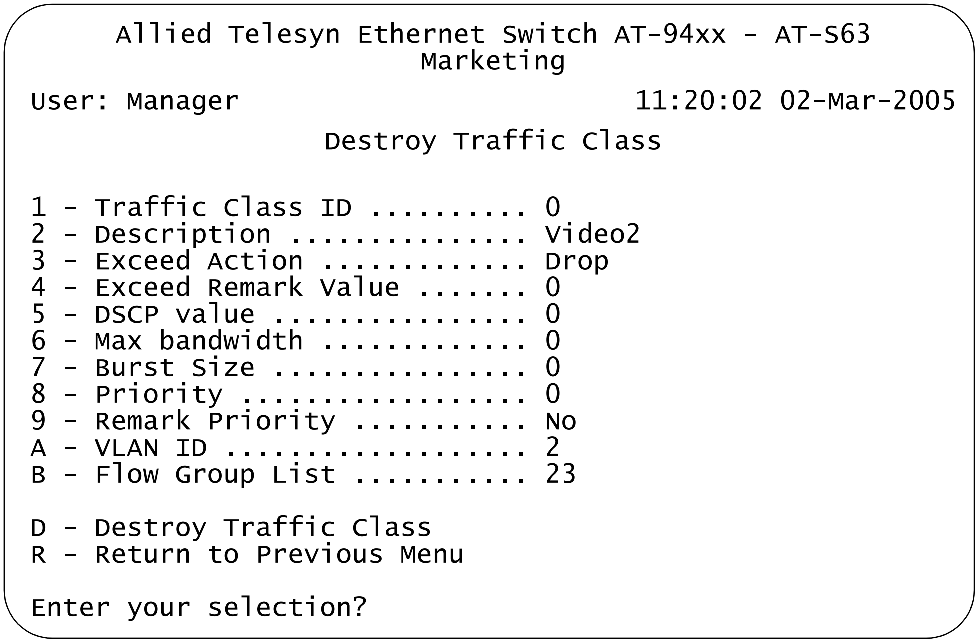
4. From the Traffic Class Configuration menu, type **3** to select Destroy Traffic Class.

   The following prompt is displayed:

   ```
   Available Traffic Class(es): 0-7
   Enter Traffic Class ID :  [0 to 511] -> 0
   ```

5. Enter the ID number of the traffic class you want to delete. You can delete only one traffic class at a time.

   The Destroy Traffic Class menu is shown in Figure 118.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                        11:20:02 02-Mar-2005
                    Destroy Traffic Class

1 - Traffic Class ID .......... 0
2 - Description ............... Video2
3 - Exceed Action ............. Drop
4 - Exceed Remark Value ....... 0
5 - DSCP value ................ 0
6 - Max bandwidth ............. 0
7 - Burst Size ................ 0
8 - Priority .................. 0
9 - Remark Priority ........... No
A - VLAN ID ................... 2
B - Flow Group List ........... 23

D - Destroy Traffic Class
R - Return to Previous Menu

Enter your selection?
```

Figure 118. Destroy Traffic Class Menu

6. Type **D** to delete the traffic class.

   The traffic class is deleted from the switch. The class is removed from any policies to which it is assigned.

7. To delete another traffic class, repeat this procedure starting with step 4.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying Traffic Classes

To display the traffic classes, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

2. From the Security and Services menu, type **6** to select Quality of Service.

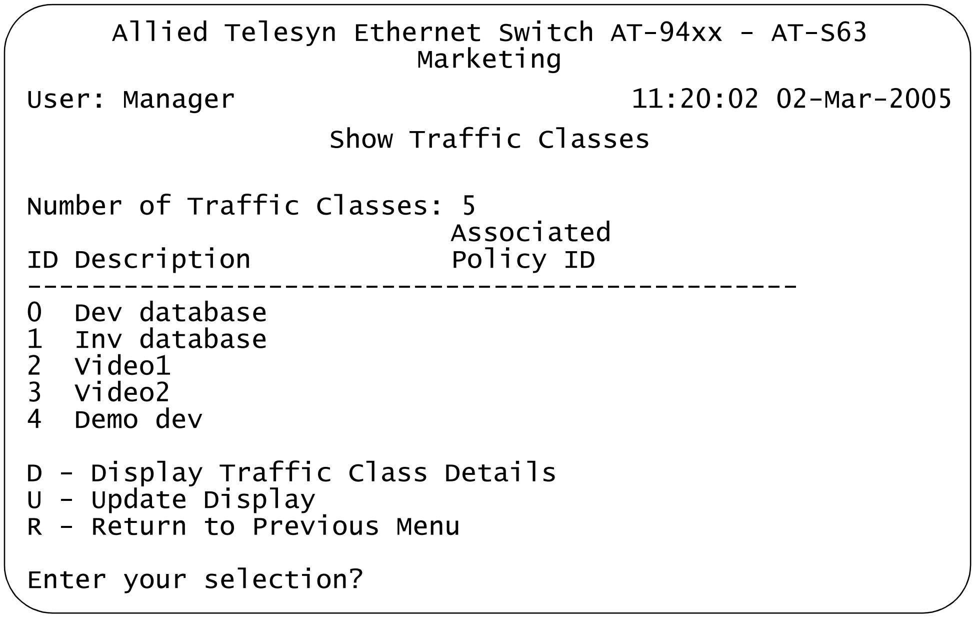
   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **2** to select Traffic Class Configuration.

   The Traffic Class Configuration menu is shown in Figure 115 on page 320.

4. From the Traffic Class Configuration menu, type **4** to select Show Traffic Classes.

   The Show Traffic Classes menu is shown in Figure 119.



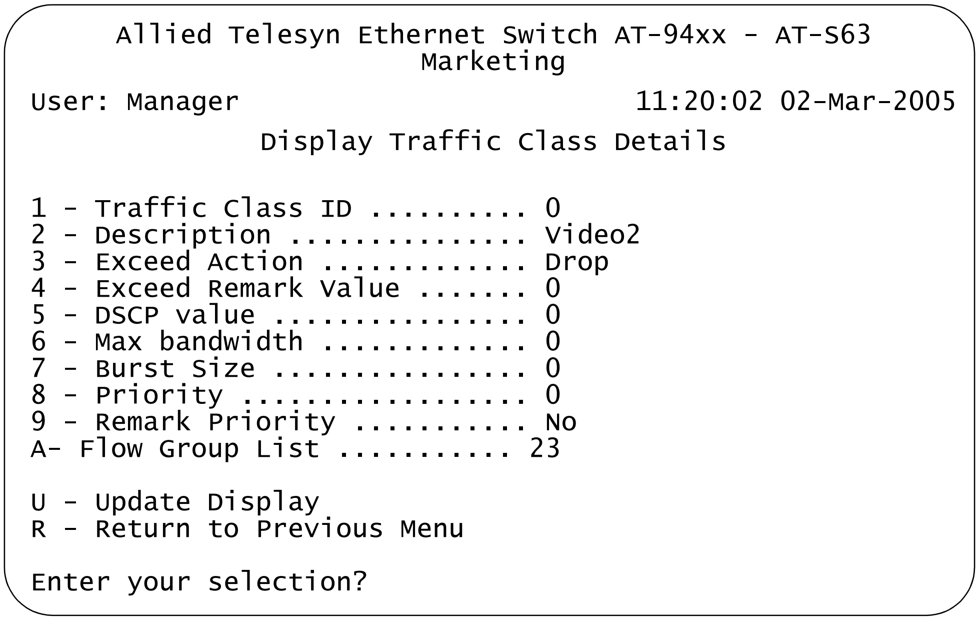
```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                    Show Traffic Classes


Number of Traffic Classes: 5
                          Associated
ID Description            Policy ID
------------------------------------------------
0  Dev database
1  Inv database
2  Video1
3  Video2
4  Demo dev

D - Display Traffic Class Details
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 119. Show Traffic Classes Menu

5. To display the specifics of a traffic class, type **D** to select Display Traffic Class Details.

6. When prompted, enter the ID number of the traffic class you want to view. You can display only one traffic class at a time.

   The Display Traffic Class Details menu is shown in Figure 120.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
              Display Traffic Class Details

1 - Traffic Class ID .......... 0
2 - Description ............... Video2
3 - Exceed Action ............. Drop
4 - Exceed Remark Value ....... 0
5 - DSCP value ................ 0
6 - Max bandwidth ............. 0
7 - Burst Size ................ 0
8 - Priority .................. 0
9 - Remark Priority ........... No
A- Flow Group List ........... 23

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 120. Display Traffic Class Details Menu

The Display Traffic Class Details menu provides the following information:

Traffic Class ID
The traffic class ID number.

Description
The description of the traffic class.

Exceed Action
The action taken if the traffic of the traffic class exceeds the maximum bandwidth.

Exceed Remark Value
The DSCP replacement value for traffic that exceeds the maximum bandwidth.

DSCP value
The replacement value to write into the DSCP (TOS) field of the packets.

Max Bandwidth
The maximum bandwidth available to the traffic class.

Burst Size
The size of a token bucket for the traffic class.

Priority
The priority value in the IEEE 802.1p tag control field that traffic belonging to this traffic class is assigned.

Remark Priority
Replaces the user priority value in the packets with the Priority value.

Flow Group List
The flow groups to be assigned to the traffic class.

Managing Policies

This section contains the following procedures:

❐ “Creating a Policy,” next

❐ “Modifying a Policy” on page 332

❐ “Deleting a Policy” on page 333

❐ “Displaying Policies” on page 334

Creating a Policy

To create a policy, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

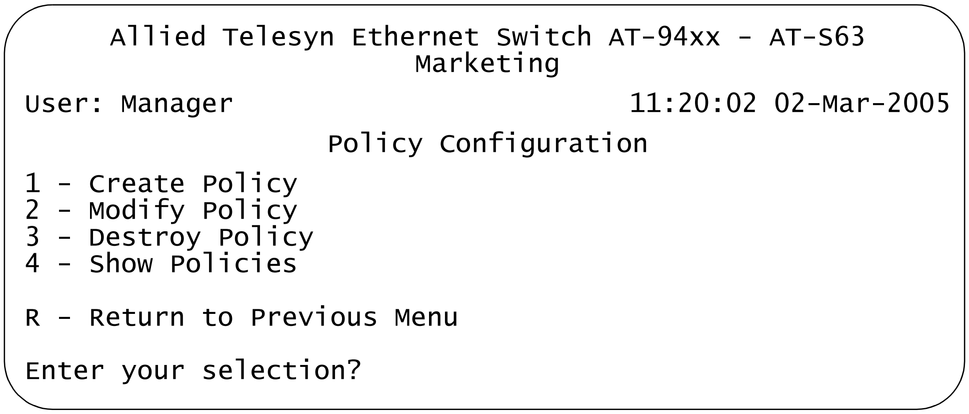
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **3** to select Policy Configuration.

   The Policy Configuration menu is shown in Figure 121.

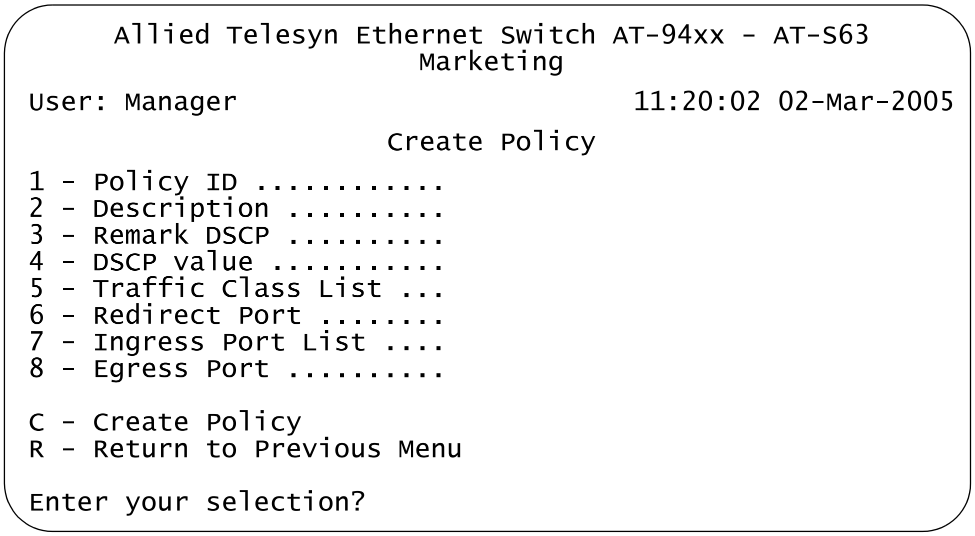


```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
                   Policy Configuration
1 - Create Policy
2 - Modify Policy
3 - Destroy Policy
4 - Show Policies

R - Return to Previous Menu

Enter your selection?
```

Figure 121. Policy Configuration Menu

4. From the Policy Configuration menu, type **1** to select Create Policy.

The Create Policy menu is shown in Figure 122.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                       Create Policy
1 - Policy ID ...........
2 - Description .........
3 - Remark DSCP .........
4 - DSCP value ..........
5 - Traffic Class List ...
6 - Redirect Port ........
7 - Ingress Port List ....
8 - Egress Port .........

C - Create Policy
R - Return to Previous Menu

Enter your selection?
```

Figure 122. Create Policy Menu

5. Configure the following parameters as needed:

1 - Policy ID
Specifies an ID number for the policy. Each policy on the switch must be assigned a unique number. The range is 0 to 255. The default is 0. This parameter is required.

2 - Description
Specifies a description for the policy. The description can be from 1 to 15 alphanumeric characters. Spaces are allowed. This parameter is optional, but recommended. Names can help you identify the policies on the switch.

3- Remark DSCP
Specifies the conditions under which the ingress DSCP value is overwritten. If All is specified, all packets are remarked. If None is specified, the function is disabled. The default is None.

4 - DSCP value
Specifies a replacement value to write into the DSCP (TOS) field of the packets. The range is 0 to 63.

A new DSCP value can be set at all three levels: flow group, traffic class, and policy. A DSCP value specified in a flow group overrides a DSCP value specified at the traffic class or policy level. A DSCP value specified at the policy level is used only if no value has been specified at the flow group and traffic class levels.

5 - Traffic Class List
Specifies the traffic classes to be assigned to the policy. The specified

traffic classes must already exist. Separate multiple IDs with commas (e.g., 4,11,13).

6 - Redirect Port
Specifies the port to which the classified traffic from the ingress ports is redirected.

7 - Ingress Port List
Specifies the ingress ports to which the policy is to be assigned. Ports can be identified individually (for example, 5,7,22), as a range (for example, 18-23), or both (for example, 1,5,14-22).

A port can be an ingress port of only one policy at a time. If a port is already an ingress port of a policy, you must remove the port from its current policy assignment before adding it to another policy.

8 - Egress Port
Specifies the egress port to which the policy is to be assigned. You can enter only one egress port.

A port can be an egress port of only one policy at a time. If a port is already an egress port of a policy, you must remove the port from its current policy assignment before adding it to another policy.

6. After configuring the parameters, type **C** to select Create Policy.

   The new policy is immediately activated on the specified ports.

7. To create another policy, repeat this procedure starting with step 3.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a Policy

To modify a policy, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **3** to select Policy Configuration.

   The Policy Configuration menu is shown in Figure 121 on page 330.

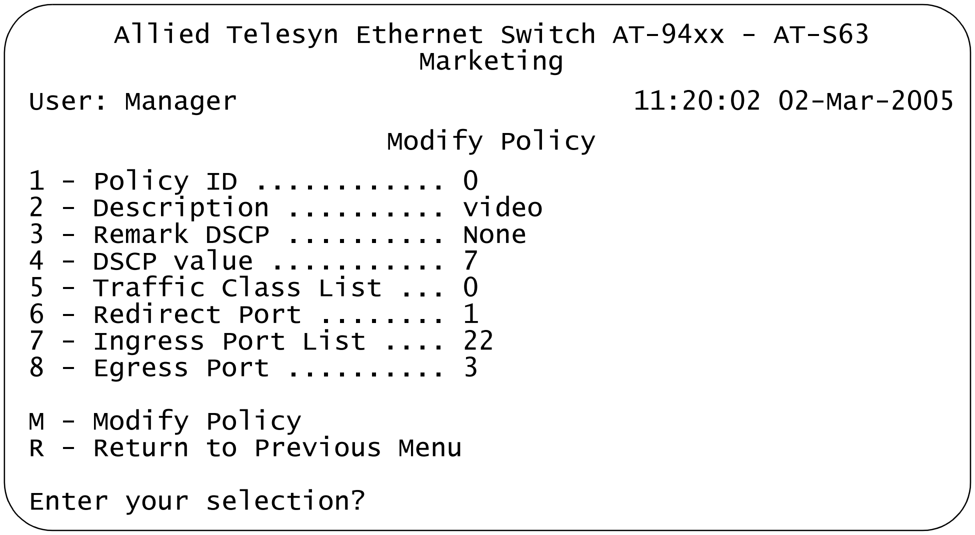
4. From the Policy Configuration menu, type **2** to select Modify Policy.

   The following prompt is displayed:

```
Available Policy(ies): 0-4
Enter Policy ID :  [0 to 255] -> 0
```

5. Enter the ID number of the policy you want to modify. You can modify only one policy at a time.

   The Modify Policy menu is shown in Figure 123.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                           11:20:02 02-Mar-2005
                        Modify Policy
1 - Policy ID ........... 0
2 - Description .......... video
3 - Remark DSCP .......... None
4 - DSCP value ........... 7
5 - Traffic Class List ... 0
6 - Redirect Port ........ 1
7 - Ingress Port List .... 22
8 - Egress Port .......... 3

M - Modify Policy
R - Return to Previous Menu

Enter your selection?
```

Figure 123. Modify Policy Menu

6. Modify the settings as needed. For parameter definitions, refer to “Creating a Policy” on page 330.

   When you modify a policy, note the following:

   - You cannot change the traffic class ID number.
   - To delete a value from a variable so as to leave it blank, select the variable and then use the backspace key to delete its default value.
   - Specifying an invalid value for a parameter that already has a value causes the parameter to revert to its default value.

7. Type **M** to select Modify Policy.

   Modifications to a policy are immediately activated on the ports where the policy is assigned.

8. To modify another policy, repeat this procedure starting with step 4.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting a Policy

To delete a policy, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **3** to select Policy Configuration.

   The Policy Configuration menu is shown in Figure 121 on page 330.

4. From the Policy Configuration menu, type, type **3** to select Destroy Policy.

   The following prompt is displayed:

   ```
   Available Policy(ies): 0-4
   Enter Policy ID :  [0 to 255] -> 0
   ```

5. Enter the ID number of the policy you want to delete. You can delete only one policy at a time.

6. Type **D** to delete the policy.

   The policy is deleted from the switch.

7. To delete another policy, repeat this procedure starting with step 4.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying Policies

To display policies, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **6** to select Quality of Service.

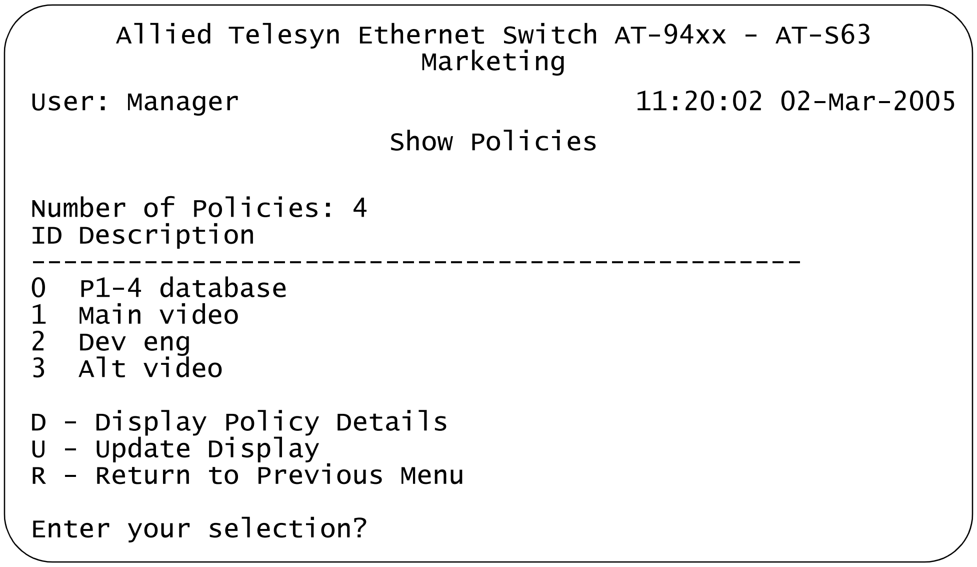
   The Quality of Service (QoS) menu is shown in Figure 108 on page 313.

3. From the Quality of Service (QoS) menu, type **3** to select Policy Configuration.

   The Policy Configuration menu is shown in Figure 121 on page 330.

4. From the Policy Configuration menu, type **4** to select Show Policies.

The Show Policies menu is shown in Figure 124.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                       Show Policies


Number of Policies: 4
ID Description
------------------------------------------------
0  P1-4 database
1  Main video
2  Dev eng
3  Alt video

D - Display Policy Details
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 124. Show Policies Menu

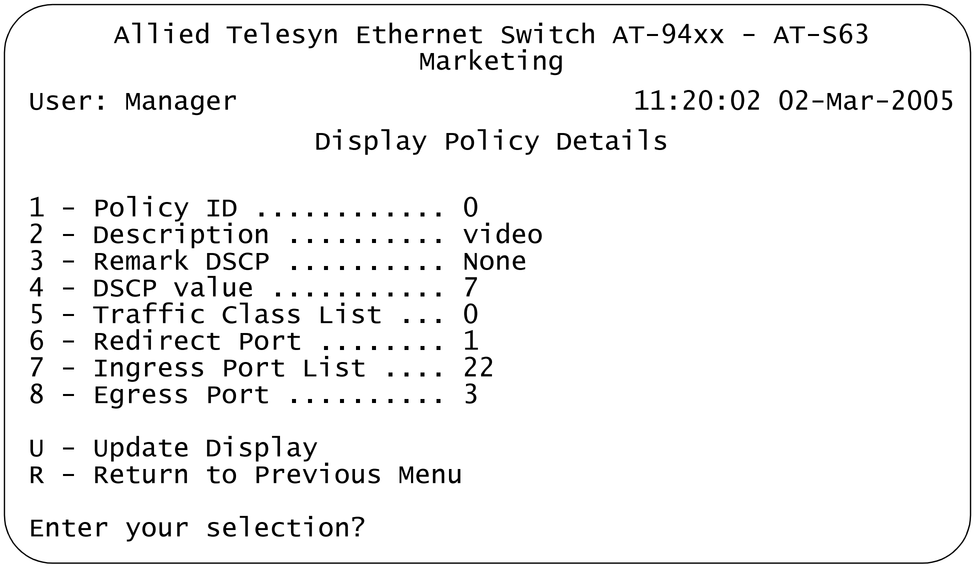
5. To display the specifics of a policy, type **D** to select Display Policy Details.

   The following prompt is displayed:

   ```
   Available Policy(ies): 0-4
   Enter Policy ID :  [0 to 255] -> 0
   ```

6. Enter the ID number of the policy you want to view. You can display only one policy at a time.

The Display Policy Details menu is shown in Figure 125.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                         11:20:02 02-Mar-2005
                  Display Policy Details

1 - Policy ID ........... 0
2 - Description .......... video
3 - Remark DSCP .......... None
4 - DSCP value ........... 7
5 - Traffic Class List ... 0
6 - Redirect Port ........ 1
7 - Ingress Port List .... 22
8 - Egress Port .......... 3

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 125. Display Policy Details Menu

The Display Policy Details menu provides the following information:

Policy ID
The policy ID number.

Description
The policy description.

Remark DSCP
The conditions under which the ingress DSCP value is overwritten.

DSCP value
The replacement value to write into the DSCP (TOS) field of the packets.

Traffic Class List
The traffic classes assigned to the policy.

Redirect Port
The port to which the classified traffic from the ingress port is assigned.

Ingress Port List
The ingress ports to which the policy is assigned.

Egress Port
The egress port to which the policy is assigned.

Chapter 17

Class of Service

This chapter contains the procedures for configuring Class of Service (CoS). Sections in the chapter include:

Class of Service Overview

When a port on an Ethernet switch becomes oversubscribed—its egress queues contain more packets than the port can handle in a timely manner—the port may be forced to delay the transmission of some packets, resulting in the delay of packets reaching their destinations. A port may be forced to delay transmission of packets while it handles other traffic, and, in some situations, some packets destined to be forwarded to an oversubscribed port from other switch ports may be discarded.

Minor delays are often of no consequence to a network or its performance. But there are applications, referred to as delay or time sensitive applications, that can be impacted by packet delays. Voice transmission and video conferencing are two examples. If packets carrying data for either of these are delayed from reaching their destination, the audio or video quality may suffer.

This is where CoS is of value. It allows you to manage the flow of traffic through a switch by having the switch ports give higher priority to some packets, such as delay sensitive traffic, over other packets. This is referred to as prioritizing traffic.

CoS applies primarily to tagged packets. A tagged packet, as explained in “Tagged VLAN Overview” on page 556, contains information within it that specifies the VLAN to which the packet belongs.

A tagged packet can also contain a priority level. This priority level is used by network switches and other networking devices to know how important (delay sensitive) that packet is compared to other packets. Packets of a high priority are typically handled before packets of a low priority.

CoS, as defined in the IEEE 802.1p standard, has eight levels of priority. The priorities are 0 to 7, with 0 the lowest priority and 7 the highest.

When a tagged packet is received on a port on the switch, it is examined by the AT-S63 software for its priority. The switch software uses the priority to determine which egress priority queue the packet should be directed to on the egress port.

Each switch port has four egress queues, labeled Q0, Q1, Q2, and Q3. Q0 is the lowest priority queue and Q3 is the highest. A packet in a high priority egress queue is typically transmitted out a port sooner than a packet in a low priority queue.

Table 6 lists the mappings between the eight CoS priority levels and the four egress queues of a switch port.

Table 6. Default Mappings of IEEE 802.1p Priority Levels to Priority Queues

IEEE 802.1p Priority Level	Port Priority Queue
0	Q1
1	Q0
2	Q0
3	Q1
4	Q2
5	Q2
6	Q3
7	Q3

For example, if a tagged packet with a priority level of 3 entered a port on the switch, the switch would store the packet in Q1 queue on the egress port.

Note that priority 0 is mapped to CoS queue 1 instead of CoS queue 0 because tagged traffic that has never been prioritized has a VLAN tag User Priority of 0. If priority 0 was mapped to CoS queue 0, this default traffic goes to the lowest queue, which is probably undesirable. This mapping also makes it possible to give some traffic a lower priority than the default traffic.

You can change these mappings. For example, you might decide that packets with a priority of 5 need to be handled by egress queue Q3 and packets with a priority of 2 should be handled in Q1. The result is shown in Table 7..

Table 7. Customized Mappings of IEEE 802.1p Priority Levels to Priority Queues

IEEE 802.1p Priority Level	Port Priority Queue
0	Q1
1	Q0
2	Q1
3	Q1
4	Q2

Table 7. Customized Mappings of IEEE 802.1p Priority Levels to Priority Queues

IEEE 802.1p Priority Level	Port Priority Queue
5	Q3
6	Q3
7	Q3

The procedure for changing the default mappings is found in "Mapping CoS Priorities to Egress Queues" on page 346. Note that because all ports must use the same priority-to-egress queue mappings, these mappings are applied at the switch level. They cannot be set on a per-port basis.

You can configure a port to completely ignore the priority levels in its tagged packets and store all the packets in the same egress queue. For instance, perhaps you decide that all tagged packets received on port 4 should be stored in an egress port's Q3 egress queue, regardless of the priority level in the packets themselves. The procedure for overriding priority levels is explained in "Configuring CoS" on page 343.

CoS relates primarily to tagged packets rather than untagged packets because untagged packets do not contain a priority level. By default, all untagged packets are placed in a port's Q0 egress queue, the queue with the lowest priority. But you can override this and instruct a port's untagged frames to be stored in a higher priority queue. The procedure for this is also explained in "Configuring CoS" on page 343.

One last thing to note is that the AT-S63 software does not change the priority level in a tagged packet. The packet leaves the switch with the same priority it had when it entered. This is true even if you change the default priority-to-egress queue mappings.

Scheduling

A switch port needs a mechanism for knowing the order in which it should handle the packets in its four egress queues. For example, if all the queues contain packets, should the port transmit all packets from Q3, the highest priority queue, before moving on to the other queues, or should it instead just do a few packets from each queue and, if so, how many?

This control mechanism is called *scheduling*. Scheduling determines the order in which a port handles the packets in its egress queues. The AT-S63 software has two types of scheduling:

❒ Strict priority

❒ Weighted round robin priority

Note
Scheduling is set at the switch level. You cannot set this on a per-port basis.

Strict Priority Scheduling

With this type of scheduling, a port transmits all packets out of higher priority queues before transmitting any from the lower priority queues. For instance, as long as there are packets in Q3 it does not handle any packets in Q2.

The value to this type of scheduling is that high priority packets are always handled before low priority packets.

The problem with this method is that some low priority packets might never be transmitted out the port because a port might never get to the low priority queues. A port handling a large volume of high priority traffic may be so busy transmitting that traffic that it never has an opportunity to get to any packets that are stored in its low priority queues.

Weighted Round Robin Priority Scheduling

The weighted round robin scheduling method functions as its name implies. The port transmits a set number of packets from each queue, in a round robin fashion, so that each has a chance to transmit traffic. This method guarantees that every queue receives some attention from the port for transmitting packets.

To use this scheduling method, you need to specify the maximum number of packets a port should transmit from a queue before moving to the next queue. This is referred to as specifying the “weight” of a queue. In all likelihood, you will want to give greater weight to the packets in the higher priority queues over the lower queues.

Table 8 shows an example.

Table 8. Example of Weighted Round Robin Priority

Port Egress Queue	Maximum Number of Packets
Q3	15
Q2	10
Q1	5
Q0	1

In this example, the port transmits a maximum number of 15 packets from

Q3 before moving to Q2, from which it transmits up to 10 packets, and so forth.

Configuring CoS

As explained in "Class of Service Overview" on page 338, a tagged packet received on a port is placed it into one of four priority queues on the egress port according to the switch's mapping of 802.1p priority levels to egress priority queues. The default mappings are shown in Table 6 on page 339.

However, you can override the mappings at the port level so that all tagged packets are placed into a specific egress priority queue regardless of the priority level in the packets themselves. Note that this determination is made when a packet is received on the ingress port and before the frame is forwarded to the egress port. Consequently, you need to configure this feature on the ingress port.

For example, when you configure a switch port so that all ingress tagged frames are handled by the egress priority queue Q2, all tagged frames received on the port are directed to the Q2 priority egress queue on the egress ports.

You can also use CoS to control which priority queue handles untagged frames that ingress a port. By default, untagged frames (that is, frames without VLAN or priority level information) are automatically assigned to Q0, the lowest priority queue. But you can configure CoS on a port so that all untagged frames received on the port are directed to one of the other queues.

To configure CoS for a port, perform the following procedure:

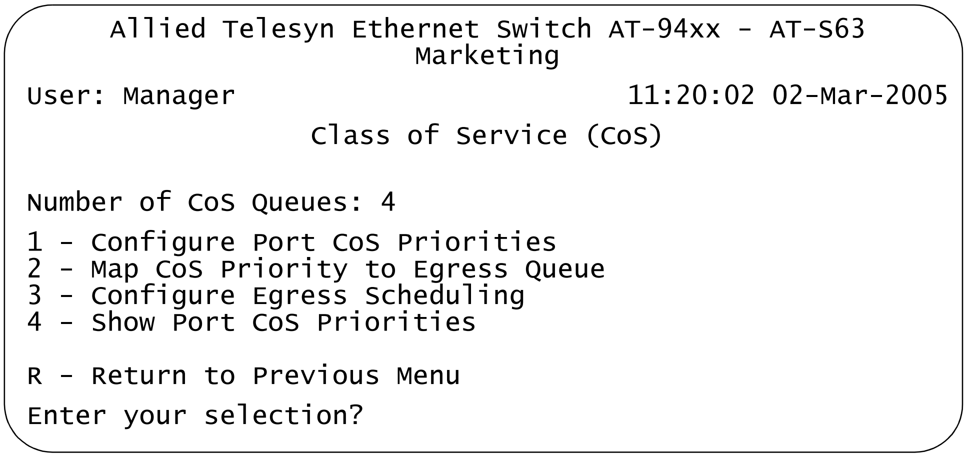
1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

   Note
   Items 7, 8, and 9 are not available in all versions of the AT-S63 management software. Contact your sales representative to determine if these features are available for your locale.

2. From the Security and Services menu, type **5** to select Class of Service (CoS).

The Class of Service (CoS) menu is shown in Figure 126.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
                  Class of Service (CoS)

Number of CoS Queues: 4

1 - Configure Port CoS Priorities
2 - Map CoS Priority to Egress Queue
3 - Configure Egress Scheduling
4 - Show Port CoS Priorities

R - Return to Previous Menu

Enter your selection?
```

Figure 126. Class of Service (CoS) Menu

The “Number of CoS Queues” line indicates the number of egress queues each port has. On the AT-8500 Series switch, there are four queues per port. This value cannot be changed.

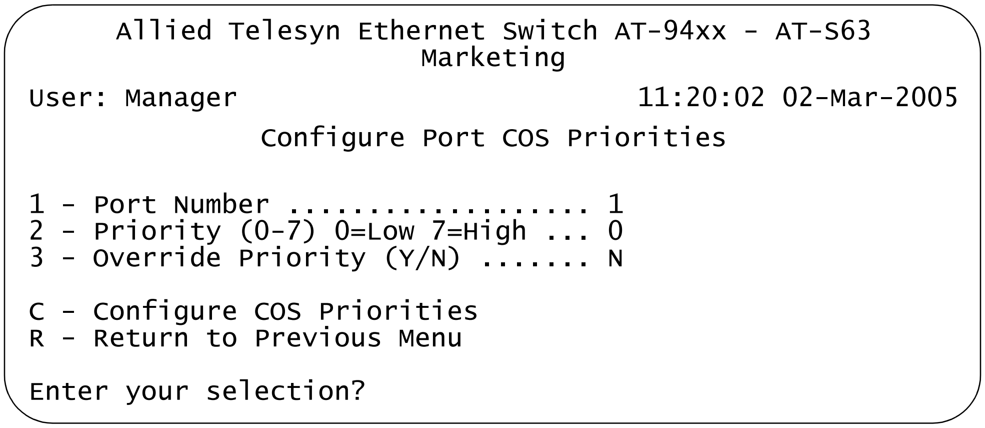
3. From the Class of Service menu, type **1** to select Configure Port CoS Priorities.

   The following prompt is displayed:

   ```
   Enter port number -> [1 to 24] ->
   ```

4. Enter the number of the port on the switch where you want to configure CoS. You can specify only one port at a time.

   The Configure Port COS Priorities menu is shown in Figure 127.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
              Configure Port COS Priorities

1 - Port Number ................... 1
2 - Priority (0-7) 0=Low 7=High ... 0
3 - Override Priority (Y/N) ....... N

C - Configure COS Priorities
R - Return to Previous Menu

Enter your selection?
```

Figure 127. Configure Port COS Priorities Menu

Menu option 1 cannot be changed.

5. Type **2** to select Priority (0 - 7). The following prompt is displayed:

   ```
   Enter new value -> [0 to 7]
   ```

6. Enter a value from 1 to 7 that corresponds to the egress queue where you want all untagged frames received on the port to be stored. For example, if you want all ingress untagged packets received on the port stored in egress queue Q2, enter 4 or 5. The default is 0, which corresponds to Q0. (If you perform Step 6 and override the priority level in tagged packets, this queue will also be used to store all tagged packets.) The default values are listed in Table 6.

7. If you are configuring a tagged port and you want the switch to ignore the priority tag in ingress tagged frames, type **3** to select Override Priority and type **Y**.

   All ingress tagged frames are directed to the queue specified in Step 6.

   Note
   The tagged information in a frame is not changed as the frame traverses the switch. A tagged frame leaves a switch with the same priority level that it had when it entered.

   The default for this parameter is No, meaning that the priority level of tagged frames is determined by the priority level specified in the frame itself.

8. Type **C** to select Configure Port COS Priorities.

   A change to a port CoS setting is immediately activated on the port.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Mapping CoS Priorities to Egress Queues

This procedure explains how to change the default mappings of CoS priorities to egress priority queues, shown in Table 8 on page 341. This is set at the switch level. You cannot set this at the per-port level.

To change the mappings, perform the following procedure.

1. From the Main Menu, type **7** to select Security and Services.

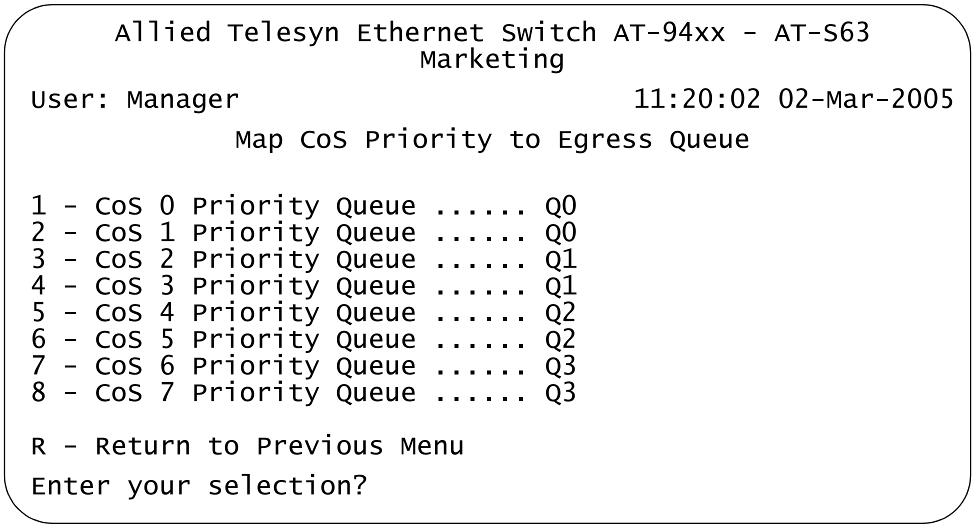
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **5** to select Class of Service (CoS).

   The Class of Service (CoS) menu is shown in Figure 126 on page 344.

3. From the Class of Service (CoS) menu, type **2** to select Map CoS Priority to Egress Queue.

   The Map CoS Priority to Egress Queue menu is shown in Figure 128.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
             Map CoS Priority to Egress Queue

1 - CoS 0 Priority Queue ...... Q0
2 - CoS 1 Priority Queue ...... Q0
3 - CoS 2 Priority Queue ...... Q1
4 - CoS 3 Priority Queue ...... Q1
5 - CoS 4 Priority Queue ...... Q2
6 - CoS 5 Priority Queue ...... Q2
7 - CoS 6 Priority Queue ...... Q3
8 - CoS 7 Priority Queue ...... Q3

R - Return to Previous Menu
Enter your selection?
```

Figure 128. Map CoS Priority to Egress Queue Menu

4. Type the number of the CoS priority whose queue assignment you want to change. This toggles the queue value through the possible queue settings.

   For example, to direct all tagged packets with a CoS priority of 5 to egress queue Q3, you would toggle 6 until the CoS 5 Priority Queue value reads Q3.

5. If desired, repeat Step 3 to change the queue assignments of other CoS priorities.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring Egress Scheduling

This procedure explains how to select and configure a scheduling method for Class of Service. Scheduling determines the order in which the ports handle packets in their egress queues. For an explanation of the two scheduling methods, refer to “Scheduling” on page 340. Scheduling is set at the switch level. You cannot set this on a per-port basis.

1. From the Main Menu, type **7** to select Security and Services.

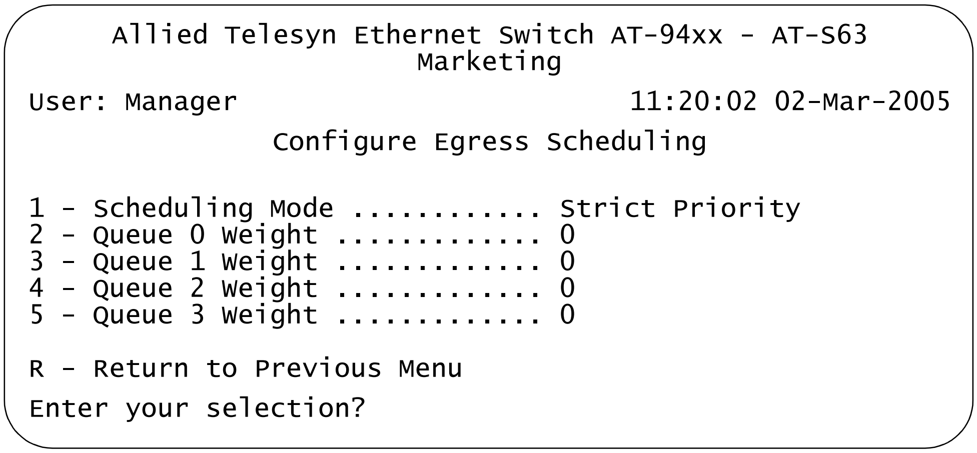
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **5** to select Class of Service (CoS).

   The Class of Service (CoS) menu is shown in Figure 126 on page 344.

3. From the Class of Service (CoS) menu, type **3** to select Configure Egress Scheduling.

   The Configure Egress Scheduling menu is shown in Figure 129.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                            11:20:02 02-Mar-2005
                 Configure Egress Scheduling

1 - Scheduling Mode ............ Strict Priority
2 - Queue 0 Weight ............. 0
3 - Queue 1 Weight ............. 0
4 - Queue 2 Weight ............. 0
5 - Queue 3 Weight ............. 0

R - Return to Previous Menu
Enter your selection?
```

Figure 129. Configure Egress Scheduling Menu

4. Type **1** to toggle Scheduling Mode between its two possible settings. The default setting is Strict Priority.

   If you select Strict Priority, skip the next step. Options 2 through 5 in the menu do not apply to Strict Priority scheduling.

5. If you select Weighted Round Robin Priority as the scheduling method, select menu options 2 through 5 and specify the maximum number of packets you want a port to transmit from each queue before it moves to the next queue. The range is 0 to 255. For an example, refer to Table 8 on page 341. The default value of 1 for each queue gives all egress queues the same weight.

6. Return to the Main Menu and type **S** to select Save Configuration Changes.

Displaying Port CoS Priorities

The following procedure displays a menu that lists the current egress priority queue settings for each port.

1. From the Main Menu, type **7** to select Security and Services.

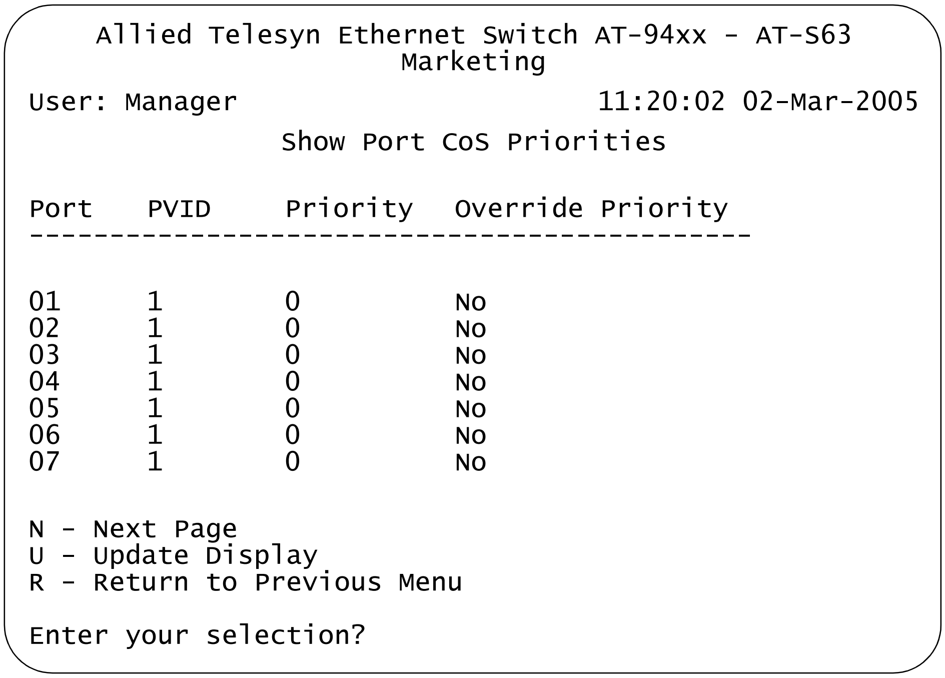
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **5** to select Class of Service (CoS).

   The Class of Service (CoS) menu is shown in Figure 126 on page 344.

3. From the Class of Service (CoS) menu, type **4** to select Show Port CoS Priorities.

   The Show Port CoS Priorities menu is shown in Figure 130.



```
    Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                       11:20:02 02-Mar-2005
                Show Port CoS Priorities

Port   PVID    Priority  Override Priority
---------------------------------------------


01     1       0         No
02     1       0         No
03     1       0         No
04     1       0         No
05     1       0         No
06     1       0         No
07     1       0         No

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 130. Show Port CoS Priorities Menu

The PVID column displays the current PVID value for each switch port.

Chapter 18

IGMP Snooping

This chapter explains how to activate and configure the Internet Group Management Protocol (IGMP) snooping feature on the switch. Sections in the chapter include:

IGMP Snooping Overview

The IGMP protocol enables routers to create lists of nodes that are members of multicast groups. (A multicast group is a group of end nodes that want to receive multicast packets from a multicast application.) The router creates a multicast membership list by periodically sending out queries to the local area networks connected to its ports.

A node wanting to become a member of a multicast group responds to a query by sending a *report*. A report indicates an end node's desire to become a member of a multicast group. Nodes that join a multicast group are referred to as *host nodes*. After becoming a member of a multicast group, a host node must continue to periodically issue reports to remain a member.

After the router has received a report from a host node, it notes the multicast group that the host node wants to join and the port on the router where the node is located. Any multicast packets belonging to that multicast group are then forwarded by the router out the port. If a particular port on the router has no nodes that want to be members of multicast groups, the router does not send multicast packets out the port. This improves network performance by restricting multicast packets only to router ports where host nodes are located.

There are three versions of IGMP — versions 1, 2, and 3. One of the differences between the versions is how a host node signals that it no longer wants to be a member of a multicast group. In version 1 it stops sending reports. If a router does not receive a report from a host node after a predefined length of time, referred to as a *time-out value*, it assumes that the host node no longer wants to receive multicast frames, and removes it from the membership list of the multicast group.

In version 2 a host node exits from a multicast group by sending a *leave request*. After receiving a leave request from a host node, the router removes the node from appropriate membership list. The router also stops sending multicast packets out the port to which the node is connected if it determines there are no further host nodes on the port.

Version 3 adds the ability of host nodes to join or leave specific sources in a multicast group through the use of *Group-Source report* and *Group-Source leave* messages.

The IGMP snooping feature on the AT-9400 Series switch supports all three versions of IGMP. It enables the switch to monitor the flow of queries from a router and reports and leave messages from host nodes to build its own multicast membership lists. It uses the lists to forward multicast packets only to switch ports where there are host nodes that are members of multicast groups. This improves switch performance and network security by restricting the flow of multicast packets only to those switch ports connected to host nodes.

Without IGMP snooping a switch would have to flood multicast packets out all of its ports, except the port on which it received the packet. Such flooding of packets can negatively impact switch and network performance.

The AT-9400 Series switch maintains its list of multicast groups through an adjustable timeout value, which controls how frequently it expects to see reports from end nodes that want to remain members of multicast groups, and by processing leave requests.

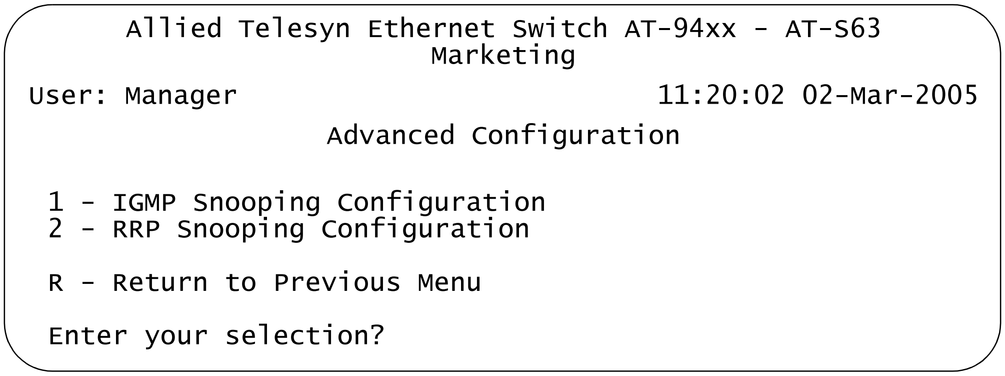
Note
By default, IGMP snooping is disabled on the switch.

Configuring IGMP Snooping

To configure IGMP snooping on the switch, perform the following procedure:

1. From the Main Menu, type **6** to select Advanced Configuration.

   The Advanced Configuration menu is shown in Figure 131.



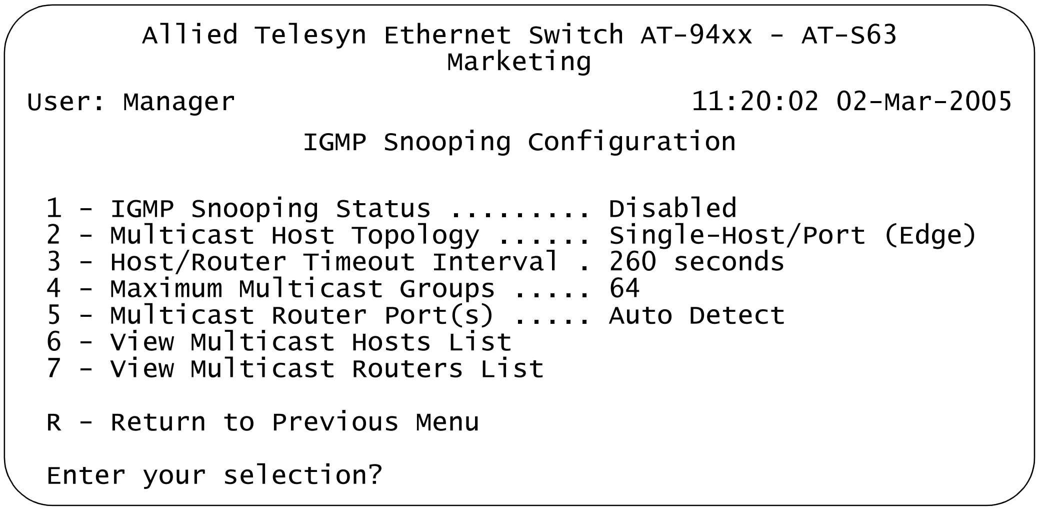
```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                   Advanced Configuration

 1 - IGMP Snooping Configuration
 2 - RRP Snooping Configuration

 R - Return to Previous Menu

 Enter your selection?
```

Figure 131. Advanced Configuration Menu

2. From the Advanced Configuration menu, type **1** to select IGMP Snooping Configuration.

Note
Selection 2, RRP Snooping Configuration, is described in Chapter 19, “RRP Snooping” on page 363.

The IGMP Snooping Configuration menu is shown in Figure 132.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                            11:20:02 02-Mar-2005
                 IGMP Snooping Configuration

 1 - IGMP Snooping Status ......... Disabled
 2 - Multicast Host Topology ...... Single-Host/Port (Edge)
 3 - Host/Router Timeout Interval . 260 seconds
 4 - Maximum Multicast Groups ..... 64
 5 - Multicast Router Port(s) ..... Auto Detect
 6 - View Multicast Hosts List
 7 - View Multicast Routers List

 R - Return to Previous Menu

 Enter your selection?
```

Figure 132. IGMP Snooping Configuration Menu

3. Adjust the following parameters as necessary:

1 - IGMP Snooping Status
Enables or disables IGMP snooping on the switch. After you choose this selection, type E to enable to D to disable this feature.

2 - Multicast Host Topology
Defines whether there is only one host node per switch port or multiple host nodes per port. The possible settings are:

Single-Host/Port (Edge)
The Single-Host/Port setting is appropriate when there is only one host node connected to each port on the switch. This setting causes the switch to immediately stop sending multicast packets out a switch port when a host node signals its desire to leave a multicast group by sending a leave request or when the host node stops sending reports. The switch responds by immediately ceasing the transmission of additional multicast packets out the port where the host node is connected.

Multiple Host/Ports (Intermediate)
The Multi-Host setting is appropriate if there is more than one host node connected to a switch port, such as when a port is connected to an Ethernet hub to which multiple host nodes are connected. With this setting selected the switch continues sending multicast packets out a port even after it receives a leave request from a host node on the port. This ensures that the remaining active host nodes on the port continue to receive the multicast packets. Only after all the host nodes connected to a switch port have transmitted leave requests or have timed out does the switch stop sending multicast packets out the port.

If a switch has a mixture of host nodes, that is, some connected directly to the switch and others through an Ethernet hub, you should select the Multi-Host Port (Intermediate) selection.

3 - Host/Router Timeout Interval
Specifies the time period in seconds at which the switch determines that a host node has become inactive. An inactive host node is a node that has not sent an IGMP report during the specified time interval. The range is from 0 second to 86,400 seconds (24 hours). The default is 260 seconds. If you set the timeout to zero (0), the timer never times out, and the timeout interval is essentially disabled.

This parameter also specifies the time interval used by the switch in determining whether a multicast router is still active. The switch makes the determination by watching for queries from the router. If the switch does not detect any queries from a multicast router during the specified time interval, it assumes that the router is no longer active on the port.

When you select a value for this parameter, it is important to note that the value you enter actually defines the approximate mid-point of a range within which a timeout can occur. Consequently, an actual timeout may occur earlier or later than the value that you enter. The range is from 0.7 to 1.4 of your value. For example, if you leave this parameter set to the default 260 seconds, a timeout can occur from 182 seconds to 364 seconds. Also, the last 10 seconds are not aged out regardless of the interval you set. You may need to take this information into account when setting this parameter.

4 - Maximum Multicast Groups
This parameter specifies the maximum number of multicast groups the switch learns. This parameter is useful with networks that contain a large number of multicast groups. You can use the parameter to prevent the switch's MAC address table from filling up with multicast addresses, leaving no room for dynamic or static MAC addresses. The range is 1 to 255 groups. The default is 64 multicast groups.

5 - Multicast Router Port(s)
Specifies the port on the switch to which a multicast router is detected. You can let the switch determine this automatically by selecting Auto Detect, or you can specify the port yourself by entering a port number. To select Auto Detect, enter "0" (zero) for this parameter. You can specify more than one port.

Note
A change to any parameter in this menu is immediately activated on the switch.

Note
Selection 6, View Multicast Hosts List, is described in "Displaying a List of Host Nodes", next. Selection 7, View Multicast Routers List, is described in "Displaying a List of Multicast Routers" on page 360.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

   Your changes are activated immediately on the switch.

Enabling or Disabling IGMP Snooping

To configure IGMP snooping on the switch, perform the following procedure:

1. From the Main Menu, type **6** to select Advanced Configuration.

   The Advanced Configuration menu is shown in Figure 131 on page 354.

2. From the Advanced Configuration menu, type **1** to select IGMP Snooping Configuration.

   The IGMP Snooping Configuration menu is shown in Figure 132 on page 354.

3. From the IGMP Snooping Configuration menu, type **1** to select IFGMP Snooping Status.

   The following message is displayed:

   ```
   IGMP Snooping (E-Enabled, D-Disabled):
   ```

4. Type **E** to enable IGMP Snooping or **D** to disable IGMP Snooping. The default is disabled.

Displaying a List of Host Nodes

You can use the AT-S63 management software to display a list of the multicast groups on a switch, as well as the host nodes. To display the list, perform the following procedure:

1. From the Main Menu, type **6** to select Advanced Configuration.

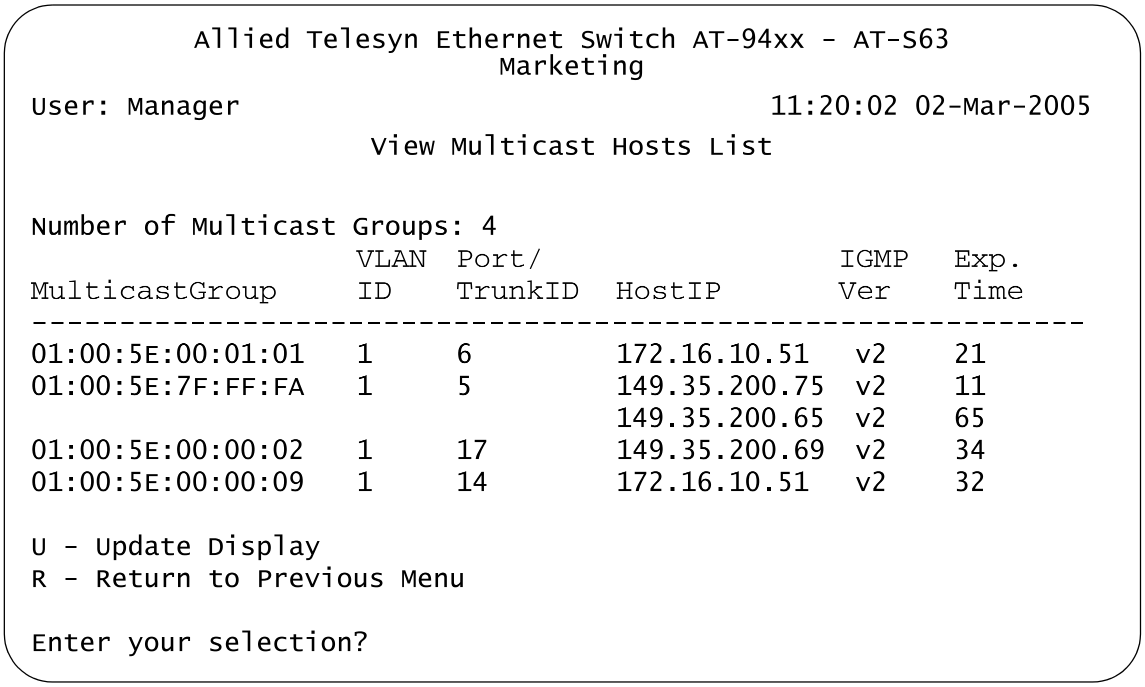
   The Advanced Configuration menu is shown in Figure 131 on page 354

2. From the Advanced Configuration menu, type **1** to select IGMP Snooping Configuration.

   The IGMP Snooping Configuration menu is shown in Figure 132 on page 354.

3. From the IGMP Snooping Configuration menu, type **6** to select View Multicast Hosts List.

   The View Multicast Host List menu is shown in Figure 133.



```
           Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                             Marketing
User: Manager                                 11:20:02 02-Mar-2005
                     View Multicast Hosts List


Number of Multicast Groups: 4
                    VLAN  Port/                   IGMP   Exp.
MulticastGroup      ID    TrunkID  HostIP         Ver    Time
------------------------------------------------------------------
01:00:5E:00:01:01   1     6        172.16.10.51   v2     21
01:00:5E:7F:FF:FA   1     5        149.35.200.75  v2     11
                                   149.35.200.65  v2     65
01:00:5E:00:00:02   1     17       149.35.200.69  v2     34
01:00:5E:00:00:09   1     14       172.16.10.51   v2     32

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 133. View Multicast Hosts List Menu

The View Multicast Hosts List menu displays a table with the following columns of information:

Multicast Group
The multicast address of the group.

VLAN
The VID of the VLAN where the port is an untagged member.

Port/Trunk
The port on the switch where the host node is connected. If the host node is connected to the switch through a trunk, the trunk ID number, not the port number, is displayed.

HostIP
The IP address of the host node connected to the port.

IGMP Ver.
The version of IGMP used by the host.

Exp. Time
The number of seconds remaining before the host is timed out if no further IGMP reports are received from it.

Displaying a List of Multicast Routers

A multicast router is a router that is receiving multicast packets from a multicast application and transmitting the packets to host nodes. You can use the AT-S63 management software to display a list of the multicast routers that are connected to the switch.

To display a list of the multicast routers, perform the following procedure:

1. From the Main Menu, type **6** to select Advanced Configuration.

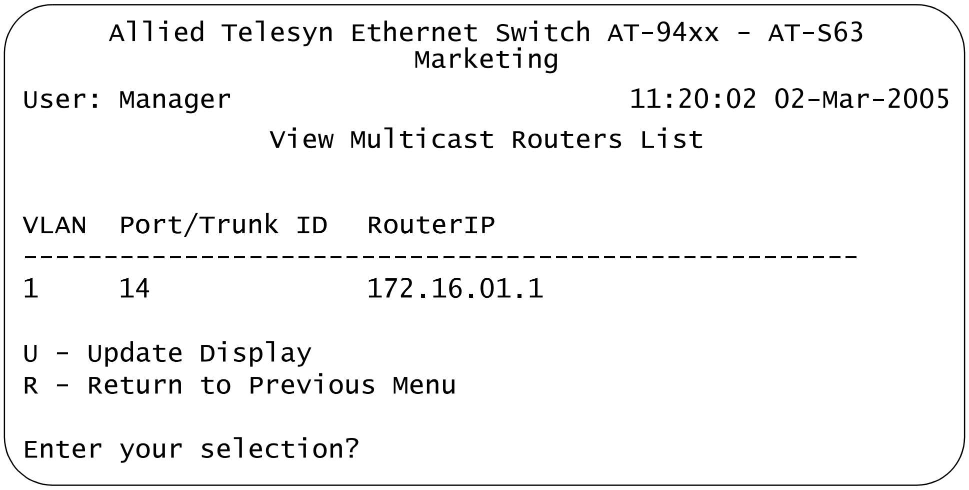
   The Advanced Configuration menu is shown in Figure 131 on page 354

2. From the Advanced Configuration menu, type **1** to select IGMP Snooping Configuration.

   The IGMP Snooping Configuration menu is shown in Figure 132 on page 354.

3. From the IGMP Snooping Configuration menu, type **7** to select View Multicast Routers List.

   The View Multicast Routers List menu is shown in Figure 134.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
               View Multicast Routers List


VLAN  Port/Trunk ID  RouterIP
----------------------------------------------------
1     14             172.16.01.1

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 134. View Multicast Routers List Menu

The View Multicast Routers List menu displays a table that contains the following columns of information:

VLAN
The VID of the VLAN in which the port is an untagged member.

Port/Trunk ID
The port on the switch where the multicast router is connected. If the

switch learned the router on a port trunk, the trunk ID number, not the port number, is displayed.

Router IP
The IP address of the multicast router.

Chapter 19
RRP Snooping

This chapter explains RRP snooping and contains the following sections:

RRP Snooping Overview

The Router Redundancy Protocol (RRP) allows multiple routers to share the same virtual IP address and MAC address. In network topologies where redundant router paths or links exist, the protocol enables routers, through an election process, to designate one as the master router. This router functions as the provider of the primary path between LAN segments. Slave routers function as backup paths in the event that the master router or primary path fails.

Because the master and slave routers are able to share the same virtual IP address and MAC address, a change in data paths does not necessitate adjusting the default gateways on the network nodes that employ the routers. When a slave router transitions to master, it uses the same IP address as the previous master router, making the transition transparent to network end nodes. In large networks, these transparent transitions can save the time and effort of manually reconfiguring default gateway addresses on large numbers of network nodes when a router pathway fails.

RRP snooping on the switch facilitates the transition to a new master router by minimizing the loss of traffic, and so reduces the impact the transition could have on your network traffic. RRP snooping monitors ingress RRP packets, determined by their source MAC address. Source MAC addresses considered by the AT-S63 management software as RRP packets are:

- 00:E0:2B:00:00:80-9F
- 00:A0:D2EB:FF:00
- 00:00:5E:00:01:00-FF

A port receiving an RRP packet is deemed by the switch as the master RRP port. The virtual MAC address of the router is entered as a dynamic address on the port. If the switch starts to receive RRP packets on another port, it assumes that a backup or slave router has made the transition into the role of the new master router.

The switch responds by deleting all dynamic MAC addresses from the MAC address table. As the switch relearns the addresses, the virtual MAC address of the new master router is learned on the new master RRP port, rather than the old port. Any packets received by the switch and destined for the router are forwarded to the new master router.

The following guidelines apply to the RRP snooping feature:

- The default setting for this feature is disabled.
- Activating the feature flushes all dynamic MAC addresses from the MAC address table.
- RRP snooping is supported on ports operating in the MAC security level of automatic. This feature is not supported on ports operating with a security level of limited, secured, or locked.
- RRP snooping is supported on port trunks.

Enabling or Disabling RRP Snooping

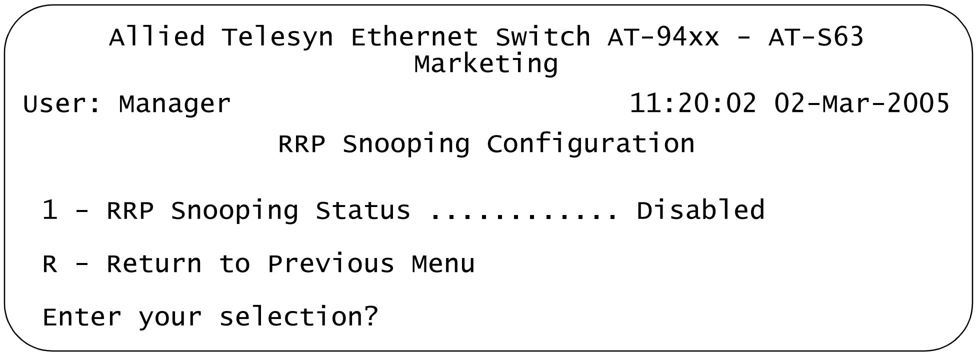
To enable or disable RRP snooping on a switch, perform the following procedure:

1. From the Main Menu, type **6** to select Advanced Configuration.

   The Advanced Configuration menu is shown in Figure 131 on page 354.

2. From the Advanced Configuration menu, type **2** to select RRP Snooping Configuration.

   The RRP Snooping Configuration menu is shown in Figure 135.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
                 RRP Snooping Configuration

 1 - RRP Snooping Status ........... Disabled

 R - Return to Previous Menu

 Enter your selection?
```

Figure 135. RRP Snooping Menu

3. From the RRP Snooping Configuration menu, type **1** to toggle the setting between Enabled and Disabled. The default setting is disabled.

   A change to the status of RRP snooping is immediately activated on the switch.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Section III
SNMPv3

The chapter in this section provides information and procedures for SNMPv3. The chapter is:

Chapter 20
SNMPv3

This chapter provides a description of the AT-S63 implementation of the SNMPv3 protocol. In addition, the chapter contains procedures that allow you to create and modify SNMPv3 entities. The following sections are provided:

SNMPv3 Overview

The SNMPv3 protocol builds on the existing SNMPv1 and SNMPv2c protocol implementation which is described in Chapter 4, “SNMPv1 and SNMPv2c” on page 75. In SNMPv3, User-based Security Model (USM) authentication is implemented along with encryption, allowing you to configure a secure SNMP environment.

In addition, SNMP terminology changes in the SNMPv3 protocol. In the SNMPv1 and SNMPv2c protocols, the terms *agent* and *manager* are used. An agent is an SNMP user while a manager is an SNMP host. In the SNMPv3 protocol, agents and managers are called *entitie*s. In any SNMPv3 communication, there is an authoritative entity and a non-authoritative entity. The authoritative entity checks the authenticity of the non-authoritative entity. And, the non-authoritative entity checks the authenticity of the authoritative entity.

With the SNMPv3 protocol, you create users, determine the protocol used for message authentication as well as determine if data transmitted between two SNMP entities is encrypted. In addition, you can restrict user privileges by determining the user’s view of the Management Information Bases (MIB). In this way, you restrict which MIBs the user can display and modify. In addition, you can restrict the types of messages, or traps, the user can send. (A trap is a type of SNMP message.)

After you have created a user, you define SNMPv3 message notification. This consists of determining where messages are sent and what types of messages can be sent. This configuration is similar to the SNMPv1 and SNMPv2c configuration because you configure IP addresses of trap receivers, or hosts. In addition, with the SNMPv3 implementation you decide what types of messages are sent.

Note
For the SNMP RFCs supported by this release of the AT-S63 software, see “Using an SNMP Network Management Application” on page 31.

This section further describes the features of the SNMPv3 protocol. The following subsections are included:

- ❒ “SNMPv3 Authentication Protocols” on page 371
- ❒ “SNMPv3 Privacy Protocol” on page 371
- ❒ “SNMPv3 MIB Views” on page 372
- ❒ “SNMPv3 Storage Types” on page 373
- ❒ “SNMPv3 Message Notification” on page 373
- ❒ “SNMPv3 Tables” on page 374

❒ "SNMPv3 Configuration Example" on page 378

SNMPv3 Authentication Protocols

The SNMPv3 protocol supports two authentication protocols—HMAC-MD5-96 (MD5) and HMAC-SHA-96 (SHA). Both MD5 and SHA use an algorithm to generate a message digest. Each authentication protocol authenticates a user by checking the message digest. In addition, both protocols use keys to perform authentication. The keys for both protocols are generated locally using the Engine ID, a unique identifier that is assigned to the switch automatically, and the user password. You modify a key only by modifying the user password.

In addition, you have the option of assigning no user authentication. In this case, no authentication is performed for this user. You may want to make this configuration for someone with super-user capabilities.

Note
The keys generated by the MD5 and SHA protocols are specific to the SNMPv3 protocol. They have no relation to the SSL and SSH keys for encryption.

SNMPv3 Privacy Protocol

After you have configured an authentication protocol, you have the option of assigning a privacy protocol if you have the encrypted version of the AT-S63 software. In SNMPv3 protocol terminology, privacy is equivalent to encryption. Currently, the DES protocol is the only encryption protocol supported. The DES privacy protocol requires the authentication protocol to be configured as either MD5 or SHA.

If you assign a DES privacy protocol to a user, then you are also required to assign a privacy password. If you choose to not assign a privacy value, then SNMPv3 messages are sent in plain text format.

SNMPv3 MIB Views

The SNMPv3 protocol allows you to configure MIB views for users and groups. The MIB tree is defined by RFC 1155 (Structure of Management Information). See Figure 136.

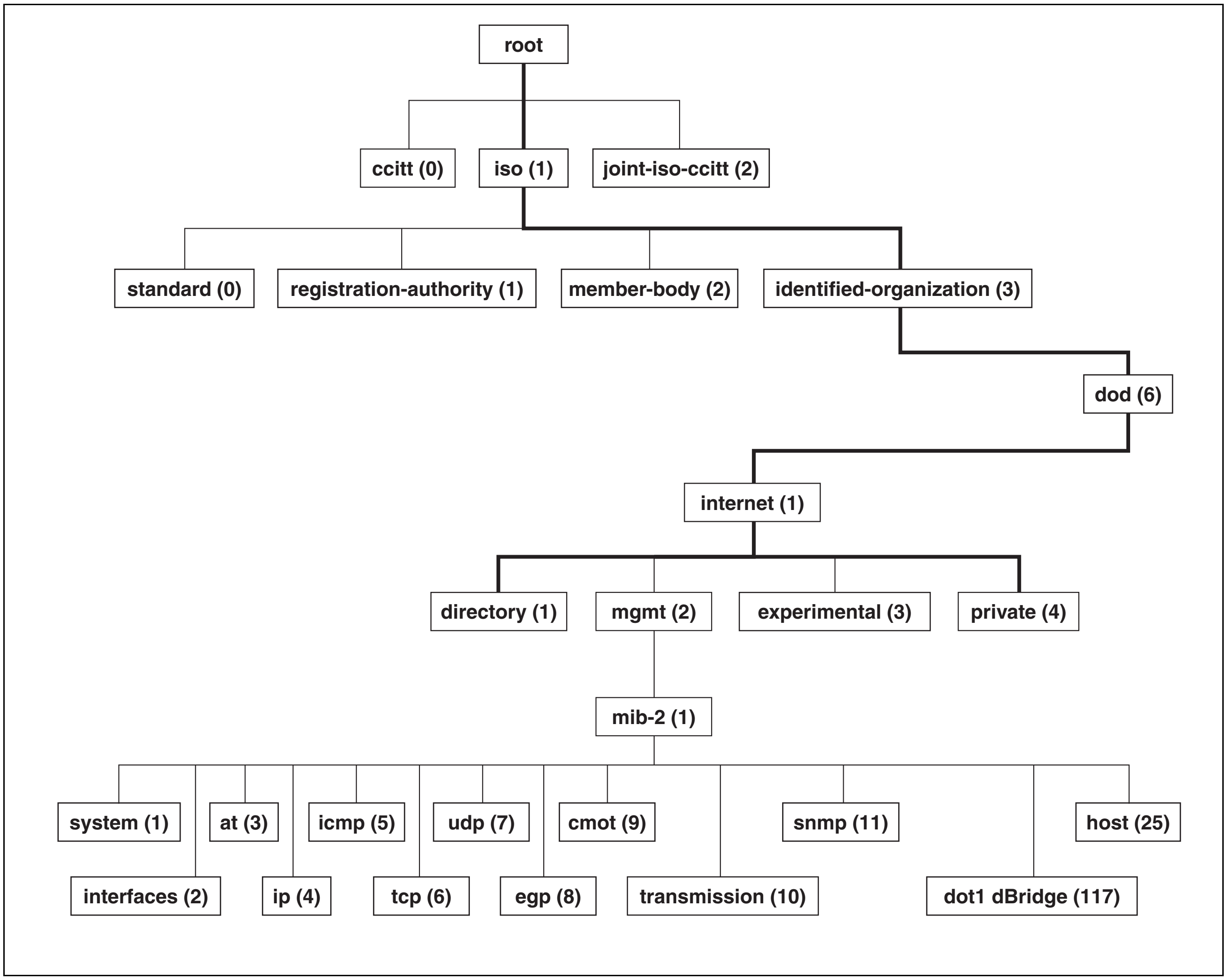


Figure 136. MIB Tree

The AT-S63 software supports the MIB tree, starting with the Internet MIBs, as defined by 1.3.6.1. There are two ways to specify a MIB view. You can enter the OID number of the MIB view or its equivalent text name. For example, to specify MIBs in the Internet view, you can enter the OID format “1.3.6.1” or the text name “internet.”

In addition, you can define a MIB view that the user can access or a MIB view that the user cannot access. When you want to permit a user to access a MIB view, you include a particular view. When you want to deny a user access to a MIB view, you exclude a particular view.

After you specify a MIB subtree view you have the option of further restricting a view by defining a subtree mask. The relationship between a

MIB subtree view and a subtree mask is analogous to the relationship between an IP address and a subnet mask. The switch uses the subnet mask to determine which portion of an IP address represents the network address and which portion represents the node address. In a similar way, the subtree mask further refines the subtree view and enables you to restrict a MIB view to a specific row of the OID MIB table. You need a thorough understanding of the OID MIB table to define a subtree mask.

SNMPv3 Storage Types

Each SNMPv3 table entry has its own storage type. You can choose between nonvolatile storage which allows you to save the table entry or volatile storage which does not allow you to save an entry. If you select the volatile storage type, when you power off the switch your SNMPv3 configuration is lost and cannot be recovered.

At each SNMPv3 menu, you are prompted to configure a storage type. You do not have to configure the same storage type value for each table entry.

SNMPv3 Message Notification

When you generate an SNMPv3 message from the switch, there are three basic pieces of information included in the message:

- The type of message
- The destination of the message
- SNMP security information

To configure the type of message, you need to define if you are sending a Trap or Inform message. Basically, the switch expects a response to an Inform message and the switch does not expect a response to a Trap message. These two message types are defined in the SNMPv3 (RFC 2571-6).

To determine the destination of the message, you configure the IP address of the host. This configuration is similar to the SNMPv1 and SNMPv2c configuration.

The SNMP security information consists of information about the following:

- User
- View of the MIB Tree
- Security Level
- Security Model
- Authentication Level
- Privacy Protocol
- Group

To configure the SNMP security information, you associate a user and its related information—View, Security Level, Security Model, Authentication

Level, Privacy Protocol and Group—with the type of message and the host IP address.

SNMPv3 Tables

The SNMPv3 configuration is neatly divided into configuring SNMPv3 user information and configuring the message notification. You must configure all seven tables to successfully configure the SNMPv3 protocol. You use the following tables for user configuration:

❒ Configure SNMPv3 User Table

❒ Configure SNMPv3 View Table

❒ Configure SNMPv3 Access Table

❒ Configure SNMPv3 SecurityToGroup Table

First, you create a user in the Configure SNMPv3 User Table. Then you define the MIB view this user has access to in the Configure SNMPv3 View Table. To configure a security group and associate a MIB view to a security group, you configure the Configure SNMPv3 Access Table. Finally, configure the Configure SNMPv3 SecurityToGroup menu to associate a user to a security group. See Figure 137 for an illustration of how the user configuration tables are linked.

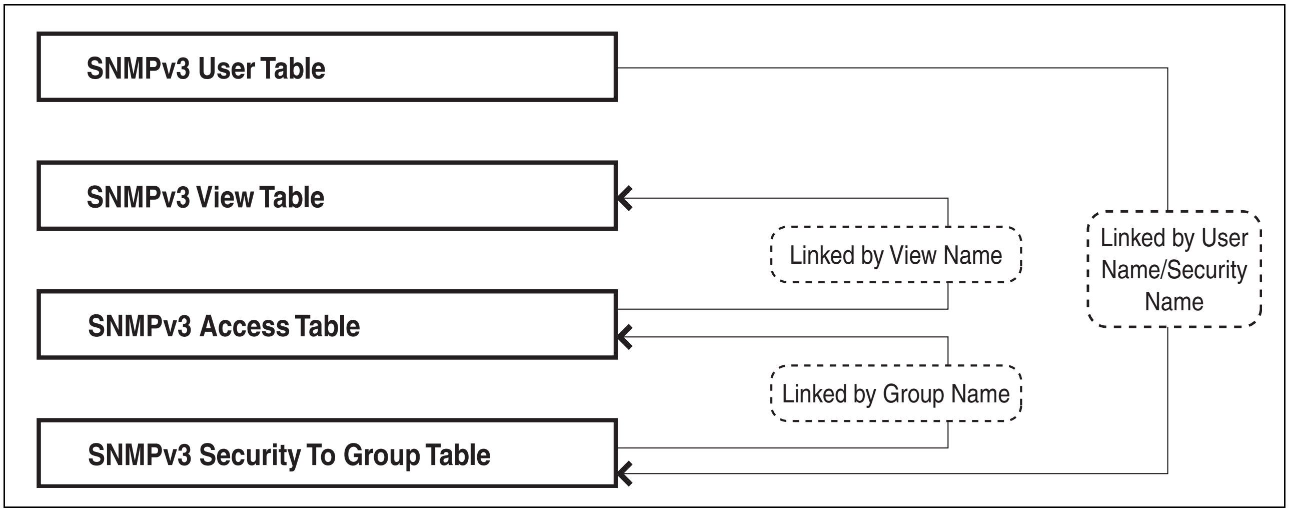


Figure 137. SNMPv3 User Configuration Process

In general, you focus on configuring security groups and then add and delete users from the groups as needed. For example, you may want to have two groups—one for manager privileges and a second one for operator privileges. See Appendix B, “SNMPv3” on page 369 for an example of manager and operator configurations.

After you configure an SNMPv3 user, you need to configure SNMPv3 message notification. This configuration is accomplished with the following tables:

- ❐ Configure SNMPv3 Notify Table
- ❐ Configure SNMPv3 Target Address Table
- ❐ Configure SNMPv3 Target Parameters Table

You start the message notification configuration by defining the type of message you want to send with the SNMPv3 Notify Table. Then you define a IP address that is used for notification in the Configure SNMPv3 Target Address Table. This is the IP address of the SNMPv3 host. Finally, you associate the trap information with a user by configuring the Configure SNMPv3 Target Parameters Table.

See Figure 138 for an illustration of how the message notification tables are linked.

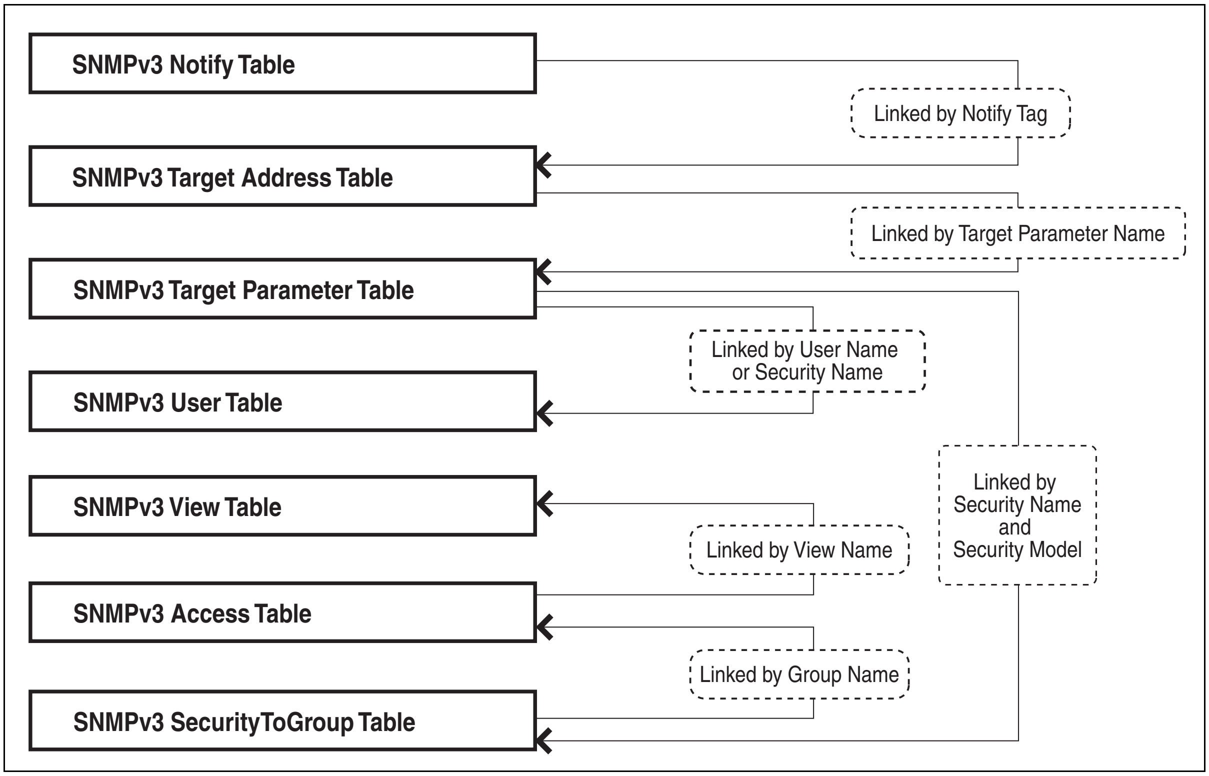

SNMPv3 Notify Table
Linked by Notify Tag
SNMPv3 Target Address Table
Linked by Target Parameter Name
SNMPv3 Target Parameter Table
Linked by User Name or Security Name
SNMPv3 User Table
Linked by Security Name and Security Model
SNMPv3 View Table
Linked by View Name
SNMPv3 Access Table
Linked by Group Name
SNMPv3 SecurityToGroup Table

Figure 138. SNMPv3 Message Notification Process

For a more detailed description of the SNMPv3 Tables, see the following subsections:

- ❐ "SNMPv3 User Table" on page 376
- ❐ "SNMPv3 View Table" on page 376
- ❐ "SNMPv3 SecurityToGroup Table" on page 377
- ❐ "SNMPv3 Notify Table" on page 377
- ❐ "SNMPv3 Target Address Table" on page 377

- ❒ “SNMPv3 Target Parameters Table” on page 377
- ❒ “SNMPv3 Community Table” on page 377

SNMPv3 User Table

The Configure SNMPv3 User Table menu allows you to create an SNMPv3 user and provides the options of configuring authentication and privacy protocols. With the SNMPv3 protocol, users are authenticated when they send and receive messages. In addition, you can configure a privacy protocol and password so messages a user sends and receives are encrypted. The DES privacy algorithm uses the privacy password and the Engine ID to generate a key that is used for encryption. Lastly, you can configure a storage type for this table entry which allows you to save this user and its related configuration to flash memory.

SNMPv3 View Table

The Configure SNMPv3 View Table menu allows you to create a view of the MIB OID Table. First, you configure a view of a subtree. Then you have the option of configuring a Subtree Mask that further refines the subtree view. For example, you can use a Subtree Mask to restrict a user’s view to one row of the MIB OID Table. In addition, you can chose to include or exclude a view. As a result, you can let a user see a particular view or prevent a user from seeing a particular view. Lastly, you can configure a storage type for this table entry which allows you to save this view to flash memory.

SNMPv3 Access Table

The Configure SNMPv3 Access Table menu allows you to configure a security group. After you create a security group, you assign a set of users with the same access privileges to this group using the SNMPv3 SecurityToGroup Table. Consider the types of groups you want to create and the types of access privileges each group will have. In this way, you can more easily keep track of your users as belonging to one or two groups.

For each group, you can assign read, write, and notify views of the MIB table. The views you assign here have been previously defined in the Configure SNMPv3 View Table menu. For example, the Read View allows group members to view the specified portion of the OID MIB table. The Write View allows group members to write to, or modify, the MIBs in the specified MIB view. The Notify View allows group members to send trap messages defined by the MIB view. Lastly, you can configure a storage type for this table entry which allows you to save this view to flash memory.

SNMPv3 SecurityToGroup Table

The Configure SNMPv3 SecurityToGroup Table menu allows you to associate a User Name with a security group called a Group Name. The User Name is previously configured with the Configure SNMPv3 User Table menu. The security group is previously configured with the Configure SNMPv3 Access Table menu. Lastly, you can configure a storage type for this table entry which allows you to save the entry to flash memory.

SNMPv3 Notify Table

The Configure SNMPv3 Notify Table menu allows you to define the type of message that is sent from the switch to the SNMP host. In addition, you have the option of defining the message type as either an Inform or a Trap message. The difference between these two types of messages is that when a switch sends an Inform message, the switch expects a response from the host. In comparison, the switch does not expect the host to respond to Trap messages.

In addition, you define a Notify Tag that links an SNMPv3 Notify Table entry to the host IP address defined in the Configure SNMPv3 Target Address Table menu. Lastly, you can configure a storage type for this table entry which allows you to save the entry to flash memory.

SNMPv3 Target Address Table

The Configure SNMPv3 Target Address Table menu allows you to configure the IP address of the host. Also, in an SNMPv3 Target Address Table entry, you configure the values of the Tag List parameter with the previously defined Notify Tag parameter values. The Notify Tag parameter is configured in the Configure SNMPv3 Notify Table. In this way, the Notify and Target Address tables are linked. Lastly, you can configure a storage type for this table entry which allows you to save the entry to flash memory.

SNMPv3 Target Parameters Table

The Configure SNMPv3 Target Parameters Table menu allows you to define which user can send messages to the host IP address defined in the Configure SNMPv3 Target Address Table. The user and its associated information is previously configured in the Configure SNMPv3 User Table, SNMPv3 View Table, SNMPv3 Access Table, and SNMPv3 SecurityToGroup Table. Lastly, you can configure a storage type for this table entry which allows you to save the entry to flash memory.

SNMPv3 Community Table

The Configure SNMPv3 Community Table menu allows you to configure SNMPv1 and SNMPv2c communities. If you are going to use the SNMPv3

Tables to configure SNMPv1 and SNMPv2c communities, start with the SNMPv3 Community Table. See “Configuring the SNMPv3 Community Table” on page 455.

Note
Allied Telesyn recommends that you use the procedures described in Chapter 4, “SNMPv1 and SNMPv2c” on page 75 to configure the SNMPv1 and SNMPv2c protocols.

SNMPv3 Configuration Example

You may want to have two classes of SNMPv3 users—Managers and Operators. In this scenario, you would configure one group, called Managers, with full access privileges. Then you would configure a second group, called Operators, with monitoring privileges only. For a detailed example of this configuration, see Appendix B, “SNMPv3 Configuration Examples” on page 699.

Configuring SNMPv3 Entities

This section describes how to configure SNMPv3 entities using the SNMPv3 Tables. To successfully configure this protocol, you must perform the procedures in the order given. For overview information about SNMPv3, see the "SNMPv3 Overview" on page 370.

The following SNMPv3 tables are described:

❒ "Configuring the SNMPv3 User Table," next

❒ "Configuring the SNMPv3 View Table" on page 390

❒ "Configuring the SNMPv3 Access Table" on page 399

❒ "Configuring the SNMPv3 SecurityToGroup Table" on page 414

❒ "Configuring the SNMPv3 Notify Table" on page 422

❒ "Configuring the SNMPv3 Target Address Table" on page 429

❒ "Configuring the SNMPv3 Target Parameters Table" on page 442

❒ "Configuring the SNMPv3 Community Table" on page 455

The SNMPv3 User, View, Access, and SecurityToGroup tables are concerned with setting up a user, determining authentication and privacy, and associating a user to a security group. The SNMPv3 Notify, Target Address, and Target Parameters tables are concerned with message notification. You use the SNMPv3 Community Table to configure SNMPv1 and SNMPv2 communities.

Due to the complexity of the SNMPv3 configuration, Allied Telesyn recommends that you configure the SNMPv3 protocol with the procedures listed above, in the order they are listed. However, you can configure the SNMPv3 protocol using the above procedures in any order.

Configuring the SNMPv3 User Table

This section contains a description of the SNMPv3 User Table and how to create, delete, and modify table entries. Configure the SNMPv3 User Table first. Creating this table, allows you to create an entry in an SNMPv3 User Table for a User Name. In addition, this table allows you to associate a User Name with the following parameters:

- ❒ Authentication protocol
- ❒ Authentication password
- ❒ Privacy protocol
- ❒ Privacy password

There are three functions you can perform with the SNMPv3 User Table.

- ❒ “Creating an SNMPv3 User Table Entry,” next
- ❒ “Deleting an SNMPv3 User Table Entry” on page 384
- ❒ “Modifying an SNMPv3 User Table Entry” on page 384

Creating an SNMPv3 User Table Entry

To create an entry in the SNMPv3 User Table, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

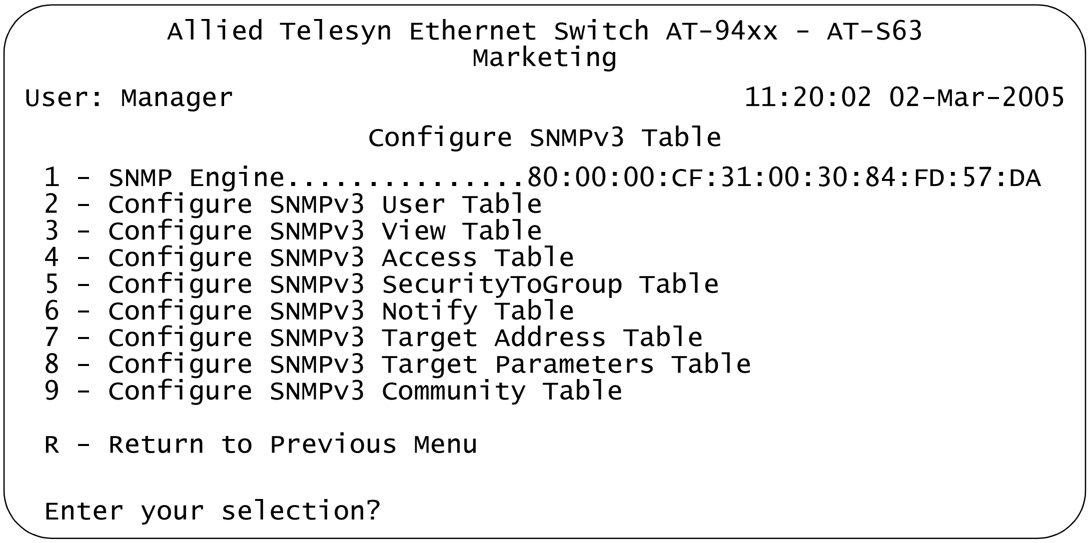
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **5** to select SNMP Configuration.

   The SNMP Configuration menu is shown in Figure 16 on page 79.

3. From the SNMP Configuration menu, type **5** to select Configure SNMPv3 Table.

The Configure SNMPv3 Table menu is shown in Figure 139.



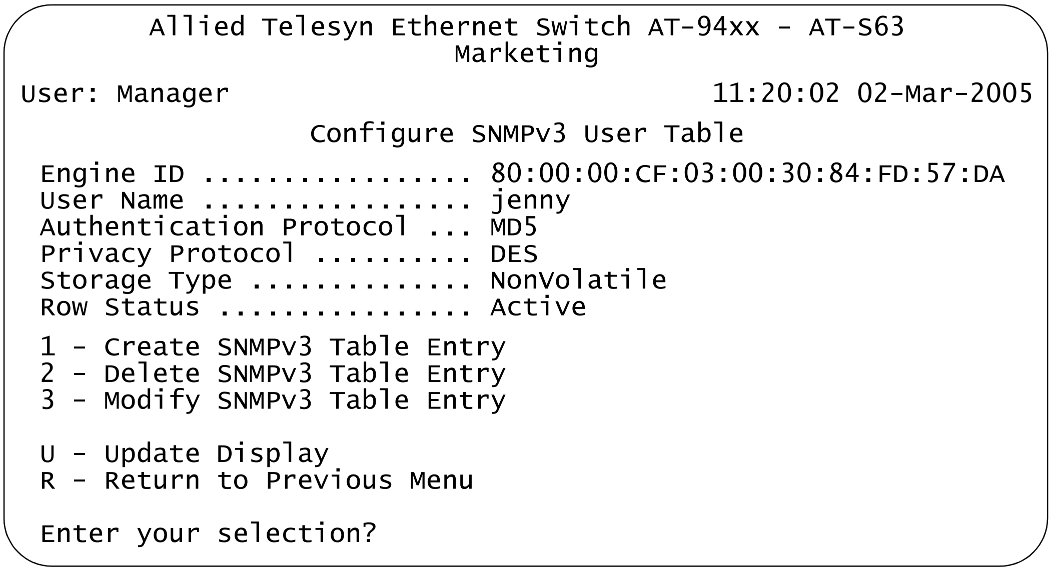
```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                                11:20:02 02-Mar-2005
                     Configure SNMPv3 Table
 1 - SNMP Engine...............80:00:00:CF:31:00:30:84:FD:57:DA
 2 - Configure SNMPv3 User Table
 3 - Configure SNMPv3 View Table
 4 - Configure SNMPv3 Access Table
 5 - Configure SNMPv3 SecurityToGroup Table
 6 - Configure SNMPv3 Notify Table
 7 - Configure SNMPv3 Target Address Table
 8 - Configure SNMPv3 Target Parameters Table
 9 - Configure SNMPv3 Community Table

 R - Return to Previous Menu

 Enter your selection?
```

Figure 139. Configure SNMPv3 Table Menu

Note
The SNMP Engine field is a read-only field. You cannot change the setting. The field displays the SNMP engine identifier that is assigned automatically to the switch.

4. From the Configure SNMPv3 Table menu, type **2** to select Configure SNMPv3 User Table.

   The Configure SNMPv3 User Table menu is shown in Figure 140.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                                11:20:02 02-Mar-2005
                  Configure SNMPv3 User Table
 Engine ID ................ 80:00:00:CF:03:00:30:84:FD:57:DA
 User Name ................ jenny
 Authentication Protocol ... MD5
 Privacy Protocol .......... DES
 Storage Type .............. NonVolatile
 Row Status ................ Active

 1 - Create SNMPv3 Table Entry
 2 - Delete SNMPv3 Table Entry
 3 - Modify SNMPv3 Table Entry

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 140. Configure SNMPv3 User Table Menu

5. To create a new user table, type **1** to select Create SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter User (Security) Name:
   ```

6. Enter a descriptive name of the user.

   You can enter a name that consists of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Authentication Protocol [M-MD5, S-SHA, N-None]:
   ```

7. Enter one of the following:

   M-MD5
   This value represents the MD5 authentication protocol. With this selection, users (SNMP entities) are authenticated with the MD5 authentication protocol after a message is received. This algorithm generates the message digest. The user is authenticated when the authentication protocol checks the message digest. With the MD5 selection, you can configure a Privacy Protocol.

   S-SHA
   This value represents the SHA authentication protocol. With this selection, users are authenticated with the SHA authentication protocol after a message is received. This algorithm generates the message digest. The user is authenticated when the authentication protocol checks the message digest. With the SHA selection, you can configure a Privacy Protocol.

   N-None
   This value represents no authentication protocol. When messages are received, users are not authenticated. With the None selection, you cannot configure a Privacy Protocol.

   Note
   You may want to assign NONE to a super user.

   If you select NONE, you are prompted for the Storage Type. Go to Step 13.

   If you select MD5 or SHA, the following prompt is displayed:

   ```
   Enter Authentication Password:
   ```

8. Enter an authentication password of up to 32 alphanumeric characters and press Return.

You are prompted to re-enter the password.

The following prompt is displayed:

```
Enter Privacy Protocol [D-DES, N-None]:
```

Note
You can only configure the Privacy Protocol if you have configured the Authentication Protocol with the MD5 or SHA values.

9. Select one of the following options:

   D -DES
   Select this value to make the DES privacy (or encryption) protocol the privacy protocol for this User Table entry. With this selection, messages transmitted between the host and the switch are encrypted with the DES protocol.

   N -None
   Select this value if you do not want a privacy protocol for this User Table entry. With this selection, messages transmitted between the host and the switch are not encrypted.

   If you select NONE, you are prompted for the Storage Type. Go to Step 13.

   If you select DES, the following prompt is displayed:

   ```
   Enter Privacy Password:
   ```

10. Enter a privacy password of up to 32 alphanumeric characters.

    You are prompted to re-enter the password.

    The following prompt is displayed:

    ```
    Enter Storage Type [V-Volatile, N-NonVolatile]:
    ```

11. Select one of the following storage types for this table entry:

    V - Volatile
    Select this storage type if you do not want the ability to save an entry in the SNMPv3 User Table to nonvolatile memory. After making changes to an SNMPv3 User Table entry with a Volatile storage type, the **S** - Save Configuration Changes option does not appear on the Main Menu.

    N-NonVolatile
    Select this storage type if you want the ability to save an entry in the SNMPv3 User Table to nonvolatile memory. After making changes to an SNMPv3 User Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu,

allowing you to save your changes. Allied Telesyn recommends this storage type.

Note
The Row Status parameter is a read-only field. The Active value indicates the SNMPv3 User Table entry takes effect immediately.

12. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting an SNMPv3 User Table Entry

You may want to delete an entry from the SNMPv3 User Table. When you delete an entry in the SNMPv3 User Table, there is no way to undelete, or recover the entry.

To delete an entry in the SNMPv3 User Table, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Configuring the SNMPv3 User Table” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **2** to select Configure SNMPv3 User Table.

   The SNMPv3 User Table is shown in Figure 140 on page 381.

3. From the SNMPv3 User Table, type **2** to select Delete SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter User (Security) Name:
   ```

4. Enter the User Name of the User Table entry you want to delete.

   The following prompt is displayed:

   ```
   Do you want to delete this table entry? (Y/N):[Yes/No]->
   ```

5. Enter **Y** to delete the user or **N** to save the user.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an SNMPv3 User Table Entry

This section describes how to modify parameters in an SNMPv3 Notify Table entry. See the following procedures:

❐ “Modifying the Authentication Protocol and Password” on page 385

❐ “Modifying the Privacy Protocol and Password” on page 387

❐ “Modifying the Storage Type” on page 388

Modifying the Authentication Protocol and Password

To modify the Authentication Protocol and Password in an SNMPv3 User Table entry, perform the following procedure.

7. Follow steps 1 through 5 in the procedure described in “Configuring the SNMPv3 User Table” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

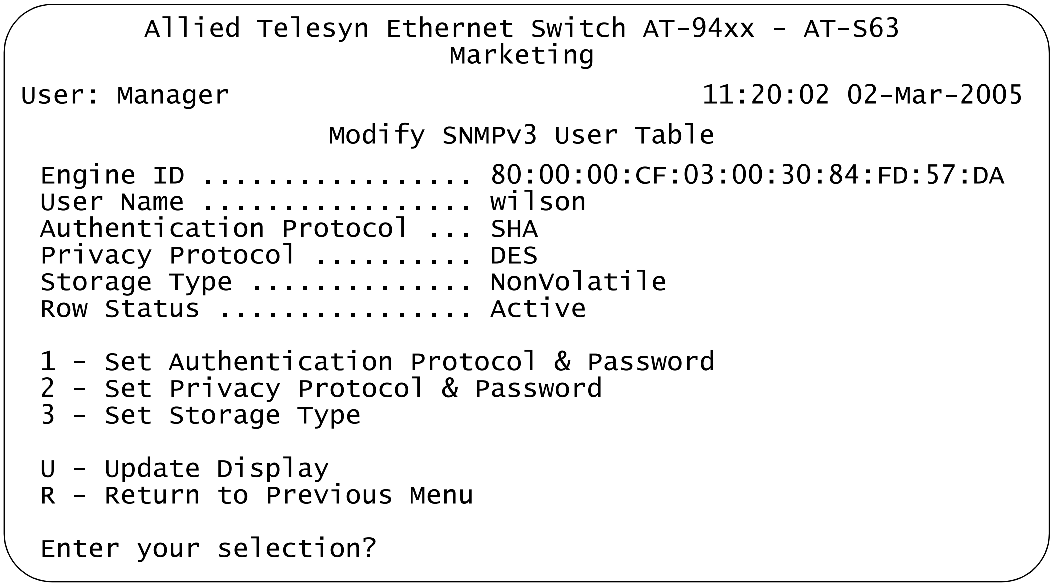
   The Configure SNMPv3 User Table menu is shown in Figure 139 on page 381.

8. From the Configure SNMPv3 Table menu, type **2** to select Configure SNMPv3 User Table.

   The SNMPv3 User Table is shown in Figure 140 on page 381.

9. From the SNMPv3 User Table, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 User Table is shown in Figure 141.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                           11:20:02 02-Mar-2005
                 Modify SNMPv3 User Table
 Engine ID ................ 80:00:00:CF:03:00:30:84:FD:57:DA
 User Name ................ wilson
 Authentication Protocol ... SHA
 Privacy Protocol ......... DES
 Storage Type ............. NonVolatile
 Row Status ............... Active

 1 - Set Authentication Protocol & Password
 2 - Set Privacy Protocol & Password
 3 - Set Storage Type

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 141. Modify SNMPv3 User Table Menu

10. To change the authentication protocol and password, type **1** to select Set Authentication Protocol & Password.

    The following prompt is displayed:

    ```
    Enter User Name:
    ```

11. Enter the User Name of the User Table you want to modify.

    The following prompt is displayed:

    ```
    Enter Authentication Protocol [M-MD5, S-SHA, N-None]:
    ```

12. Enter one of the following:

    M-MD5
    This value represents the MD5 authentication protocol. With this selection, users (SNMP entities) are authenticated with the MD5 authentication protocol after a message is received. This algorithm generates the message digest. The user is authenticated when the authentication protocol checks the message digest. With the MD5 selection, you can configure a Privacy Protocol.

    S-SHA
    This value represents the SHA authentication protocol. With this selection, users are authenticated with the SHA authentication protocol after a message is received. This algorithm generates the message digest. The user is authenticated when the authentication protocol checks the message digest. With the SHA selection, you can configure a Privacy Protocol.

    N-None
    This value represents no authentication protocol. When messages are received, users are not authenticated. With the None selection, you cannot configure a Privacy Protocol.

    If you select None, go to step 9.

    If you select MD5 or SHA, the following prompt is displayed:

    ```
    Enter Authentication Password:
    ```

13. Enter an authentication password of up to 32 alphanumeric characters.

    The following prompt is displayed:

    ```
    Re-enter Authentication password:
    ```

14. Re-enter the password.

    The following message is displayed:

    ```
    Authentication protocol algorithm has been changed.
    ```

    The following prompt is displayed:

    ```
    Please enter privacy password to regenerate privacy key.
    ```

15. Enter the Privacy Password for this User Name.

    The following prompt is displayed:

```
Re-enter Privacy password:
```

16. Re-enter the password.

17. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Privacy Protocol and Password

To modify the Privacy Protocol and Password in an SNMPv3 User Table entry, perform the following procedure.

> **Note**
> You can only configure the Privacy Protocol if you have configured the Authentication Protocol with the MD5 or SHA values.

1. Follow steps 1 through 5 in the procedure described in "Configuring the SNMPv3 User Table" on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 User Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **2** to select Configure SNMPv3 User Table.

   The SNMPv3 User Table is shown in Figure 140 on page 381.

3. From the SNMPv3 User Table, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Table menu is shown in Figure 141 on page 385.

4. Type **2** to select Privacy Protocol & Password.

   The following prompt is displayed:

   ```
   Enter User (Security) Name:
   ```

5. Enter the User Name.

   The following prompt is displayed:

   ```
   Enter Privacy Protocol [D-DES, N-None]:
   ```

6. Choose one of the following Privacy Protocols:

   D -DES
   Select this value to make the DES privacy (or encryption) protocol the privacy protocol for this User Table entry. With this selection,

messages transmitted between the host and the switch are encrypted with the DES protocol.

N -None
Select this value if you do not want a privacy protocol for this User Table entry. With this selection, messages transmitted between the host and the switch are not encrypted.

If you select None, proceed to step 9.

If you select DES, the following prompt is displayed:

```
Enter Privacy Password:
```

7. Enter a privacy password of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Re-enter Authentication password:
   ```

8. Re-enter the password.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Storage Type

To modify the Storage Type in an SNMPv3 User Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Configuring the SNMPv3 User Table” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 User Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **2** to select Configure SNMPv3 User Table.

   The SNMPv3 User Table is shown in Figure 140 on page 381.

3. From the SNMPv3 User Table, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Table menu is shown in Figure 141 on page 385.

4. To change the storage type, type **3** to select Set Storage Type.

   The following prompt is displayed:

   ```
   Enter User (Security) Name:
   ```

5. Enter the User Name.

   The following prompt is displayed:

   ```
   Enter Storage Type [V-Volatile, N-NonVolatile]:
   ```

6. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 User Table to nonvolatile memory. After making changes to an SNMPv3 User Table entry with a Volatile storage type, the **S** - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 User Table to nonvolatile memory. After making changes to an SNMPv3 User Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring the SNMPv3 View Table

This section contains a description of the SNMPv3 View Table and how to create, delete, and modify table entries. Creating this table, allows you to specify a view using the following parameters:

❒ Subtree OID

❒ Subtree Mask

❒ MIB OID Table View

To configure the SNMPv3 View Table, you need to be very familiar with the OID table. You can be very specific about the view a user can or cannot access—down to a column or row of the table. AT-S63 supports the Internet subtree of the OID table.

There are three functions you can perform with the SNMPv3 User Table:

❒ “Creating an SNMPv3 View Table Entry,” next

❒ “Deleting an SNMPv3 View Table Entry” on page 393

❒ “Modifying an SNMPv3 View Table Entry” on page 394

Creating an SNMPv3 View Table Entry

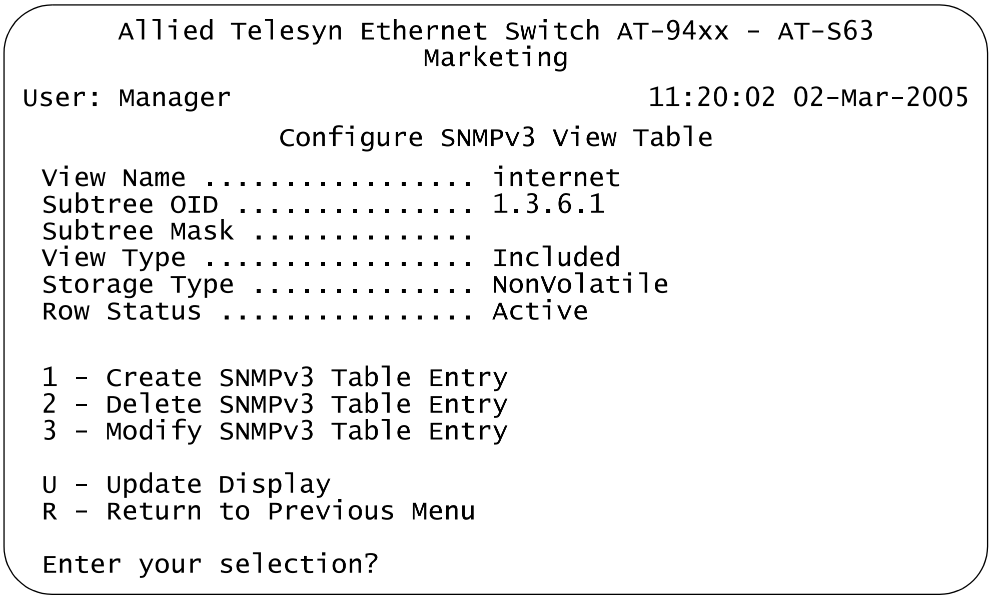
To create an entry in the SNMPv3 View Table, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **3** to select Configure SNMPv3 View Table.

The Configure SNMPv3 View Table menu is shown in Figure 142.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                           11:20:02 02-Mar-2005
                Configure SNMPv3 View Table
 View Name ................. internet
 Subtree OID ............... 1.3.6.1
 Subtree Mask ..............
 View Type ................. Included
 Storage Type .............. NonVolatile
 Row Status ................ Active


 1 - Create SNMPv3 Table Entry
 2 - Delete SNMPv3 Table Entry
 3 - Modify SNMPv3 Table Entry

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 142. Configure SNMPv3 View Table Menu

3. From the Configure SNMPv3 View Table menu, type **1** to select Create SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter View Name:
   ```

4. Enter a descriptive name of this View.

   Enter a unique name of up to 32 alphanumeric characters.

   Note
   The "defaultViewAll" value is the default entry for the SNMPv1 and SNMPv2c configuration. You cannot use the default value for an SNMPv3 View Table entry.

   The following prompt is displayed:

   ```
   Enter View Subtree (OID format/Text Name):
   ```

5. Enter the subtree that this view will or will not be permitted to display.

   You can enter either a numeric value in hex format or the equivalent text name. For example, the OID hex format for TCP/IP is:

   ```
   1.3.6.1.2.1.6
   ```

   The text format is for TCP/IP is:

```
tcp
```

The following prompt is displayed:

```
Enter Subtree Mask (Hex format):
```

6. Enter a subtree mask in hexadecimal format.

   This is an optional parameter that is used to further refine the value in the View Subtree parameter. This parameter is in binary format.

   The relationship between a subtree mask and a subtree is similar to the relationship between an IP address and a subnet mask. The subnet mask further refines the IP address. In the same way, the OID table entry defines a MIB View and the subtree mask further restricts a user's view to a specific the column and row of the MIB View. The value of the Subnet Mask parameter is dependent on the subtree you select. For example, if you configure the View Subtree parameter as MIB, ifEntry.0.3 has the following value:

   ```
   1.3.6.1.2.1.2.2.1.0.3
   ```

   To restrict the user's view to the third row (all columns) of the ifEntry MIB, enter the following value for the Subtree Mask parameter

   ```
   ff:bf
   ```

   The following prompt is displayed:

   ```
   Enter View Type [I-Included, E-Excluded]:
   ```

7. Enter one of the following view types:

   I - Included
   Enter this value to permit the View Name to see the subtree specified above.

   E - Excluded
   Enter this value to not permit the View Name to see the subtree specified above.

   The following prompt is displayed:

   ```
   Enter Storage Type [V-Volatile, N-NonVolatile]:
   ```

8. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 View Table to the configuration file. After making changes to an SNMPv3 View Table entry with a Volatile storage type, the **S -** Save Configuration Changes option does not appear on the Main Menu.

N-NonVolatile
Select this storage type if you want the ability to save an entry in the SNMPv3 View Table to the configuration file. After making changes to an SNMPv3 View Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

> **Note**
> The Row Status parameter is a read-only field. The Active value indicates the SNMPv3 View Table entry takes effect immediately.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting an SNMPv3 View Table Entry

You may want to delete an entry from the SNMPv3 View Table. After you delete an SNMPv3 View Table entry, there is no way to undelete, or recover the entry.

To delete an entry in the SNMPv3 View Table, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **3** to select Configure SNMPv3 View Table.

   The SNMPv3 View Table is shown in Figure 142 on page 391.

3. From the SNMPv3 View Table, type **2** to select Delete SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter View Name:
   ```

4. Enter the View Name of the View Table entry you want to delete.

   The following prompt is displayed:

   ```
   Enter View Subtree (OID format/Text Name):
   ```

5. Enter the subtree for this view.

   ```
   Do you want to delete this table entry? (Y/N):[Yes/No]->
   ```

6. Enter **Y** to delete the view or **N** to save the view.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an SNMPv3 View Table Entry

This section describes how to modify parameters in an SNMPv3 Notify Table entry. See the following procedures:

- ❒ “Modifying a Subtree Mask” on page 394
- ❒ “Modifying a View Type” on page 396
- ❒ “Modifying a Storage Type” on page 397

Modifying a Subtree Mask

To modify the Subtree Mask parameter in an SNMPv3 View Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

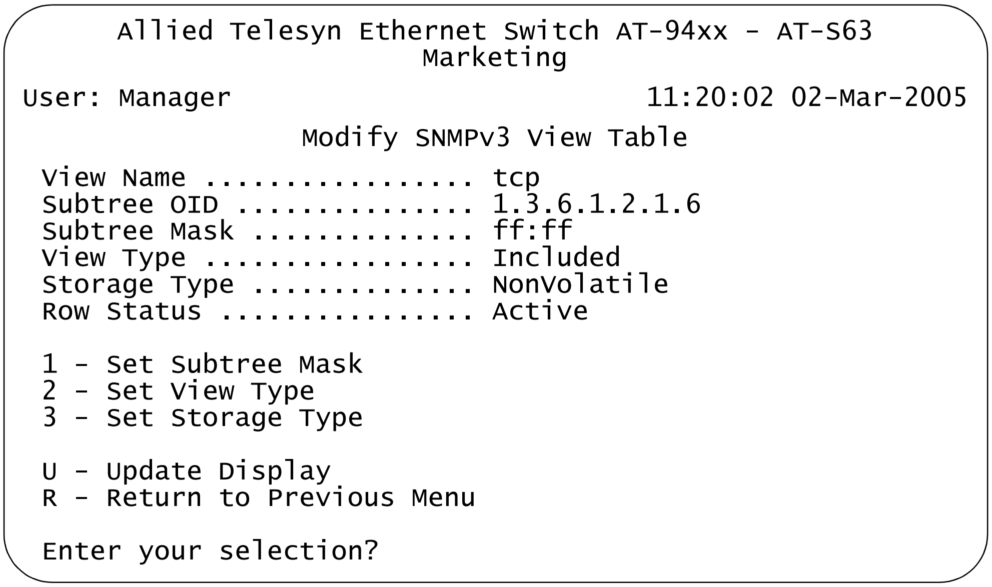
   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **3** to select Configure SNMPv3 View Table.

   The Configure SNMPv3 View Table menu is shown in Figure 142 on page 391.

3. From the Configure SNMPv3 View Table menu, type **3** to select Modify SNMPv3 Table Entry.

The Modify SNMPv3 View Table menu is shown in Figure 143.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                              11:20:02 02-Mar-2005
                   Modify SNMPv3 View Table
 View Name ................ tcp
 Subtree OID .............. 1.3.6.1.2.1.6
 Subtree Mask ............. ff:ff
 View Type ................ Included
 Storage Type ............. NonVolatile
 Row Status ............... Active

 1 - Set Subtree Mask
 2 - Set View Type
 3 - Set Storage Type

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 143. Modify SNMPv3 View Table Menu

4. To modify the Subtree Mask for this view, type **1** to select Set Subtree Mask.

   The following prompt is displayed:

   ```
   Enter View Name:
   ```

5. Enter an existing View Name.

   The following prompt is displayed:

   ```
   Enter View Subtree (OID format/Text Name):
   ```

6. Enter Subtree that this view will or will not be permitted to display.

   You can enter either a numeric value in hex format or the equivalent text name. For example, the OID hex format for TCP/IP is:

   ```
   1.3.6.1.2.1.6
   ```

   The text format is for TCP/IP is:

   ```
   tcp
   ```

   The following prompt is displayed:

   ```
   Enter Subtree Mask (Hex format):
   ```

7. Enter a Subtree Mask in hexadecimal format.

This is an optional parameter that is used to further refine the value in the View Subtree parameter. This parameter is in binary format.

A subtree mask and a subtree have a similar relationship as an IP address and a subnet mask. The subnet mask further refines the IP address. In the same way, the OID table entry defines a MIB View and the subtree mask further restricts a user's view to a specific the column and row of the MIB View. The value of the Subnet Mask parameter is dependent on the subtree you select. For example, if you configure the View Subtree parameter as MIB, ifEntry.0.3 has the following value:

```
1.3.6.1.2.1.2.2.1.0.3
```

To restrict the user's view to the third row (all columns) of the ifEntry MIB, enter the following value for the Subtree Mask parameter:

```
ff:bf
```

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a View Type

To modify the View Type parameter in an SNMPv3 View Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in "Creating an SNMPv3 User Table Entry" on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **3** to select Configure SNMPv3 View Table.

   The Configure SNMPv3 View Table menu is shown in Figure 142 on page 391.

3. From the Configure SNMPv3 View Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Table menu is shown in Figure 143 on page 395.

4. To modify the View Type, type **2** to select Set View Type.

   The following prompt is displayed:

   ```
   Enter View Name:
   ```

5. Enter a View Name that was previously configured.

The following prompt is displayed:

```
Enter View Subtree (OID format/Text Name):
```

6. Enter the View Subtree value for this View Name.

   You can enter either a numeric value in hex format or the equivalent text name. For example, the OID hex format for TCP/IP is:

   ```
   1.3.6.1.2.1.6
   ```

   The text format is for TCP/IP is:

   ```
   tcp
   ```

   The following prompt is displayed:

   ```
   Enter View Type [I-Included, E-Excluded]:
   ```

7. Choose one of the following view types:

   I - Included
   Enter this value to permit the View Name to see the subtree specified above.

   E - Excluded
   Enter this value to not permit the View Name to see the subtree specified above.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a Storage Type

To modify the Storage Type parameter in an SNMPv3 View Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **3** to select Configure SNMPv3 View Table.

   The Configure SNMPv3 View Table menu is shown in Figure 142 on page 391.

3. From the Configure SNMPv3 View Table menu, type **3** to select Modify SNMPv3 Table Entry.

The Modify SNMPv3 Table menu is shown in Figure 143 on page 395.

4. To modify the storage type, type **3** to select Set Storage Type.

   The following prompt is displayed:

   ```
   Enter View Name:
   ```

5. Enter the View Name you want to modify.

   The following prompt is displayed:

   ```
   Enter View Subtree (OID format/Text Name):
   ```

6. Enter the View Subtree for this View Name.

   The following prompt is displayed:

   ```
   Enter Storage Type [V-Volatile, N-Nonvolatile]:
   ```

7. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 View Table to the configuration file. After making changes to an SNMPv3 View Table entry with a Volatile storage type, the **S** - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 View Table to the configuration file. After making changes to an SNMPv3 View Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring the SNMPv3 Access Table

This section contains a description of the SNMPv3 Access Table and how to create, delete, and modify table entries. The SNMPv3 Access Table allows you to configure a security group. Each user must belong to a security group. After you have configured a security group, use the SecurityToGroup Table to assign users to security groups. See “Creating an SNMPv3 SecurityToGroup Table Entry” on page 414.

For each security group, you can assign the following attributes:

- a Security Model (SNMPv1, SNMPv2c, SNMPv3)
- Read, write, and notify views
- A security level
- A storage type

Before you begin this procedure, you will need to configure entries in the View Table. These values are used to configure the Read, Write, and Notify View parameters in this procedure. See “Configuring the SNMPv3 View Table” on page 390.

There are three functions you can perform with the SNMPv3 Access Table.

- “Creating an SNMPv3 Access Table Entry,” next
- “Deleting an SNMPv3 Access Table Entry” on page 403
- “Modifying an SNMPv3 Access Table Entry” on page 405

Creating an SNMPv3 Access Table Entry

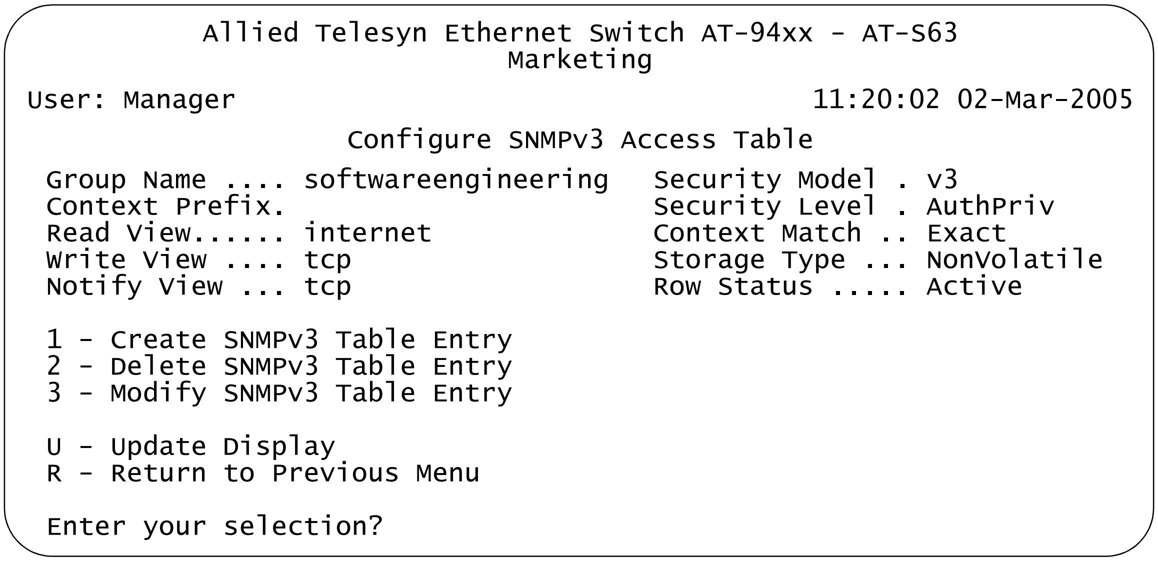
To create an entry in the SNMPv3 Access Table, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **4** to select Configure SNMPv3 Access Table.

The Configure SNMPv3 Access Table menu is shown in Figure 144.



```
           Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                Marketing
User: Manager                                      11:20:02 02-Mar-2005
                      Configure SNMPv3 Access Table
 Group Name .... softwareengineering   Security Model . v3
 Context Prefix.                       Security Level . AuthPriv
 Read View...... internet              Context Match .. Exact
 Write View .... tcp                   Storage Type ... NonVolatile
 Notify View ... tcp                   Row Status ..... Active

 1 - Create SNMPv3 Table Entry
 2 - Delete SNMPv3 Table Entry
 3 - Modify SNMPv3 Table Entry

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 144. Configure SNMPv3 Access Table Menu

3. To create a group in the SNMPv3 Access Table, type **1** to select Create SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter Group Name:
   ```

4. Enter a descriptive name of the group. The Group Name can consist of up to 32 alphanumeric characters.

   The Group Name can consist of up to 32 alphanumeric characters.

   You are not required to enter a unique value here because the SNMPv3 Access Table entry is index with the Group Name, Security Model, and Security Level parameter values. However, unique group names allow you to more easily distinguish the groups.

   There are four default values for this field:

   ❒ defaultV1GroupReadOnly

   ❒ defaultV1GroupReadWrite

   ❒ defaultV2cGroupReadOnly

   ❒ defaultV2cGroupReadWrite

   These values are reserved for SNMPv1 and SNMPv2c implementations.

Note
The Context Prefix and the Context Match fields are a read only fields. The Context Prefix field is always set to null. The Context Match field is always set to exact.

The following prompt is displayed:

```
Enter Security Model [1-v1, 2-v2c, 3-v3]:
```

5. Select one of the following SNMP protocols as the Security Model for this Group Name.

   1-v1
   Select this value to associate the Group Name with the SNMPv1 protocol.

   2-v2c
   Select this value to associate the Group Name with the SNMPv2c protocol.

   3-v3
   Select this value to associate the Group Name with the SNMPv3 protocol. The SNMPv3 protocol allows you to configure the group to authenticate SNMPv3 entities (users) and encrypt messages.

   The following prompt is displayed:

   ```
   Enter Security Level [N-NoAuthNoPriv, A-AuthNoPriv,
   P-AuthPriv]:
   ```

6. Select one of the following security levels:

   N-NoAuthNoPriv
   This option represents no authentication and no privacy protocol. Select this security level if you do not want to authenticate SNMP entities and you do not want to encrypt messages using a privacy protocol. This security level provides the least security.

   Note
   If you have selected SNMPv1 or SNMPv2c, N-NoAuthNoPriv is the only security level you can select.

   A-AuthNoPriv
   This option represents authentication, but no privacy protocol. Select this security level if you want to authenticate SNMP users, but you do not want to encrypt messages using a privacy protocol.You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

P-AuthPriv
This option represents authentication and the privacy protocol. Select this security level to encrypt messages using a privacy protocol and authenticate SNMP entities. This level provides the greatest level of security. You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

The following prompt is displayed:

```
Enter Read View Name:
```

7. Enter a value that you configured with the View Name parameter in the SNMPv3 View Table.

   A Read View Name allows the users assigned to this Group Name to view the information specified by the View Table entry. This value does not need to be unique.

   The following prompt is displayed:

   ```
   Enter Write View Name:
   ```

8. Enter a value that you configured with the View Name parameter in the SNMPv3 View Table.

   A Write View Name allows the users assigned to this Security Group to write, or modify, the information in the specified View Table. This value does not need to be unique.

   The following prompt is displayed:

   ```
   Enter Notify View Name:
   ```

9. Enter a value that you configured with the View Name parameter in the SNMPv3 View Table.

   A Notify View Name allows the users assigned to this Group Name to send traps permitted in the specified View. This value does not need to be unique.

   The following prompt is displayed:

   ```
   Enter Storage Type [V-Volatile, N-NonVolatile]:
   ```

10. Select one of the following storage types for this table entry:

    V - Volatile
    Select this storage type if you do not want the ability to save an entry in the SNMPv3 Access Table to the configuration file. After making changes to an SNMPv3 Access Table entry with a Volatile storage type, the
    S - Save Configuration Changes option does not appear on the Main Menu.

N-NonVolatile
Select this storage type if you want the ability to save an entry in the SNMPv3 Access Table to the configuration file. After making changes to an SNMPv3 Access Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

Note
The Row Status parameter is a read-only field. The Active value indicates the SNMPv3 Access Table entry will take effect immediately.

11. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting an SNMPv3 Access Table Entry

You may want to delete an entry from the SNMPv3 Access Table. After you delete an SNMPv3 Access Table, there is no way to undelete, or recover, the entry.

To delete an entry in the SNMPv3 Access Table, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **4** to select Configure SNMPv3 Access Table.

   The SNMPv3 Access Table is shown in Figure 144 on page 400.

   Note
   To display a particular Group Name and its associated parameters from the Configure SNMPv3 Access Table menu, type **N** to display the Next Page and **P** to display the previous page.

3. From the SNMPv3 Access Table, type **2** to select Delete SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter Group Name:
   ```

4. Enter the Group Name that you want to delete.

The following prompt is displayed:

```
Enter Security Model [1-v1, 2-v2c, 3-v3]:
```

5. Enter the Security Model of this Group Name.

   Select one of the following security levels:

   1-v1
   Select this value to associate the Group Name with the SNMPv1 protocol.

   2-v2c
   Select this value to associate the Group Name with the SNMPv2c protocol.

   3-v3
   Select this value to associate the Group Name with the SNMPv3 protocol. The following prompt is displayed:

   ```
   Enter the Security Level [N-NoAuthNoPriv,
   A-AuthNoPriv, P-AuthPriv]:
   ```

6. Enter the Security Level of this Group Name.

   Select one of the following Security Levels:

   N-NoAuthNoPriv
   This option represents no authentication and no privacy protocol. Select this security level if you do not want to authenticate SNMP entities and you do not want to encrypt messages using a privacy protocol. This security level provides the least security.

   Note
   If you have selected SNMPv1 or SNMPv2c, N-NoAuthNoPriv is the only security level you can select.

   A-AuthNoPriv
   This option represents authentication, but no privacy protocol. Select this security level if you want to authenticate SNMP users, but you do not want to encrypt messages using a privacy protocol.You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

   P-AuthPriv
   This option represents authentication and the privacy protocol. Select this security level to encrypt messages using a privacy protocol and authenticate SNMP entities. This level provides the greatest level of security. You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

   The following prompt is displayed:

```
Do you want to delete this table entry?(Y/N):[Yes/No]->
```

7. Enter **Y** to delete the view or **N** to save the view.

   The following prompt is displayed:

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an SNMPv3 Access Table Entry

This section describes how to modify parameters in an SNMPv3 Access Table entry. For each entry in the SNMPv3 Access Table, you can modify the following parameters:

- Read View Name
- Write View Name
- Notify View Name
- Storage Type

Configure the values of the Read View Name, Write View Name, and Notify View Name parameters with values previously configured with the View Name parameter in the SNMPv3 View Table. This is the only way to associate a Group Name with these Views. See "Creating an SNMPv3 View Table Entry" on page 390.

See the following procedures:

- "Modifying the Read View Name" on page 405
- "Modifying the Write View Name" on page 407
- "Modifying the Notify View Name" on page 409
- "Modifying the Storage Type" on page 411

Modifying the Read View Name

To modify the Read View Name parameter in an SNMPv3 Access Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in "Creating an SNMPv3 User Table Entry" on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

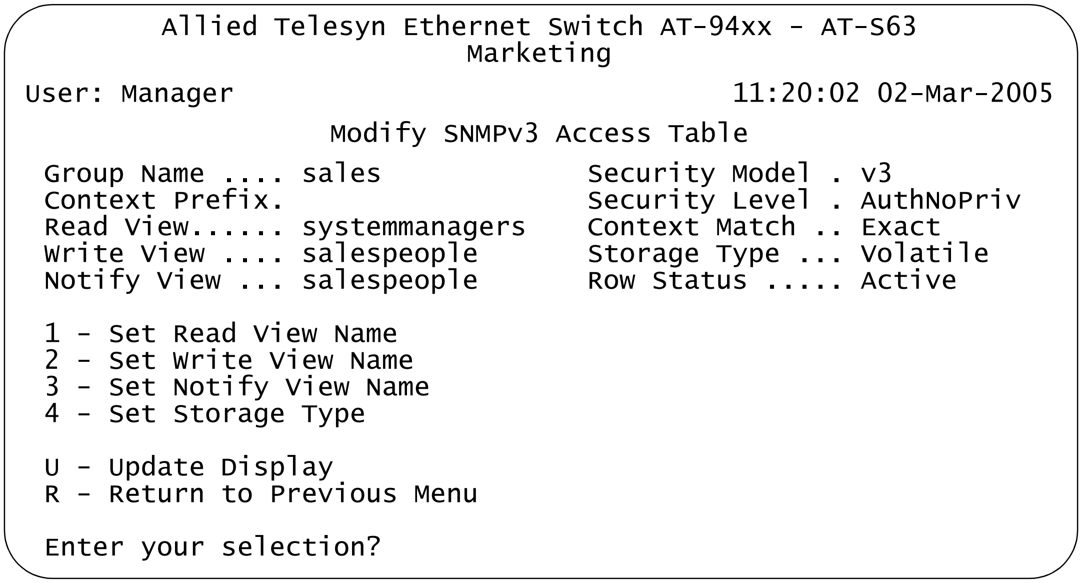
   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **4** to select Configure SNMPv3 Access Table.

   The Configure SNMPv3 Access Table is shown in Figure 144 on page 400.

3. From the Configure SNMPv3 Access Table, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Access Table is shown in Figure 145.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                                11:20:02 02-Mar-2005
                     Modify SNMPv3 Access Table
 Group Name .... sales              Security Model . v3
 Context Prefix.                    Security Level . AuthNoPriv
 Read View...... systemmanagers     Context Match .. Exact
 Write View .... salespeople        Storage Type ... Volatile
 Notify View ... salespeople        Row Status ..... Active

 1 - Set Read View Name
 2 - Set Write View Name
 3 - Set Notify View Name
 4 - Set Storage Type

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 145. Modify SNMPv3 Access Table Menu

4. To modify the Read View Name parameter, type **1** to select Set Read View Name.

   The following prompt is displayed:

   ```
   Enter Group Name:
   ```

5. Enter a Group Name that was previously configured.

   The following prompt is displayed:

   ```
   Enter Security Model [1-v1, 2-v2c, 3-v3]:
   ```

6. Enter the Security Model configured for this Group Name. You cannot change the value of the Security Model parameter.

   Select one of the following SNMP protocols:

   1-v1
   Select this value to associate the Group Name with the SNMPv1 protocol.

   2-v2c
   Select this value to associate the Group Name with the SNMPv2c protocol.

3-v3
Select this value to associate the Group Name with the SNMPv3 protocol.

The following prompt is displayed:

```
Enter Security Level [N-NoAuthNoPriv, A-AuthNoPriv,
P-AuthPriv]:
```

7. Select one of the following security levels:

   N-NoAuthNoPriv
   This option represents no authentication and no privacy protocol. Select this security level if you do not want to authenticate SNMP entities and you do not want to encrypt messages using a privacy protocol. This security level provides the least security.

   > **Note**
   > If you have selected SNMPv1 or SNMPv2c, N-NoAuthNoPriv is the only security level you can select.

   A-AuthNoPriv
   This option represents authentication, but no privacy protocol. Select this security level if you want to authenticate SNMP users, but you do not want to encrypt messages using a privacy protocol.You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

   P-AuthPriv
   This option represents authentication and the privacy protocol. Select this security level to encrypt messages using a privacy protocol and authenticate SNMP entities. This level provides the greatest level of security. You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

   The following prompt is displayed:

   ```
   Enter Read View Name:
   ```

8. Enter a value that you configured with the View Name parameter in the SNMPv3 View Table. See “Creating an SNMPv3 View Table Entry” on page 390.

   A Read View Name allows the users assigned to this Security Group to view the information specified in the View Table. This value does not need to be unique.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Write View Name

To modify the Write View Name parameter in an SNMPv3 Access Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **4** to select Configure SNMPv3 Access Table.

   The Configure SNMPv3 Access Table is shown in Figure 144 on page 400.

3. From the Configure SNMPv3 Access Table, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Table menu is shown in Figure 145 on page 406.

4. To modify the Write View Name parameter, type **2** to select Set Write View Name.

   The following prompt is displayed:

   ```
   Enter Group Name:
   ```

5. Enter a Group Name that was previously configured.

   The following prompt is displayed:

   ```
   Enter Security Model[1-v1, 2-v2c, 3-v3]:
   ```

6. Enter the Security Model configured for this Group Name. You cannot change the value of the Security Model parameter.

   Select one of the following SNMP protocols:

   1-v1
   Select this value to associate the Group Name with the SNMPv1 protocol.

   2-v2c
   Select this value to associate the Group Name with the SNMPv2c protocol.

   3-v3
   Select this value to associate the Group Name with the SNMPv3 protocol.

   The following prompt is displayed:

```
Enter Security Level [N-NoAuthNoPriv, A-AuthNoPriv,
P-AuthPriv]:
```

7. Enter the Security Level configured for this Group Name. You cannot change the value of the Security Level parameter.

   Select one of the following security levels:

   N-NoAuthNoPriv
   This option represents no authentication and no privacy protocol. Select this security level if you do not want to authenticate SNMP entities and you do not want to encrypt messages using a privacy protocol. This security level provides the least security.

   > **Note**
   > If you have selected SNMPv1 or SNMPv2c, N-NoAuthNoPriv is the only security level you can select.

   A-AuthNoPriv
   This option represents authentication, but no privacy protocol. Select this security level if you want to authenticate SNMP users, but you do not want to encrypt messages using a privacy protocol.You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

   P-AuthPriv
   This option represents authentication and the privacy protocol. Select this security level to encrypt messages using a privacy protocol and authenticate SNMP entities. This level provides the greatest level of security. You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

   The following prompt is displayed:

   ```
   Enter Write View Name:
   ```

8. Enter a value that you configured with the View Name parameter in the SNMPv3 View Table.

   A Write View Name allows the people assigned to this Security Group to write, or modify, to the information in the specified View Table. This value does not need to be unique.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Notify View Name

To modify the Notify View Name parameter in an SNMPv3 Access Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **4** to select Configure SNMPv3 Access Table.

   The Configure SNMPv3 Access Table is shown in Figure 144 on page 400.

3. From the Configure SNMPv3 Access Table, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Table menu is shown in Figure 145 on page 406.

4. To modify the Notify View Name parameter, type **3** to select Set Notify View Name.

   The following prompt is displayed:

   ```
   Enter Group Name:
   ```

5. Enter a Group Name that was previously configured.

   The following prompt is displayed:

   ```
   Enter Security Model[1-v1, 2-v2c, 3-v3]:
   ```

6. Enter the Security Model configured for this Group Name. You cannot change the value of the Security Model parameter.

   Select one of the following SNMP protocols:

   1-v1
   Select this value to associate the Group Name with the SNMPv1 protocol.

   2-v2c
   Select this value to associate the Group Name with the SNMPv2c protocol.

   3-v3
   Select this value to associate the Group Name with the SNMPv3 protocol.

   The following prompt is displayed:

   ```
   Enter Security Level [N-NoAuthNoPriv, A-AuthNoPriv,
   P-AuthPriv]:
   ```

7. Enter the Security Level configured for this Group Name. You cannot change the value of the Security Level parameter.

   Select one of the following security levels:

   N-NoAuthNoPriv
   This option represents no authentication and no privacy protocol. Select this security level if you do not want to authenticate SNMP entities and you do not want to encrypt messages using a privacy protocol. This security level provides the least security.

   > **Note**
   > If you have selected SNMPv1 or SNMPv2c, N-NoAuthNoPriv is the only security level you can select.

   A-AuthNoPriv
   This option represents authentication, but no privacy protocol. Select this security level if you want to authenticate SNMP users, but you do not want to encrypt messages using a privacy protocol.You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

   P-AuthPriv
   This option represents authentication and the privacy protocol. Select this security level to encrypt messages using a privacy protocol and authenticate SNMP entities. This level provides the greatest level of security. You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

   The following prompt is displayed:

   ```
   Enter Notify View Name:
   ```

8. Enter a value that you configured with the View Name parameter in the SNMPv3 View Table.

   A Notify View Name permits the users assigned to this Security Group to send traps specified in this view of the MIB tree. This value does not need to be unique.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Storage Type

To modify the Storage Type parameter in an SNMPv3 Access Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **4** to select Configure SNMPv3 Access Table.

   The Configure SNMPv3 Access Table is shown in Figure 144 on page 400.

3. From the Configure SNMPv3 Access Table, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Table menu is shown in Figure 145 on page 406.

4. To modify the Storage Type parameter, type **4** to select Set Storage Type.

   The following prompt is displayed:

   ```
   Enter Group Name:
   ```

5. Enter a Group Name that was previously configured.

   The following prompt is displayed:

   ```
   Enter Security Model[1-v1, 2-v2c, 3-v3]:
   ```

6. Enter the Security Model configured for this Group Name. You cannot change the value of the Security Model parameter.

   Select one of the following SNMP protocols:

   1-v1
   Select this value to associate the Group Name with the SNMPv1 protocol.

   2-v2c
   Select this value to associate the Group Name with the SNMPv2c protocol.

   3-v3
   Select this value to associate the Group Name with the SNMPv3 protocol.

   The following prompt is displayed:

   ```
   Enter Security Level [N-NoAuthNoPriv, A-AuthNoPriv,
   P-AuthPriv]:
   ```

7. Enter the Security Level configured for this Group Name. You cannot change the value of the Security Level parameter.

   Select one of the following security levels:

N-NoAuthNoPriv
This option represents no authentication and no privacy protocol. Select this security level if you do not want to authenticate SNMP entities and you do not want to encrypt messages using a privacy protocol. This security level provides the least security.

Note
If you have selected SNMPv1 or SNMPv2c, N-NoAuthNoPriv is the only security level you can select.

A-AuthNoPriv
This option represents authentication, but no privacy protocol. Select this security level if you want to authenticate SNMP users, but you do not want to encrypt messages using a privacy protocol.You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

P-AuthPriv
This option represents authentication and the privacy protocol. Select this security level to encrypt messages using a privacy protocol and authenticate SNMP entities. This level provides the greatest level of security. You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

The following prompt is displayed:

```
Enter Storage Type [V-Volatile, N-NonVolatile]:
```

8. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 Access Table to the configuration file. After making changes to an SNMPv3 Access Table entry with a Volatile storage type, the
   S - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 Access Table to the configuration file. After making changes to an SNMPv3 Access Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring the SNMPv3 SecurityToGroup Table

This section contains a description of the SNMPv3 SecurityToGroup Table and how to create, delete, and modify table entries. The SNMPv3 SecurityToGroup Table allows you to associate a User Name with a Group Name. The User Name is configured in the Configure SNMPv3 User Table menu while the Group Name is configured in the Configure SNMPv3 Access Table menu. In addition, the configuration in the Configure SNMPv3 Access Table menu defines which MIB views this User can read, write (modify), and send traps from. For each User Name, you can assign:

- A Security Model (SNMPv1, SNMPv2c, SNMPv3)
- A Group Name
- A Storage Type

There are three functions you can perform with the SNMPv3 Access Table.

- “Creating an SNMPv3 SecurityToGroup Table Entry,” next
- “Deleting an SNMPv3 SecurityToGroup Table Entry” on page 417
- “Modifying an SNMPv3 SecurityToGroup Table Entry” on page 418

Creating an SNMPv3 SecurityToGroup Table Entry

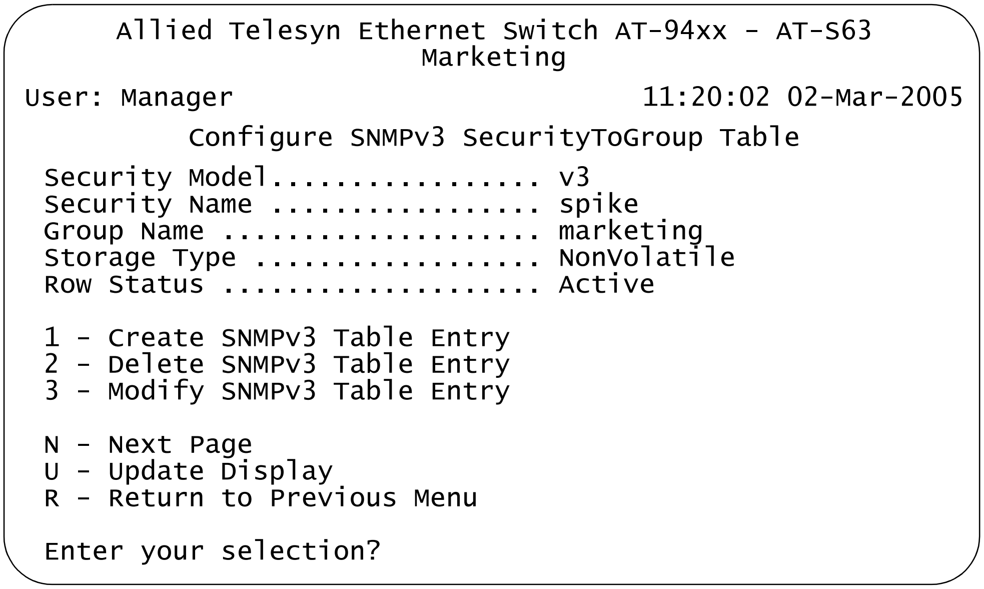
To create an entry in the SecurityToGroup Table, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **5** to select Configure SNMPv3 SecurityToGroup Table.

The Configure SNMPv3 SecurityToGroup Table menu is shown in Figure 146.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                         11:20:02 02-Mar-2005
          Configure SNMPv3 SecurityToGroup Table
 Security Model................. v3
 Security Name ................. spike
 Group Name .................... marketing
 Storage Type .................. NonVolatile
 Row Status .................... Active

 1 - Create SNMPv3 Table Entry
 2 - Delete SNMPv3 Table Entry
 3 - Modify SNMPv3 Table Entry

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 146. Configure SNMPv3 SecurityToGroup Table Menu

3. To configure a group in the SNMPv3 SecurityToGroup Table, type **1** to select Create SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter User (Security) Name:
   ```

4. Enter the User Name that you want to associate with a group.

   Enter a User Name that you configured in "Creating an SNMPv3 User Table Entry" on page 380.

   The following prompt is displayed:

   ```
   Enter Security Model [1-v1, 2-v2c, 3-v3]:
   ```

5. Select the SNMP protocol that was configured for this User Name.

   Choose from the following:

   1-v1
   Select this value to associate the Group Name with the SNMPv1 protocol.

   2-v2c
   Select this value to associate the Group Name with the SNMPv2c protocol.

3-v3
Select this value to associate the Group Name with the SNMPv3 protocol.

The following prompt is displayed:

```
Enter Group Name:
```

6. Enter a Group Name that you configured in the SNMPv3 Access Table. See “Creating an SNMPv3 Access Table Entry” on page 399.

   There are four default values for this field:

   ❒ defaultV1GroupReadOnly

   ❒ defaultV1GroupReadWrite

   ❒ defaultV2cGroupReadOnly

   ❒ defaultV2cGroupReadWrite

   These values are reserved for SNMPv1 and SNMPv2c implementations.

   The following prompt is displayed:

   ```
   Enter Storage Type [V-Volatile, N-NonVolatile]:
   ```

7. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 SecurityToGroup Table to the configuration file. After making changes to an SNMPv3 SecurityToGroup Table entry with a Volatile storage type, the **S** - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 SecurityToGroup Table to the configuration file. After making changes to an SNMPv3 SecurityToGroup Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

Note
The Row Status parameter is a read-only field. The Active value indicates the SNMPv3 SecurityToGroup Table entry will take effect immediately.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting an SNMPv3 SecurityToGroup Table Entry

You may want to delete an entry from the SNMPv3 SecurityToGroup Table. When you delete an SNMPv3 SecurityToGroup Table entry, there is no way to undelete, or recover, the entry.

To delete an entry in the SNMPv3 SecurityToGroup Table, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **5** to select Configure SNMPv3 SecurityToGroup Table.

   The SNMPv3 SecurityToGroup Table is shown in Figure 146 on page 415.

   Note
   To display a Group Name and its associated parameters from the Configure SNMPv3 SecurityToGroup Table menu, type **N** to display the Next Page and **P** to display the previous page.

3. From the SNMPv3 SecurityToGroup Table, type **2** to select Delete SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter User (Security) Name:
   ```

4. Enter a User Name.

   The following prompt is displayed:

   ```
   Enter Security Model [1-v1, 2-v2c, 3-v3]:
   ```

5. Enter the Security Model of this User Name.

   Choose from the following:

   1-v1
   Select this value to associate the Group Name with the SNMPv1 protocol.

   2-v2c
   Select this value to associate the Group Name with the SNMPv2c protocol.

3-v3
Select this value to associate the Group Name with the SNMPv3 protocol.

The following prompt is displayed:

```
Do you want to delete this table entry? (Y/N):[Yes/No]->
```

6. Enter **Y** to delete this SecurityToGroup entry or **N** to save the entry.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an SNMPv3 SecurityToGroup Table Entry

This section describes how to modify parameters in an SNMPv3 SecurityToGroup Table entry. See the following procedures:

- ❒ "Modifying the Group Name" on page 418
- ❒ "Modifying the Storage Type" on page 420

Modifying the Group Name

To modify the Group Name in an SNMPv3 SecurityToGroup Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in "Creating an SNMPv3 User Table Entry" on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

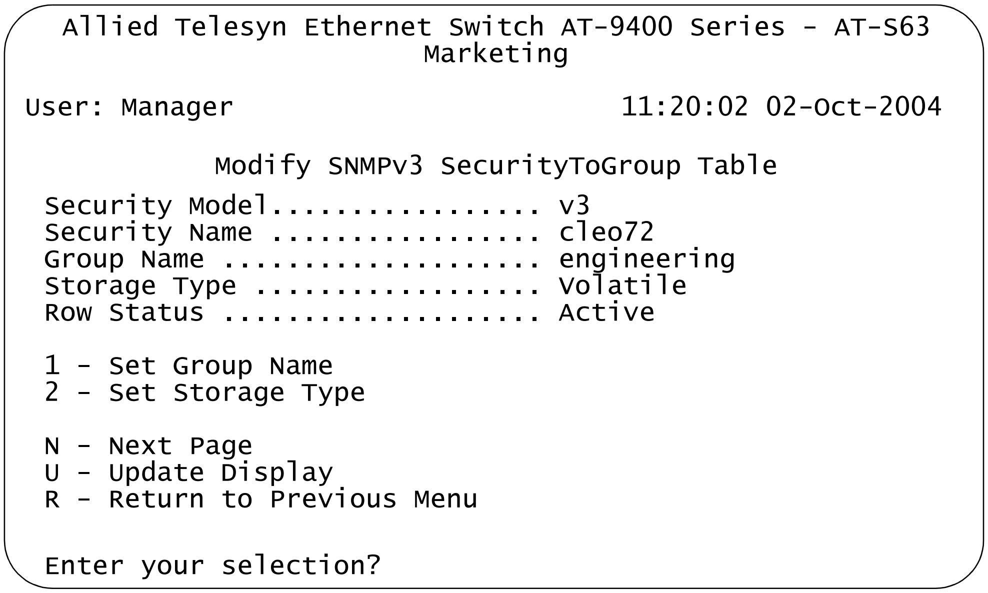
   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **5** to select Configure SNMPv3 SecurityToGroup Table.

   The Configure SNMPv3 SecurityToGroup Table is shown in Figure 144.

3. From the Configure SNMPv3 SecurityToGroup Table, type **3** to select Modify SNMPv3 Table Entry.

The Modify SecurityToGroup Table is displayed as shown Figure 146.



```
  Allied Telesyn Ethernet Switch AT-9400 Series - AT-S63
                        Marketing

User: Manager                         11:20:02 02-Oct-2004

            Modify SNMPv3 SecurityToGroup Table
 Security Model................. v3
 Security Name ................. cleo72
 Group Name .................... engineering
 Storage Type .................. Volatile
 Row Status .................... Active

 1 - Set Group Name
 2 - Set Storage Type

 N - Next Page
 U - Update Display
 R - Return to Previous Menu


 Enter your selection?
```

Figure 147. Modify SNMPv3 SecurityToGroup Table Menu

4. To modify the Group Name, type **1** to select Set Group Name.

   The following prompt is displayed:

   ```
   Enter User (Security) Name:
   ```

5. Enter a User Name.

   The User Name must be previously configured in the Configure SNMPv3 User Table menu. See “Creating an SNMPv3 User Table Entry” on page 380.

   The following prompt is displayed:

   ```
   Enter Security Model [1-v1, 2-v2c, 3-v3]:
   ```

6. Enter the Security Model configured for this User Name. You cannot change the value of the Security Model parameter.

   Select one of the following SNMP protocols:

   1-v1
   Select this value if this User Name is configured with the SNMPv1 protocol.

   2-v2c
   Select this value to associate the User Name with the SNMPv2c protocol.

3-v3
Select this value to associate the User Name with the SNMPv3 protocol.

The following prompt is displayed:

```
Enter Group Name:
```

7. Enter the new Group Name.

   This value must match a value configured in the Group Name parameter in the Configure SNMPv3 Access Table. See “Creating an SNMPv3 Access Table Entry” on page 399.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Storage Type

To modify the Storage Type in an SNMPv3 SecurityToGroup Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **5** to select Configure SNMPv3 SecurityToGroup Table.

   The Configure SNMPv3 SecurityToGroup Table is shown in Figure 144 on page 400.

3. From the Configure SNMPv3 SecurityToGroup Table, type **3** to select Modify SNMPv3 Table Entry.

4. To modify the storage type, type **2** to select Set Storage Type.

   The following prompt is displayed:

   ```
   Enter User (Security) Name:
   ```

5. Enter a User Name.

   The User Name must be previously configured in the Configure SNMPv3 User Table menu. See “Creating an SNMPv3 User Table Entry” on page 380.

   The following prompt is displayed:

   ```
   Enter Security Model [1-v1, 2-v2c, 3-v3]:
   ```

6. Enter the Security Model configured for this User Name. You cannot change the value of the Security Model parameter.

   Select one of the following SNMP protocols:

   1-v1
   Select this value if this User Name is configured with the SNMPv1 protocol.

   2-v2c
   Select this value if this User Name is configured with the SNMPv2c protocol.

   3-v3
   Select this value if this User Name is configured with the SNMPv3 protocol.

   The following prompt is displayed:

   ```
   Enter Storage Type [V-Volatile, N-NonVolatile]:
   ```

7. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 SecurityToGroup Table to the configuration file. After making changes to an SNMPv3 SecurityToGroup Table entry with a Volatile storage type, the **S** - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 SecurityToGroup Table to the configuration file. After making changes to an SNMPv3 SecurityToGroup Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring the SNMPv3 Notify Table

This section contains a description of the SNMPv3 Notify Table menu and how to create, delete, and modify table entries. The Configure SNMPv3 Notify Table menu allows you to define a name for sending traps. For each Notify Name, you define if a trap or inform message ia sent. The two message types, trap and inform, have different packet formats.

For each Notify group, you can configure:

- ❐ Notify Name
- ❐ Notify Tag
- ❐ Notify Type
- ❐ Storage Type

The value of the Notify Tag is linked with the Tag List parameter in the Configure SNMPv3 Target Address Table menu. As a result, the Notify Tag parameter assigns a Target IP address to the Notify Table internally.

There are three functions you can perform with the Configure SNMPv3 Notify Table menu.

- ❐ “Creating an SNMPv3 Notify Table Entry,” next
- ❐ “Deleting an SNMPv3 Notify Table Entry” on page 424
- ❐ “Modifying an SNMPv3 Notify Table Entry” on page 425

Creating an SNMPv3 Notify Table Entry

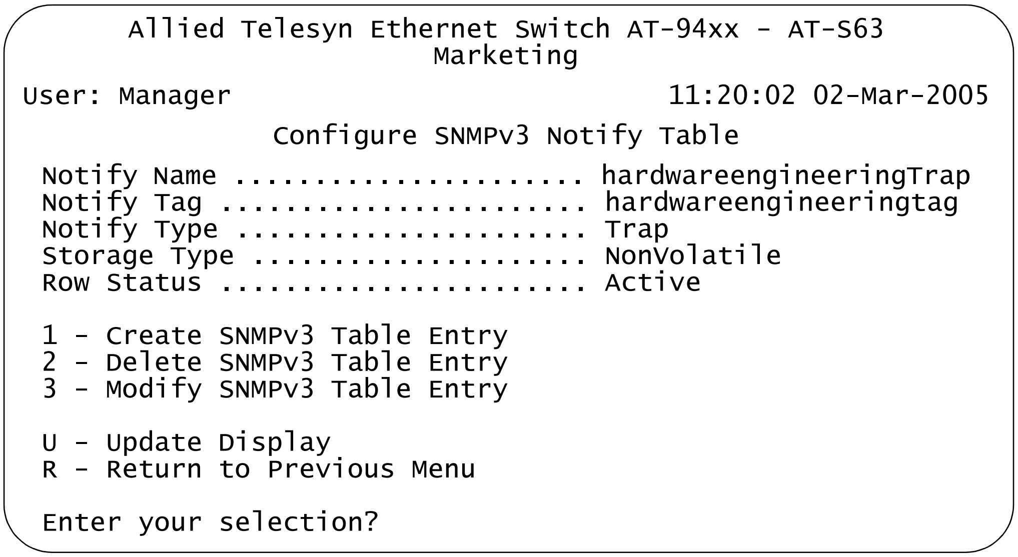
To create an entry in the SNMPv3 Notify Table menu, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **6** to select Configure SNMPv3 Notify Table.

The Configure SNMPv3 Notify Table menu is shown in Figure 148.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                             11:20:02 02-Mar-2005
               Configure SNMPv3 Notify Table
 Notify Name ...................... hardwareengineeringTrap
 Notify Tag ....................... hardwareengineeringtag
 Notify Type ...................... Trap
 Storage Type ..................... NonVolatile
 Row Status ....................... Active

 1 - Create SNMPv3 Table Entry
 2 - Delete SNMPv3 Table Entry
 3 - Modify SNMPv3 Table Entry

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 148. Configure SNMPv3 Notify Table Menu

3. To create an entry in the table, type **1** to select Create SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter Notify Name:
   ```

4. Enter the name associated with this trap message.

   Enter a name of up to 32 alphanumeric characters. For example, you might want to define a trap message for hardware engineering and enter a value of “hardwareengineeringtrap” for the Notify Name.

   The following prompt is displayed:

   ```
   Enter Notify Tag:
   ```

5. Enter the name of the Notify Tag.

   Enter a name of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Notify Type [T-Trap, I-Inform]:
   ```

6. Enter one of the following message types:

   T-Trap
   Indicates this notify table is used to send traps. With this message type, the switch does not expects a response from the host.

I-Inform
Indicates this notify table is used to send inform messages. With this message type, the switch expects a response from the host.

The following prompt is displayed:

```
Enter Storage Type [V-Volatile, N-NonVolatile]:
```

7. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 Notify Table to the configuration file. After making changes to an SNMPv3 Notify Table entry with a Volatile storage type, the
   S - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 Notify Table to the configuration file. After making changes to an SNMPv3 Notify Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

> **Note**
> The Row Status parameter is a read-only field. The Active value indicates the SNMPv3 Notify Table entry takes effect immediately.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting an SNMPv3 Notify Table Entry

You may want to delete an entry from the Configure SNMPv3 Notify Table menu. When you delete a Configure SNMPv3 Notify Table entry, there is no way to undelete, or recover, the entry.

To delete an entry in the Configure SNMPv3 Notify Table menu, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **6** to select Configure SNMPv3 Notify Table.

The Configure SNMPv3 Notify Table menu is shown in Figure 148 on page 423.

> **Note**
> To display a Group Name and its associated parameters from the Configure SNMPv3 SecurityToGroup Table menu, type **N** to display the Next Page and **P** to display the previous page.

3. To delete an SNMPv3 Notify Table entry, type **2** to select Delete SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter Notify Name:
   ```

4. Enter a Notify Name.

   The following prompt is displayed:

   ```
   Do you want to delete this table entry? (Y/N):[Yes/No]->
   ```

5. Enter **Y** to delete the SNMPv3 Notify Table entry or **N** to save the entry.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an SNMPv3 Notify Table Entry

This section describes how to modify parameters in an SNMPv3 Notify Table entry. See the following procedures:

- ❐ "Modifying a Notify Tag" on page 425
- ❐ "Modifying a Notify Type" on page 426
- ❐ "Modifying a Storage Type" on page 427

Modifying a Notify Tag

To modify the Notify Tag parameter in an SNMPv3 Notify Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in "Creating an SNMPv3 User Table Entry" on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

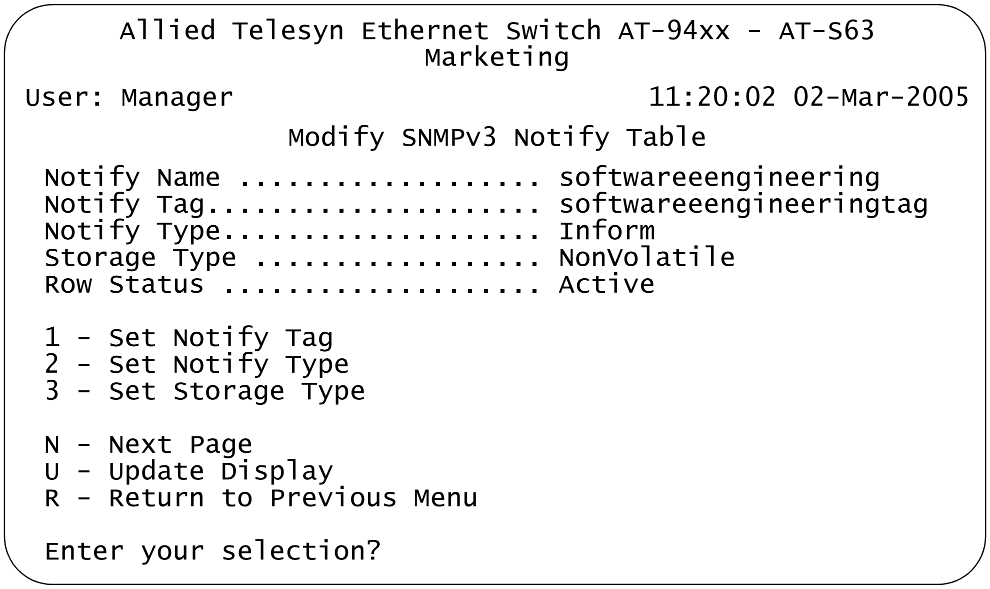
   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **6** to select Configure SNMPv3 Notify Table.

   The Configure SNMPv3 Notify Table menu is shown in Figure 148 on page 423.

3. From the Configure SNMPv3 Notify Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Notify Table menu is shown in Figure 149.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                             11:20:02 02-Mar-2005
                    Modify SNMPv3 Notify Table
 Notify Name .................. softwareeengineering
 Notify Tag..................... softwareeengineeringtag
 Notify Type.................... Inform
 Storage Type .................. NonVolatile
 Row Status .................... Active

 1 - Set Notify Tag
 2 - Set Notify Type
 3 - Set Storage Type

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 149. Modify SNMPv3 Notify Table Menu

> **Note**
> To display a Group Name and its associated parameters from the Configure SNMPv3 SecurityToGroup Table menu, type **N** to display the Next Page and **P** to display the previous page.

4. To modify the Notify Tag, type **1** to select Set Notify Tag.

   The following prompt is displayed:

   ```
   Enter Notify Name:
   ```

5. Enter a Notify Name.

   The following prompt is displayed:

   ```
   Enter Notify Tag:
   ```

6. Enter the new Notify Tag.

   Enter an alphanumeric value of up to 32 characters.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a Notify Type

To modify the Notify Type parameter in an SNMPv3 Notify Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **6** to select Configure SNMPv3 Notify Table.

   The Configure SNMPv3 Notify Table menu is shown in Figure 148 on page 423.

3. From the Configure SNMPv3 Notify Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Notify Table is shown in Figure 149 on page 426.

4. To modify the Notify Type, type **2** to select Set Notify Type.

   The following prompt is displayed:

   ```
   Enter Notify Name:
   ```

5. Enter a Notify Name.

   The following prompt is displayed:

   ```
   Enter Notify Type [T-Trap, I-Inform]:
   ```

6. Enter one of the following message types:

   T-Trap
   Indicates this notify table is used to send traps. With this message type, the switch does not expect a response from the host.

   I-Inform
   Indicates this notify table is used to send inform messages. With this message type, the switch expects a response from the host.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a Storage Type

To modify the Storage Type parameter in an SNMPv3 Notify Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **6** to select Configure SNMPv3 Notify Table.

   The Configure SNMPv3 Notify Table menu is shown in Figure 148 on page 423.

3. From the Configure SNMPv3 Notify Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Notify Table is shown in Figure 149 on page 426.

4. To modify the Storage Type, type **3** to select Set Storage Type.

   The following prompt is displayed:

   ```
   Enter Notify Name:
   ```

5. Enter a Notify Name.

   The following prompt is displayed:

   ```
   Enter Storage type [V-Volatile, N-NonVolatile]:
   ```

6. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 Notify Table to the configuration file. After making changes to an SNMPv3 Notify Table entry with a Volatile storage type, the
   S - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 Notify Table to the configuration file. After making changes to an SNMPv3 Notify Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring the SNMPv3 Target Address Table

This section contains a description of the SNMPv3 Target Address Table menu and how to create, delete, and modify table entries. You use the SNMPv3 Target Address Table menu to assign the IP address of a host that is used for generating notifications. The Configure SNMPv3 Target Address Table menu is linked internally to the Configure SNMPv3 Notify Table through the Tag List parameter. The Configure SNMPv3 Notify Table menu receives the host IP address through the configuration of the SNMPv3 Target Address Table menu.

For each Target Address Table entry, you can configure the following parameters:

- Target Address Name
- Target IP Address
- UDP Port
- Timeout Value
- Number of Retries
- Tag List
- Target Parameters
- Storage Type

The values for the Tag List parameter are configured with the Notify Tag parameter in the Configure SNMPv3 Notify Table. See "Creating an SNMPv3 Notify Table Entry" on page 422.

There are three functions you can perform with the Configure SNMPv3 Target Address Table menu.

- "Creating an SNMPv3 Target Address Table Entry," next
- "Deleting an SNMPv3 Target Address Table Entry" on page 432
- "Modifying an SNMPv3 Target Address Table Entry" on page 433

Creating an SNMPv3 Target Address Table Entry

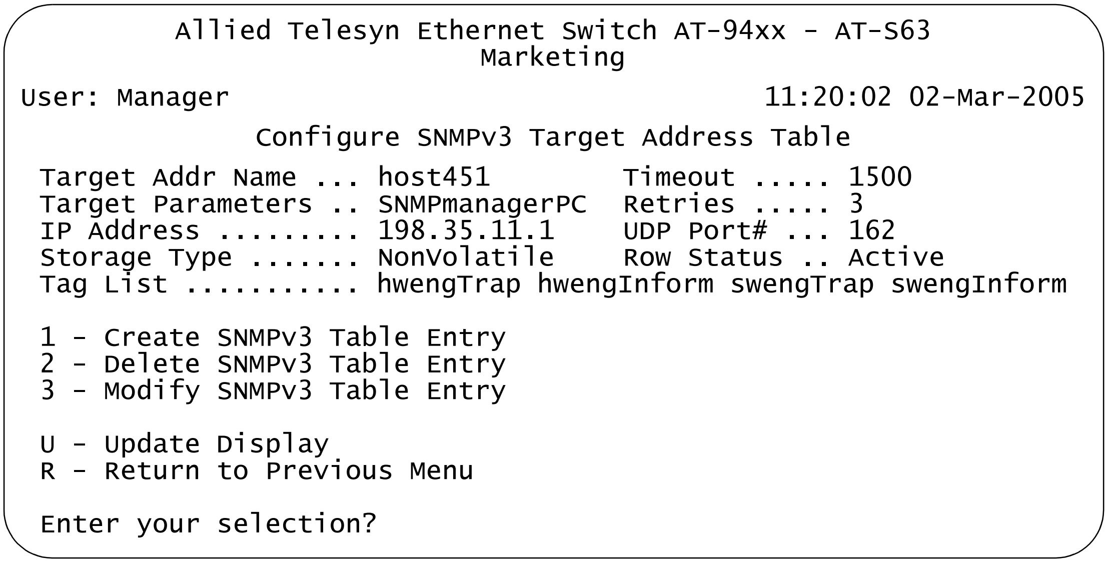
To create an entry in the Configure SNMPv3 Target Address Table menu, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in "Creating an SNMPv3 User Table Entry" on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **7** to select Configure SNMPv3 Target Address Table.

The Configure SNMPv3 Target Address Table menu is shown in Figure 150.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                            Marketing
User: Manager                                  11:20:02 02-Mar-2005
              Configure SNMPv3 Target Address Table
 Target Addr Name ... host451        Timeout ..... 1500
 Target Parameters .. SNMPmanagerPC  Retries ..... 3
 IP Address ......... 198.35.11.1    UDP Port# ... 162
 Storage Type ....... NonVolatile    Row Status .. Active
 Tag List ........... hwengTrap hwengInform swengTrap swengInform

 1 - Create SNMPv3 Table Entry
 2 - Delete SNMPv3 Table Entry
 3 - Modify SNMPv3 Table Entry

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 150. Configure SNMPv3 Target Address Table Menu

3. To create an entry in the SNMPv3 Target Address Table, type **1** to select Create SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter Target Address Name:
   ```

4. Enter the name of the SNMP manager, or host, that manages the SNMP activity on your switch.

   You can enter a name of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter IP Address:
   ```

5. Enter the IP address of the host.

   Use the following format for an IP address:
   XXX.XXX.XXX.XXX

   The following prompt is displayed:

   ```
   Enter UDP Port#: [0 to 65535]-> 162
   ```

6. Enter a UDP port.

   You can enter a UDP port in the range of 0 to 65,535. The default UDP port is 162.

The following prompt is displayed:

```
Enter Timeout (10mS): [0 to 2147483647]-> 1500
```

7. Enter a timeout value in milliseconds.

   When an Inform message is generated, a response from the switch is required. The timeout value determines how long the switch considers the Inform message an active message. This parameter applies to Inform messages only. The range is from 0 to 2,147,483,647 milliseconds. The default value is 1500 milliseconds.

   The following prompt is displayed:

   ```
   Enter Retries:[0 to 255]-> 3
   ```

8. Enter the number of times the switch will retry, or resend, an Inform message.

   When an Inform message is generated, a response from the switch is required. This parameter determines how many times the switch resends an Inform message. The Retries parameter applies to Inform messages only. The range is 0 to 255 retries. The default is 3 retries.

   The following prompt is displayed:

   ```
   Enter Tag List:
   ```

9. Enter a Tag List.

   This list consists of a tag or list of tags you configured in a Configure SNMPv3 Notify Table entry with the Notify Tag parameter. See “Creating an SNMPv3 Notify Table Entry” on page 422. Enter a Tag List of up to 256 alphanumeric characters. Use a space to separate entries, for example:

   ```
   hwengtag swengtag testengtag
   ```

   The following prompt is displayed:

   ```
   Enter Target Parameters:
   ```

10. Enter a Target Parameters name.

    This name can consist of up to 32 alphanumeric characters. The value configured here must match the value configured with the Target Parameters Name parameter in the Configure SNMPv3 Target Parameters Table.

    The following prompt is displayed:

    ```
    Enter Storage Type [V-Volatile, N-NonVolatile]:
    ```

11. Select one of the following storage types for this table entry:

V - Volatile
Select this storage type if you do not want the ability to save an entry in the SNMPv3 Target Address Table to the configuration file. After making changes to an SNMPv3 Target Address Table entry with a Volatile storage type, the **S** - Save Configuration Changes option does not appear on the Main Menu.

N-NonVolatile
Select this storage type if you want the ability to save an entry in the SNMPv3 Target Address Table to the configuration file. After making changes to an SNMPv3 Target Address entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

Note
The Row Status parameter is a read-only field. The Active value indicates the SNMPv3 Target Address Table entry will take effect immediately.

12. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting an SNMPv3 Target Address Table Entry

You may want to delete an entry from the SNMPv3 Target Address Table. After you delete an SNMPv3 Target Address Table entry, there is no way to undelete, or recover, the entry.

To delete an entry in the SNMPv3 Target Address Table, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **7** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Address Table menu is shown in Figure 152 on page 443.

Note
To display a Group Name and its associated parameters from the Configure SNMPv3 SecurityToGroup Table menu, type **N** to display the Next Page and **P** to display the previous page.

3. To delete an SNMPv3 Target Address Table entry, type **2** to select Delete SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter Target Address Name:
   ```

4. Enter a Target Address Name.

   The following prompt is displayed:

   ```
   Do you want to delete this table entry?(Y/N):[Yes/No]->
   ```

5. Enter **Y** to delete the SNMPv3 Target Address Table entry or **N** to save the entry.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an SNMPv3 Target Address Table Entry

This section describes how to modify parameters in an SNMPv3 Target Address Table entry. See the following procedures:

- “Modifying a Target IP Address” on page 433
- “Modifying the Target Address UDP Port” on page 435
- “Modifying the Target Address Timeout” on page 436
- “Modifying the Target Address Retries” on page 437
- “Modifying the Target Address Tag List” on page 438
- “Modifying the Target Parameters Field” on page 439
- “Modifying the Storage Type” on page 440

> **Note**
> You cannot modify the Target Address Name parameter.

Modifying a Target IP Address

To modify the target IP address in an SNMPv3 Target Address Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

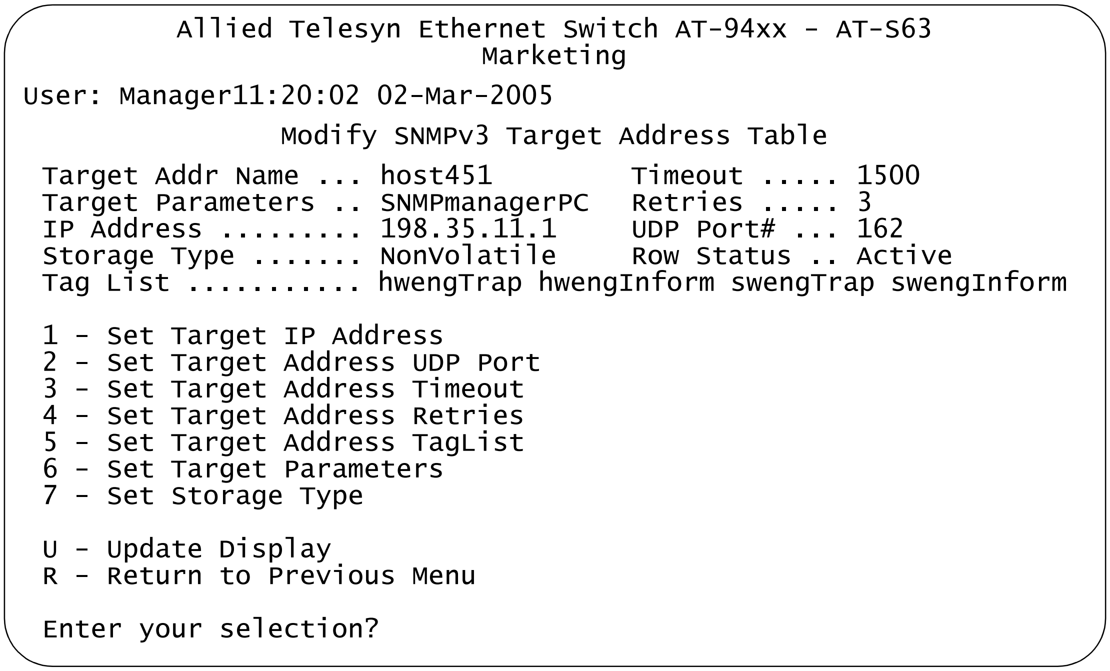
   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **7** to select Configure SNMPv3 Target Address Table.

The Configure SNMPv3 Target Address Table menu is shown in Figure 150 on page 430.

3. From the Configure SNMPv3 Target Address Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Address Table menu is shown in Figure 151.



```
          Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager11:20:02 02-Mar-2005
                Modify SNMPv3 Target Address Table
 Target Addr Name ... host451        Timeout ..... 1500
 Target Parameters .. SNMPmanagerPC  Retries ..... 3
 IP Address ......... 198.35.11.1    UDP Port# ... 162
 Storage Type ....... NonVolatile    Row Status .. Active
 Tag List ........... hwengTrap hwengInform swengTrap swengInform

 1 - Set Target IP Address
 2 - Set Target Address UDP Port
 3 - Set Target Address Timeout
 4 - Set Target Address Retries
 5 - Set Target Address TagList
 6 - Set Target Parameters
 7 - Set Storage Type

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 151. Modify SNMPv3 Target Address Table Menu

4. To change the Target IP Address, type **1** to select Set Target IP Address.

   The following prompt is displayed:

   ```
   Enter Target Address Name:
   ```

5. Enter a previously configured Target Address Name.

   This is the name of the SNMP manager, or host, that manages the SNMP activity on your switch. You can enter a name of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter IP Address:
   ```

6. Enter the IP address of the host.

Use the following format for an IP address:
XXX.XXX.XXX.XXX

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Target Address UDP Port

To modify the Target Address UDP Port parameter in an SNMPv3 Target Address Table entry, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **7** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Address Table menu is shown in Figure 150 on page 430.

3. From the Configure SNMPv3 Target Address Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Address Table menu is shown in Figure 151 on page 434.

4. To change the Target Address UDP Port, type **2** to select Set Target Address UDP Port.

   The following prompt is displayed:

   ```
   Enter Target Address Name:
   ```

5. Enter a previously configured Target Address Name.

   This is the name of the SNMP manager, or host, that manages the SNMP activity on your switch. You can enter a name of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter UDP Port#: [0 to 65535]-> 162
   ```

6. Enter a UDP port.

   You can enter a UDP port in the range of 0 to 65,535. The default UDP port is 162.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Target Address Timeout

The Target Address Timeout parameter only applies when the message type is an Inform message. To modify the Target Address Timeout parameter in an SNMPv3 Target Address Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **7** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Address Table menu is shown in Figure 150 on page 430.

3. From the Configure SNMPv3 Target Address Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Address Table menu is shown in Figure 151 on page 434.

4. To modify the Target Address Timeout, type **3** to select Set Target Address Timeout.

   The following prompt is displayed:

   ```
   Enter Target Address Name:
   ```

5. Enter a previously configured Target Address Name.

   This is the name of the SNMP manager, or host, that manages the SNMP activity on your switch. You can enter a name of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Timeout (10mS): [0 to 2147483647]-> 1500
   ```

6. Enter a timeout value in milliseconds.

   When an Inform message is generated, a response from the switch is required. The timeout value determines how long the switch considers the Inform message an active message. This parameter applies to

Inform messages only. The range is from 0 to 2,147,483,647 milliseconds. The default value is 1500 milliseconds.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Target Address Retries

The Target Address Retries parameter only applies when the message type is an Inform message. To modify the Target Address Retries parameter in an SNMPv3 Target Address Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **7** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Address Table menu is shown in Figure 150 on page 430.

3. From the Configure SNMPv3 Target Address Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Address Table menu is shown in Figure 151 on page 434.

4. To modify the Target Address Retries, type **4** to select Set Target Address Retries.

   The following prompt is displayed:

   ```
   Enter Target Address Name:
   ```

5. Enter a previously configured Target Address Name.

   This is the name of the SNMP manager, or host, that manages the SNMP activity on your switch. You can enter a name of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Retries:[0 to 255]-> 3
   ```

6. Enter the number of times the switch will retry, or resend, the Inform message.

The range is 0 to 255 retries. The default is 3 retries.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Target Address Tag List

To modify the Target Address Tag List parameter in an SNMPv3 Target Address Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **7** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Address Table menu is shown in Figure 150 on page 430.

3. From the Configure SNMPv3 Target Address Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Address Table menu is shown in Figure 151 on page 434.

4. To modify the Target Address Tag List, type **5** to select Set Target Address TagList.

   The following prompt is displayed:

   ```
   Enter Target Address Name:
   ```

5. Enter a previously configured Target Address Name.

   This is the name of the SNMP manager, or host, that manages the SNMP activity on your switch. You can enter a name of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Tag List:
   ```

   Enter a Tag List of up to 256 alphanumeric characters. Use a space to separate entries. This list consists of a tag or list of tags you configured in a Configure SNMPv3 Notify Table entry with the Notify Tag parameter. See “Creating an SNMPv3 Notify Table Entry” on page 422.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Target Parameters Field

To modify the Target Parameters field in an SNMPv3 Target Address Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **7** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Address Table menu is shown in Figure 150 on page 430.

3. From the Configure SNMPv3 Target Address Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Address Table menu is shown in Figure 151 on page 434.

4. To modify the Target Parameters field, type **6** to select Set Target Parameters.

   The following prompt is displayed:

   ```
   Enter Target Address Name:
   ```

5. Enter a previously configured Target Address Name.

   This is the name of the SNMP manager, or host, that manages the SNMP activity on your switch. You can enter a name of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Target Parameters:
   ```

6. Enter a Target Parameters Name.

   The value configured here must match the value configured with the Target Parameters Name parameter in the Configure SNMPv3 Target Parameters Table. This name can consist of up to 32 alphanumeric characters.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Storage Type

To modify the Storage Type parameter in an SNMPv3 Target Address Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **7** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Address Table menu is shown in Figure 150 on page 430.

3. From the Configure SNMPv3 Target Address Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Address Table menu is shown in Figure 151 on page 434.

4. To modify the Storage Type, type **7** to select Set Storage Type.

   The following prompt is displayed:

   ```
   Enter Target Address Name:
   ```

5. Enter a previously configured Target Address Name.

   This is the name of the SNMP manager, or host, that manages the SNMP activity on your switch. You can enter a name of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Storage Type [V-Volatile, N-NonVolatile]:
   ```

6. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 Target Address Table to the configuration file. After making changes to an SNMPv3 Target Address Table entry with a Volatile storage type, the **S** - Save Configuration Changes option does not appear on the Main Menu.

N-NonVolatile
Select this storage type if you want the ability to save an entry in the SNMPv3 Target Address Table to the configuration file. After making changes to an SNMPv3 Target Address entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring the SNMPv3 Target Parameters Table

This section contains a description of the SNMPv3 Target Parameters Table and how to create, delete, and modify table entries. The SNMPv3 Target Parameters Table links the user security information with the message notification information configured in the Configure SNMPv3 Notify Table menu and Configure SNMPv3 Target Address Table menu.

In the SNMPv3 Target Parameters Table, you specify the SNMP parameters that are used when a message is generated to a target, or host, IP address. The SNMPv3 Target Parameters Table also links a User Name and its related security information, called *user security information*, with a host. The user security information consists of the following parameters listed in the SNMPv3 tables where they are configured:

- User Name parameter configured in the SNMPv3 User Table menu
- View Name parameter configured in the SNMPv3 View Table menu
- Group Name, Security Model, and Security Level parameters configured in the SNMPv3 Access Table
- User Name, Security Model, and Group Name configured in the SNMPv3 SecurityToGroup Table

When you enter user security information in an SNMPv3 Target Parameters Table entry, the information must match the configuration in the SNMPv3 tables listed above. If the user security information in the SNMPv3 Target Parameters Table entry does not match the configuration in the tables listed above, messages are not sent on behalf of the user.

Note
In the SNMPv3 Target Parameters Table, the Security Name parameter is the equivalent to the User Name parameter in the SNMPv3 User Table.

For each Target Address Table entry, you can configure:

- Target Parameters Name
- Security Name (User Name)
- Security Model
- Security Level
- Storage Type

There are three functions you can perform with the Configure SNMPv3 Target Parameters Table menu.

- “Creating an SNMPv3 Target Parameters Table Entry,” next

❒ “Deleting an SNMPv3 Target Parameters Table Entry” on page 446

❒ “Modifying an SNMPv3 Target Parameters Table Entry” on page 447

Creating an SNMPv3 Target Parameters Table Entry

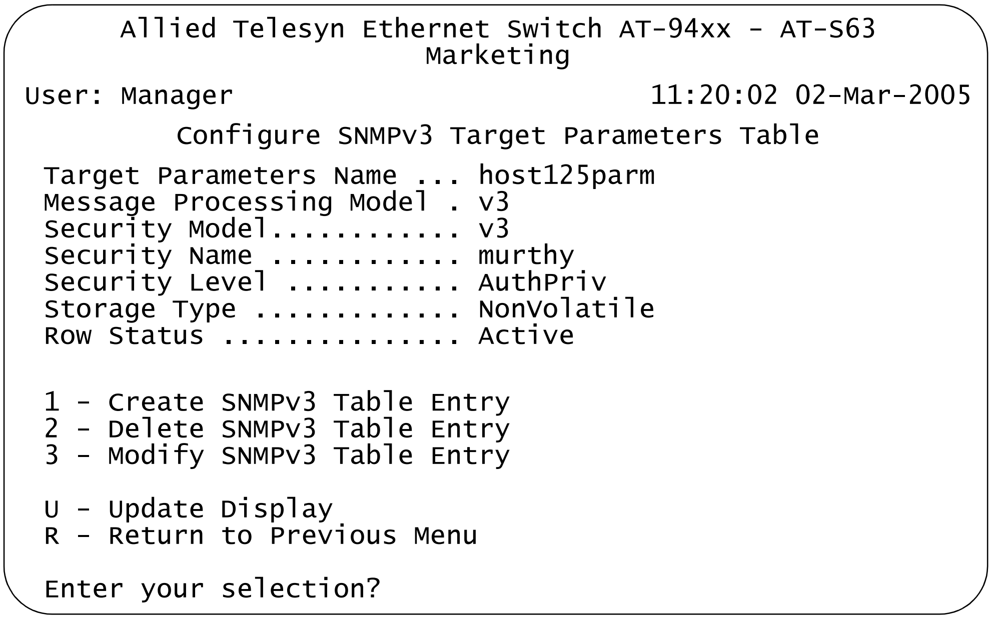
To create an entry in the Configure SNMPv3 Target Parameters Table, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **8** to select Configure SNMPv3 Target Parameters Table menu.

   The Configure SNMPv3 Target Parameters Table menu is shown in Figure 152.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                           11:20:02 02-Mar-2005
        Configure SNMPv3 Target Parameters Table
 Target Parameters Name ... host125parm
 Message Processing Model . v3
 Security Model........... v3
 Security Name ........... murthy
 Security Level .......... AuthPriv
 Storage Type ............ NonVolatile
 Row Status .............. Active


 1 - Create SNMPv3 Table Entry
 2 - Delete SNMPv3 Table Entry
 3 - Modify SNMPv3 Table Entry

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 152. Configure SNMPv3 Target Parameters Table Menu

3. To create an SNMPv3 Target Parameters Table, type **1** to select Create SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter Target Parameters Name:
   ```

4. Enter a name of the Target Parameters.

   Enter a value of up to 32 alphanumeric characters.

Note
You are prompted to enter a value for the Message Processing Model parameter only if you select SNMPv1 or SNMPv2c as the Security Model. If you select the SNMPv3 protocol as the Security Model, then the Message Processing Model is automatically assigned to SNMPv3.

The following prompt is displayed:

```
Enter User (Security) Name:
```

5. Enter a User Name.

   The value of this parameter is previously configured with the Configure SNMPv3 User Table. See “Creating an SNMPv3 User Table Entry” on page 380.

   The following prompt is displayed:

   ```
   Enter Security Model [1-v1, 2-v2c, 3-v3]:
   ```

6. Select one of the following SNMP protocols as the Security Model for this Security Name, or User Name.

   1-v1
   Select this value to associate the Security Name, or User Name, with the SNMPv1 protocol.

   2-v2c
   Select this value to associate the Security Name, or User Name, with the SNMPv2c protocol.

   3-v3
   Select this value to associate the Security Name, or User Name, with the SNMPv3 protocol. The SNMPv3 protocol allows you to configure the group to authenticate SNMPv3 entities (users) and to encrypt messages.

   The following prompt is displayed:

   ```
   Enter Security Level [N-NoAuthNoPriv, A-AuthNoPriv,
   P-AuthPriv]:
   ```

7. Select one of the following Security Levels:

Note
The value you configure for the Security Level must match the value configured for the User Name in the Configure SNMPv3 User Table menu. See “Creating an SNMPv3 User Table Entry” on page 380.

N-NoAuthNoPriv
This option represents no authentication and no privacy protocol. Select this security level if you do not want to authenticate SNMP entities and you do not want to encrypt messages using a privacy protocol. This security level provides the least security.

Note
If you have selected SNMPv1 or SNMPv2c, N-NoAuthNoPriv is the only security level you can select.

A-AuthNoPriv
This option represents authentication, but no privacy protocol. Select this security level if you want to authenticate SNMP users, but you do not want to encrypt messages using a privacy protocol.You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

P-AuthPriv
This option represents authentication and the privacy protocol. Select this security level to encrypt messages using a privacy protocol and authenticate SNMP entities. This level provides the greatest level of security. You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

The following prompt is displayed:

```
Enter Storage Type [V-Volatile, N-NonVolatile]:
```

8. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 Target Parameters Table to the configuration file. After making changes to an SNMPv3 Target Parameters Table entry with a Volatile storage type, the **S** - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 Target Parameters Table to the configuration file. After making changes to an SNMPv3 Target Parameters Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

Note
The Row Status parameter is a read-only field. The Active value indicates the SNMPv3 Target Parameters Table entry will take effect immediately.

---

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting an SNMPv3 Target Parameters Table Entry

You may want to delete an entry from the SNMPv3 Target Parameters Table. When you delete an SNMPv3 Target Parameters Table entry, there is no way to undelete, or recover, the entry.

To delete an entry in the SNMPv3 Target Parameters Table, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **8** to select Configure SNMPv3 Target Parameters Table.

   The Configure SNMPv3 Parameters Table menu is shown in Figure 152 on page 443.

   Note
   To display a Group Name and its associated parameters from the Configure SNMPv3 SecurityToGroup Table menu, type **N** to display the Next Page and **P** to display the previous page.

3. To delete an SNMPv3 Target Parameters Table entry, type **2** to select Delete SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter Target Parameters Name:
   ```

4. Enter a Target Parameters Name.

   The following prompt is displayed:

   ```
   Do you want to delete this table entry?(Y/N):[Yes/No]->
   ```

5. Enter **Y** to delete the SNMPv3 Target Address Table entry or **N** to save the entry.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an SNMPv3 Target Parameters Table Entry

This section provides procedures for modifying parameters in an SNMPv3 Target Parameters Table entry. The parameter values configured in the Target Parameters Table must match those configured in the other tables. For a more detailed explanation, see "Creating an SNMPv3 Target Parameters Table Entry" on page 443.

In an SNMPv3 Target Parameters Table entry, the Security Name parameter is linked to the User Name parameter on the SNMPv3 User Table. In an SNMPv3 User Table entry, the User Name parameter is used as an index for the entry. Because the User Name and Security Name parameters are linked, the information you configure that relates to a User Table entry must match the information you configure in the SNMPv3 Target Parameters Table entry. In addition, the values configured for the following parameters in an SNMPv3 Target Parameters Table entry must match those configured in the corresponding table entry:

- User Name parameter in the SNMPv3 User Table
- View Name parameter in the SNMPv3 View Table
- Group Name, Security Model, and Security Level parameters in the SNMPv3 Access Table
- User Name, Security Model, Group Name parameters in the SNMPv3 SecurityToGroup Table

See the following procedures:

- "Modifying the Security Name (User Name)" on page 447
- "Modifying the Security Model" on page 449
- "Modifying the Security Level" on page 450
- "Modifying the Message Process Model" on page 452
- "Modifying the Storage Type" on page 453

Note
You cannot modify the Target Params Name parameter.

Note
You cannot modify an entry in the SNMPv3 Target Parameter Table that contains a value of "default" in the Target Parameters Name field.

Modifying the Security Name (User Name)

In the AT-S63 implementation of the SNMPv3 protocol, the Security Name and the User Name parameters are equivalent. In the SNMPv3 Target Parameters Table menu, the Security Name and the User Name parameters are used interchangeably.

When you modify the Security Name parameter, you must use a value that you configured with the User Name parameter in the Configure SNMPv3 User Table menu. If you do not use a value configured with the User Name parameter, messages are not sent on behalf of this User Name. See “Creating an SNMPv3 User Table Entry” on page 380.

To modify the Security Name parameter in an SNMPv3 Target Parameter Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

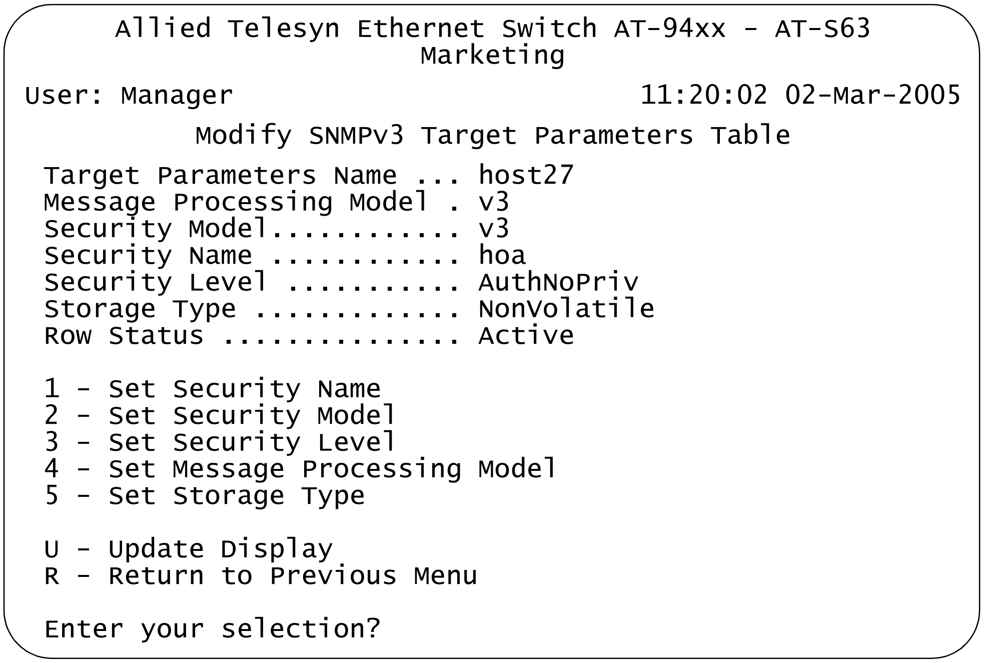
   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **8** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Parameters Table menu is shown in Figure 152.

3. From the Configure SNMPv3 Target Parameters Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Parameters Table menu is shown in Figure 153.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                         11:20:02 02-Mar-2005
          Modify SNMPv3 Target Parameters Table
 Target Parameters Name ... host27
 Message Processing Model . v3
 Security Model............ v3
 Security Name ............ hoa
 Security Level ........... AuthNoPriv
 Storage Type ............. NonVolatile
 Row Status ............... Active

 1 - Set Security Name
 2 - Set Security Model
 3 - Set Security Level
 4 - Set Message Processing Model
 5 - Set Storage Type

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 153. Modify SNMPv3 Target Parameters Table Menu

4. To change the Security Name parameter, type **1** to select Set Security Name.

   The following prompt is displayed:

   ```
   Enter Target Parameters Name:
   ```

5. Enter a previously configured Target Parameters Name.

   Enter a value of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter User (Security) Name:
   ```

6. Enter a User Name.

   Enter a value that you previously configured with the Configure SNMPv3 User Table menu. You can enter a value of up to 32 alphanumeric characters.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Security Model

For the Security or User Name you have selected, the value of the Security Model parameter in an SNMPv3 Target Parameter Table entry must match the value of the Security Model parameter in the SNMPv3 Access Table entry.

Caution
If the values of the Security Model parameter in the SNMPv3 User Table and the SNMPv3 Target Parameter Table entry do not match, notification messages are not generated on behalf of this User (Security) Name.

To modify the Security Model parameter in an SNMPv3 Target Parameter Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **8** to select Configure SNMPv3 Target Address Table.

The Configure SNMPv3 Target Parameters Table menu is shown in Figure 152.

3. From the Configure SNMPv3 Target Parameters Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Parameters Table menu is shown in Figure 153 on page 448.

4. To change the Security Model, type **2** to select Security Model.

   The following prompt is displayed:

   ```
   Enter Target Parameters Name:
   ```

5. Enter a previously configured Target Parameters Name.

   Enter a value of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Security Model [1-v1, 2-v2c, 3-v3]:
   ```

6. Select one of the following SNMP protocols that was previously configured as the Security Model for this Security Name, or User Name.

   1-v1
   Select this value if this User Name is associated with the SNMPv1 protocol.

   2-v2c
   Select this value if this User Name is associated with the SNMPv2c protocol.

   3-v3
   Select this value if this User Name is associated with the SNMPv3 protocol.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Security Level

For the Security or User Name you have selected, the value of the Security Level parameter in an SNMPv3 Target Parameter Table entry must match the value of the Security Level parameter in the SNMPv3 User Table entry.

To modify the Security Level parameter in an SNMPv3 Target Parameter Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type

5->**1**->**1**->**8**->**5**.

The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **8** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Parameters Table menu is shown in Figure 152.

3. From the Configure SNMPv3 Target Parameters Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Parameters Table menu is shown in Figure 153 on page 448.

4. To modify the Security Level, type **3** to select Set Security Level.

   The following prompt is displayed:

   ```
   Enter Target Parameters Name:
   ```

5. Enter a previously configured Target Parameters Name.

   Enter a value of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Security Level [N-NoAuthNoPriv, A-AuthNoPriv,
   P-AuthPriv]:
   ```

6. Enter the Security Level.

   Select one of the following Security Levels:

Note
The value you configure for the Security Level must match the value configured for the User Name in the Configure SNMPv3 User Table menu. See "Creating an SNMPv3 User Table Entry" on page 380.

N-NoAuthNoPriv
This option represents no authentication and no privacy protocol. Select this security level if you do not want to authenticate SNMP entities and you do not want to encrypt messages using a privacy protocol. This security level provides the least security.

Note
If you have selected SNMPv1 or SNMPv2c, N-NoAuthNoPriv is the only security level you can select.

A-AuthNoPriv
This option represents authentication, but no privacy protocol. Select this security level if you want to authenticate SNMP users, but you do not want to encrypt messages using a privacy protocol.You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

P-AuthPriv
This option represents authentication and the privacy protocol. Select this security level to encrypt messages using a privacy protocol and authenticate SNMP entities. This level provides the greatest level of security. You can select this value if you configured the Security Model parameter with the SNMPv3 protocol.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Message Process Model

You can modify the Message Process Model for SNMPv1 and SNMPv2c protocol configurations only. When you configure the SNMPv3 protocol, the Message Process Model is automatically assigned to the SNMPv3 protocol.

To modify the Message Process Model parameter in an SNMPv3 Target Parameter Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **8** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Parameters Table menu is shown in Figure 152.

3. From the Configure SNMPv3 Target Parameters Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Parameters Table menu is shown in Figure 153 on page 448.

4. To modify the Message Process Model, type **4** to select Set Message Processing Model.

   The following prompt is displayed:

   ```
   Enter Target Parameters Name:
   ```

5. Enter a previously configured Target Parameters Name.

   Enter a value of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Message Processing Model[1-v1,2-v2c,3-v3]:
   ```

6. Select one of the following SNMP protocols that is used to process, or send messages:

   1-v1
   Select this value to process messages with the SNMPv1 protocol.

   2-v2c
   Select this value to process messages with the Security Name, or User Name, with the SNMPv2c protocol.

   3-v3
   Select this value to process messages with the SNMPv3 protocol.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Storage Type

To modify the Storage Type parameter in an SNMPv3 Target Parameter Table entry, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **8** to select Configure SNMPv3 Target Address Table.

   The Configure SNMPv3 Target Parameters Table menu is shown in Figure 152.

3. From the Configure SNMPv3 Target Parameters Table menu, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Target Parameters Table menu is shown in Figure 153 on page 448.

4. To modify the Storage Type, type **5** to select Storage Type.

   The following prompt is displayed:

   ```
   Enter Target Parameters Name:
   ```

5. Enter a previously configured Target Parameters Name.

   Enter a value of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Storage Type [V-Volatile, N-NonVolatile]:
   ```

6. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 Target Parameters Table to the configuration file. After making changes to an SNMPv3 Target Parameters Table entry with a Volatile storage type, the **S** - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 Target Parameters Table to the configuration file. After making changes to an SNMPv3 Target Parameters Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring the SNMPv3 Community Table

This section contains a description of the SNMPv3 Community Table and how to create, delete, and modify table entries. The SNMPv3 Community Table allows you to create SNMPv1 and SNMPv2c Communities using the SNMPv3 Tables.

Allied Telesyn does not recommend that you use the menu described in this section to configure SNMPv1 and SNMPv2c communities. Instead, use the procedures described in "Enabling or Disabling SNMP Management" on page 79.

However, if you want to configure SNMPv1 and SNMPv2c with the SNMPv3 Tables you need to start your configuration with the SNMPv3 Community Table and then create entries in the following tables:

- SNMPv3 View Table—See "Creating an SNMPv3 View Table Entry" on page 390.
- SNMPv3 Access Table—See "Creating an SNMPv3 Access Table Entry" on page 399.
- SNMPv3 SecurityToGroup Table—See "Creating an SNMPv3 SecurityToGroup Table Entry" on page 414.
- SNMPv3 Notify Table—See "Configuring the SNMPv3 Notify Table" on page 422.
- SNMPv3 Target Address Table—See "Creating an SNMPv3 Target Address Table Entry" on page 429.
- SNMPv3 Target Parameters Table—See "Creating an SNMPv3 Target Parameters Table Entry" on page 443.

Note that you do not create an entry in the SNMPv3 User Table when you are configuring SNMPv1 and SNMPv2c with the SNMPv3 Tables. When you configure the SNMPv3 protocol, the various tables are linked with the User Name parameter and its related information. With the SNMPv1 and SNMPv2c configuration, the Security Name parameter and its related information (configured in the SNMPv3 Community Table menu) links an SNMPv3 Community Table entry to the other SNMPv3 Table entries.

Note
In the SNMPv3 Community Table entry, the Security Name parameter is not related to the User Name parameter.

For each SNMPv3 Community Table entry, you can configure the following parameters:

- Community Index
- Community Name

- Security Name
- Transport Tag
- Storage Type

In addition, you can display the entries configured with the Configure SNMPv1 & SNMPv2c Community menu in the Configure SNMPv3 Community Table menu. However, you cannot modify an SNMPv1 & SNMPv2c Community Table entry with the Configure SNMPv3 Community Table menu.

There are three functions you can perform with the Configure SNMPv3 Target Parameters Table menu.

- "Creating an SNMPv3 Community Table Entry," next
- "Deleting an SNMPv3 Community Table Entry" on page 459
- "Modifying an SNMPv3 Community Table Entry" on page 460

Creating an SNMPv3 Community Table Entry

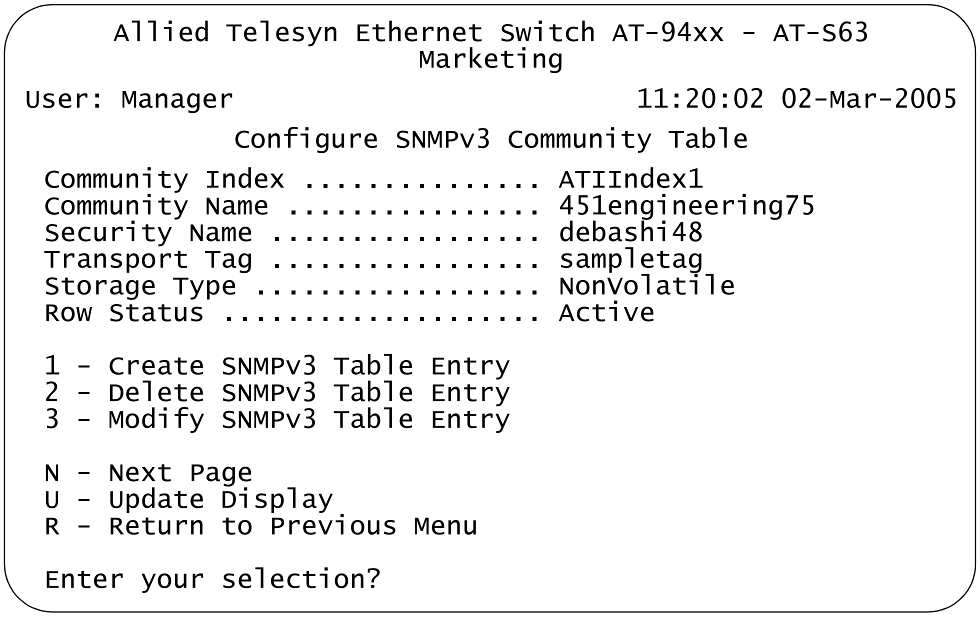
To create an entry in the Configure SNMPv3 Community Table menu, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in "Creating an SNMPv3 User Table Entry" on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is displayed Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **9** to select Configure SNMPv3 Community Table.

The Configure SNMPv3 Community Table menu is shown in Figure 154.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                        11:20:02 02-Mar-2005
             Configure SNMPv3 Community Table
 Community Index ............... ATIIndex1
 Community Name ................ 451engineering75
 Security Name ................. debashi48
 Transport Tag ................. sampletag
 Storage Type .................. NonVolatile
 Row Status .................... Active

 1 - Create SNMPv3 Table Entry
 2 - Delete SNMPv3 Table Entry
 3 - Modify SNMPv3 Table Entry

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 154. Configure SNMPv3 Community Table Menu

3. To create an entry in the SNMPv3 Community Table, type **1** to select Create SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter Community Index:
   ```

4. Enter the name of this Community Index.

   This parameter describes the name of this community and is used to index the other parameters in an SNMPv3 Community Table entry. Enter a value of up to 32 alphanumeric characters.

   The following prompt is displayed:

   ```
   Enter Community Name:
   ```

5. Enter a Community Name of up to 64 alphanumeric characters.

   The value of the Community Name parameter acts as a password for the SNMPv3 Community Table entry. This parameter is case sensitive.

Note
Allied Telesyn recommends that you select SNMP Community Names carefully to ensure these names are known only to authorized personnel.

The following prompt is displayed:

```
Enter Security Name:
```

6. Enter the name of an SNMPv1 and SNMPv2c user.

   This name must be unique. Enter a value of up to 32 alphanumeric characters.

   > **Note**
   > Do not use a value configured with the User Name parameter in the SNMPv3 User Table.

   The following prompt is displayed:

   ```
   Enter Transport Tag:
   ```

7. Enter a name of up to 32 alphanumeric characters for the Transport Tag.

   The Transport Tag parameter is similar to the Notify Tag parameter in the SNMPv3 Notify Table. Add the value you configure for the Transport Tag parameter to the Tag List parameter in the Target Address Table. In this way, the Transport Tag parameter links an SNMPv3 Community Table entry with an entry in the SNMPv3 Target Address Table. See “SNMPv3 Target Address Table” on page 377.

   The following prompt is displayed:

   ```
   Enter Storage type [V-volatile, N-NonVolatile]:
   ```

8. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to save an entry in the SNMPv3 Community Table to the configuration file. After making changes to an SNMPv3 Community Table entry with a Volatile storage type, the **S** - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 Community Table to the configuration file. After making changes to an SNMPv3 Community Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

Note
The Row Status parameter is a read-only field. The Active value indicates the SNMPv3 Community Table entry takes effect immediately.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting an SNMPv3 Community Table Entry

You may want to delete an entry from the SNMPv3 Community Table. When you delete an entry in the SNMPv3 Community Table, there is no way to undelete or recover the entry.

To delete an entry in the SNMPv3 Community Table, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in "Creating an SNMPv3 User Table Entry" on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is shown in Figure 140 on page 381.

2. From the Configure SNMPv3 Table menu, type **9** to select Configure SNMPv3 Community Table.

   The Configure SNMPv3 Community Table menu is shown in Figure 154 on page 457.

3. To delete an entry in the SNMPv3 Community Table, type **2** to select Delete SNMPv3 Table Entry.

   The following prompt is displayed:

   ```
   Enter Community Index:
   ```

4. Enter the Community Index that you want to delete.

   The following prompt is displayed:

   ```
   Do you want to delete this table entry?(Y/N):[Yes/No]->
   ```

5. Choose one of the following:

   Y
   Type Y to delete an SNMPv3 Community table entry.

   N
   Type N to retain the SNMPv3 Community table entry.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an SNMPv3 Community Table Entry

For each entry in the SNMPv3 Community Table, you can modify the following parameters:

- ❒ Community Name
- ❒ Security Name
- ❒ Transport Tag
- ❒ Storage Type

However, you cannot modify the Community Index parameter.

Although you can display the SNMPv1 and SNMPv2c configuration created with the procedures described in “Creating an SNMP Community String” on page 81, you cannot modify these Community Table entries with the SNMPv3 Tables.

See the following procedures:

- ❒ “Modifying the Community Name” on page 460
- ❒ “Modifying the Security Name” on page 462
- ❒ “Modifying the Transport Tag” on page 462
- ❒ “Modifying the Storage Type” on page 463

Modifying the Community Name

To modify the Community Name parameter in an SNMPv3 Community Table entry, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main menu type **5**->**1**->**1**->**8**->**5**.

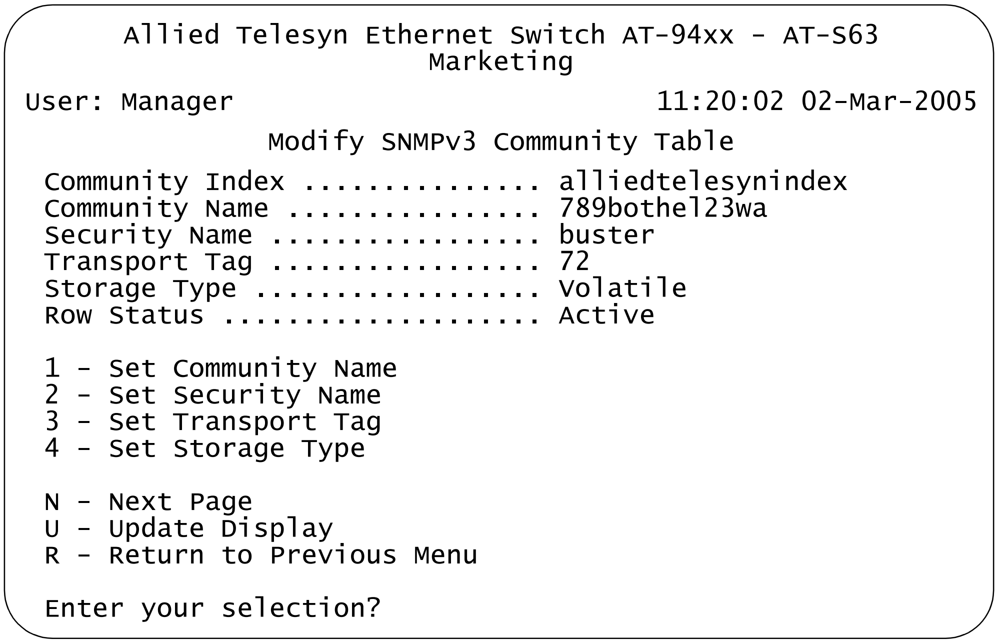
   The Configure SNMPv3 Table menu is displayed Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **9** to select Configure SNMPv3 Community Table.

   The SNMPv3 Community Table is shown in Figure 154 on page 457.

3. From the Configure SNMPv3 Community Table, type **3** to select Modify SNMPv3 Table Entry.

The Modify SNMPv3 Community Table menu is shown in Figure 155.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                               11:20:02 02-Mar-2005
                 Modify SNMPv3 Community Table
 Community Index ............... alliedtelesynindex
 Community Name ................ 789bothel23wa
 Security Name ................. buster
 Transport Tag ................. 72
 Storage Type .................. Volatile
 Row Status .................... Active

 1 - Set Community Name
 2 - Set Security Name
 3 - Set Transport Tag
 4 - Set Storage Type

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 155. Modify SNMPv3 Community Table Menu

4. To change the Community Name, type **1** to select Set Community Name.

   The following prompt is displayed:

   ```
   Enter Community Index:
   ```

5. Enter the Community Index that you want to modify.

   The following prompt is displayed:

   ```
   Enter Community Name:
   ```

6. Enter the new Community Name.

   The value of the Community Name parameter acts as a password for the SNMPv3 Community Table entry. This parameter is case sensitive. Enter a value of up to 64 alphanumeric characters.

   Note
   Allied Telesyn recommends that you select SNMP Community Names carefully to ensure these names are known only to authorized personnel.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Security Name

To modify the Security Name parameter in an SNMPv3 Community Table entry, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is displayed as shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **9** to select Configure SNMPv3 Community Table.

   The Configure SNMPv3 Community Table menu is shown in Figure 154 on page 457.

3. From the Configure SNMPv3 Community Table, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Community Table menu is shown in Figure 155 on page 461.

4. To change the Security Name, type **2** to select Set Security Name.

   The following prompt is displayed:

   ```
   Enter Community Index:
   ```

5. Enter the Community Index of the Security Name you want to change.

   The following prompt is displayed:

   ```
   Enter Security Name:
   ```

6. Enter the new Security Name.

   Enter a value of up to 32 alphanumeric characters.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Transport Tag

To modify the Transport Tag parameter in an SNMPv3 Community Table entry, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in “Creating an SNMPv3 User Table Entry” on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

The Configure SNMPv3 Table menu is displayed as shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **9** to select Configure SNMPv3 Community Table.

   The Configure SNMPv3 Community Table menu is shown in Figure 154 on page 457.

3. From the Configure SNMPv3 Community Table, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Community Table menu is shown in Figure 155 on page 461.

4. To change the Transport Tag, type **3** to select Set Transport Tag.

   The following prompt is displayed:

   ```
   Enter Community Index:
   ```

5. Enter the Community Index of the Transport Tag you want to change.

   The following prompt is displayed:

   ```
   Enter Transport Tag:
   ```

6. Enter the new value for the Transport Tag.

   Enter a name of up to 32 alphanumeric characters.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying the Storage Type

To modify the Storage Type parameter in an SNMPv3 Community Table entry, perform the following procedure:

1. Follow steps 1 through 5 in the procedure described in "Creating an SNMPv3 User Table Entry" on page 380. Or, from the Main Menu type **5**->**1**->**1**->**8**->**5**.

   The Configure SNMPv3 Table menu is displayed as shown in Figure 139 on page 381.

2. From the Configure SNMPv3 Table menu, type **9** to select Configure SNMPv3 Community Table.

   The Configure SNMPv3 Community Table menu is shown in Figure 154 on page 457.

3. From the Configure SNMPv3 Community Table, type **3** to select Modify SNMPv3 Table Entry.

   The Modify SNMPv3 Community Table Menu is shown in Figure 155 on page 461.

4. To change the Storage Type, type **4** to select Set Storage Type.

   The following prompt is displayed:

   ```
   Enter Community Index:
   ```

5. Enter the Community Index of the Storage Type you want to change.

   The following prompt is displayed:

   ```
   Enter Storage type [V-volatile, N-NonVolatile]:
   ```

6. Select one of the following storage types for this table entry:

   V - Volatile
   Select this storage type if you do not want the ability to an entry in the SNMPv3 Community Table to the configuration file. After making changes to an SNMP Community Table entry with a Volatile storage type, the
   S - Save Configuration Changes option does not appear on the Main Menu.

   N-NonVolatile
   Select this storage type if you want the ability to save an entry in the SNMPv3 Community Table to the configuration file. After making changes to an SNMPv3 Community Table entry with a NonVolatile storage type, the **S** - Save Configuration Changes option appears on the Main Menu, allowing you to save your changes. Allied Telesyn recommends this storage type.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying SNMPv3 Table Menus

The procedures in this section describe how to display the SNMPv3 Tables. The following procedures are provided:

- ❐ "Displaying the Display SNMPv3 User Table Menu," next
- ❐ "Displaying the Display SNMPv3 View Table Menu" on page 466
- ❐ "Displaying the Display SNMPv3 Access Table Menu" on page 467
- ❐ "Displaying the Display SNMPv3 SecurityToGroup Table Menu" on page 468
- ❐ "Displaying the Display SNMPv3 Notify Table Menu" on page 469
- ❐ "Displaying the Display SNMPv3 Target Address Table Menu" on page 470
- ❐ "Displaying the Display SNMPv3 Target Parameters Table Menu" on page 470
- ❐ "Displaying the Display SNMPv3 Community Table Menu" on page 471

Displaying the Display SNMPv3 User Table Menu

This section describes how to display the Display SNMPv3 User Table menu. For information about the SNMPv3 User Table, see "Creating an SNMPv3 User Table Entry" on page 380.

To display the Display SNMPv3 User Table menu, perform the following procedure.

1. From the Main Menu, type **5** to select System Administration.

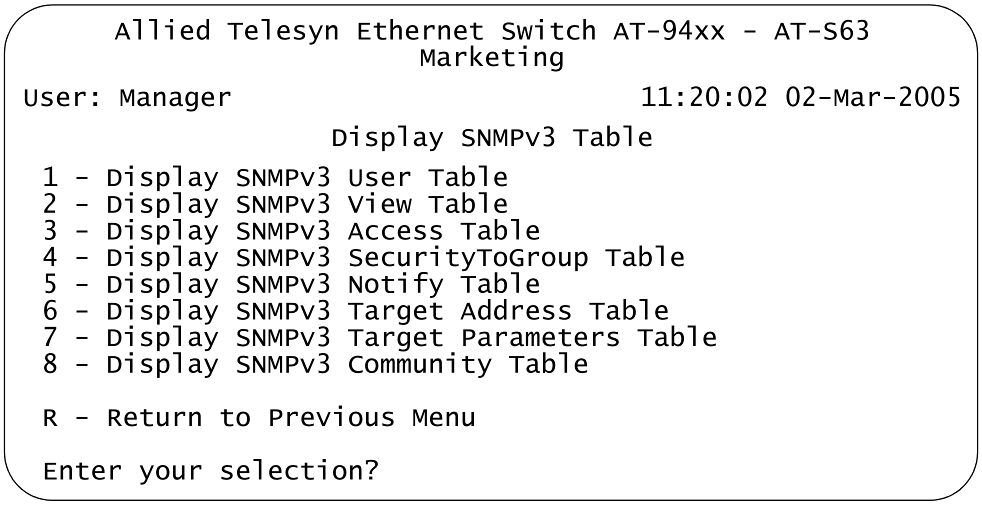
   The System Administration menu is shown in Figure 7 on page 53.

2. From the System Administration menu, type **5** to select SNMP Configuration.

   The SNMP Configuration menu is shown in Figure 16 on page 79.

3. From the SNMP Configuration menu, type **6** to select Display SNMPv3 Table.

The Display SNMPv3 Table menu is shown in Figure 156.

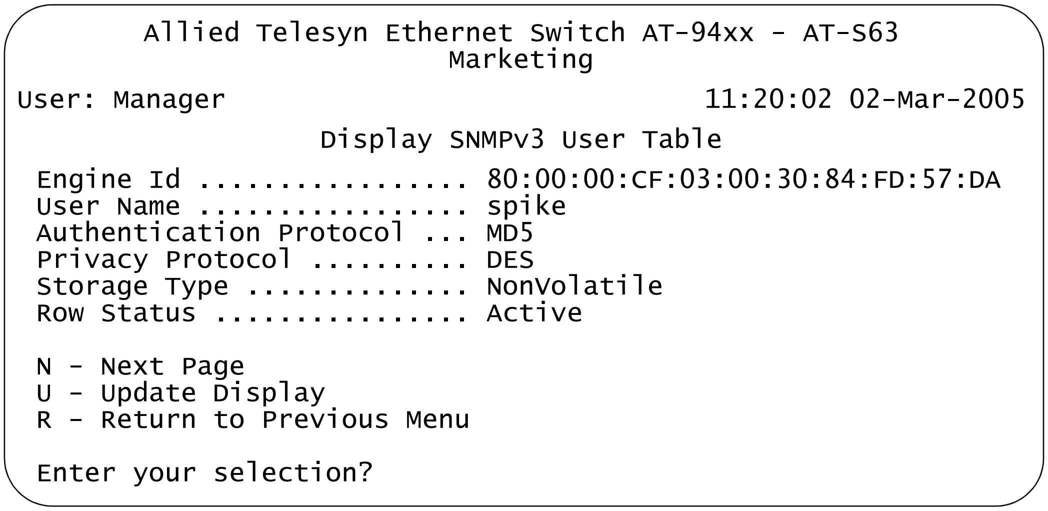


```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                            11:20:02 02-Mar-2005
                       Display SNMPv3 Table
 1 - Display SNMPv3 User Table
 2 - Display SNMPv3 View Table
 3 - Display SNMPv3 Access Table
 4 - Display SNMPv3 SecurityToGroup Table
 5 - Display SNMPv3 Notify Table
 6 - Display SNMPv3 Target Address Table
 7 - Display SNMPv3 Target Parameters Table
 8 - Display SNMPv3 Community Table

 R - Return to Previous Menu

 Enter your selection?
```

Figure 156. Display SNMPv3 Table Menu

4. From the Display SNMPv3 Table menu, type **1** to select Display SNMPv3 User Table.

   The Display SNMPv3 User Table is shown in Figure 157.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                              11:20:02 02-Mar-2005
                   Display SNMPv3 User Table
 Engine Id ................ 80:00:00:CF:03:00:30:84:FD:57:DA
 User Name ................ spike
 Authentication Protocol ... MD5
 Privacy Protocol .......... DES
 Storage Type .............. NonVolatile
 Row Status ................ Active

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 157. Display SNMPv3 User Table Menu

Displaying the Display SNMPv3 View Table Menu

This section describes how to display the Display SNMPv3 View Table menu. For information about the SNMPv3 View Table parameters, see “Creating an SNMPv3 View Table Entry” on page 390.

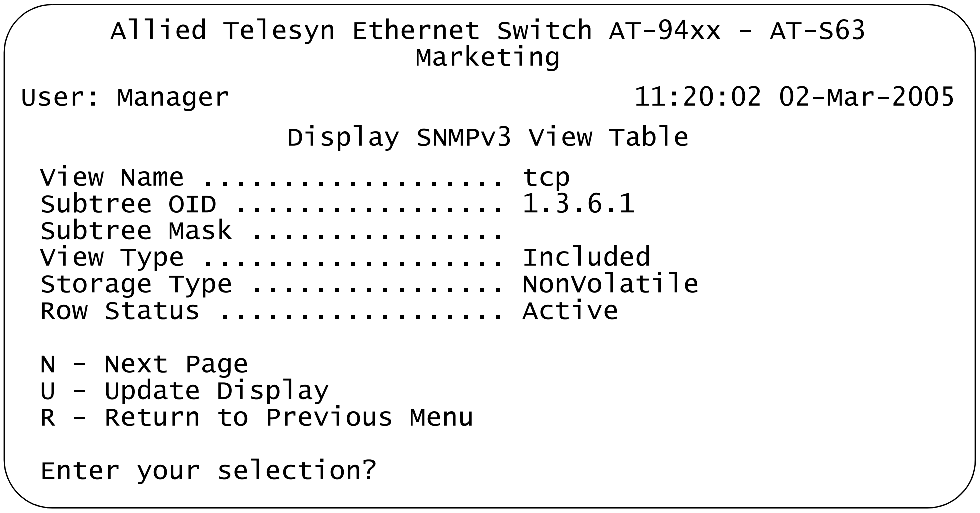
To display the Display SNMPv3 View Table menu, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Displaying the

Display SNMPv3 User Table Menu" on page 465. Or, from the Main menu type **5**->**1**->**1**->**8**->**6**.

2. From the Display SNMPv3 Table menu, type **2** to select Display SNMPv3 View Table.

   The Display SNMPv3 View Table menu is shown in Figure 158.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                           11:20:02 02-Mar-2005
                 Display SNMPv3 View Table
 View Name .................. tcp
 Subtree OID ................ 1.3.6.1
 Subtree Mask ...............
 View Type .................. Included
 Storage Type ............... NonVolatile
 Row Status ................. Active

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 158. Display SNMPv3 View Table Menu

Displaying the Display SNMPv3 Access Table Menu

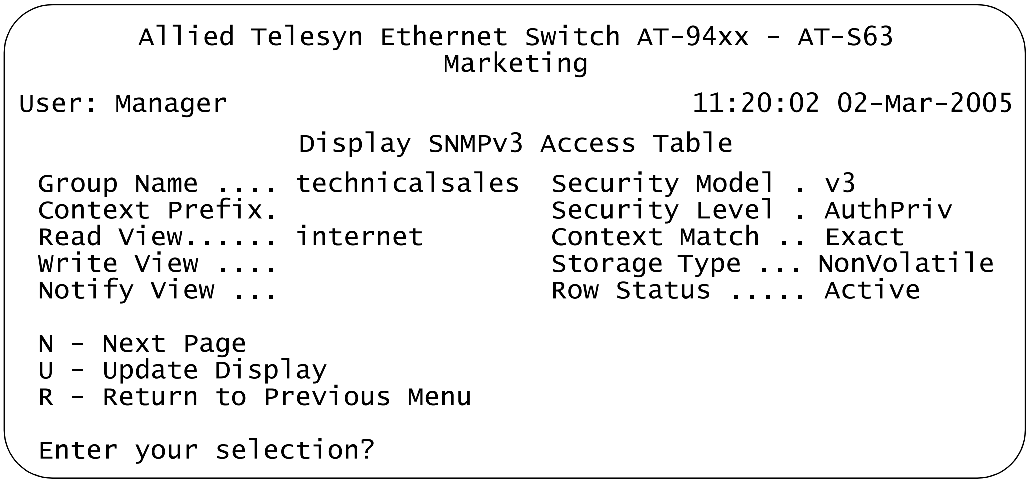
This section describes how to display the Display SNMPv3 Access Table menu. For information about the SNMPv3 Access Table parameters, see "Creating an SNMPv3 Access Table Entry" on page 399.

To display the Display SNMPv3 Access Table menu, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in "Displaying the Display SNMPv3 User Table Menu" on page 465. Or, from the Main Menu type **5**->**1**->**1**->**8**->**6**.

2. From the Display SNMPv3 Table menu, type **3** to select Display SNMPv3 Access Table.

The Display SNMPv3 Access Table menu is shown in Figure 159.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                            11:20:02 02-Mar-2005
                 Display SNMPv3 Access Table
 Group Name .... technicalsales  Security Model . v3
 Context Prefix.                 Security Level . AuthPriv
 Read View...... internet        Context Match .. Exact
 Write View ....                 Storage Type ... NonVolatile
 Notify View ...                 Row Status ..... Active

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 159. Display SNMPv3 Access Table Menu

Displaying the Display SNMPv3 SecurityToGroup Table Menu

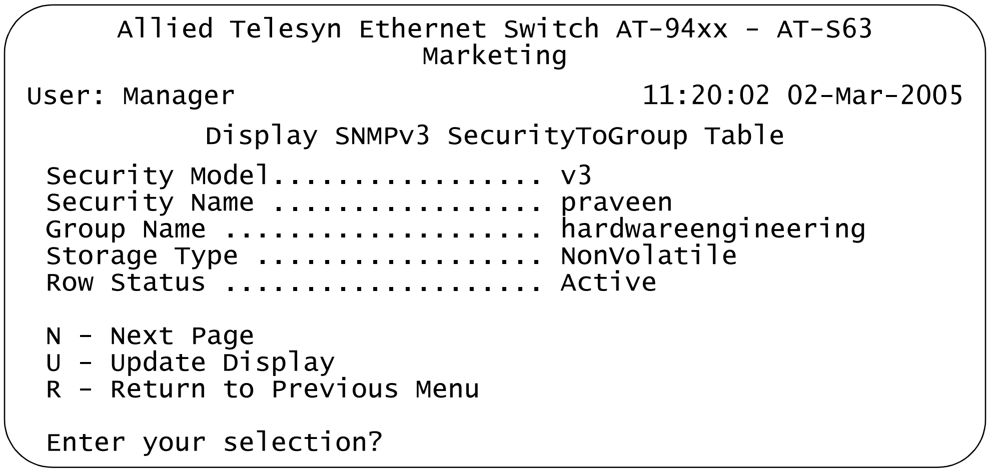
This section describes how to display the Display SNMPv3 SecurityToGroup Table menu. For more information about the parameters in the SNMPv3 SecurityToGroup Table menu, see “Creating an SNMPv3 SecurityToGroup Table Entry” on page 414.

To display the Display SNMPv3 SecurityToGroup Table menu, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Displaying the Display SNMPv3 User Table Menu” on page 465. Or, from the Main Menu type **5**->**1**->**1**->**8**->**6**.

2. From the Display SNMPv3 Table menu, type **4** to select Display SNMPv3 SecurityToGroup Table.

The Display SNMPv3 SecurityToGroup Table menu is shown in Figure 160.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                           11:20:02 02-Mar-2005
           Display SNMPv3 SecurityToGroup Table
 Security Model................. v3
 Security Name ................. praveen
 Group Name .................... hardwareengineering
 Storage Type .................. NonVolatile
 Row Status .................... Active

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 160. Display SNMPv3 SecurityToGroup Table Menu

Displaying the Display SNMPv3 Notify Table Menu

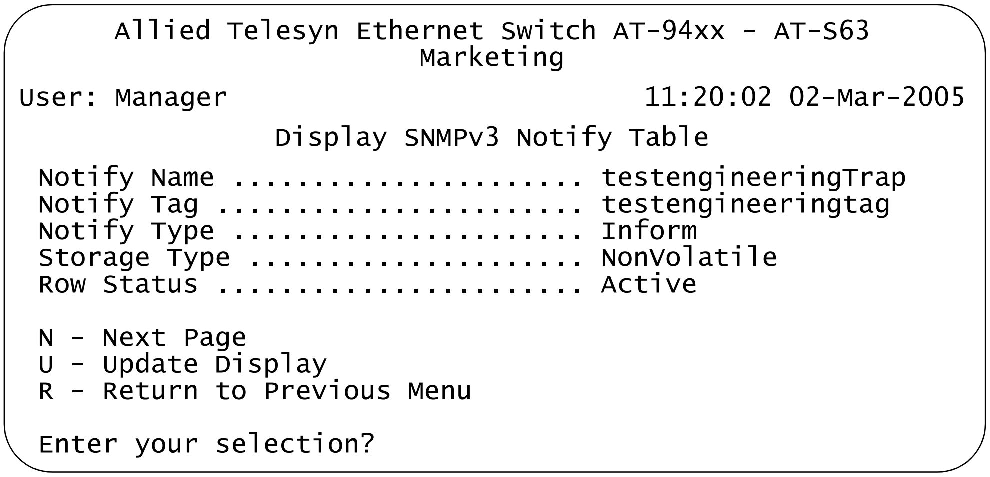
This section describes how to display the Display SNMPv3 Notify Table menu. For information about the SNMPv3 Notify Table parameters, see "Creating an SNMPv3 Notify Table Entry" on page 422.

To display the Display SNMPv3 Notify Table menu, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in "Displaying the Display SNMPv3 User Table Menu" on page 465. Or, from the Main Menu type **5**->**1**->**1**->**8**->**6**.

2. From the Display SNMPv3 Table menu, type **5** to select Display SNMPv3 Notify Table.

   The Display SNMPv3 Notify Table menu is shown in Figure 160.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                            11:20:02 02-Mar-2005
                Display SNMPv3 Notify Table
 Notify Name ..................... testengineeringTrap
 Notify Tag ...................... testengineeringtag
 Notify Type ..................... Inform
 Storage Type .................... NonVolatile
 Row Status ...................... Active

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 161. Display SNMPv3 Notify Table Menu

Displaying the Display SNMPv3 Target Address Table Menu

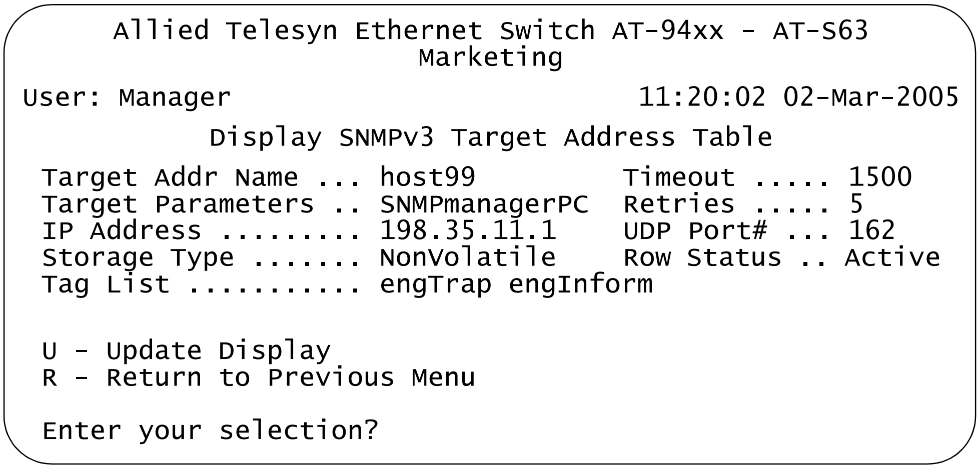
This section describes how to display the Display SNMPv3 Target Address Table menu. For information about the SNMPv3 Target Address Table parameters, see “Creating an SNMPv3 Target Address Table Entry” on page 429.

To display the Display SNMPv3 Target Address Table menu, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Displaying the Display SNMPv3 User Table Menu” on page 465. Or, from the Main Menu type **5**->**1**->**1**->**8**->**6**.

2. From the Display SNMPv3 Table menu, type **6** to select Display SNMPv3 Target Address Table.

   The Display SNMPv3 Target Address Table menu is shown in Figure 160.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
            Display SNMPv3 Target Address Table
 Target Addr Name ... host99         Timeout ..... 1500
 Target Parameters .. SNMPmanagerPC  Retries ..... 5
 IP Address ......... 198.35.11.1    UDP Port# ... 162
 Storage Type ....... NonVolatile    Row Status .. Active
 Tag List ........... engTrap engInform


 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 162. Display SNMPv3 Target Address Table Menu

Displaying the Display SNMPv3 Target Parameters Table Menu

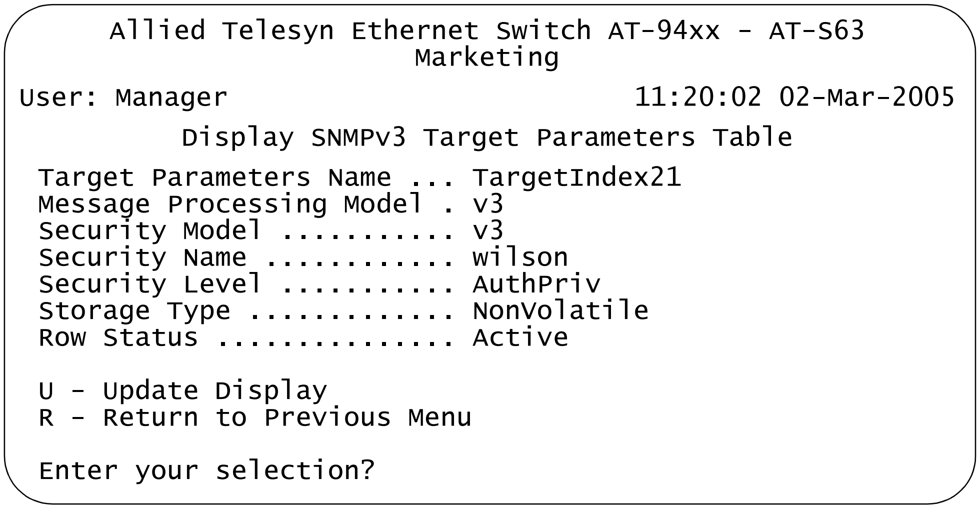
This section describes how to display the Display SNMPv3 Target Parameters Table menu. For information about the SNMPv3 Target Parameters Table parameters, see “Creating an SNMPv3 Target Parameters Table Entry” on page 443.

To display the Display SNMPv3 Target Parameters Table menu, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in “Displaying the Display SNMPv3 User Table Menu” on page 465. Or, from the Main Menu type **5**->**1**->**1**->**8**->**6**.

2. From the Display SNMPv3 Table menu, type **7** to select Display SNMPv3 Target Parameters Table.

The Display SNMPv3 Target Parameters Table menu is shown in Figure 160.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                         11:20:02 02-Mar-2005
          Display SNMPv3 Target Parameters Table
 Target Parameters Name ... TargetIndex21
 Message Processing Model . v3
 Security Model ........... v3
 Security Name ............ wilson
 Security Level ........... AuthPriv
 Storage Type ............. NonVolatile
 Row Status ............... Active

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 163. Display SNMPv3 Target Parameters Table Menu

Displaying the Display SNMPv3 Community Table Menu

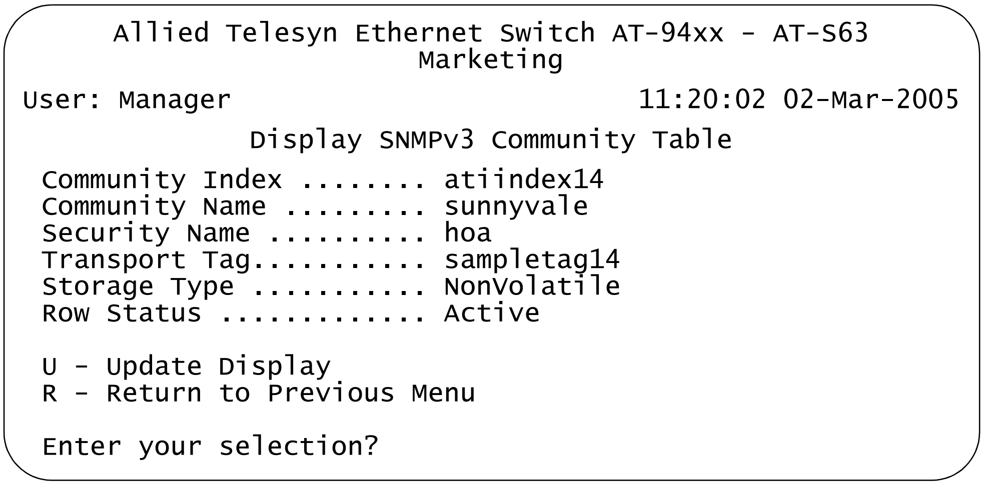
This section describes how to display the Display SNMPv3 Community Table menu. For information about the SNMPv3 Community Table parameters, see "Creating an SNMPv3 Community Table Entry" on page 456.

To display the Display SNMPv3 Community Table menu, perform the following procedure.

1. Follow steps 1 through 5 in the procedure described in "Displaying the Display SNMPv3 User Table Menu" on page 465. Or, from the Main Menu type **5**->**1**->**1**->**8**->**6**.

2. From the Display SNMPv3 Table menu, type **8** to select Display SNMPv3 Community Table.

The Display SNMPv3 Community Table menu is shown in Figure 160.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
               Display SNMPv3 Community Table
 Community Index ........ atiindex14
 Community Name ......... sunnyvale
 Security Name .......... hoa
 Transport Tag........... sampletag14
 Storage Type ........... NonVolatile
 Row Status ............. Active

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 164. Display SNMPv3 Community Table Menu

Section IV

Spanning Tree Protocols

The chapters in this section provide information and procedures for the spanning tree protocols. The chapters include:

Chapter 21
STP and RSTP

This chapter provides background information on the Spanning Tree Protocol (STP) and Rapid Spanning Tree Protocol (RSTP). The chapter also contains procedures on how to adjust the STP and RSTP bridge and port parameters. The sections in this chapter include:

The Multiple Spanning Tree Protocol is described in Chapter 22, “MSTP” on page 501.

Note
For detailed information on the Spanning Tree Protocol, refer to IEEE Std 802.1D. For detailed information on the Rapid Spanning Tree Protocol, refer to IEEE Std 802.1w.

STP and RSTP Overview

The performance of a Ethernet network can be negatively impacted by the formation of a data loop in the network topology. A data loop exists when two or more nodes on a network can transmit data to each other over more than one data path. The problem that data loops pose is that data packets can become caught in repeating cycles, referred to as broadcast storms, that needlessly consume network bandwidth and can significantly reduce network performance.

STP and RSTP prevent data loops from forming by ensuring that only one path exists between the end nodes in your network. Where multiple paths exist, these protocols place the extra paths in a standby or blocking mode, leaving only one main active path.

STP and RSTP can also activate a redundant path if the main path goes down. So not only do these protocols guard against multiple links between segments and the risk of broadcast storms, but they can also maintain network connectivity by activating a backup redundant path in case a main link fails.

Where the two protocols differ is in the time each takes to complete the process referred to as *convergence*. When a change is made to the network topology, such as the addition of a new bridge, a spanning tree protocol must determine whether there are redundant paths that must be blocked to prevent data loops, or activated to maintain communications between the various network segments. This is the process of convergence.

With STP, convergence can take up to a minute to complete in a large network. This can result in the loss of communication between various parts of the network during the convergence process, and the subsequent lost of data packets.

RSTP is much faster. It can complete a convergence in seconds, and so greatly diminish the possible impact the process can have on your network.

Only one spanning tree can be active on the switch at a time. The default is RSTP.

The STP implementation on the AT-S63 management software complies with the IEEE 802.1d standard. The RSTP implementation complies with the IEEE 802.1w standard. The following subsections provide a basic overview on how STP and RSTP operate and define the different parameters that you can adjust.

Bridge Priority and the Root Bridge

The first task that bridges perform when a spanning tree protocol is activated on a network is the selection of a *root bridge*. A root bridge distributes network topology information to the other network bridges and is used by the other bridges to determine if there are redundant paths in the network.

A root bridge is selected by the *bridge priority* number, also referred to as the bridge identifier, and sometimes the bridge's MAC address. The bridge with the lowest bridge priority number in the network is selected as the root bridge. If two or more bridges have the same bridge priority number, of those bridges the one with the lowest MAC address is designated as the root bridge.

You can change the bridge priority number in the AT-S63 management software. You can designate which switch on your network you want as the root bridge by giving it the lowest bridge priority number. You might also consider which bridge should function as the backup root bridge in the event you need to take the primary root bridge offline, and assign that bridge the second lowest bridge identifier number.

The bridge priority has a range 0 to 61440 in increments of 4096. To make this easier for you, the AT-S63 management software divides the range into increments. You specify the increment that represents the desired bridge priority value. The range is divided into sixteen increments, as shown in Table 9.

Table 9. Bridge Priority Value Increments

Increment	Bridge Priority	Increment	Bridge Priority
0	0	8	32768
1	4096	9	36864
2	8192	10	40960
3	12288	11	45056
4	16384	12	49152
5	20480	13	53248
6	24576	14	57344
7	28672	15	61440

Path Costs and Port Costs

After the root bridge has been selected, the bridges must determine if the network contains redundant paths and, if one is found, they must select a preferred path while placing the redundant paths in a backup or blocking state.

Where there is only one path between a bridge and the root bridge, the bridge is referred to as the *designated bridge* and the port through which the bridge is communicating with the root bridge is referred to as the *root port*.

If redundant paths exist, the bridges that are a part of the paths must determine which path will be the primary, active path, and which path(s) will be placed in the standby, blocking mode. This is accomplished by an determination of *path costs*. The path offering the lowest cost to the root bridge becomes the primary path and all other redundant paths are placed into blocking state.

Path cost is determined through an evaluation of *port costs*. Every port on a bridge participating in STP has a cost associated with it. The cost of a port on a bridge is typically based on port speed. The faster the port, the lower the port cost. The exception to this is the ports on the root bridge, where all ports have a port cost of 0.

Path cost is simply the sum of the port costs between a bridge and the root bridge.

The port cost of a port on an AT-9400 Series switch is adjustable through the AT-S63 management software. For STP, the range is 0 to 65,535. For RSTP, the range is 0 to 20,000,000.

Port cost also has an Auto-Detect feature. This feature allows spanning tree to automatically set the port cost according to the speed of the port, assigning a lower value for higher speeds. Auto-Detect is the default setting. Table 12 lists the STP port costs with Auto-Detect.

Table 10. STP Auto-Detect Port Costs

Port Speed	Port Cost
10 Mbps	100
100 Mbps	10
1000 Mbps	4

Table 11 lists the STP port costs with Auto-Detect when a port is part of a port trunk.

Table 11. STP Auto-Detect Port Trunk Costs

Port Speed	Port Cost
10 Mbps	4
100 Mbps	4

Table 11. STP Auto-Detect Port Trunk Costs

Port Speed	Port Cost
1000 Mbps	2

Table 12 lists the RSTP port costs with Auto-Detect.

Table 12. RSTP Auto-Detect Port Costs

Port Speed	Port Cost
10 Mbps	2,000,000
100 Mbps	200,000
1000 Mbps	20,000

Table 13 lists the RSTP port costs with Auto-Detect when the port is part of a port trunk.

Table 13. RSTP Auto-Detect Port Trunk Costs

Port Speed	Port Cost
10 Mbps	20,000
100 Mbps	20,000
1000 Mbps	2,000

You can override Auto-Detect and set the port cost manually.

Port Priority

If two paths have the same port cost, the bridges must select a preferred path. In some instances this can involve the use of the *port priority* parameter. This parameter is used as a tie breaker when two paths have the same cost.

The range for port priority is 0 to 240. As with bridge priority, this range is broken into increments, in this case multiples of 16. To select a port priority for a port, you enter the increment of the desired value. Table 14 lists the values and increments. The default value is 128, which is increment 8.

Table 14. Port Priority Value Increments

Increment	Bridge Priority	Increment	Bridge Priority
0	0	8	128
1	16	9	144

Table 14. Port Priority Value Increments

Increment	Bridge Priority	Increment	Bridge Priority
2	32	10	160
3	48	11	176
4	64	12	192
5	80	13	208
6	96	14	224
7	112	15	240

Forwarding Delay and Topology Changes

If there is a change in the network topology due to a failure, removal, or addition of any active components, the active topology also changes. This may trigger a change in the state of some blocked ports. However, a change in a port state is not activated immediately.

It might take time for the root bridge to notify all bridges that a topology change has occurred, especially if it is a large network. If a topology change is made before all bridges have been notified, a temporary data loop could occur, and that could adversely impact network performance.

To forestall the formation of temporary data loops during topology changes, a port designated to change from blocking to forwarding passes through two additional states—listening and learning—before it begins to forward frames. The amount of time a port spends in these states is set by the forwarding *delay* value. This value states the amount of time that a port spends in the listening and learning states prior to changing to the forwarding state.

The forwarding delay value is adjustable in the AT-S63 management software. The appropriate value for this parameter depends on a number of variables; the size of your network is a primary factor. For large networks, you should specify a value large enough to allow the root bridge sufficient time to propagate a topology change throughout the entire network. For small networks, you should not specify a value so large that a topology change is unnecessarily delayed, which could result in the delay or loss of some data packets.

Note
The forwarding delay parameter applies only to ports on the switch that are operating STP-compatible mode.

Hello Time and Bridge Protocol Data Units (BPDU)

The bridges that are part of a spanning tree domain communicate with each other using a bridge broadcast frame that contains a special section devoted to carrying STP or RSTP information. This portion of the frame is referred to as the bridge protocol data unit (BPDU). When a bridge is brought online, it issues a BPDU in order to determine whether a root bridge has already been selected on the network, and if not, whether it has the lowest bridge priority number of all the bridges and should therefore become the root bridge.

The root bridge periodically transmits a BPDU to determine whether there have been any changes to the network topology and to inform other bridges of topology changes. The frequency with which the root bridge sends out a BPDU is called the *hello time*. This is a value that you can set in the AT-S63 management software. The interval is measured in seconds and the default is two seconds. Consequently, if an AT-9400 Series switch is selected as the root bridge of a spanning tree domain, it transmits a BPDU every two seconds.

Point-to-Point and Edge Ports

Note
This section applies only to RSTP.

Part of the task of configuring RSTP is defining the port types on the bridge. This relates to the device(s) connected to the port. With the port types defined, RSTP can reconfigure a network much quicker than STP when a change in network topology is detected.

There are two possible selections:

- Point-to-point port
- Edge port

If a bridge port is operating in full-duplex mode, than the port is functioning as a point-to-point port. Figure 165 illustrates two AT-9400 Series switches that have been connected with one data link. With the link operating in full-duplex, the ports are point-to-point ports.

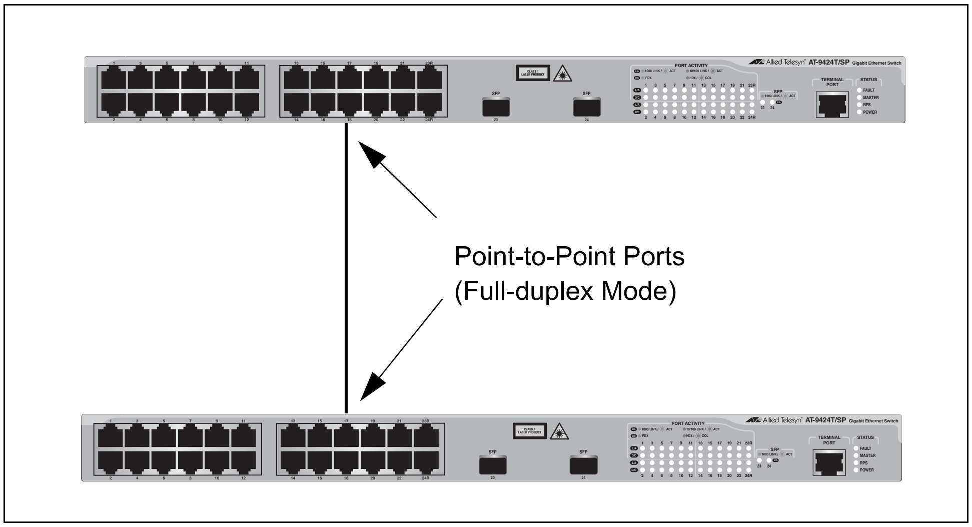


Figure 165. Point-to-Point Ports

If a port is operating in half-duplex mode and is not connected to any further bridges participating in STP or RSTP, then the port is an edge port. Figure 166 illustrates an edge port on an AT-9400 switch. The port is connected to an Ethernet hub, which in turn is connected to a series of Ethernet workstations. This is an edge port because it is connected to a device operating at half-duplex mode and there are no participating STP or RSTP devices connected to it.

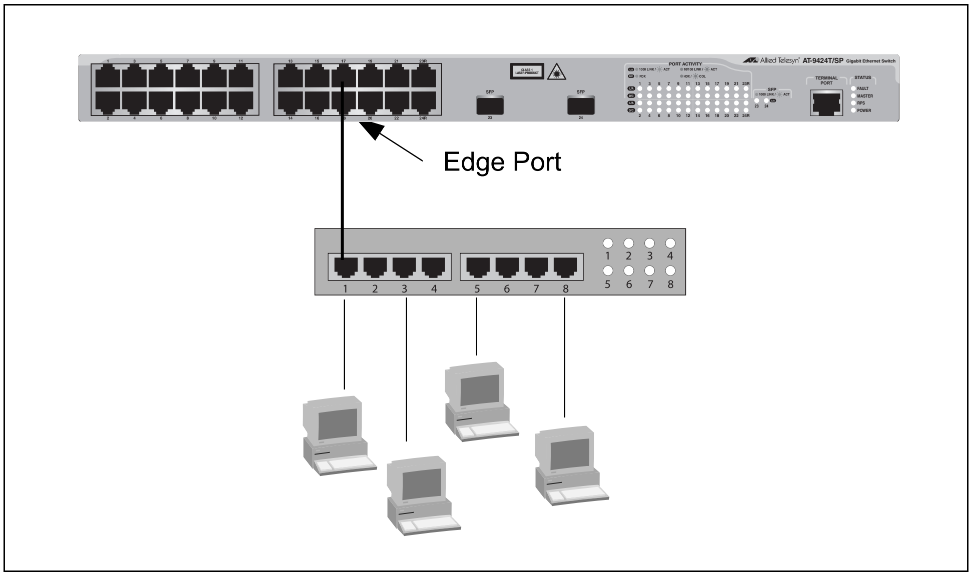


Figure 166. Edge Port

A port can be both a point-to-point and an edge port at the same time. It operates in full-duplex and has no STP or RSTP devices connected to it. Figure 167 illustrates a port functioning as both a point-to-point and edge port.

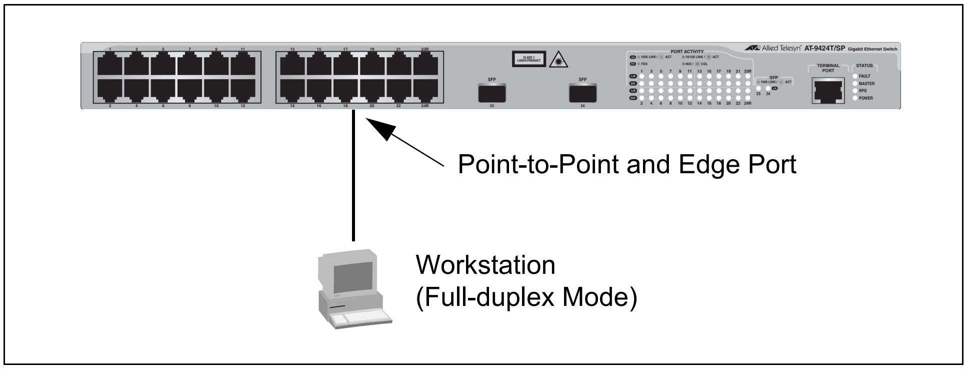


Figure 167. Point-to-Point and Edge Port

Determining whether a bridge port is point-to-point, edge, or both, can be a bit confusing. For that reason, do not change the default values for this RSTP feature unless you have a good grasp of the concept. In most cases, the default values work well.

Mixed STP and RSTP Networks

RSTP IEEE 802.1w is fully compliant with STP IEEE 802.1d. Your network can consist of bridges running both protocols. STP and RSTP in the same network can operate together to create a single spanning tree domain.

If you decide to activate spanning tree on the switch, there is no reason not to activate RSTP on an AT-9400 Series switch even when all other switches are running STP. The switch can combine its RSTP with the STP of the other switches. The switch monitors the traffic on each port for BPDU packets. Ports that receive RSTP BPDU packets operates in RSTP mode while ports receiving STP BPDU packets operate in STP mode.

Spanning Tree and VLANs

The spanning tree implementation in the AT-S63 management software is a single-instance spanning tree. The switch supports just one spanning tree. You cannot define multiple spanning trees.

The single spanning tree encompasses all ports on the switch. If the ports are divided into different VLANs, the spanning tree crosses the VLAN boundaries. This point can pose a problem in networks containing multiple VLANs that span different switches and are connected with untagged ports. In this situation, STP blocks a data link because it detects a data loop. This can cause fragmentation of your VLANs.

This issue is illustrated in Figure 168. Two VLANs, Sales and Production, span two AT-9400 Series switches. Two links consisting of untagged ports connect the separate parts of each VLAN. If STP or RSTP is activated on the switches, one of the links is disabled. In the example, the port on the top switch that links the two parts of the Production VLAN is changed to the block state. This leaves the two parts of the Production VLAN unable to communicate with each other.

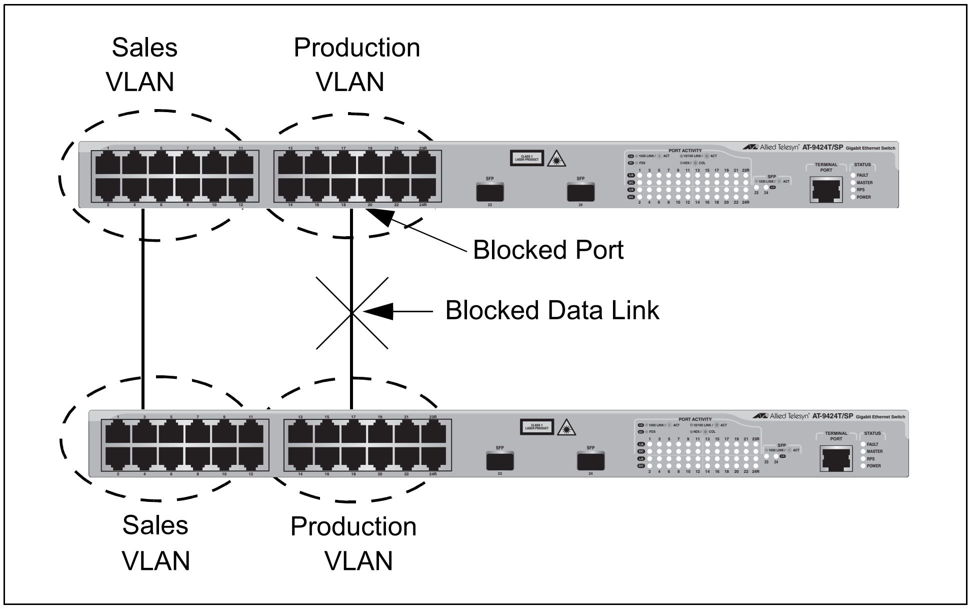


Figure 168. VLAN Fragmentation

You can avoid this problem by not activating spanning tree or by connecting VLANs using tagged instead of untagged ports. (For information on tagged and untagged ports, refer to Chapter 23, “Port-based and Tagged VLANs” on page 547.)

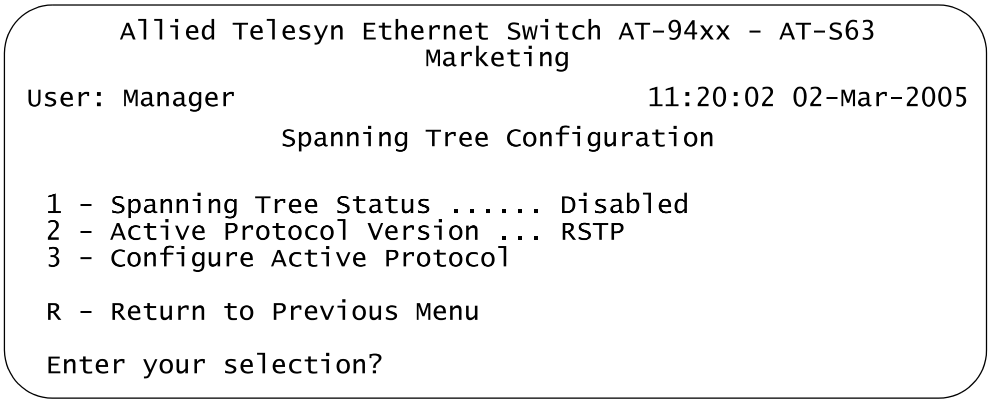
Enabling or Disabling a Spanning Tree Protocol

The AT-S63 management software supports STP, RSTP, and MSTP. However, only one spanning tree protocol can be active on the switch at a time. Before you can enable a spanning tree protocol, you must first select it as the active spanning tree protocol on the switch. After you have selected it as the active protocol, you can then configure it and enable or disable it.

To select and activate a spanning tree protocol, or to disable spanning tree, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
                Spanning Tree Configuration

 1 - Spanning Tree Status ...... Disabled
 2 - Active Protocol Version ... RSTP
 3 - Configure Active Protocol

 R - Return to Previous Menu

 Enter your selection?
```

Figure 169. Spanning Tree Configuration Menu

> **Note**
> Do not enable spanning tree on the switch until after you have selected an activate spanning tree protocol and configured the settings. If you only want to disable spanning tree, go to step 5.

2. To change the active version of spanning tree on the switch, type **2** to select Active Protocol Version.

   The following prompt is displayed:

   ```
   Enter new value (S-STP, R-RSTP, M-MSTP):
   ```

3. Type **S** to select STP or **R** to select RSTP, or **M** to select MSTP.

> **Note**
> A change to the active spanning tree is automatically saved on the switch.

4. If you selected STP as the active spanning tree protocol, go to “Configuring STP” on page 487 for further instructions. If you selected RSTP, go to “Configuring RSTP” on page 493. Multiple Spanning Tree Protocol (MSTP) is described in Chapter 22, “MSTP” on page 501.

> **Note**
> After you have configured the spanning tree parameters, perform steps 5 through 7 to enable spanning tree.

5. To enable or disable spanning tree, type **1** to select Spanning Tree Status.

   The following prompt is displayed:

   ```
   Enter new value (E-Enable, D-Disable):
   ```

6. Type **E** to enable spanning tree or **D** to disable it. The default is disabled.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring STP

This section contains the following procedures:

- ”Configuring STP Bridge Settings”, next
- “Configuring STP Port Settings” on page 489

Configuring STP Bridge Settings

This section contains the procedure for configuring a bridge’s STP settings.

> **Caution**
> The default STP parameters are adequate for most networks. Changing them without prior experience and an understanding of how STP works might have a negative effect on your network. You should consult the IEEE 802.1d standard before changing any of the STP parameters.

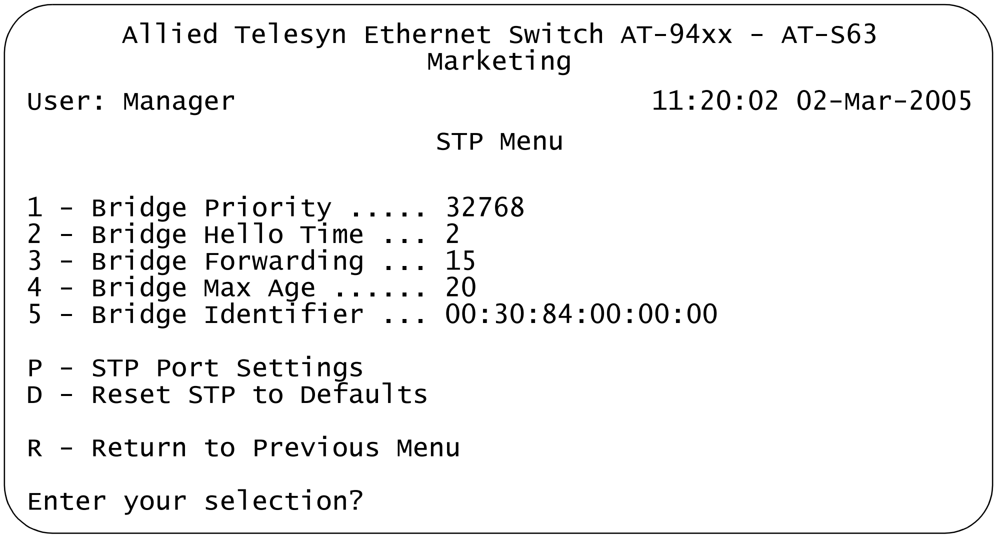
To configure the bridge settings, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The STP menu is shown in Figure 170.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                          STP Menu

1 - Bridge Priority ..... 32768
2 - Bridge Hello Time ... 2
3 - Bridge Forwarding ... 15
4 - Bridge Max Age ...... 20
5 - Bridge Identifier ... 00:30:84:00:00:00

P - STP Port Settings
D - Reset STP to Defaults

R - Return to Previous Menu

Enter your selection?
```

Figure 170. STP Menu

3. Adjust the following parameters as needed.

   1 - Bridge Priority
   The priority number for the bridge. This number is used to determine the root bridge for RSTP. The bridge with the lowest priority number is selected as the root bridge. If two or more bridges have the same priority value, the bridge with the numerically lowest MAC address becomes the root bridge. When a root bridge goes offline, the bridge with the next priority number automatically takes over as the root bridge. This parameter can be from 0 (zero) to 61,440 in increments of 4096, with 0 being the highest priority. For a list of the increments, refer to Table 9, Bridge Priority Value Increments on page 477.

   2 - Bridge Hello Time
   The time interval between generating and sending configuration messages by the bridge. This parameter can be from 1 to 10 seconds. The default is 2 seconds.

   3 - Bridge Forwarding
   The waiting period in seconds before a bridge changes to a new state, for example, becomes the new root bridge after the topology changes. If the bridge transitions too soon, not all links may have yet adapted to the change, resulting in network loops. The range is 4 to 30 seconds. The default is 15 seconds.

   4 - Bridge Max Age
   The length of time after which stored bridge protocol data units (BPDUs) are deleted by the bridge. All bridges in a bridged LAN use this aging time to test the age of stored configuration messages called bridge protocol data units (BPDUs). For example, if you use the default value 20, all bridges delete current configuration messages after 20 seconds. This parameter can be from 6 to 40 seconds.

   When you select a value for maximum age, observe the following rules:

   MaxAge must be greater than (2 x (HelloTime + 1)).

   MaxAge must be less than (2 x (ForwardingDelay - 1)).

   Note
   The aging time for BPDUs is different from the aging time used by the MAC address table.

   5 - Bridge Identifier
   The MAC address of the switch. This value cannot be changed.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

5. To change STP port settings, go to the next procedure.

Configuring STP Port Settings

To adjust STP port parameters, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

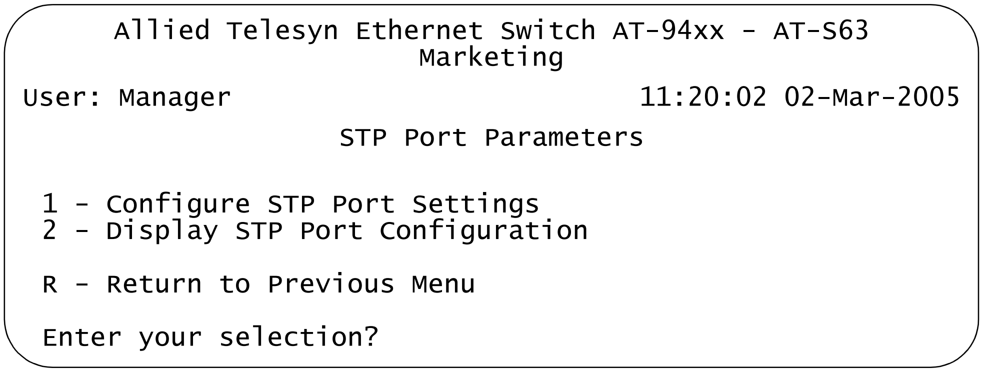
   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The STP menu is shown in Figure 170 on page 487.

3. From the STP menu, type **P** to select STP Port Parameters.

   The STP Port Parameters menu is shown in Figure 171.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                            11:20:02 02-Mar-2005
                     STP Port Parameters

 1 - Configure STP Port Settings
 2 - Display STP Port Configuration

 R - Return to Previous Menu

 Enter your selection?
```

Figure 171. STP Port Parameters Menu

4. Type **1** to select Configure STP Port Settings.

   The following prompt is displayed:

   ```
   Start Port to Configure [1 to 26] ->
   ```

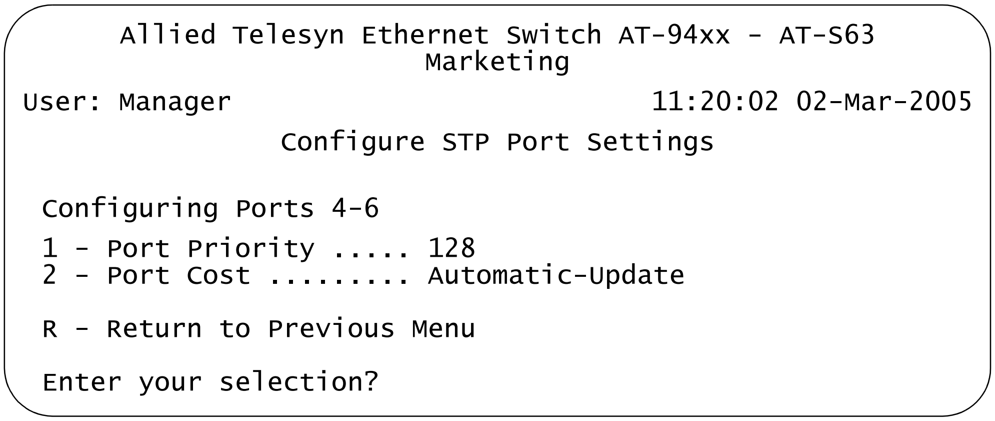
5. Enter the number of the port you want to configure. To configure a range of ports, enter the first port of the range.

   The following prompt is displayed:

   ```
   End Port to Configure [1 to 24] ->
   ```

6. To configure just one port, enter the same port number here as you entered in the previous step. To configure a range of ports, enter the last port of the range.

The Configure STP Port Settings menu is shown in Figure 172.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
                Configure STP Port Settings

 Configuring Ports 4-6

 1 - Port Priority ..... 128
 2 - Port Cost ......... Automatic-Update

 R - Return to Previous Menu

 Enter your selection?
```

Figure 172. Configure STP Port Settings Menu

7. Adjust the following parameters as needed.

> **Note**
> A change to the port priority parameter takes effect immediately. A change to the port cost value requires you to reset the switch. A new port cost value is not implemented until the unit is reset.

1 - Port Priority
This parameter is used as a tie breaker when two or more ports are determined to have equal costs to the root bridge. The range is 0 to 240 in increments of 16. The default value is 8 (priority value 128). For a list of the increments, refer to Table 14, “Port Priority Value Increments” on page 479.

2 - Port Cost
The spanning tree algorithm uses the cost parameter to decide which port provides the lowest cost path to the root bridge for that LAN. The range is 0 to 65,535. The default setting is Automatic Update, which sets port cost depending on the speed of the port. The Automatic Update default values are shown in Table 10 on page 478 andTable 11 on page 478.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying STP Port Settings

To display STP port settings, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

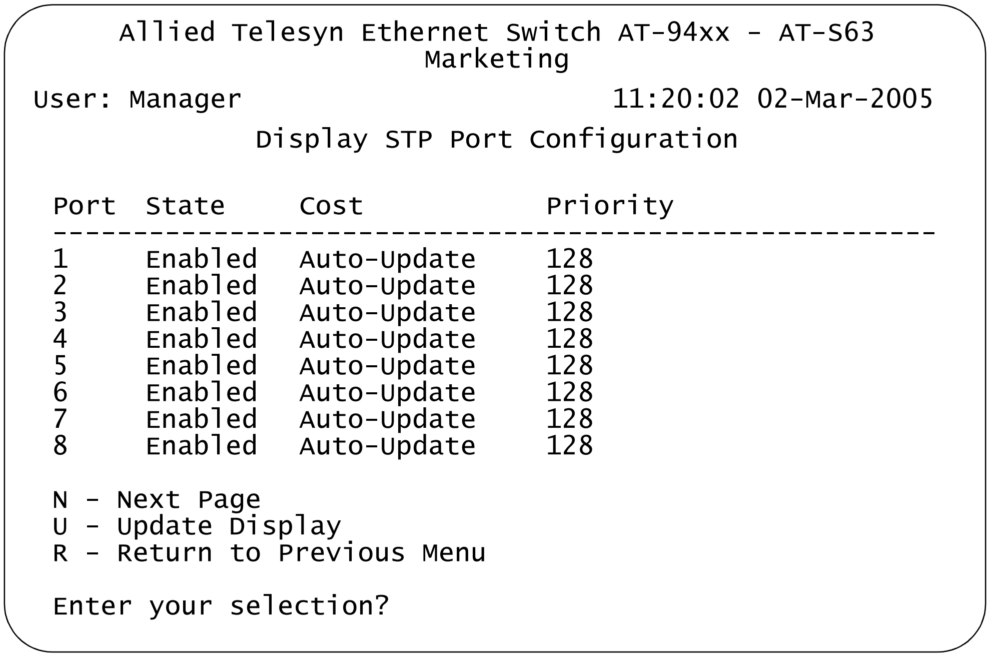
   The STP menu is shown in Figure 170 on page 487.

3. From the STP menu, type **P** to select STP Port Parameters.

   The STP Port Parameters menu is shown in Figure 171 on page 489.

4. From the STP Port Parameters menu, type **2** to select Display STP Port Configuration.

   The Display STP Port Configuration menu is shown in Figure 173.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                        11:20:02 02-Mar-2005
              Display STP Port Configuration


 Port  State    Cost          Priority
 -------------------------------------------------------
 1     Enabled  Auto-Update    128
 2     Enabled  Auto-Update    128
 3     Enabled  Auto-Update    128
 4     Enabled  Auto-Update    128
 5     Enabled  Auto-Update    128
 6     Enabled  Auto-Update    128
 7     Enabled  Auto-Update    128
 8     Enabled  Auto-Update    128

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 173. Display STP Port Configuration Menu

The Display STP Port Configuration menu displays a table that contains the following columns of information:

Port
The port number.

State
Current state of the port. The possible states are Enabled or Disabled.

Cost
Port cost of the port. The default is Auto-Update.

Priority
The number used as a tie breaker when two or more ports have equal costs to the root bridge.

Resetting STP to the Default Settings

To reset STP to the default settings, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The STP menu is shown in Figure 170 on page 487.

3. From the STP menu, type **D** to select Reset STP to Defaults.

   The following prompt is displayed:

   ```
   Do you want to reset STP configuration to default [Yes/
   No] ->
   ```

4. Enter **Y** for Yes or **N** for No and press Return.

   The STP configuration is reset to the defaults.

Configuring RSTP

This section contains the following procedures:

❐ ”Configuring RSTP Bridge Settings”, next

❐ “Configuring RSTP Port Settings” on page 495

Configuring RSTP Bridge Settings

This section contains the procedure for configuring a bridge’s RSTP settings.

Caution
The default RSTP parameters are adequate for most networks. Changing them without prior experience and an understanding of how RSTP works might have a negative effect on your network. You should consult the IEEE 802.1w standard before changing any of the RSTP parameters.

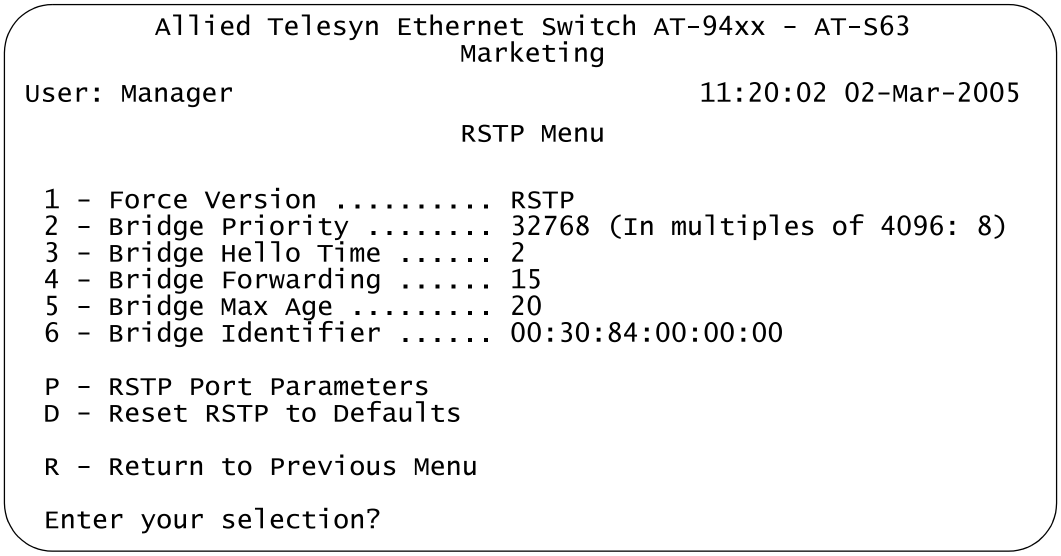
To configure the RSTP bridge settings, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The RSTP menu is shown in Figure 174.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                               11:20:02 02-Mar-2005
                           RSTP Menu

 1 - Force Version .......... RSTP
 2 - Bridge Priority ........ 32768 (In multiples of 4096: 8)
 3 - Bridge Hello Time ...... 2
 4 - Bridge Forwarding ...... 15
 5 - Bridge Max Age ......... 20
 6 - Bridge Identifier ...... 00:30:84:00:00:00

 P - RSTP Port Parameters
 D - Reset RSTP to Defaults

 R - Return to Previous Menu

 Enter your selection?
```

Figure 174. RSTP Menu

3. Adjust the following parameters as necessary.

1 - Force Version
This selection determines whether the bridge operates with RSTP or in an STP-compatible mode. If you select RSTP, the bridge operates all ports in RSTP, except for those ports that receive STP BPDU packets. If you select Force STP Compatible, the bridge operates in RSTP, using the RSTP parameter settings, but it sends only STP BPDU packets out the ports.

2 - Bridge Priority
The priority number for the bridge. This number is used in determining the root bridge for RSTP. The bridge with the lowest priority number is selected as the root bridge. If two or more bridges have the same priority value, the bridge with the numerically lowest MAC address becomes the root bridge. When a root bridge goes off-line, the bridge with the next priority number automatically takes over as the root bridge. This parameter can be from 0 (zero) to 61,440 in increments of 4096, with 0 being the highest priority. For a list of the increments, refer to Table 9, “Bridge Priority Value Increments” on page 477.

3 - Bridge Hello Time
The time interval between generating and sending configuration messages by the bridge. This parameter can be from 1 to 10 seconds. The default is 2 seconds.

4 - Bridge Forwarding
The waiting period before a bridge changes to a new state, for example, becomes the new root bridge after the topology changes. If the bridge transitions too soon, not all links may have yet adapted to the change, possibly resulting in a network loop. The range is 4 to 30 seconds. The default is 15 seconds. This setting applies only to ports running in the STP-compatible mode.

5 - Bridge Max Age
The length of time after which stored bridge protocol data units (BPDUs) are deleted by the bridge. All bridges in a bridged LAN use this aging time to test the age of stored configuration messages called bridge protocol data units (BPDUs). For example, if you use the default 20, all bridges delete current configuration messages after 20 seconds. This parameter can be from 6 to 40 seconds. The default is 20 seconds.

When you select a value for maximum age, observe the following rules:

MaxAge must be greater than (2 x (HelloTime + 1)).

MaxAge must be less than (2 x (ForwardingDelay - 1))

6 - Bridge Identifier
The MAC address of the bridge. The bridge identifier is used as a tie

breaker in the selection of the root bridge when two or more bridges have the same bridge priority value. This value cannot be changed.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring RSTP Port Settings

To adjust RSTP port parameters, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

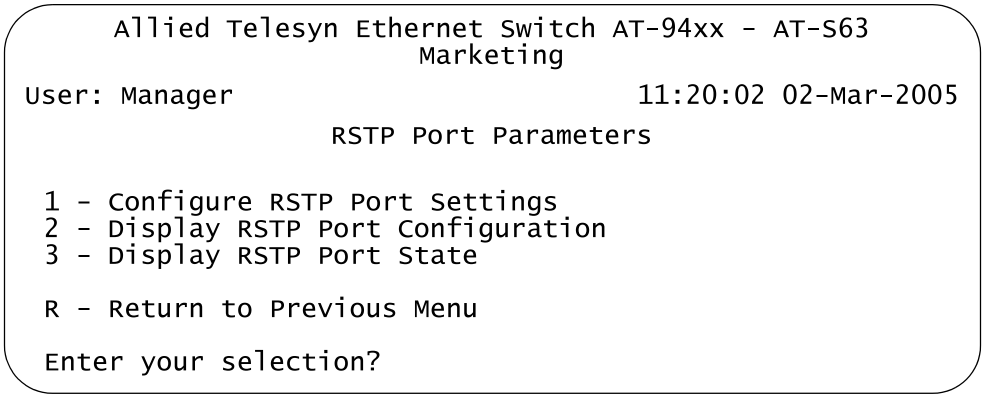
   The RSTP menu is shown in Figure 170 on page 487.

3. From the Spanning Tree Configuration menu, type **3** to select STP Configuration.

   The STP menu is shown in Figure 170 on page 487.

4. From the STP menu, type **P** to select RSTP Port Parameters.

   The RSTP Port Parameters menu is shown in Figure 175.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                         11:20:02 02-Mar-2005
                   RSTP Port Parameters

 1 - Configure RSTP Port Settings
 2 - Display RSTP Port Configuration
 3 - Display RSTP Port State

 R - Return to Previous Menu

 Enter your selection?
```

Figure 175. RSTP Port Parameters Menu

5. Type **1** to select Configure RSTP Port Settings.

   The following prompt is displayed:

   ```
   Starting Port to Configure [1 to 24] ->
   ```

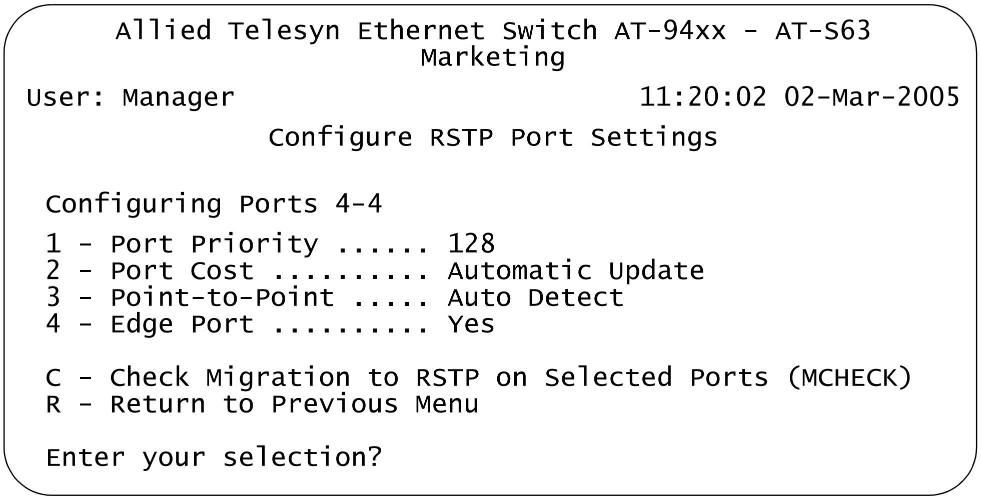
6. Enter the number of the port you want to configure. To configure a range of ports, enter the first port of the range.

   The following prompt is displayed:

```
Ending Port to Configure [1 to 24] ->
```

7. To configure just one port, enter the same port number here as you entered in the previous step. To configure a range of ports, enter the last port of the range.

   The Configure RSTP Port Settings menu is shown in Figure 176.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
               Configure RSTP Port Settings

 Configuring Ports 4-4
 1 - Port Priority ...... 128
 2 - Port Cost .......... Automatic Update
 3 - Point-to-Point ..... Auto Detect
 4 - Edge Port .......... Yes

 C - Check Migration to RSTP on Selected Ports (MCHECK)
 R - Return to Previous Menu

 Enter your selection?
```

Figure 176. Configure RSTP Port Settings Menu

8. Adjust the following parameters as necessary.

   1 - Port Priority
   This parameter is used as a tie breaker when two or more ports are determined to have equal costs to the root bridge. The range is 0 to 240 in increments of 16. The default value is 8 (priority value 128). For a list of the increments, refer to Table 14, “Port Priority Value Increments” on page 479.

   2 - Port Cost
   The spanning tree algorithm uses the cost parameter to decide which port provides the lowest cost path to the root bridge for that LAN. The range is 0 to 20,000,000. The default setting is Automatic Update, which sets port cost depending on the speed of the port. The Automatic Update default values are shown in Table 12 on page 479 and Table 13 on page 479.

   3 - Point-to-Point
   This parameter defines whether the port is functioning as a point-to-point port. The possible settings are Yes, No, and Auto Detect. For an explanation of this parameter, refer to “Point-to-Point and Edge Ports” on page 481.

   4 - Edge Port
   This parameter defines whether the port is functioning as an edge port.

The possible settings are Yes and No. For an explanation of this parameter, refer to "Point-to-Point and Edge Ports" on page 481.

C - Check Migration To RSTP on Selected Ports (MCHECK)
The MCHECK parameter is displayed only when RSTP is enabled. This parameter resets an RSTP port, allowing it to send RSTP BPDUs. When an RSTP bridge receives STP BPDUs on an RSTP port, the port transmits STP BPDUs. The RSTP port continues to transmit STP BPDUs indefinitely. Type C to reset the MSTP port to transmit RSTP BPDUs.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying the RSTP Port Configuration

To display the RSTP port configuration, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

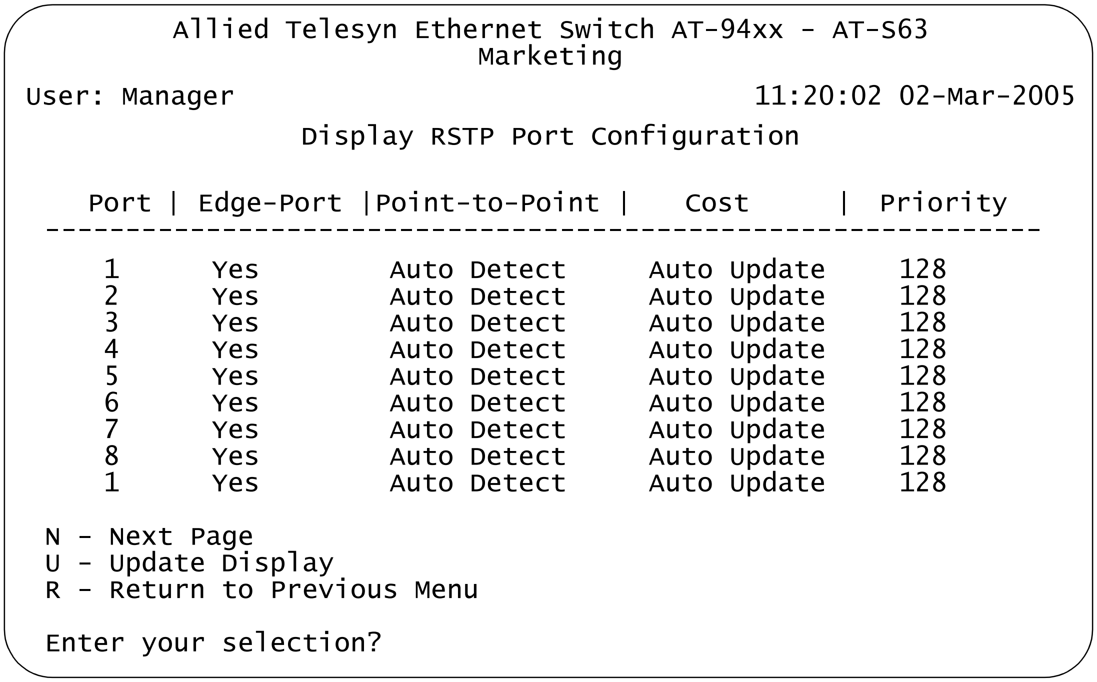
   The RSTP menu is shown in Figure 170 on page 487.

3. From the RSTP menu, type **P** to select RSTP Port Parameters.

   The RSTP Port Parameters menu is shown in Figure 175 on page 495.

4. From the RSTP Port Parameters menu, type **2** to select Display RSTP Port Configuration.

The Display RSTP Port Configuration menu is shown in Figure 177.



```
           Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing
User: Manager                                   11:20:02 02-Mar-2005
                  Display RSTP Port Configuration

   Port | Edge-Port |Point-to-Point |    Cost     |  Priority
 --------------------------------------------------------------

    1      Yes       Auto Detect     Auto Update    128
    2      Yes       Auto Detect     Auto Update    128
    3      Yes       Auto Detect     Auto Update    128
    4      Yes       Auto Detect     Auto Update    128
    5      Yes       Auto Detect     Auto Update    128
    6      Yes       Auto Detect     Auto Update    128
    7      Yes       Auto Detect     Auto Update    128
    8      Yes       Auto Detect     Auto Update    128
    1      Yes       Auto Detect     Auto Update    128

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 177. Display RSTP Port Configuration Menu

The Display RSTP Port Configuration menu displays a table that contains the following columns of information:

Port
The port number.

Edge-Port
Whether or not the port is operating as an edge port. The possible settings are Yes and No.

Point-to-Point
Whether or not the port is functioning as a point-to-point port. The possible settings are Yes, No, and Auto Detect.

Cost
Port cost of the port. The default is Auto Update.

Priority
The number used as a tie breaker when two or more ports have equal costs to the root bridge.

Displaying the RSTP Port State

To display the RSTP port state, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

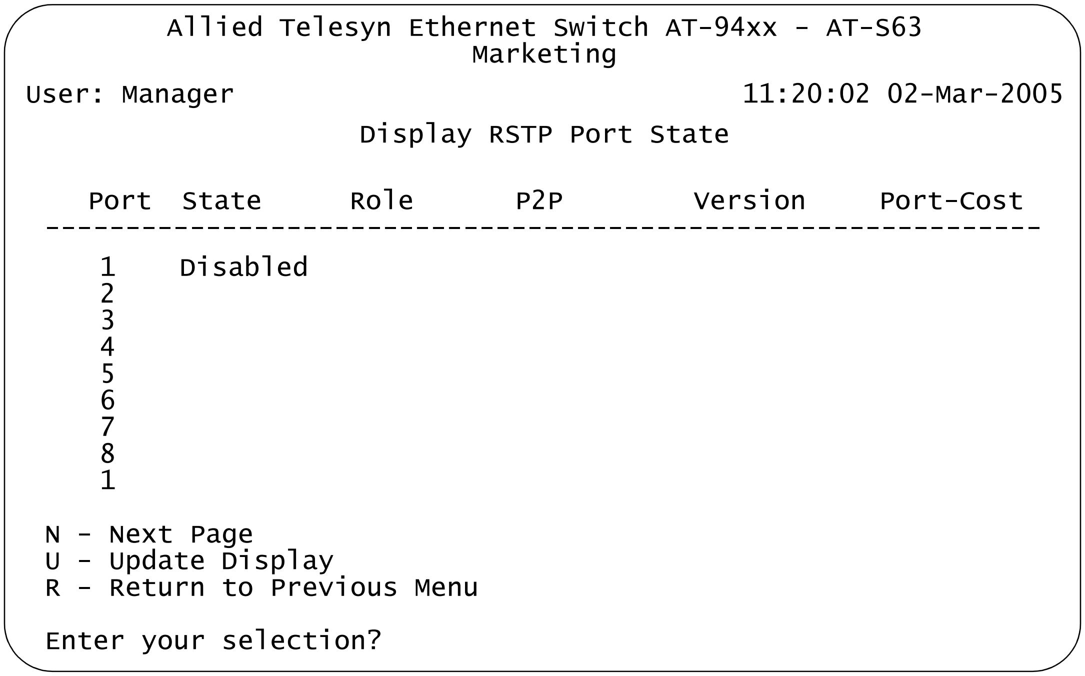
   The RSTP menu is shown in Figure 170 on page 487.

3. From the RSTP menu, type **P** to select RSTP Port Parameters.

   The RSTP Port Parameters menu is shown in Figure 175 on page 495.

4. From the RSTP Port Parameters menu, type **3** to select Display RSTP Port State.

   The Display RSTP Port State menu is shown in Figure 178.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing
User: Manager                                   11:20:02 02-Mar-2005
                       Display RSTP Port State

    Port  State      Role      P2P        Version     Port-Cost
 --------------------------------------------------------------
     1    Disabled
     2
     3
     4
     5
     6
     7
     8
     1

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 178. Display RSTP Port State Menu

The Display RSTP Port State menu displays a table that contains the following information:

Port
The port number.

State
The RSTP state of the port. The possible states are:

Discarding - The port is discarding received packets and is not submitting forwarded packets for transmission.

Learning - The port is enabled for receiving, but not forwarding packets.

Forwarding - Normal operation.

Disabled - The port has not established a link with its end node.

Role
The RSTP role of the port. Possible roles are:

Root - The port that is connected to the root switch, directly or through other switches, with the least path cost.

Alternate - The port offers an alternate path in the direction of the root switch.

Backup - The port on a designated switch that provides a backup for the path provided by the designated port.

Designated - The port on the designated switch for a LAN that has the least cost path to the root switch. This port connects the LAN to the root switch.

P2P
Whether or not the port is functioning as a point-to-point port. The possible settings are Yes, No, and Auto-Detect.

Version
Whether the port is operating in RSTP mode or STP-compatible mode.

Port Cost
The port cost of the port.

Resetting RSTP to the Default Settings

To reset RSTP to the default settings, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The RSTP menu is shown in Figure 174 on page 493.

3. From the RSTP Menu, type **D** to select Reset RSTP to Defaults.

   The following prompt is displayed:

   ```
   Do you want to reset RSTP configuration to default [Yes/
   No] ->
   ```

4. Type **Y** for Yes or **N** for No and press Return.

   The RSTP configuration is reset to the defaults.

Chapter 22
MSTP

This chapter provides background information on the Multiple Spanning Tree Protocol (MSTP) and contains procedures on how to adjust spanning tree bridge and port parameters. The sections in this chapter include:

Spanning Tree Protocol (STP) and Rapid Spanning Tree Protocol (RSTP) are described in Chapter 21, “STP and RSTP” on page 475.

MSTP Overview

As mentioned in Chapter 21, ”STP and RSTP” on page 475, STP and RSTP are referred to as single-instance spanning trees that search for physical loops across all VLANs in a bridged network. When loops are detected, the protocols stop the loops by placing one or more bridge ports in a blocking state.

As explained in “Spanning Tree and VLANs” on page 483, STP and RSTP can result in VLAN fragmentation where VLANs that span multiple bridges are connected together with untagged ports. The untagged ports creating the links can represent a physical loop in the network, which are blocked by spanning tree. The result can be a loss of communication between different parts of the same VLAN.

One way to resolve this, other than by not activating spanning tree on your network, is to link the switches using tagged ports, which can handle traffic from multiple VLANs simultaneously. The drawback to this approach is that the link formed by the tagged ports can create a bottleneck to your Ethernet traffic, resulting in reduced network performance.

Another approach is to use the Multiple Spanning Tree Protocol (MSTP). This spanning tree shares many of the same characteristics as RSTP. It features rapid convergence and has many of the same parameters. But the main difference is that while RSTP, just like STP, supports only a single-instance spanning tree, MSTP supports multiple spanning trees within a network.

The following sections describe some of the terms and concepts relating to MSTP. If you are not familiar with spanning tree or RSTP, you should first review “STP and RSTP Overview” on page 476.

Note
Do not activate MSTP on an AT-9400 Series switch without first familiarizing yourself with the following concepts and guidelines. Unlike STP and RSTP, you cannot activate this spanning tree protocol on a switch without first configuring the protocol parameters.

Note
The AT-S63 MSTP implementation complies fully with the new IEEE 802.1s standard. Any other vendor’s fully compliant 802.1s implementation is interoperable with the AT-S63 implementation.

Multiple Spanning Tree Instance (MSTI)

The individual spanning trees in MSTP are referred to as Multiple Spanning Tree Instances (MSTIs). A MSTI can span any number of AT-9400 Series switches, and an AT-9400 Series switch can support up to 16 MSTIs at a time.

To create a MSTI, you first assign it a number, referred to as the MSTI ID. The range is 1 to 15. (The switch is shipped with a default MSTI with an MSTI ID of 0. This default spanning tree instance is discussed later in “Common and Internal Spanning Tree (CIST)” on page 511.)

After you have selected an MSTI ID, you need to define the scope of the MSTI by assigning one or more VLANs to it. An instance can contain any number of VLANs, but a VLAN can belong to only one MSTI at a time.

Following are several examples. Figure 179 illustrates two AT-9400 Series switches, each containing the two VLANs Sales and Production. The two parts of each VLAN are connected with a direct link using untagged ports on both switches.

If the switches were running STP or RSTP, one of the links would be blocked because the links constitute a physical loop. Which link would be blocked depends on the STP or RSTP bridge settings.

In Figure 179, the link between the two parts of the Production VLAN is blocked, resulting in a loss of communications between the two parts of the Production VLAN.

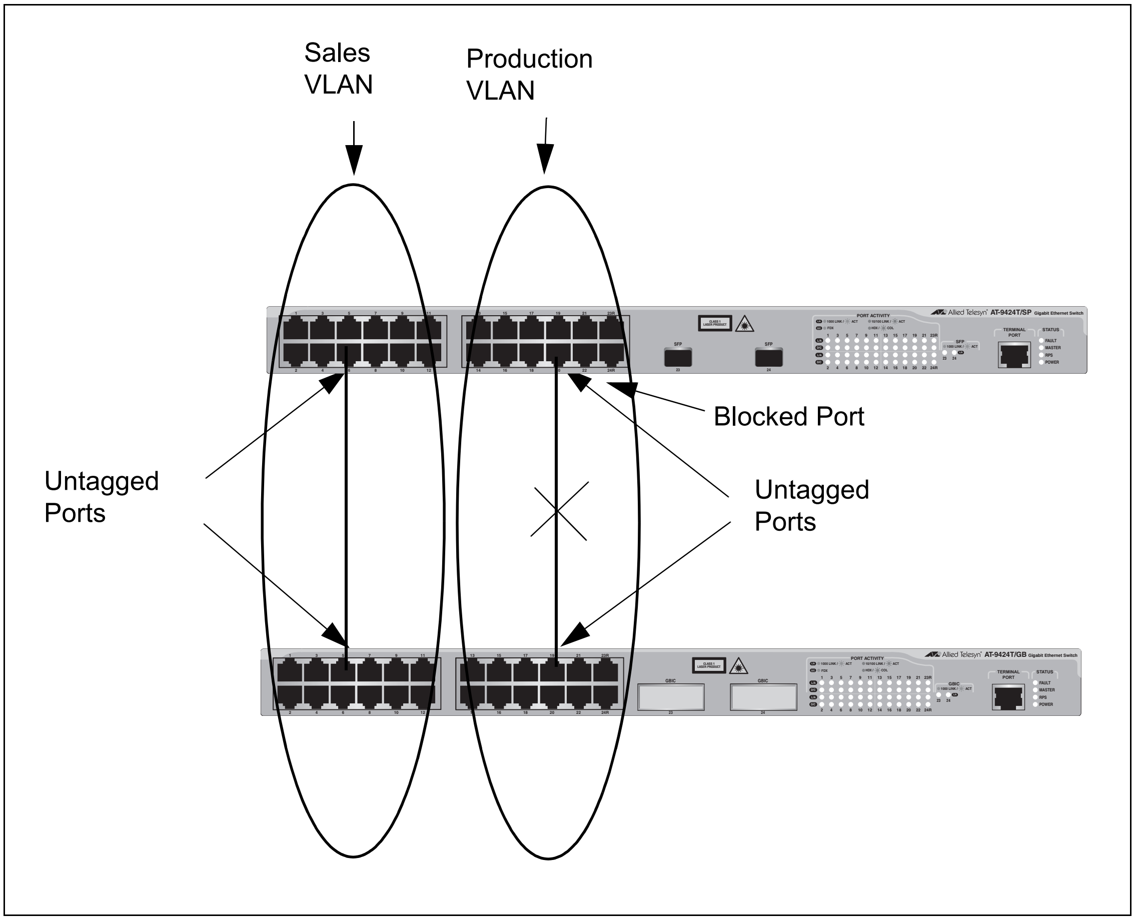


Figure 179. VLAN Fragmentation with STP or RSTP

Figure 180 illustrates the same two AT-9400 Series switches and the same two virtual LANs. But in this example, the two switches are running MSTP and the two VLANs have been assigned different spanning tree instances. Now that they reside in different MSTIs, both links remain active, enabling the VLANs to forward traffic over their respective direct link.

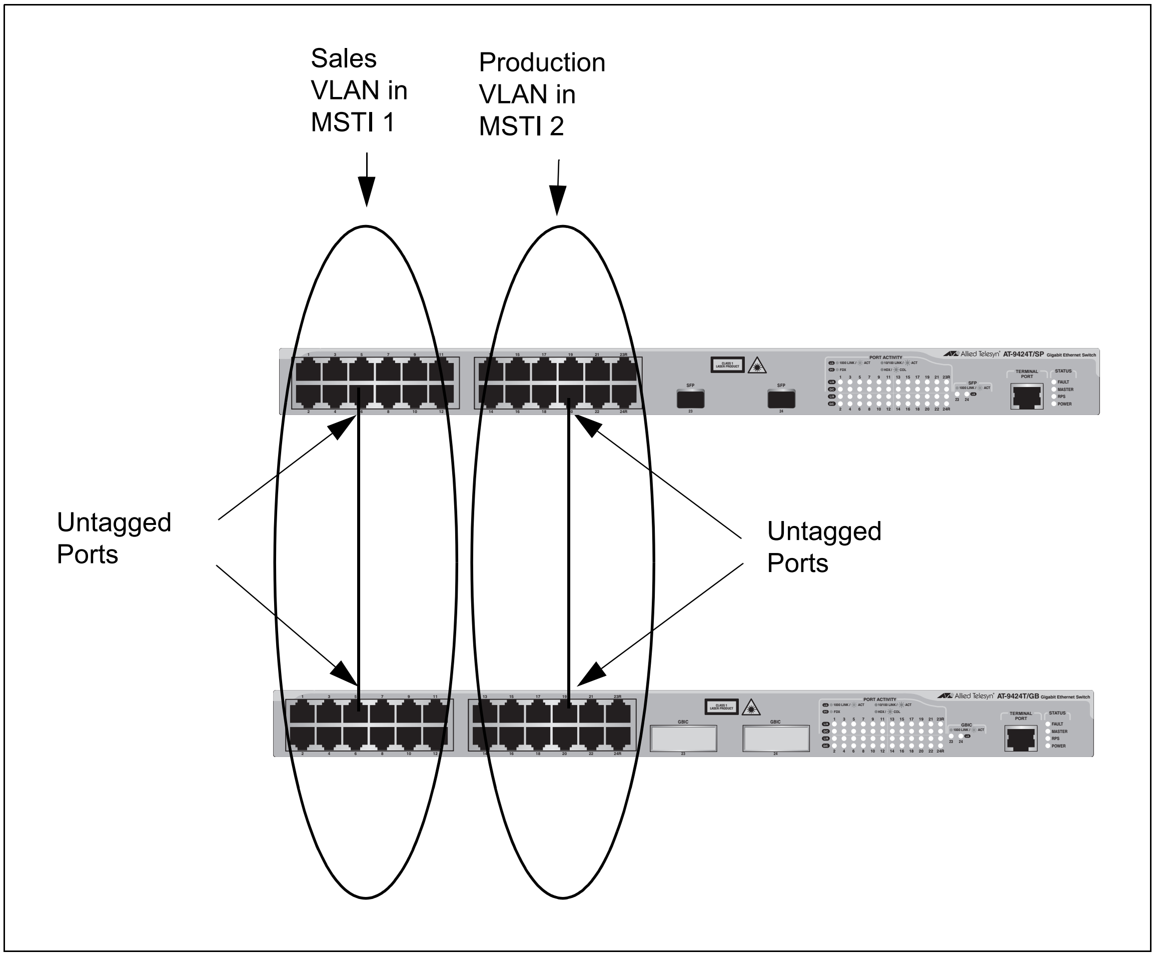


Figure 180. MSTP Example of Two Spanning Tree Instances

A MSTI can contain more than one VLAN. This is illustrated in Figure 181 where there are two AT-9400 Series switches with four VLANs. There are two MSTIs, each containing two VLANs. MSTI 1 contains the Sales and Presales VLANs and MSTI 2 contains the Design and Engineering VLANs.

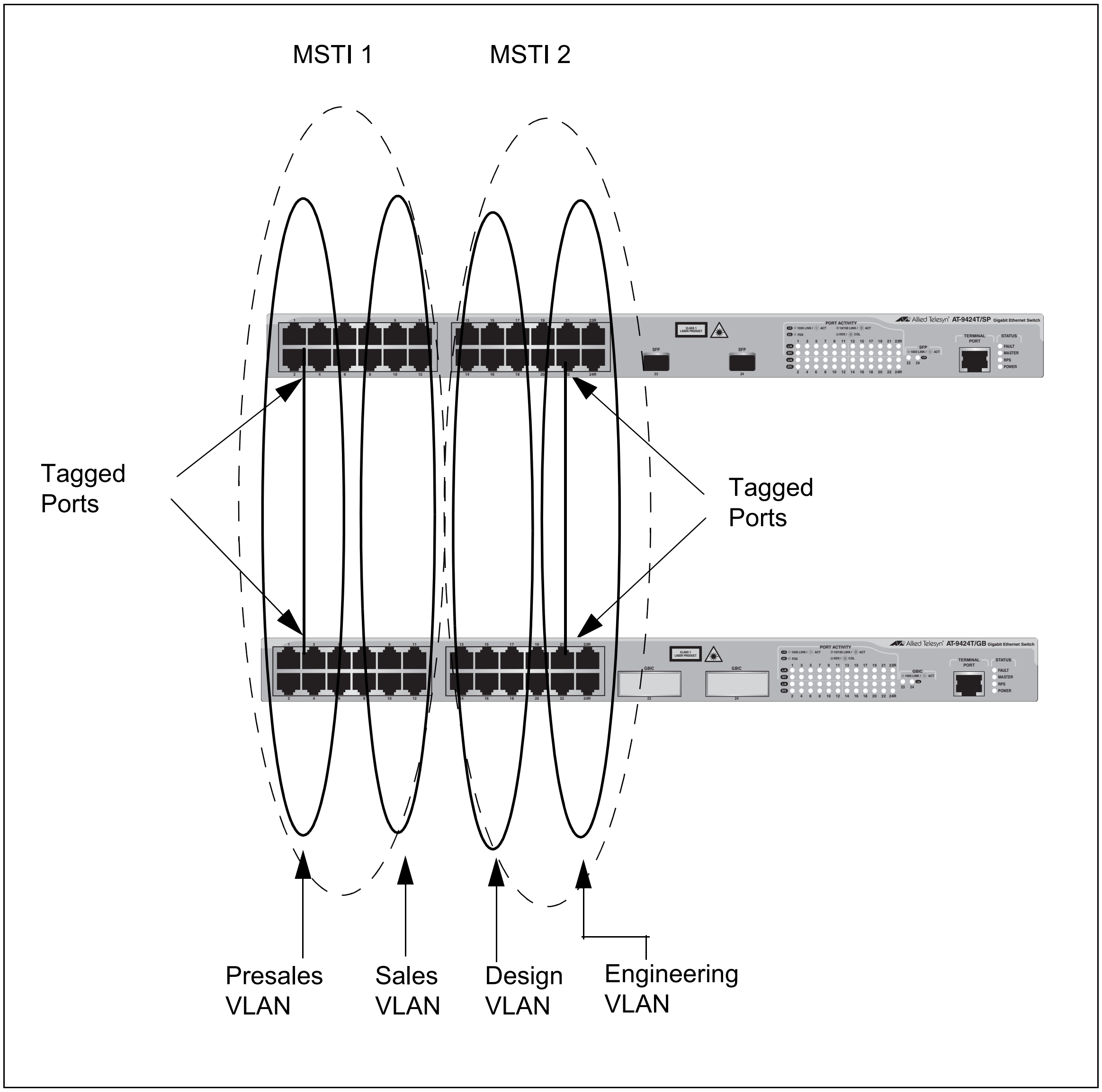


Figure 181. Multiple VLANs in a MSTI

In this example, because an MSTI contains more than one VLAN, the links between the VLAN parts is made with tagged, not untagged, ports so that they can carry traffic from more than one virtual LAN. Referring again to Figure 181, the tagged link in MSTI 1 is carrying traffic for both the Presales and Sales VLANs while the tagged link in MSTI 2 is carrying traffic for the Design and Engineering VLANs.

MSTI Guidelines

Following are several guidelines to keep in mind about MSTIs:

- An AT-9400 Series switch can support up to 16 spanning tree instances, including the CIST, at a time.
- A MSTI can contain any number of VLANs.
- A VLAN can belong to only one MSTI at a time.
- A switch port can belong to more than one spanning tree instance at a time. This allows you to assign a port as an untagged and tagged member of VLANs that belong to different MSTI's. What makes this possible is a port's ability to be in different MSTP states for different MSTI's simultaneously. For example, a port can be in the MSTP blocking state for one MSTI and the forwarding state for another spanning tree instance.
- A router or Layer 3 network device is required to forward traffic between different VLANs.

VLAN and MSTI Associations

Part of the task to configuring MSTP involves assigning VLANs to spanning tree instances. The mapping of VLANs to MSTIs is called *associations*. A VLAN, either port-based or tagged, can belong to only one instance at a time, but an instance can contain any number of VLANs.

Ports in Multiple MSTIs

An AT-9400 Series switch allows a port to be a member of more than one MSTI at a time. This can happen if a port is a tagged member of one or more VLANs and the VLANs are assigned to different MSTI's. If this occurs, a port might be required to operate in different spanning tree states simultaneously, depending on the requirements of the MSTIs. For example, a port that is a member of two VLANs assigned to two different MSTIs might operate in the forwarding state in one MSTI and in the blocking state in the other.

When you configure a port's MSTI parameter settings you will notice that the parameters are divided into two groups. The first group is referred to as generic parameters. These are set just once on a port, regardless of the number of MSTI's where a port happens to be a member. One of these parameters is the external path cost, which sets the operating cost of the port in situations where it is connected to a device that is outside its region. A port can have only one external path cost even if it belongs to multiple MSTI's. Other generic parameters designate whether the port is an edge port or a point-to-point port.

The second group can be applied independently on a port for each MSTI where the port is a member. One of the parameters is the internal path cost. This parameter specifies the port's operating cost if it is connected to a bridge that is a part of the same MSTP region. You can give a port a different internal path cost for each MSTI where it is a member. This group also has a parameter for setting port priority, used as a tie breaker when two or more ports have equal costs to a regional root bridge. As with the internal path cost, a port can have a different priority value for each of its MSTI's.

Multiple Spanning Tree Regions

Another important concept of MSTP is *regions*. A MSTP region is defined as a group of bridges that share exactly the same MSTI characteristics. Those characteristics are:

❒ Configuration name

❒ Revision number

❒ VLANs

❒ VLAN to MSTI ID associations

A *configuration name* is a name you assign to a region to help you identify it. You must assign each bridge in a region exactly the same name; even the same upper and lowercase lettering. Identifying the regions in your network is easier if you choose names that are characteristic of the functions of the nodes and bridges of the region. Examples are Sales Region and Engineering Region.

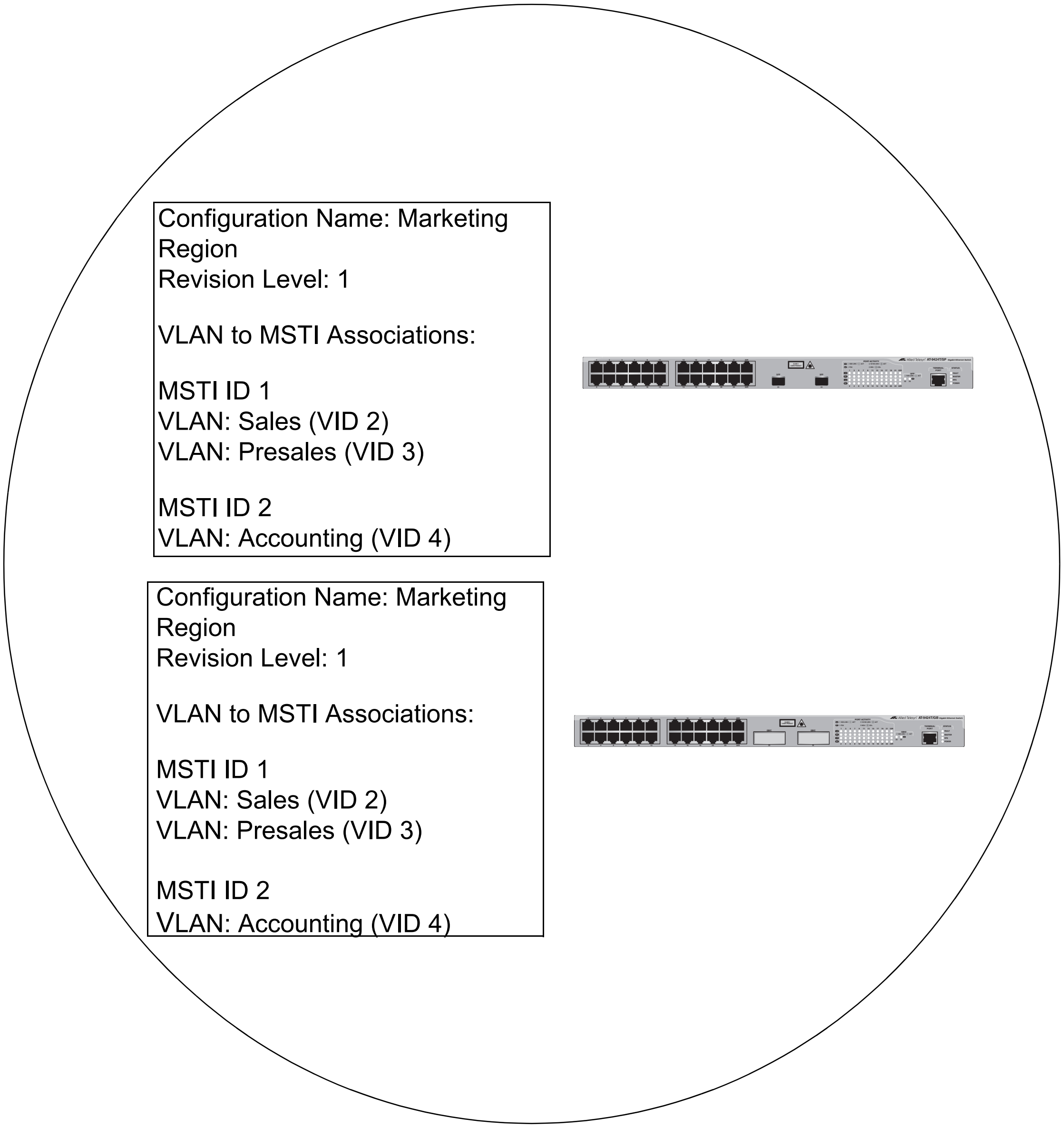
The *revision number* is an arbitrary number you assign to a region. This number can be used to keep track of the revision level of a region's configuration. For example, you might use this value to maintain the number of times you revise a particular MSTP region. It is not important that you maintain this number, only that each bridge in a region have the same number.

The bridges of a particular region must also have the same VLANs. The names of the VLANs and the VIDs must be same on all bridges of a region.

Finally, the VLANs in the bridges must be associated to the same MSTIs.

If any of the above information is different on two bridges, MSTP does consider the bridges as residing in different regions.

Figure 182 illustrates the concept of regions. It shows one MSTP region consisting of two AT-9400 Series switches. Each switch in the region has the same configuration name and revision level. The switches also have the same five VLANs and the VLANs are associated with the same MSTIs.



Configuration Name: Marketing Region
Revision Level: 1

VLAN to MSTI Associations:

MSTI ID 1
VLAN: Sales (VID 2)
VLAN: Presales (VID 3)

MSTI ID 2
VLAN: Accounting (VID 4)

Configuration Name: Marketing Region
Revision Level: 1

VLAN to MSTI Associations:

MSTI ID 1
VLAN: Sales (VID 2)
VLAN: Presales (VID 3)

MSTI ID 2
VLAN: Accounting (VID 4)

Figure 182. Multiple Spanning Tree Region

The AT-9400 Series switch determines regional boundaries by examining the MSTP BPDUs received on the ports. A port that receives a MSTP BPDU from another bridge with regional information different from its own is considered to be a boundary port and the bridge connected to the port as belonging to another region.

The same is true for any ports connected to bridges running the single-instance spanning tree STP or RSTP. Those ports are also considered as part of another region.

Each MSTI functions as an independent spanning tree within a region. Consequently, each MSTI must have a root bridge to locate physical loops within the spanning tree instance. An MSTI's root bridge is called a *regional root*. The MSTIs within a region may share the same regional root or they can have different regional roots.

A regional root for an MSTI must be within the region where the MSTI is located. An MSTI cannot have a regional root that is outside its region.

A regional root is selected by a combination of the *MSTI priority* value and the bridge's MAC address. The MSTI priority is analogous to the RSTP bridge priority value. Where they differ is that while the RSTP bridge priority is used to determine the root bridge for an entire bridged network, MSTI priority is used only to determine the regional root for a particular MSTI.

The range for this parameter is the same as the RSTP bridge priority; from 0 to 61,440 in sixteen increments of 4,096. To set the parameter, you specify the increment that represents the desired MSTI priority value. Table 14 on page 479 lists the increments.

Region Guidelines

Following are several points to remember about regions.

- A network can contain any number of regions and a region can contain any number of AT-9400 Series switches.
- An AT-9400 Series switch can belong to only one region at a time.
- A region can contain any number of VLANs.
- All of the bridges in a region must have the same configuration name, revision level, VLANs, and VLAN to MSTI associations.
- An MSTI cannot span multiple regions.
- Each MSTI must have a regional root for locating loops in the instance. MSTIs can share the same regional root or have different roots. A regional root is determined by the MSTI priority value and a bridge's MAC address.
- The regional root of a MSTI must be in the same region as the MSTI.

Common and Internal Spanning Tree (CIST)

MSTP has a default spanning tree instance called the Common and Internal Spanning Tree (CIST). This instance has an MSTI ID of 0.

This instance has unique features and functions that make it different from the MSTIs that you create yourself. First, you cannot delete this instance and you cannot change its MSTI ID.

Second, when you create a new port-based or tagged VLAN, it is by default associated with the CIST and is automatically given an MSTI ID of 0. The Default_VLAN is also associated by default with CIST.

Another critical difference is that when you assign a VLAN to another MSTI, it still partially remains a member of CIST. This is because CIST is used by MSTP to communicate with other MSTP regions and with any RSTP and STP single-instance spanning trees in the network. MSTP uses CIST to participate in the creation of a spanning tree between different regions and between regions and single-instance spanning tree, to form one spanning tree for the entire bridged network.

MSTP uses CIST to form the spanning tree of an entire bridged network because CIST can cross regional boundaries, while a MSTI cannot. If a port is a boundary port, that is, if it is connected to another region, that port automatically belongs solely to CIST, even if it was assigned to an MSTI, because only CIST is active outside of a region.

As mentioned earlier, every MSTI must have a root bridge, referred to as a regional root, in order to locate loops that might exist within the instance. CIST must also have a regional root. However, the CIST regional root communicates with the other MSTP regions and single-instance spanning trees in the bridged network.

The CIST regional root is set with the *CIST Priority* parameter. This parameter, which functions similar to the RSTP bridge priority value, selects the root bridge for the entire bridged network. If an AT-9400 Series switch has the lowest CIST Priority value among all the spanning tree bridges, it functions as the root bridge for all the MSTP regions and STP and RSTP single-instance spanning trees in the network.

MSTP with STP and RSTP

MSTP is fully compatible with STP and RSTP. If a port on an AT-9400 Series switch running MSTP receives STP BPDUs, the port sends only STP BPDU packets. If a port receives RSTP BPDUs, the port sends MSTP BPDUs because RSTP can process MSTP BPDUs.

A port connected to a bridge running STP or RSTP is considered to be a boundary port of the MSTP region and the bridge as belonging to a different region.

An MSTP region can be considered as a virtual bridge. The implication is that other MSTP regions and STP and RSTP single-instance spanning trees cannot discern the topology or constitution of a MSTP region. The only bridge they are aware of is the regional root of the CIST instance.

Summary of Guidelines

Careful planning is essential for the successful implementation of MSTP. This section reviews all the rules and guidelines mentioned in earlier sections, and contains a few new ones:

- An AT-9400 Series switch can support up to 16 spanning tree instances, including the CIST, at a time.
- A MSTI can contain any number of VLANs.
- A VLAN can belong to only one MSTI at a time.
- An MSTI ID can be from 1 to 15.
- The CIST ID is 0. You cannot change this value.
- A switch port can belong to more than one spanning tree instance at a time. This allows you to assign a port as an untagged and tagged member of VLANs that belong to different MSTIs. What makes this possible is a port's ability to be in different MSTP states for different MSTIs simultaneously. For example, a port can be in the MSTP blocking state for one MSTI and the forwarding state for another spanning tree instance.
- A router or Layer 3 network device is required to forward traffic between VLANs.
- A network can contain any number of regions and a region can contain any number of AT-9400 Series switches.
- An AT-9400 Series switch can belong to only one region at a time.
- A region can contain any number of VLANs.
- All of the bridges in a region must have the same configuration name, revision level, VLANs, and VLAN to MSTI associations.
- An MSTI cannot span multiple regions.
- Each MSTI must have a regional root for locating loops in the instance. MSTIs can share the same regional root or have different roots. A regional root is determined by the MSTI priority value and a bridge's MAC address.
- The regional root of a MSTI must be in the same region as the MSTI.
- The CIST must have a regional root for communicating with other regions and single-instance spanning trees.
- MSTP is compatible with STP and RSTP.
- A port transmits CIST information even when it is associated with another MSTI ID. However, in determining network loops, MSTI takes precedence over CIST. (This is explained more in "Associating VLANs to MSTIs" on page 513.

Note
The AT-S63 MSTP implementation complies fully with the new IEEE 802.1s standard. Any other vendor’s fully compliant 802.1s implementation is interoperable with the AT-S63 implementation.

Associating VLANs to MSTIs

Allied Telesyn recommends that you assign all VLANs on a switch to an MSTI. You should not leave a VLAN assigned to just the CIST, including the Default_VLAN. This is to prevent the blocking of a port that should be in the forwarding state. The reason for this guideline is explained below.

An MSTP BPDU contains the instance to which the port transmitting the packet belongs. By default, all ports belong to the CIST instance. So CIST is included in the BPDU. If the port is a member of a VLAN that has been assigned to another MSTI, that information is also included in the BPDU.

This is illustrated in Figure 183. Port 8 in switch A is a member of a VLAN assigned to MSTI ID 7 while port 1 is a member of a VLAN assigned to MSTI ID 10. The BPDUs transmitted by port 8 to switch B would indicate that the port is a member of both CIST and MSTI 7, while the BPDUs from port 1 would indicate the port is a member of the CIST and MSTI 10.

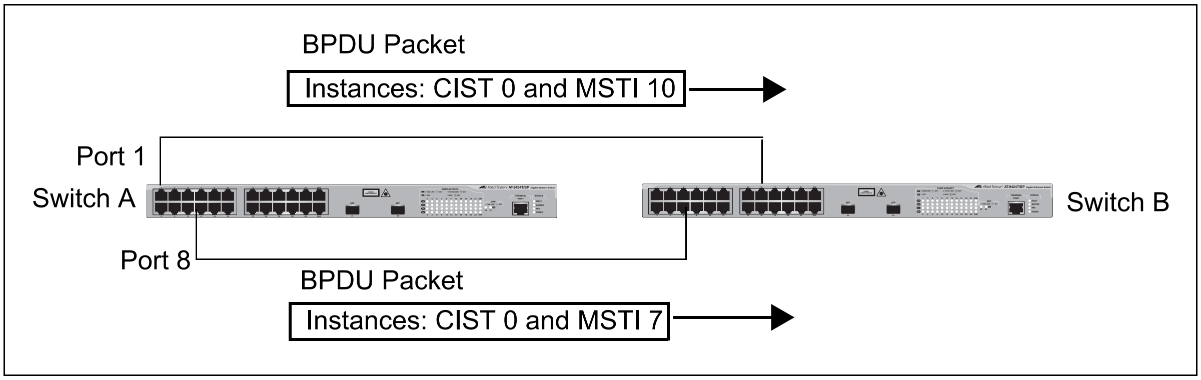


Figure 183. CIST and VLAN Guideline - Example 1

At first glance, it might appear that because both ports belong to CIST, a loop would exist between the switches and that MSTP would block a port to stop the loop. However, within a region, MSTI takes precedence over CIST. When switch B receives a packet from switch A, it uses MSTI, not CIST, to determine whether a loop exists. And because both ports on switch A belong to different MSTIs, switch B determines that no loop exists.

A problem can arise if you assign some VLANs to MSTIs while leaving others just to CIST. The problem is illustrated in Figure 184. The network is the same as the previous example. The only difference is that the VLAN containing port 8 on Switch A has not been assigned to an MSTI, and belongs only to CIST with its MSTI ID 0.

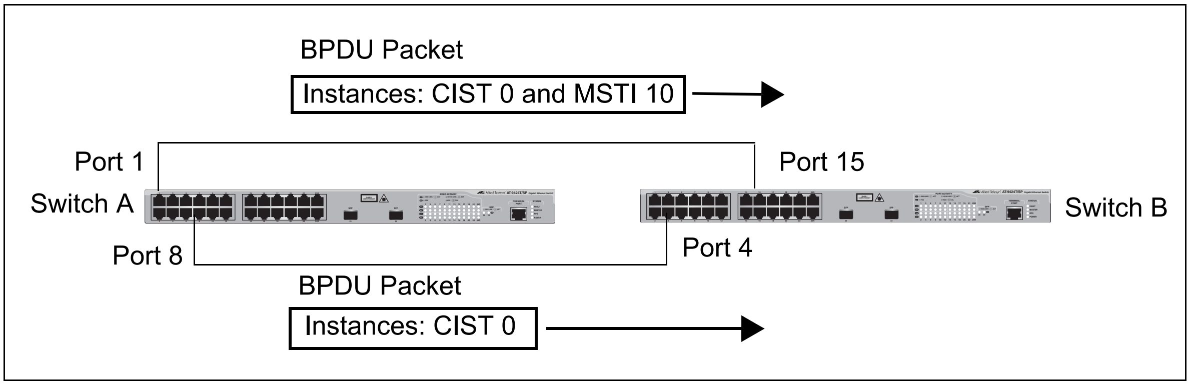


Figure 184. CIST and VLAN Guideline - Example 2

When port 4 on switch B receives a BPDU, the switch notes the port sending the packet belongs only to CIST. Therefore, switch B uses CIST in determining whether a loop exists. The result would be that the switch detects a loop because the other port is also receiving BPDU packets from CIST 0. Switch B would block a port to cancel the loop.

To avoid this issue, always assign all VLANs on a switch, including the Default_VLAN, to an MSTI. This guarantees that all ports on the switch have an MSTI ID and that helps to ensure that loop detection is based on MSTI, not CIST.

Connecting VLANs Across Different Regions

Special consideration needs to be taken into account when you connect different MSTP regions or an MSTP region and a single-instance STP or RSTP region. Unless planned properly, VLAN fragmentation can occur between the VLANS of your network.

As mentioned previously, only the CIST can span regions. A MSTI cannot. Consequently, you may run into a problem if you use more than one physical data link to connect together various parts of VLANs that reside in bridges in different regions. The result can be a physical loop, which spanning tree disables by blocking ports.

This is illustrated in Figure 185. The example show two switches, each residing in a different region. Port 1 in switch A is a boundary port. It is an untagged member of the Accounting VLAN, which has been associated with MSTI 4. Port 16 is a tagged and untagged member of three different VLANs, all associated to MSTI 12.

If both switches were a part of the same region, there would be no problem because the ports reside in different spanning tree instances. However, the switches are part of different regions and MSTIs do not cross regions. Consequently, the result is that spanning tree would determine that a loop exists between the regions, and Switch B would block a port.

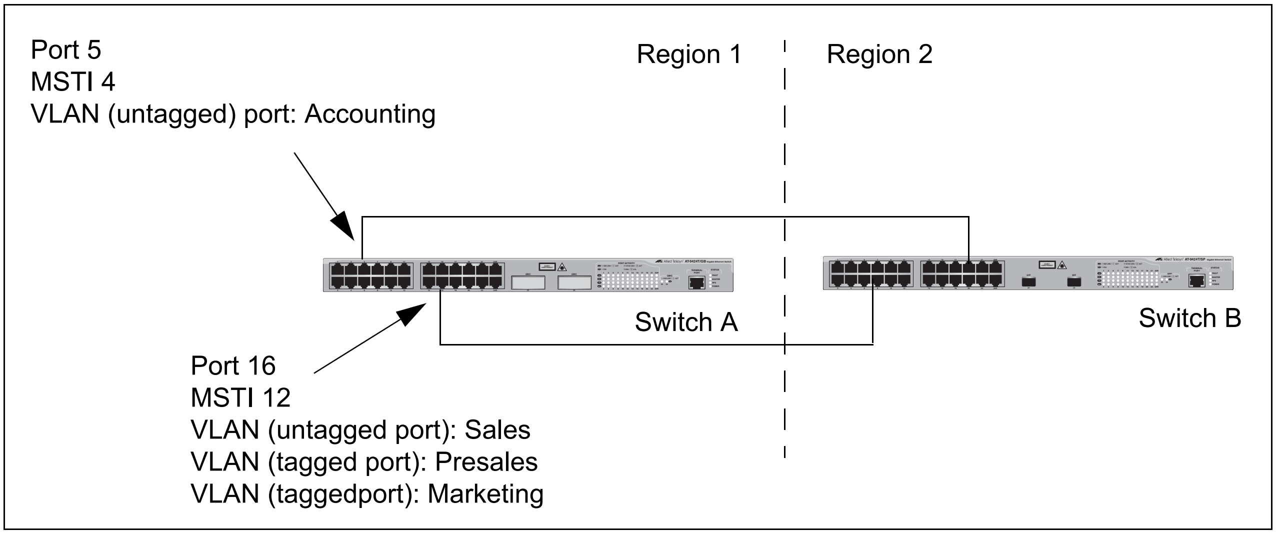

Port 5
MSTI 4
VLAN (untagged) port: Accounting
Region 1
Region 2
Switch A
Switch B
Port 16
MSTI 12
VLAN (untagged port): Sales
VLAN (tagged port): Presales
VLAN (taggedport): Marketing

Figure 185. Spanning Regions - Example 1

There are several ways to address this issue. One is to have only one MSTP region for each subnet in your network.

Another approach is to group those VLANs that need to span regions into the same MSTI. Those VLANs that do not span regions can be assigned to other MSTIs.

Here is an example. Assume that you have two regions that contain the following VLANS:

Region 1 VLANs	Region 2 VLANs
Sales	Hardware Engineering
Presales	Software Engineering
Marketing	Technical Support
Advertising	Product Management
Technical Support	CAD Development
Product Management	Accounting
Project Management	
Accounting	

The two regions share three VLANs: Technical Support, Product Management, and Accounting. You could group those VLANs into the same MSTI in each region. For instance, for Region 1 you might group the three VLANs in MSTI 11 and in Region 2 you could group them into MSTI 6. After they are grouped, you can connect the VLANs across the regions using a link of tagged ports.

Selecting MSTP as the Spanning Tree Protocol

To select and activate MSTP as the spanning tree protocol, or to disable spanning tree, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. To change the active version of spanning tree on the switch, type **2** to select Active Protocol Version.

   The following prompt is displayed:

   ```
   Enter new value (S-STP, R-RSTP, M-MSTP):
   ```

3. Type **M** to select MSTP.

   > **Note**
   > A change to the active spanning tree is automatically saved on the switch.

4. To enable or disable spanning tree, type **1** to select Spanning Tree Status.

   The following prompt is displayed:

   ```
   Enter new value (E-Enable, D-Disable):
   ```

5. Type **E** to enable spanning tree or **D** to disable it. The default is disabled.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring MSTP Bridge Settings

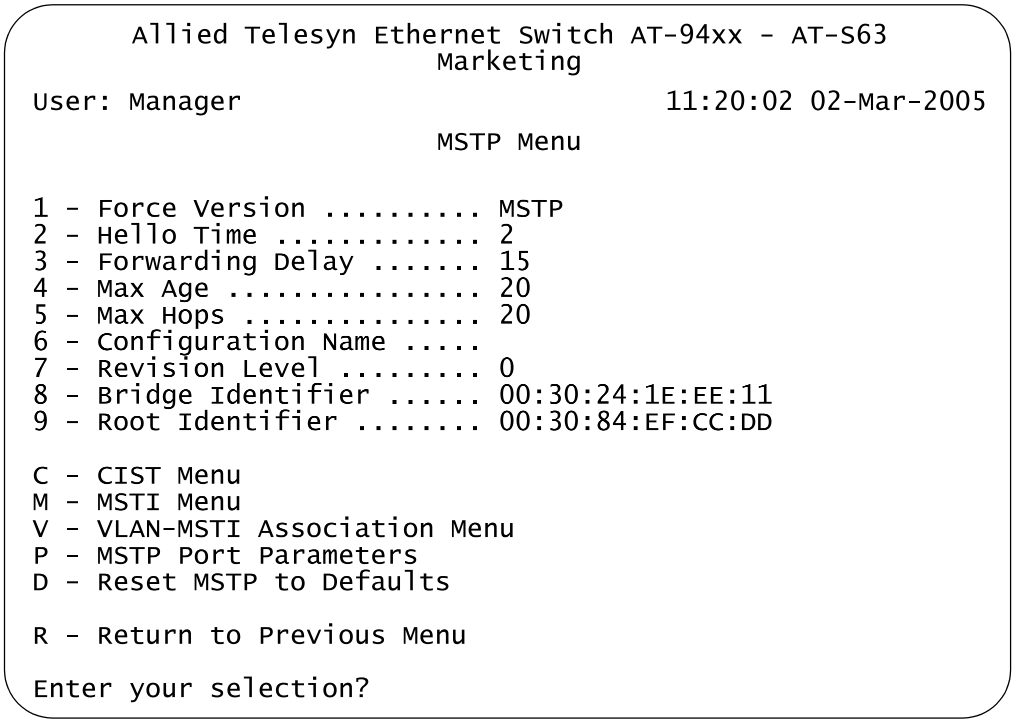
To configure a bridge's MSTP settings, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
                         MSTP Menu

1 - Force Version .......... MSTP
2 - Hello Time ............. 2
3 - Forwarding Delay ....... 15
4 - Max Age ................ 20
5 - Max Hops ............... 20
6 - Configuration Name .....
7 - Revision Level ......... 0
8 - Bridge Identifier ...... 00:30:24:1E:EE:11
9 - Root Identifier ........ 00:30:84:EF:CC:DD

C - CIST Menu
M - MSTI Menu
V - VLAN-MSTI Association Menu
P - MSTP Port Parameters
D - Reset MSTP to Defaults

R - Return to Previous Menu

Enter your selection?
```

Figure 186. MSTP Menu

3. Configure the following parameters as necessary.

   1 - Force Version
   This selection determines whether the bridge operates with MSTP or in an STP-compatible mode. If you select MSTP, the bridge operates all ports in MSTP, except for those ports that receive STP or RSTP BPDU packets. If you select Force STP Compatible, the bridge uses its MSTP parameter settings, but sends only STP BPDU packets from the ports.

   2 - Hello Time
   The time interval between generating and sending configuration messages by the bridge. The range of this parameter is 1 to 10

seconds. The default is 2 seconds. This value is active only if the bridge is selected as the root bridge of the network.

3 - Forwarding Delay
The waiting period before a bridge changes to a new state, for example, becomes the new root bridge after the topology changes. If the bridge transitions too soon, not all links may have yet adapted to the change, possibly resulting in a network loop. The range is 4 to 30 seconds. The default is 15 seconds. This setting applies only to ports running in the STP-compatible mode.

4 - Max Age
The length of time after which stored bridge protocol data units (BPDUs) are deleted by the bridge. This parameter applies only if the bridged network contains an STP or RSTP single-instance spanning tree. Otherwise, the bridges use the Max Hop counter to delete BPDUs.

All bridges in a single-instance bridged LAN use this aging time to test the age of stored configuration messages called bridge protocol data units (BPDUs). For example, if you use the default of 20, all bridges delete current configuration messages after 20 seconds. The range of this parameter is 6 to 40 seconds. The default is 20 seconds.

When you select a value for maximum age, observe the following rules:

MaxAge must be greater than (2 x (HelloTime + 1)).

MaxAge must be less than (2 x (ForwardingDelay - 1))

5 - Max Hops
MSTP regions use this parameter to discard BPDUs. The Max Hop counter in a BPDU is decremented every time the BPDU crosses an MSTP region boundary. After the counter reaches zero, the BPDU is deleted.

6 - Configuration Name
The name of the MSTP region. The range is 0 (zero) to 32 alphanumeric characters in length. The name, which is case sensitive, must be the same on all bridges in a region. Examples include Sales Region and Production Region.

7 - Revision Level
The revision level of an MSTP region. The range is 0 (zero) to 255. This is an arbitrary number that you assign to a region. The revision level must be the same on all bridges in a region. Different regions can have the same revision level without conflict.

8 - Bridge Identifier
The MAC address of the bridge. The bridge identifier is used as a tie breaker in the selection of a root bridge when two or more bridges have the same bridge priority value. This value cannot be changed.

9 - Root Identifier
If this MAC address is the same as the bridge's MAC address, then the switch is also functioning as a root bridge. If the two MAC addresses are different, then a different switch is functioning as the root bridge. You cannot change this parameter. This parameter is only displayed with MSTP is enabled.

Note
Selection C, CIST menu, is described in "Configuring the CIST Priority," next.

Selection M, MSTI menu, is described in "Creating, Deleting, and Modifying MSTI IDs" on page 524.

Selection V, VLAN-MSTI Association menu, is described in "Adding, Removing, or Modifying VLAN Associations to MSTI IDs" on page 527.

Selection P, MSTP Port Parameters, is described in "Configuring MSTP Port Settings" on page 532.

Selection D, Reset MSTP to Defaults, is described in "Resetting MSTP to the Defaults" on page 543.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring the CIST Priority

This procedure explains how to adjust the bridge’s CIST priority.

To change the CIST priority, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

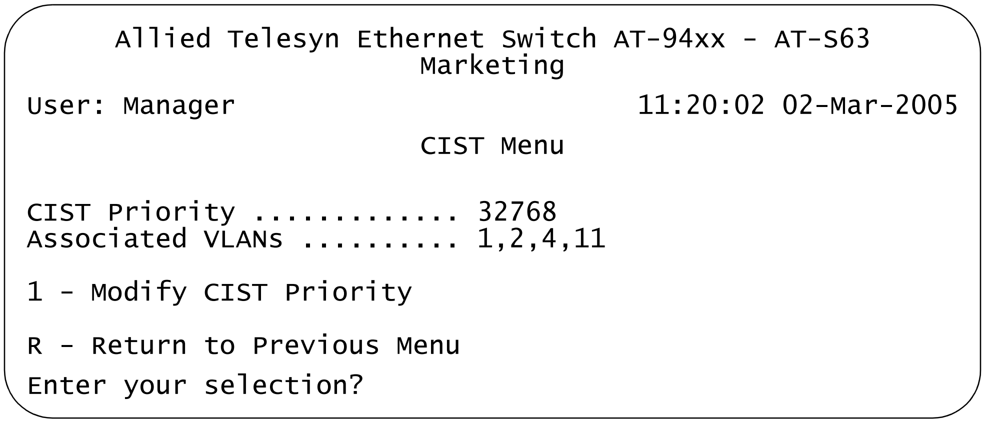
   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **C** to select CIST menu.

   The CIST menu is shown in Figure 187.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                         CIST Menu

CIST Priority ............. 32768
Associated VLANs .......... 1,2,4,11

1 - Modify CIST Priority

R - Return to Previous Menu
Enter your selection?
```

Figure 187. CIST Menu

   The CIST Priority field in the menu displays the current value for this MSTP parameter. This number is used in determining the root bridge of the network spanning tree. This number is analogous to the RSTP bridge priority value. The bridge in the network with the lowest priority number is selected as the root bridge. If two or more bridges have the same bridge or CIST priority values, the bridge with the numerically lowest MAC address becomes the root bridge.

   The Associated VLANs field displays the VIDs of the VLANs that are currently associated with CIST and have not been assigned to a MSTI.

4. From the CIST menu, type **1** to select Modify CIST Priority.

   The following prompt is displayed:

```
Enter new priority [the value will be multiplied by
4096]: [0 to 15] ->
```

5. Enter the increment that represents the new CIST priority value. The range is 0 (zero) to 61,440 in increments of 4,096, with 0 being the highest priority. For a list of the increments, refer to Table 14, “Port Priority Value Increments” on page 479.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying the CIST Priority

To change the CIST priority, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

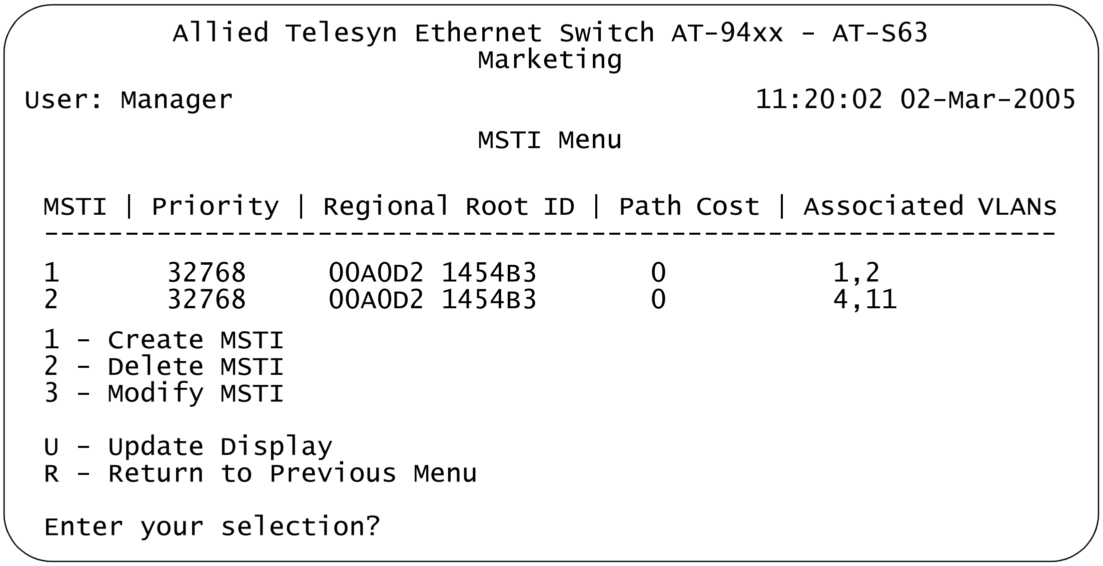
   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **M** to select MSTI menu.

   The MSTI menu is shown in Figure 188.



```
          Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                            Marketing
User: Manager                                   11:20:02 02-Mar-2005
                            MSTI Menu

 MSTI | Priority | Regional Root ID | Path Cost | Associated VLANs
 ---------------------------------------------------------------
 1       32768     00A0D2 1454B3       0           1,2
 2       32768     00A0D2 1454B3       0           4,11

 1 - Create MSTI
 2 - Delete MSTI
 3 - Modify MSTI

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 188. MSTI Menu

The MSTI menu displays a table that contains the following columns of information:

MSTI
Lists the MSTI IDs existing on the switch.

Priority
Specifies the MSTI priority value for the MSTI. The steps in this procedure explain how you can assign this value when you create an MSTI ID and how to modify the value for an existing MSTI ID.

Regional Root ID
Identifies the regional root for the MSTI by its MAC address.

Path Cost
Specifies the path cost from the bridge to the regional root. If the bridge is the regional root, the value is 0.

Associated VLANs
Specifies the VIDs of the VLANs that have been associated with the MSTI ID.

The table does not include the CIST. The table is empty if no MSTI IDs have been created.

Creating, Deleting, and Modifying MSTI IDs

The following sections contain procedures for working with MSTI IDs:

- ”Creating an MSTI ID” next
- “Deleting an MSTI ID” on page 525
- “Modifying an MSTI ID” on page 525

Creating an MSTI ID

To create an MSTI ID, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **M** to select MSTI menu.

   The MSTI menu is shown in Figure 188 on page 522.

4. Type **1** to select Create MSTI.

   The following prompt is displayed:

   ```
   Enter the MSTI ID to be created: [1 to 15] ->
   ```

5. Enter the new MSTP ID. The MSTI ID range is from 1 to 15. You can specify only one MSTI ID at a time.

   The following prompt is displayed:

   ```
   Success...Do you want to associate VLANs with this MSTI
   ID: [Yes/No] ->
   ```

6. If you want to associate VLANs to the MSTI now, type **Y** for yes. If you want to do it later, type **N** for no. (To add or remove VLANs from an existing MSTI, go to “Adding, Removing, or Modifying VLAN Associations to MSTI IDs” on page 527.)

   If you respond with yes, this prompt appears:

   ```
   Enter the list of VLANs:
   ```

7. Enter the VIDs of the VLANs that you want to associate with the MSTI ID. You can specify more than one VLAN at a time (for example, 4,6,11) To view VIDs, refer to “Displaying VLANs” on page 571.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting an MSTI ID

To delete an MSTI ID, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **M** to select MSTI menu.

   The MSTI menu is shown in Figure 188 on page 522.

4. Type **2** to select Delete MSTI.

   The following prompt is displayed:

   ```
   Enter the MSTI ID to be deleted: [1 to 15] ->
   ```

5. Enter the MSTP IDs that you want to delete. The range is 1 to 15. (You cannot delete CIST, which has a value of 0.)

   All VLANs associated with a deleted MSTP ID are returned to CIST.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying an MSTI ID

To change the MSTI priority value for an MSTI, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **M** to select MSTI menu.

   The MSTI menu is shown in Figure 188 on page 522

4. Type **3** to select Modify MSTI.

   The following prompt is displayed:

```
Enter the MSTI ID to be modified: [1 to 15] ->
```

5. Enter the MSTP IDs that you want to modify. The range is 1 to 15. You can specify only one MSTI ID at a time.

   The following prompt is displayed:

   ```
   Enter new priority [the value will be multiplied by 4096]
   [0 to 15] -> 8
   ```

6. Enter a new MSTI priority number for this MSTI on the bridge. This parameter is used in selecting a regional root for the MSTI. The range is 0 (zero) to 61,440 in increments of 4,096, with 0 being the highest priority. This parameter is used in selecting a regional root for the MSTI. For a list of the increments, refer to Table 9, “Bridge Priority Value Increments” on page 477.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Adding, Removing, or Modifying VLAN Associations to MSTI IDs

When you create a new MSTI ID, you are given the opportunity of associating VLANs to it. But after an MSTI ID is created, you may want to add more VLANs to it, or perhaps remove VLANs. This procedure explains how to associate VLANs on the switch to an existing MSTI ID and also how to remove VLANs. Before performing this procedure, note the following:

- ❒ You must create a MSTI ID before you can assign VLANs to it. To create a MSTI ID, refer to "Creating, Deleting, and Modifying MSTI IDs" on page 524.
- ❒ You can assign a VLAN to only one MSTI. By default, a VLAN, when created, is associated with the CIST instance, which has a MSTI ID of 0.
- ❒ An MSTI can contain any number of VLANs.

This section contains the following procedures:

- ❒ ”Adding or Removing a VLAN from an MSTI ID” next
- ❒ "Associating a VLAN to an MSTI ID" on page 528
- ❒ "Removing a VLAN from an MSTI ID" on page 529
- ❒ "Associating VLANs to an MSTI ID and Deleting All Associated VLANs" on page 530
- ❒ "Clearing VLAN to MSTI Associations" on page 531

Adding or Removing a VLAN from an MSTI ID

To add or remove a VLAN from an MSTI ID, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

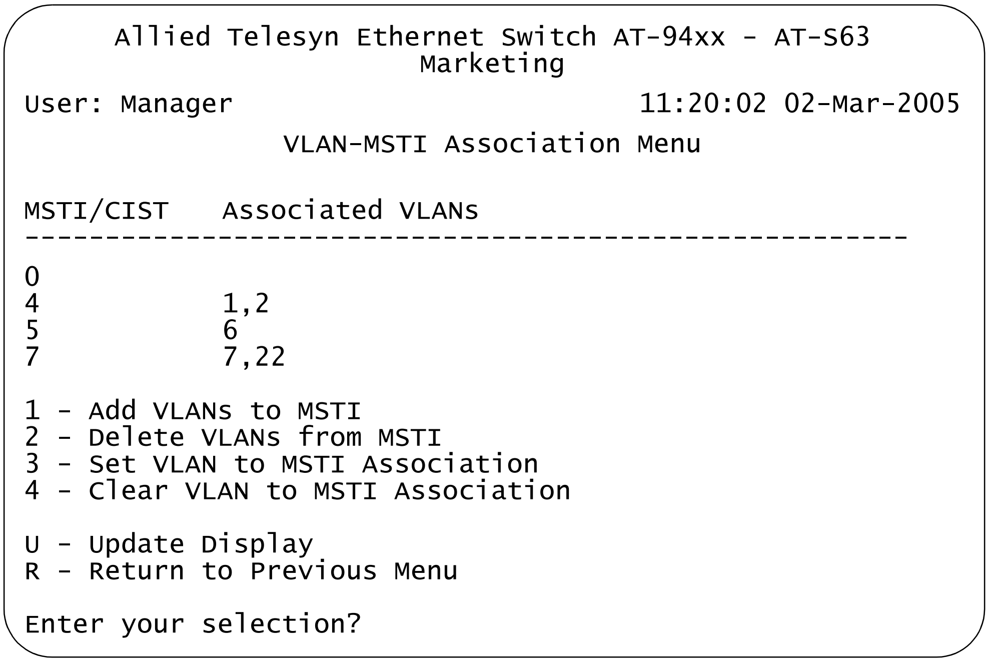
   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **M** to select MSTI menu.

   The MSTI menu is shown in Figure 188 on page 522.

4. From the MSTP menu, type **V** to select VLAN-MSTI Association menu.

The VLAN-MSTI Association menu is shown in Figure 189.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                         11:20:02 02-Mar-2005
                VLAN-MSTI Association Menu

MSTI/CIST    Associated VLANs
-------------------------------------------------------
0
4            1,2
5            6
7            7,22

1 - Add VLANs to MSTI
2 - Delete VLANs from MSTI
3 - Set VLAN to MSTI Association
4 - Clear VLAN to MSTI Association

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 189. VLAN-MSTI Association Menu

The VLAN-MSTI Association menu displays a table that contains the following columns of information:

MSTI / CIST
Lists the CIST and current MSTI IDs on the switch.

Associated VLANs
Specifies the VIDs of the VLANs associated with the CIST and MSTI IDs. For instance, referring to Figure 189, the VLANs with the VIDs 7 and 22 are assigned to MSTI 7.

Associating a VLAN to an MSTI ID

To associate a VLAN to an MSTP ID, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **M** to select MSTI menu.

   The MSTI menu is shown in Figure 188 on page 522

4. From the MSTP menu, type **V** to select VLAN-MSTI Association menu.

   The VLAN-MSTI Association menu is shown in Figure 189 on page 528.

5. From the VLAN-MSTI Association menu, type **1** to select Add VLANs to MSTI.

   The following prompt is displayed:

   ```
   Enter the MSTI ID <enter 0 for CIST> [0 to 15] ->
   ```

6. Enter the MSTI ID to which you want to associate a VLAN.

   A prompt similar to the following is displayed:

   ```
   Enter the list of VLANs:
   ```

7. Enter the VLAN ID of the virtual LAN you want to associate with the MSTI ID. You can enter more than one VLAN at a time (for example, 2,4,7). To view VIDs, refer to “Displaying VLANs” on page 571.

   The MSTI ID retains any VLANs already associated with it when new VLANs are added.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Removing a VLAN from an MSTI ID

To remove a VLAN from an MSTP ID, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **M** to select MSTI menu.

   The MSTI menu is shown in Figure 188 on page 522

4. From the MSTP menu, type **V** to select VLAN-MSTI Association menu.

   The VLAN-MSTI Association menu is shown in Figure 189 on page 528.

5. From the VLAN-MSTI Association menu, type **2** to select Delete VLANs from MSTI.

   The following prompt is displayed:

```
Enter the MSTI ID <enter 0 for CIST> [0 to 15] ->
```

6. Enter the MSTI ID to which you want to associate a VLAN.

   A prompt similar to the following is displayed:

   ```
   Enter the list of VLANs:
   ```

7. Enter the VLAN ID of the virtual LAN that you want to remove from the MSTI ID. You can enter more than one VLAN at a time (for example, 2,4,7) To view VIDs, refer to “Displaying VLANs” on page 571.

   A removed VLAN is returned to CIST.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Associating VLANs to an MSTI ID and Deleting All Associated VLANs

To associate VLANs to an MSTP ID while deleting all VLANs that are already associated with it, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **M** to select MSTI menu.

   The MSTI menu is shown in Figure 188 on page 522

4. From the MSTP menu, type **V** to select VLAN-MSTI Association menu.

   The VLAN-MSTI Association menu is shown in Figure 189 on page 528.

5. From the VLAN-MSTI Association menu, type **1** to select Add VLANs to MSTI.

   The following prompt is displayed:

   ```
   Enter the MSTI ID <enter 0 for CIST> [0 to 15] ->
   ```

6. Enter the MSTI ID to which you want to associate a VLAN.

7. A prompt similar to the following is displayed:

   ```
   Enter the list of VLANs:
   ```

8. Enter the VLAN ID of the virtual LAN that you want to associate with the MSTI ID. You can enter more than one VLAN at a time (for example, 2,4,7) (To view VIDs, refer to "Displaying VLANs" on page 571.)

   The VLANs already associated with the MSTI ID are removed when the new VLANs are added. The removed VLANs are returned to CIST.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Clearing VLAN to MSTI Associations

To clear VLAN to MSTI associations, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **M** to select MSTI menu.

   The MSTI menu is shown in Figure 188 on page 522

4. From the MSTP menu, type **V** to select VLAN-MSTI Association menu.

   The VLAN-MSTI Association menu is shown in Figure 189 on page 528.

5. From the VLAN-MSTI Association menu, type **4** to select Clear VLAN to MSTI Association.

   The following prompt is displayed:

   ```
   Enter the MSTI ID: [1 to 15] ->
   ```

6. Type the MSTI ID number and press Return.

Configuring MSTP Port Settings

As explained in “Ports in Multiple MSTIs” on page 507, MSTP port settings are divided into two groups. The parameters in the first group are set just once on a port, regardless of the number of MSTIs in which a port is a member. These settings are:

❒ External path cost

❒ Point-to-point designation

❒ Edge port designation

The procedure for setting these parameters is in “Configuring Generic MSTP Port Settings” on page 532.

The second group of port parameters can be set independently for each MSTI in which the port is a member. These parameters are:

❒ Internal path cost

❒ Priority

To set these parameters, refer to “Configuring MSTI-specific Port Parameters” on page 534.

Configuring Generic MSTP Port Settings

To configure the external path cost of a port or to designate whether the port is an edge or point-to-point port, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

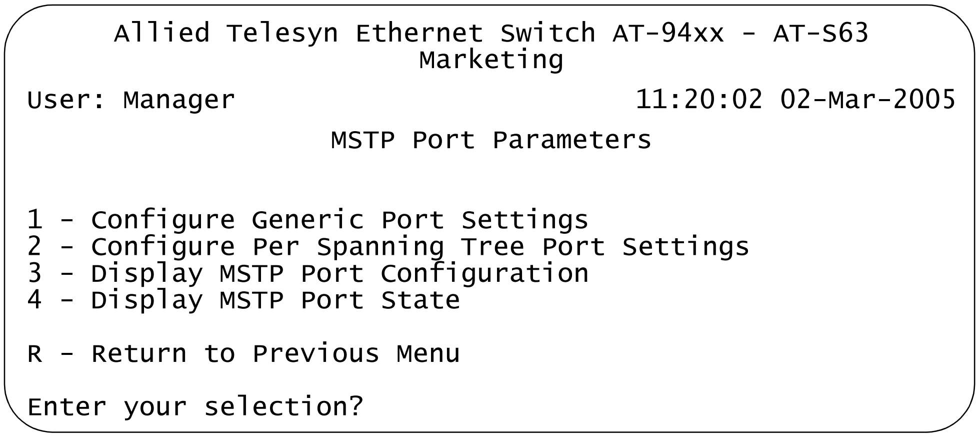
   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **P** to select MSTP Port Parameters.

The MSTP Port Parameters menu is shown in Figure 190.



```
          Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                             Marketing
User: Manager                            11:20:02 02-Mar-2005
                        MSTP Port Parameters


1 - Configure Generic Port Settings
2 - Configure Per Spanning Tree Port Settings
3 - Display MSTP Port Configuration
4 - Display MSTP Port State

R - Return to Previous Menu

Enter your selection?
```

Figure 190. MSTP Port Parameters Menu

4. From the MSTP Port Parameters menu, type **1** to select Configure Generic Port Settings.

   The following prompt is displayed:

   ```
   Start port to configure: [1 to 26] ->
   ```

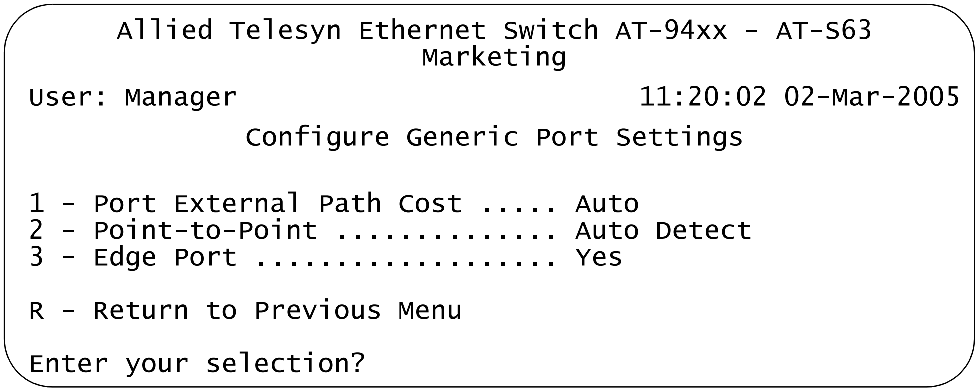
5. Enter the number of the port you want to configure. To configure a range of ports, enter the first port of the range.

   The following prompt is displayed:

   ```
   End port to configure: [1 to 26] -> 4
   ```

6. Enter the last port of the range. To configure just one port, enter the same port here as in Step 5.

   The Configure MSTP Port Settings menu is shown in Figure 191.



```
          Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                             Marketing
User: Manager                            11:20:02 02-Mar-2005
                   Configure Generic Port Settings


1 - Port External Path Cost ..... Auto
2 - Point-to-Point .............. Auto Detect
3 - Edge Port ................... Yes

R - Return to Previous Menu

Enter your selection?
```

Figure 191. Configure MSTP Port Settings Menu

7. Adjust the following parameters as necessary:

   1- Port External Path Cost
   The port cost of the port if the port is connected to a bridge which is a member of another MSTP region or is running STP or RSTP. The range is 0 to 200,000,000. The default setting is Auto, which sets port cost depending on the speed of the port. Table 15 lists the MSTP port costs with the Auto setting when the port is not a member of a trunk.

   Table 15 Auto External Path Costs

Port Speed	Port Cost
10 Mbps	2,000,000
100 Mbps	200,000
1000 Mbps	20,000

   Table 16 lists the MSTP port costs with the Auto setting when the port is part of a port trunk.

   Table 16. Auto External Path Trunk Costs

Port Speed	Port Cost
10 Mbps	20,000
100 Mbps	20,000
1000 Mbps	2,000

   2 - Point-to-Point
   This parameter defines whether the port is functioning as a point-to-point port. For an explanation of this parameter, refer to “Point-to-Point and Edge Ports” on page 481.

   3 - Edge Port
   This parameter defines whether the port is functioning as an edge port. For an explanation of this parameter, refer to “Point-to-Point and Edge Ports” on page 481.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring MSTI-specific Port Parameters

This procedure explains how to set a port’s priority and internal path cost. These parameters can be set independently on a port for each MSTI in which a port is a member. To configure the parameters, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **P** to select MSTP Port Parameters.

   The MSTP Port Parameters menu is shown in Figure 190 on page 533.

4. Type **2** to select Configure Per Spanning Tree Port Settings.

   The following prompt is displayed:

   ```
   Enter Spanning Tree (CIST/MSTI) List :
   ```

5. Enter the ID number of the CIST or MSTI where the VLAN containing the port whose settings you want to configure has been assigned. You can specify more than one ID number.

   The following prompt is displayed:

   ```
   Start port to configure: [1 to 26] -> 1
   ```

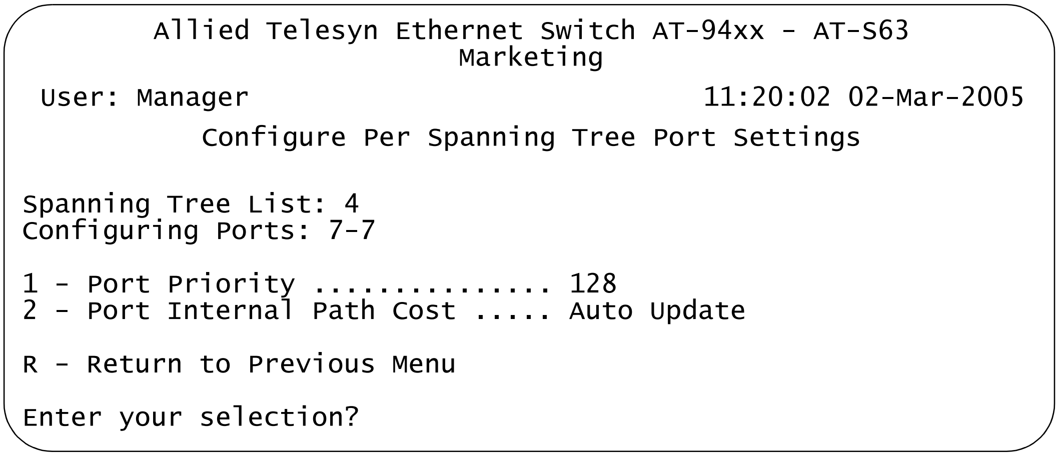
6. Enter the number of the port you want to configure. To configure a range of ports, enter the first port of the range.

   The following prompt is displayed:

   ```
   End port to configure: [1 to 26] -> 1
   ```

7. Enter the last port of the range. To configure just one port, enter the same port here as in Step 6.

Configure Per Spanning Tree Port Settings Menu is shown in Figure 192.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
 User: Manager                          11:20:02 02-Mar-2005
           Configure Per Spanning Tree Port Settings

Spanning Tree List: 4
Configuring Ports: 7-7

1 - Port Priority ............... 128
2 - Port Internal Path Cost ..... Auto Update

R - Return to Previous Menu

Enter your selection?
```

Figure 192. Configure Per Spanning Tree Port Settings Menu

The Spanning Tree List displays the ID numbers of the MSTIs you specified.

8. Adjust the following parameters as necessary:

1 - Port Priority
This parameter is used as a tie breaker when two or more ports are determined to have equal costs to the regional root bridge. The range is 0 to 240 in increments of 16. The default value is 8 (priority value 128). For a list of the increments, refer to Table 14, “Port Priority Value Increments” on page 479.

2- Port Internal Path Cost
The port cost of the port if the port is connected to a bridge which is part of the same MSTP region. The range is 0 to 200,000,000. The default setting is 0, Auto Update, which sets port cost depending on the speed of the port. Default values are 2,000,000 for 10 Mbps ports, 200,000 for a 100 Mbps ports, and 20,000 for one gigabit ports.

Table 17 lists the RSTP port costs with Auto-Detect.

Table 17. RSTP Auto-Detect Port Costs

Port Speed	Port Cost
10 Mbps	2,000,000
100 Mbps	200,000
1000 Mbps	20,000

Table 18 lists the RSTP port costs with Auto-Detect when the port is part of a port trunk.

Table 18. RSTP Auto-Detect Port Trunk Costs

Port Speed	Port Cost
10 Mbps	20,000
100 Mbps	20,000
1000 Mbps	2,000

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying the MSTP Port Configuration

To display the MSTP port configuration, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

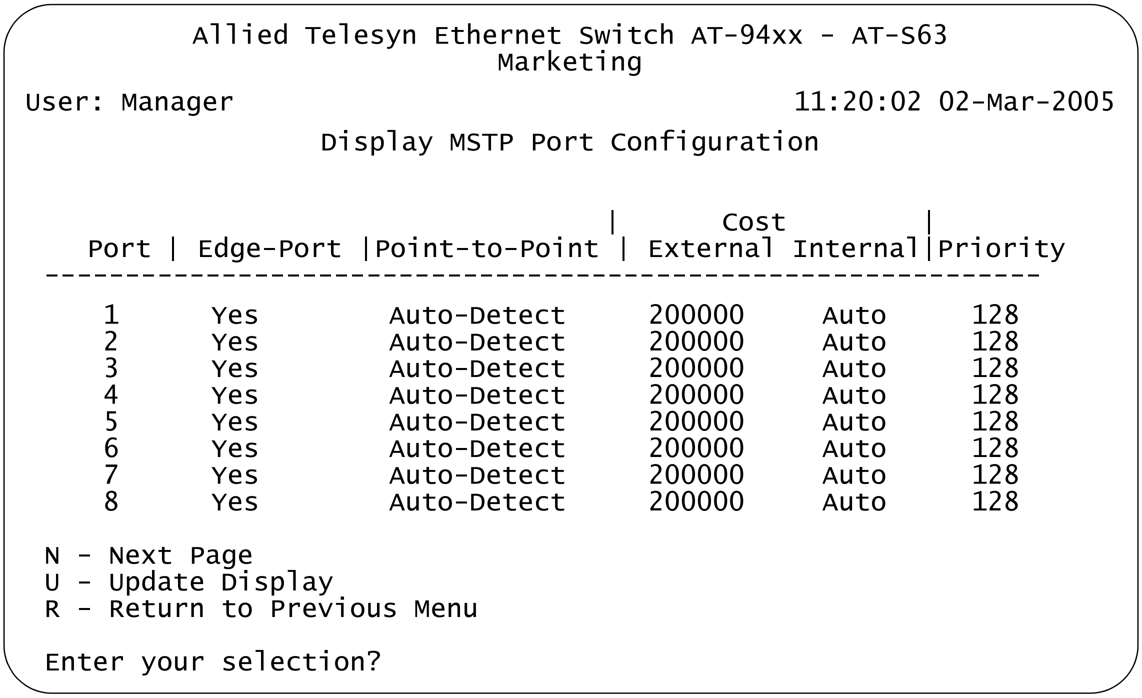
   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **P** to select MSTP Port Parameters.

   The MSTP Port Parameters menu is shown in Figure 190 on page 533.

4. From the MSTP Port Parameters menu, type **2** to select Display MSTP Port Configuration.

   The Display MSTP Port Configuration menu is shown in Figure 193.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                            Marketing
User: Manager                                   11:20:02 02-Mar-2005
                  Display MSTP Port Configuration


                                   |      Cost         |
    Port | Edge-Port |Point-to-Point | External Internal|Priority
 --------------------------------------------------------------

     1      Yes       Auto-Detect     200000     Auto     128
     2      Yes       Auto-Detect     200000     Auto     128
     3      Yes       Auto-Detect     200000     Auto     128
     4      Yes       Auto-Detect     200000     Auto     128
     5      Yes       Auto-Detect     200000     Auto     128
     6      Yes       Auto-Detect     200000     Auto     128
     7      Yes       Auto-Detect     200000     Auto     128
     8      Yes       Auto-Detect     200000     Auto     128

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 193. Display MSTP Port Configuration Menu

The Display MSTP Port Configuration menu displays a table that contains the following columns of information:

Port
The port number.

Edge-Port
Whether or not the port is functioning as an edge port. The possible settings are Yes and No.

Point-to-Point
Whether or not the port is functioning as a point-to-point port. The possible settings are Yes, No, and Auto-Detect.

External or Internal Port Cost
External Port Cost
The port cost of the port if the port is connected to a bridge which is a member of another MSTP region or is running STP or RSTP.

Internal Port Cost
The port cost of the port if the port is connected to a bridge which is part of the same MSTP region. The possible settings are:

❐ Auto-detect - Port cost is automatically set depending on the speed of the port.

❐ Default values are 2,000,000 for 10 Mbps ports, 200,000 for a 100 Mbps ports, and 20,000 for one gigabit ports.

Priority
This parameter is used as a tie breaker when two or more ports are determined to have equal costs to the regional root bridge.

Displaying the MSTP Port State

To display the MSTP port state, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **P** to select MSTP Port Parameters.

   The MSTP Port Parameters menu is shown in Figure 190 on page 533.

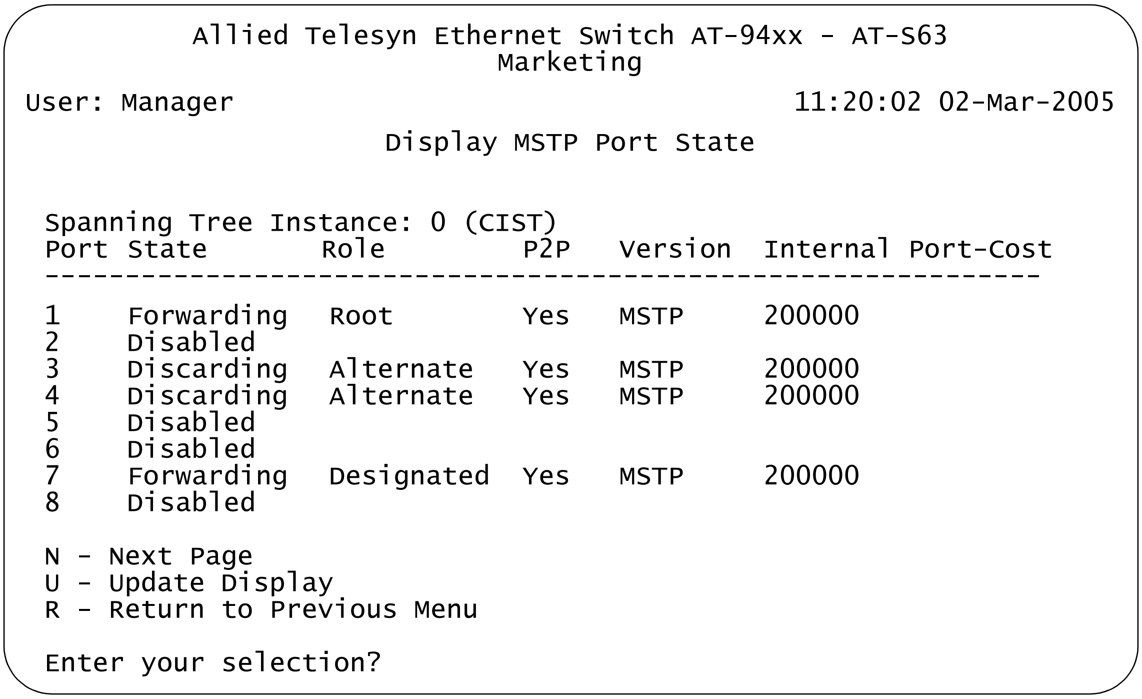
4. From the MSTP Port Parameters menu, type **3** to select Display MSTP Port State.

   The following prompt is displayed:

   ```
   Enter Spanning Tree (CIST/MSTI) ID to display port state:
   [0 to 15} ->
   ```

5. Enter an MSTI ID.

The Display MSTP Port State menu is shown in Figure 194.



```
           Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing
User: Manager                                  11:20:02 02-Mar-2005
                        Display MSTP Port State


 Spanning Tree Instance: 0 (CIST)
 Port State      Role        P2P   Version  Internal Port-Cost
 ---------------------------------------------------------------

 1    Forwarding  Root        Yes   MSTP     200000
 2    Disabled
 3    Discarding  Alternate   Yes   MSTP     200000
 4    Discarding  Alternate   Yes   MSTP     200000
 5    Disabled
 6    Disabled
 7    Forwarding  Designated  Yes   MSTP     200000
 8    Disabled

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 194. Display MSTP Port State Menu

The MSTP Port State menu displays a table that contains the following columns of information:

Port
The port number.

State
The MSTP state of the port. The possible states are:

Discarding - The port is discarding received packets and is not submitting forwarded packets for transmission.

Learning - The port is learning the MAC address from the received packet, but does not process or forward the packet.

Forwarding - Normal operation.

Disabled - The port has been disabled.

Role
The MSTP role of the port. The possible roles are:

Root - The port that is connected to the root switch, directly or through other switches, with the least path cost.

Alternate - The port offers an alternate path in the direction of the root switch.

Backup - The port on a designated switch that provides a backup for the path provided by the designated port.

Designated - The port on the designated switch for a LAN that has the least cost path to the root switch. This port connects the LAN to the root switch.

Master - Similar to the root port. When the port is a boundary port, the MSTI port roles follow the CIST port roles. The MSTI port role is called “master” when the CIST role is “root.”

P2P
Whether or not the port is functioning as a point-to-point port. The possible settings are Yes, No, and Auto-Detect.

Version
Whether the port is operating in MSTP mode or STP-compatible mode.

Internal Port-Cost
The port cost when the port is connected to a bridge in the same MSTP region.

Resetting MSTP to the Defaults

To reset MSTP to the defaults, perform the following procedure:

1. From the Main Menu, type **3** to select Spanning Tree Configuration.

   The Spanning Tree Configuration menu is shown in Figure 169 on page 485.

2. From the Spanning Tree Configuration menu, type **3** to select Configure Active Protocol.

   The MSTP menu is shown in Figure 186 on page 517.

3. From the MSTP menu, type **D** to select Reset MSTP to Defaults.

   The following message is displayed:

   ```
   Do you want to reset MSTP configuration to default? [Yes/
   No] ->
   ```

4. Enter **Y** for Yes or **N** for No and press Return.

   The MSTP configuration is reset to the defaults.

Section V

Virtual LANs

The chapters in this section provide information and procedures for basic switch setup using the AT-S63 management software. The chapters include:

- ❒ Chapter 23, “Port-based and Tagged VLANs” on page 547
- ❒ Chapter 24, “GARP VLAN Registration Protocol” on page 583
- ❒ Chapter 25, “Multiple VLANs” on page 611
- ❒ Chapter 26, “Protected Ports VLANs” on page 619

Chapter 23

Port-based and Tagged VLANs

This chapter contains basic information about virtual LANs (VLANs) and procedures for creating, modifying, and deleting VLANs from a local or Telnet management session.

This chapter contains the following sections:

VLAN Overview

A VLAN is a group of ports on an Ethernet switch that form a logical Ethernet segment. The ports of a VLAN form an independent traffic domain where the traffic generated by the nodes of a VLAN remains within the VLAN.

With VLANs, you can segment your network through the switch’s AT-S63 management software and so be able to group nodes with related functions into their own separate, logical LAN segments. These VLAN groupings can be based on similar data needs or security requirements. For example, you could create separate VLANs for the different departments in your company, such as one for Sales and another for Accounting.

VLANs offer several important benefits:

- ❒ Improved network performance

  Network performance often suffers as networks grow in size and as data traffic increases. The more nodes on each LAN segment vying for bandwidth, the greater the likelihood overall network performance decreases.

  VLANs improve network perform because VLAN traffic stays within the VLAN. The nodes of a VLAN receive traffic only from nodes of the same VLAN. This reduces the need for nodes to handle traffic not destined for them. It also frees up bandwidth within all the logical workgroups.

  In addition, because each VLAN constitutes a separate broadcast domain, broadcast traffic remains within the VLAN. This too can improve overall network performance.

- ❒ Increased security

  Because data traffic generated by a node in a VLAN is restricted only to the other nodes of the same VLAN, you can use VLANs to control the flow of packets in your network and prevent packets from flowing to unauthorized end nodes.

- ❒ Simplified network management

  VLANs can also simplify network management. Before the advent of VLANs, physical changes to the network often had to been made at the switches in the wiring closets. For example, if an employee changed departments, changing the employee’s LAN segment assignment might require a change to the wiring at the switches.

  But with VLANS, you can change the LAN segment assignment of an end node connected to the switch through the switch’s AT-S63 management software. You can change the VLAN memberships through the management software without moving the workstations physically, or changing group memberships by moving cables from one switch port to another.

In addition, a virtual LAN can span more than one switch. This means that the end nodes of a VLAN do not need to be connected to the same switch and so are not restricted to being in the same physical location.

Note
When a transceiver is inserted into an uplink slot and a link is established, that slot becomes a primary uplink port and the corresponding backup port, 23R or 24R, automatically transitions to redundant uplink status. Any VLAN settings remain intact when the backup port makes the transition to a redundant uplink state.

The AT-9400 Series switch supports the following types of VLANs you can create yourself:

❒ Port-based VLANs

❒ Tagged VLANs

These VLANs are described in the following sections.

Port-based VLAN Overview

As explained in “VLAN Overview” on page 548, a VLAN consists of a group of ports on one or more Ethernet switches that form an independent traffic domain. Traffic generated by the end nodes of a VLAN remains within the VLAN and does not cross over to the end nodes of other VLANs unless there is an interconnection device, such as a router or Layer 3 switch.

A port-based VLAN is a group of ports on a Gigabit Ethernet Switch that form a logical Ethernet segment. Each port of a port-based VLAN can belong to only one VLAN at a time.

A port-based VLAN can have as many or as few ports as needed. The VLAN can consist of all the ports on an Ethernet switch, or just a few ports. A port-based VLAN also can span switches and consist of ports from multiple Ethernet switches.

Note
The AT-9400 Series switch is preconfigured with one port-based VLAN. All ports on the switch are members of this VLAN, called the Default_VLAN.

The parts that make up a port-based VLAN are:

❐ VLAN name

❐ VLAN Identifier

❐ Untagged ports

❐ Port VLAN Identifier

VLAN Name

To create a port-based VLAN, you must give it a name. The name should reflect the function of the network devices that are be members of the VLAN. Examples include Sales, Production, and Engineering.

VLAN Identifier

Each VLAN in a network must have a unique number assigned to it. This number is called the VLAN identifier (VID). This number uniquely identifies a VLAN in the switch and the network.

If a VLAN consists only of ports located on one physical switch in your network, you assign it a VID different from all other VLANs in your network.

If a VLAN spans multiple switches, then the VID for the VLAN on the different switches should be the same. The switches are then able to recognize and forward frames belonging to the same VLAN even though the VLAN spans multiple switches.

For example, if you had a port-based VLAN titled Marketing that spanned three AT-9400 Series switches, you would assign the Marketing VLAN on each switch the same VID.

You can assign this number manually or allow the AT-S63 management software to do it automatically. If you allow the management software to do it automatically, it selects the next available VID. This is acceptable when you are creating a new, unique VLAN.

If you are creating a VLAN on a switch that will be part of a larger VLAN that spans several switch, then you will need to assign the number yourself so that the VLAN has the same VID on all switches.

Untagged Ports

You need to specify which ports on the switch are to be members of a port-based VLAN. Ports in a port-based VLAN are referred to as *untagged ports* and the frames received on the ports as *untagged frames*. The names derive from the fact that the frames received on a port will not contain any information that indicates VLAN membership, and that VLAN membership will be determined solely by the port's PVID. (There is another type of VLAN where VLAN membership is determined by information within the frames themselves, rather than by a port's PVID. This type of VLAN is explained in "Tagged VLAN Overview" on page 556.)

A port on a switch can be an untagged member of only one port-based VLAN at a time. An untagged port cannot be assigned to two port-based VLANs simultaneously.

Port VLAN Identifier

Each port in a port-based VLAN must have a port VLAN identifier (PVID). The switch associates a frame to a port-based VLAN by the PVID assigned to the port on which the frame is received, and forwards the frame only to those ports with the same PVID. Consequently, all ports of a port-based VLAN must have the same PVID. Additionally, the PVID of the ports in a VLAN must match the VLAN's VID.

For example, if you were creating a port-based VLAN on a switch and you had assigned the VLAN the VID 5, the PVID for each port in the VLAN would need to be assigned the value 5.

Some switches and switch management programs require that you assign the PVID value for each port manually. However, the AT-S63 management software performs this task automatically. The software automatically assigns a PVID to a port, making it identical to the VID of the VLAN to which the port is a member, when you assign the port as an untagged member to a VLAN.

General Rules for Creating a Port-based VLAN

Below is a summary of the general rules to observe when creating a port-based VLAN.

- Each port-based VLAN must be assigned a unique VID. If a particular VLAN spans multiples switches, each part of the VLAN on the different switches should be assigned the same VID.
- A port can be an untagged member of only one port-based VLAN at a time.
- Each port must be assigned a PVID. This value must be the same for all ports in a port-based VLAN and it must match the VLAN's VID. This value is automatically assigned by the AT-S63 management software.
- A port-based VLAN that spans multiple switches requires a port on each switch where the VLAN is located to function as an interconnection between the switches where the various parts of the VLAN reside.
- If there are end nodes in different VLANs that need to communicate with each other, a router or Layer 3 switch is required to interconnect the VLANs.
- An AT-9400 Series switch can support up to 4094 port-based VLANs.

Drawbacks of Port-based VLANs

There are several drawbacks to port-based VLANs:

- It is not easy to share network resources, such as servers and printers, across multiple VLANs. A router or Layer 3 switch must be added to the network to provide a means for interconnecting the port-based VLANs. The introduction of a router into your network could create security issues from unauthorized access to your network.
- A VLAN that spans several switches requires a port on each switch for the interconnection of the various parts of the VLAN. For example, a VLAN that spans three switches would require one port on each switch to interconnect the various sections of the VLAN. In network configurations where there are many individual VLANs that span switches, many ports could end up being used ineffectively just to interconnect the various VLANs.

Port-based Example 1

Figure 195 illustrates an example of one AT-9424T/SP Gigabit Ethernet Switch with three port-based VLANs. (For purposes of the following examples, the Default_VLAN is not shown.)

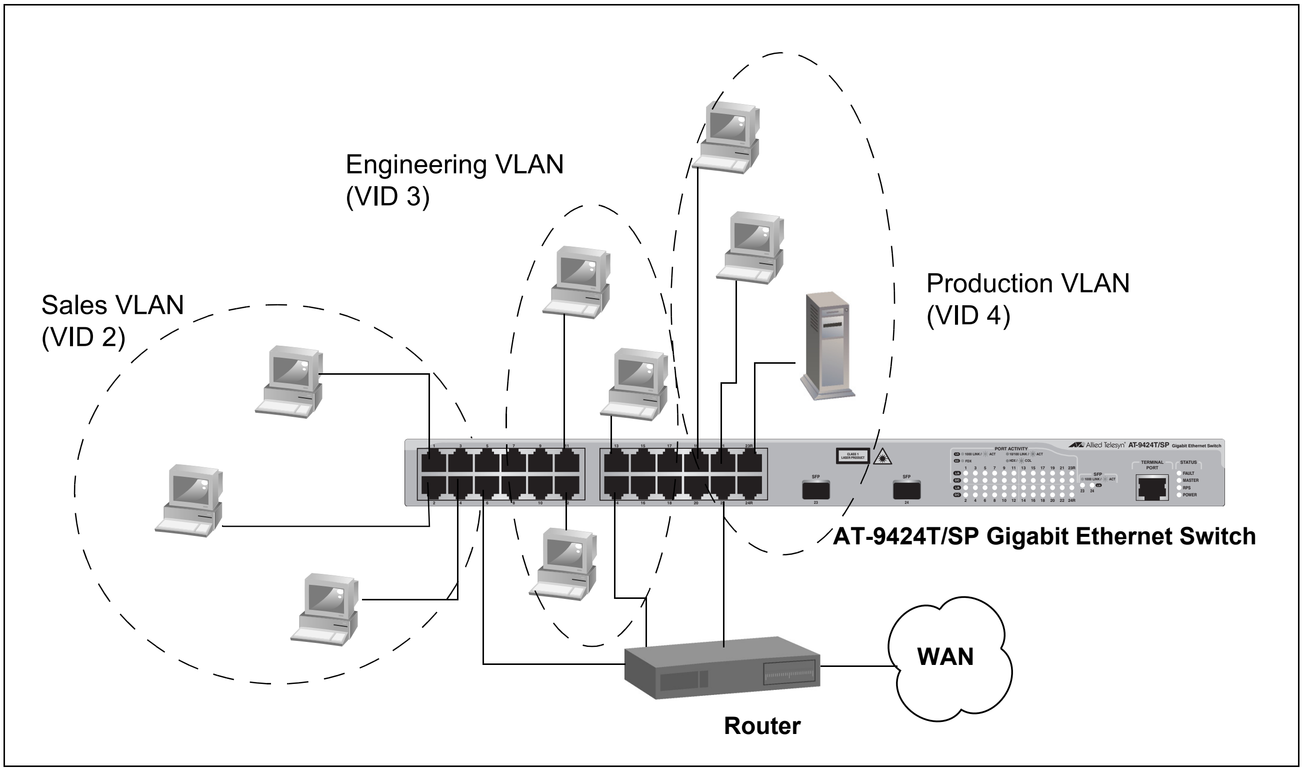


Figure 195. Port-based VLAN - Example 1

The table below lists the port assignments for the Sales, Engineering, and Production VLANs on the switch.

	Sales VLAN (VID 2)	Engineering VLAN (VID 3)	Production VLAN (VID 4)
AT-9424T/SP Switch	Ports 1 - 2, 4, 6 (PVID 2)	Ports 11 - 14 (PVID 3)	Ports 19, 21 - 23 (PVID 4)

Each VLAN has been assigned a unique VID. This number is assigned when you create a VLAN.

The ports have been assigned PVID values. A port's PVID is assigned automatically by the AT-S63 management software when you create the VLAN. The PVID of a port is the same as the VID to which the port is an untagged member.

In the example, each VLAN has one port connected to the router. The router interconnects the various VLANs and functions as a gateway to the WAN.

Port-based Example 2

Figure 196 illustrates more port-based VLANs. In this example, two VLANs, Sales and Engineering, span two AT-9400 Series Gigabit Ethernet switches.

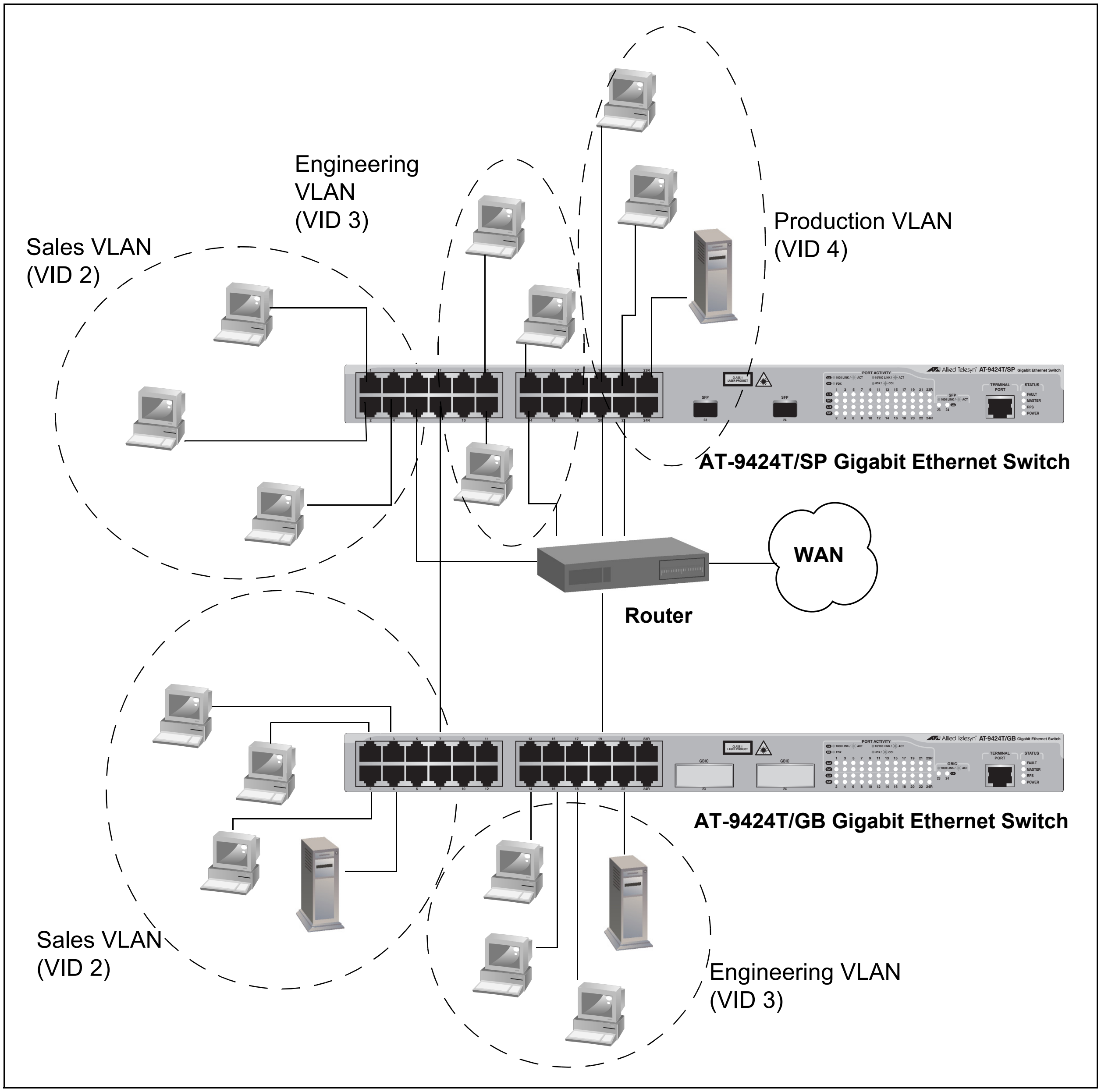


Figure 196. Port-based VLAN - Example 2

The table below lists the port assignments for the Sales, Engineering, and

Production VLANs on the switches:

	Sales VLAN (VID 2)	**Engineering VLAN (VID 3)**	**Production VLAN (VID 4)**
AT-9424T/SP Switch (top)	Ports 1 - 2, 4, 6, 8 (PVID 2)	Ports 11 - 14, 19 (PVID 3)	Ports 19, 21 - 23 (PVID 4)
AT-9424T/GB Switch (bottom)	Ports 1 - 4, 7 (PVID 2)	Ports 14, 16, 18-19, 22 (PVID 3)	none

- ❒ Sales VLAN - This VLAN spans both switches. It has a VID value of 2 and consists of five untagged ports on the top switch and five untagged ports on the bottom switch.

  The two parts of the VLAN are connected by a direct link from port 8 on the top switch to port 7 on the bottom switch. This direct link allows the two parts of the Sales VLAN to function as one logical LAN segment.

  Port 6 on the top switch connects to the router. This port allows the Sales VLAN to exchange Ethernet frames with the other VLANs and to access the WAN.

- ❒ Engineering VLAN - The workstations of this VLAN are connected to ports 11-14 on the top switch and ports 14, 16, and 18-19 on the bottom switch.

  Because this VLAN spans multiple switches, it needs a direct connection between its various parts to provide a communications path. This is provided in the example with a direct connection from port 20 on the top switch to port 19 on the bottom switch.

  This VLAN uses port 13 on the top switch as a connection to the router and the WAN.

- ❒ Production VLAN - This is the final VLAN in the example. It has the VLAN of 4 and its ports have been assigned the PVID also of 4.

  The nodes of this VLAN are connected to only the top switch. So this VLAN does not require a direct connection to the bottom VLAN. However, it uses port 22 as a connection to the router.

Tagged VLAN Overview

The second type of VLAN supported by the AT-S63 management software is the *tagged VLAN*. VLAN membership in a tagged VLAN is determined by information within the frames that are received on a port. This differs from a port-based VLAN, where the PVIDs assigned to the ports determine VLAN membership.

The VLAN information within an Ethernet frame is referred to as a *tag* or *tagged header*. A tag, which follows the source and destination addresses in a frame, contains the VID of the VLAN to which the frame belongs (IEEE 802.3ac standard). As explained earlier in this chapter in “VLAN Identifier” on page 550, this number uniquely identifies each VLAN in a network.

When a switch receives a frame with a VLAN tag, referred to as a *tagged frame*, the switch forwards the frame only to those ports that share the same VID.

A port to receive or transmit tagged frames is referred to as a *tagged port*. Any network device connected to a tagged port must be IEEE 802.1Q-compliant. This is the standard that outlines the requirements and standards for tagging. The device must be able to process the tagged information on received frames and add tagged information to transmitted frames.

The benefit of a tagged VLAN is that the tagged ports can belong to more than one VLAN at one time. This can greatly simplify the task of adding shared devices to the network. For example, a server can be configured to accept and return packets from many different VLANs simultaneously.

Tagged VLANs are also useful where multiple VLANs span across switches. You can use one port per switch to connect all VLANs on the switch to another switch.

The IEEE 802.1Q standard describes how this tagging information is used to forward the traffic throughout the switch. The handling of frames tagged with VIDs coming into a port is straightforward. If the incoming frame’s VID tag matches one of the VIDs of a VLAN of which the port is a tagged member, the frame is accepted and forwarded to the appropriate ports. If the frame’s VID does not match any of the VLANs that the port is a member of, the frame is discarded.

The parts of a tagged VLAN are much the same as those for a port-based VLAN. They are:

❐ VLAN Name

❐ VLAN Identifier

- ❐ Tagged and Untagged Ports
- ❐ Port VLAN Identifier

Note
For explanations of VLAN name and VLAN identifier, refer back to "VLAN Name" on page 550 and "VLAN Identifier" on page 550.

Tagged and Untagged Ports

You need to specify which ports will be members of the VLAN. In the case of a tagged VLAN, it is usually a combination of both untagged ports and tagged ports. You specify which ports are tagged and which untagged when you create the VLAN.

An untagged port, whether a member of a port-based VLAN or a tagged VLAN, can be in only one VLAN at a time. However, a tagged port can be a member of more than one VLAN. A port can also be an untagged member of one VLAN and a tagged member of different VLANs simultaneously.

Port VLAN Identifier

As explained earlier in the discussion on port-based VLANs, the AT-S63 management software automatically assigns a PVID to each port when a port is made a member of a VLAN. The PVID is always identical to the VLAN's VID, and that in a port-based VLAN packets are forwarded based on the PVID.

Because a tagged port determines VLAN membership by examining the tagged header within the frames that it receives, you could conclude that there is no need for a PVID. However, the PVID is used if a tagged port receives an untagged frame—a frame without any tagged information. The port forwards the frame based on the port's PVID. This is only in cases where an untagged frame arrives on a tagged port. Otherwise, the PVID of a port is ignored on a tagged port.

General Rules for Creating a Tagged VLAN

Below is a summary of the rules to observe when you create a tagged VLAN.

- Each tagged VLAN must be assigned a unique VID. If a particular VLAN spans multiple switches, each part of the VLAN on the different switches must be assigned the same VID.
- A tagged port can be a member of multiple VLANs.
- An untagged port can be an untagged member of only one VLAN at a time.
- An AT-9400 Series switch can support up to 4094 tagged VLANS.

Tagged VLAN Example

Figure 197 illustrates how tagged ports can be used to interconnect IEEE 802.1Q-based products.

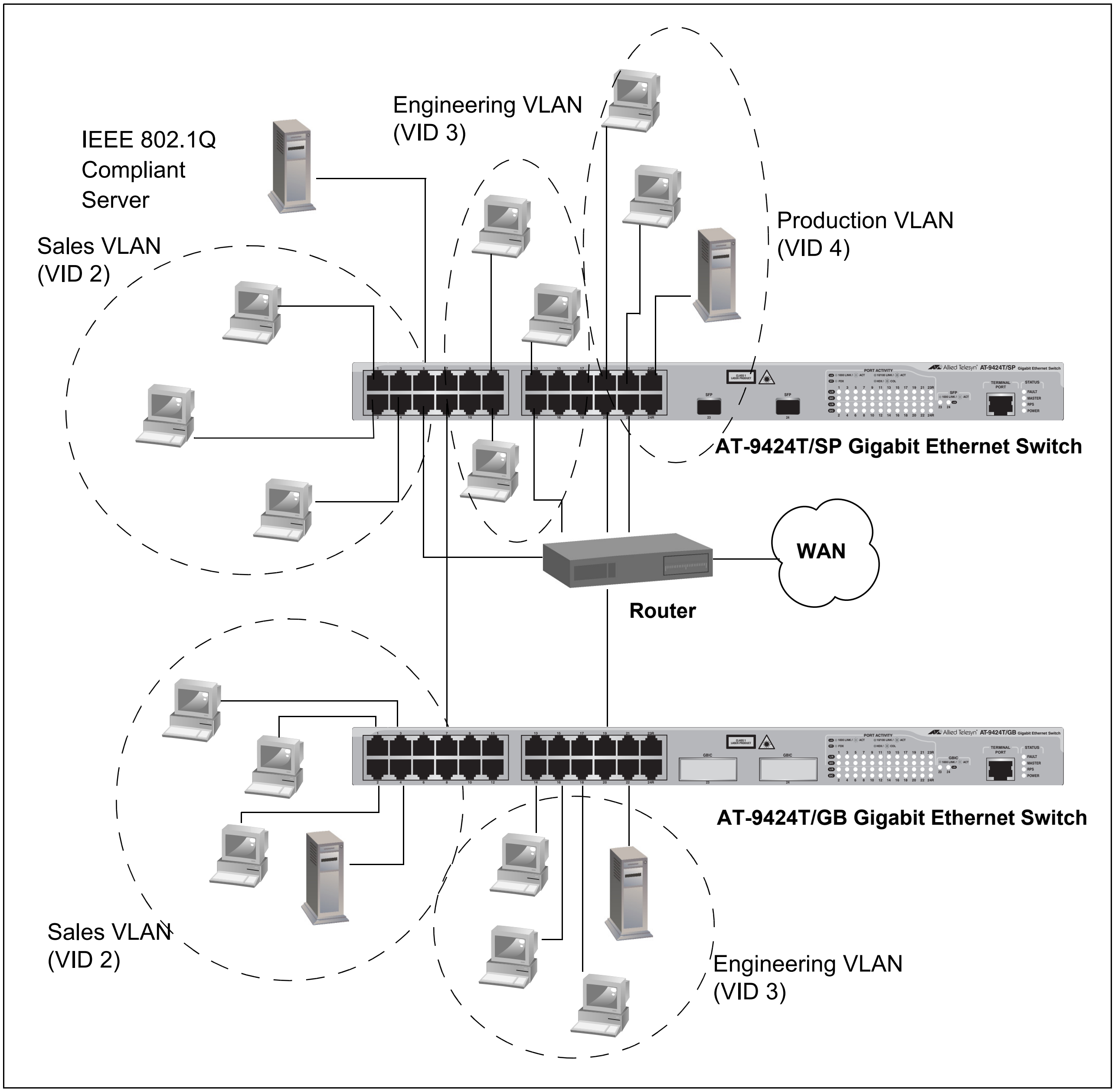


Figure 197. Example of a Tagged VLAN

The port assignments for the VLANs are as follows:

	Sales VLAN (VID 2)		**Engineering VLAN (VID 3)**		**Production VLAN (VID 4)**	
	Untagged Ports	Tagged Ports	Untagged Ports	Tagged Ports	Untagged Ports	Tagged Ports
AT-9424T/ SP Switch (top)	1-2, 4 (PVID 2)	5, 8	7-10 (PVID 3)	5, 6	19, 21-23(PVID 4)	5
AT-9424T/ GB Switch (bottom)	1-4 (PVID 2)	7	114, 16, 18, 22 (PVID 3)	7	none	none

This example is nearly identical to the “Port-based Example 2” on page 554. Tagged ports have been added to simplify network implementation and management.

One of the tagged ports is port 5 on the top switch. This port has been made a tagged member of the three VLANs. It is connected to an IEEE 802.1Q-compliant server, meaning the server can handle frames from multiple VLANs. Now all three VLANs can access the server without going through a router or other interconnection device.

It is important to note that even though the server is accepting frames from and transmitting frames to more than one VLAN, data separation and security remain.

Two other tagged ports are used to simplify network design in the example. They are ports 5 and 8 on the upper switch and port 7 on the lower switch. These ports have been made tagged members of the Sales and Engineering VLANs. They provide a connection between the different parts of these two VLANs.

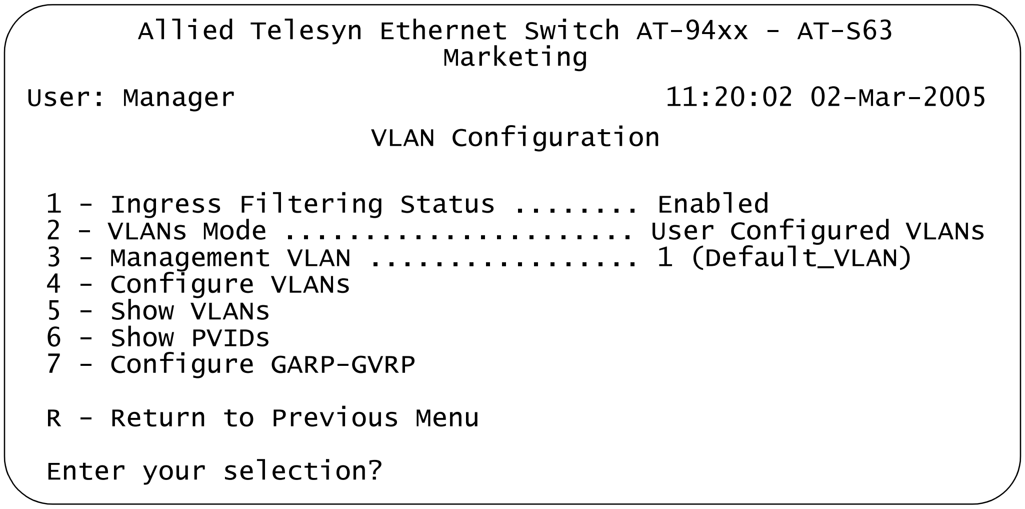
In the “Port-based Example 2” on page 554, each VLAN needed its own data link between the switches to connect the different parts of the VLANs. But with tagged ports, you can use one data link to carry data traffic from several VLANs, while still maintaining data separation and security. The tagged frames, when received by the switch, are delivered only to those ports that belong to the VLAN from which the tagged frame originated.

Creating a New Port-based or Tagged VLAN

To create a new port-based or tagged VLAN, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                     VLAN Configuration

 1 - Ingress Filtering Status ........ Enabled
 2 - VLANs Mode ...................... User Configured VLANs
 3 - Management VLAN ................. 1 (Default_VLAN)
 4 - Configure VLANs
 5 - Show VLANs
 6 - Show PVIDs
 7 - Configure GARP-GVRP

 R - Return to Previous Menu

 Enter your selection?
```

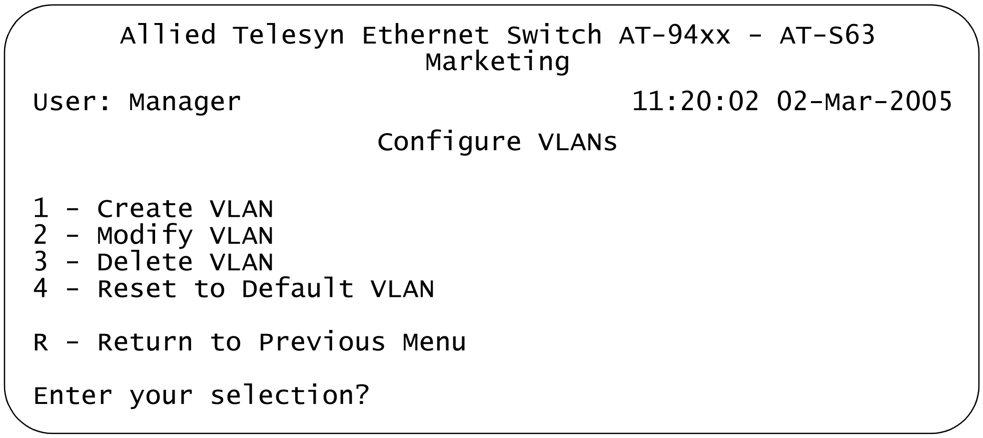
Figure 198. VLAN Configuration Menu

2. From the VLAN Configuration menu, type **4** to select Configure VLANs.

Note
If selection 4, Configure VLANs, is not displayed in the menu, the switch is running a multiple VLAN mode. To change a switch’s VLAN mode, refer to “Selecting a VLAN Mode” on page 616.

Selection 8, Configure GARP-GVRP, is described in Chapter 24, “GARP VLAN Registration Protocol” on page 583.

The Configure VLANs menu is shown in Figure 199.

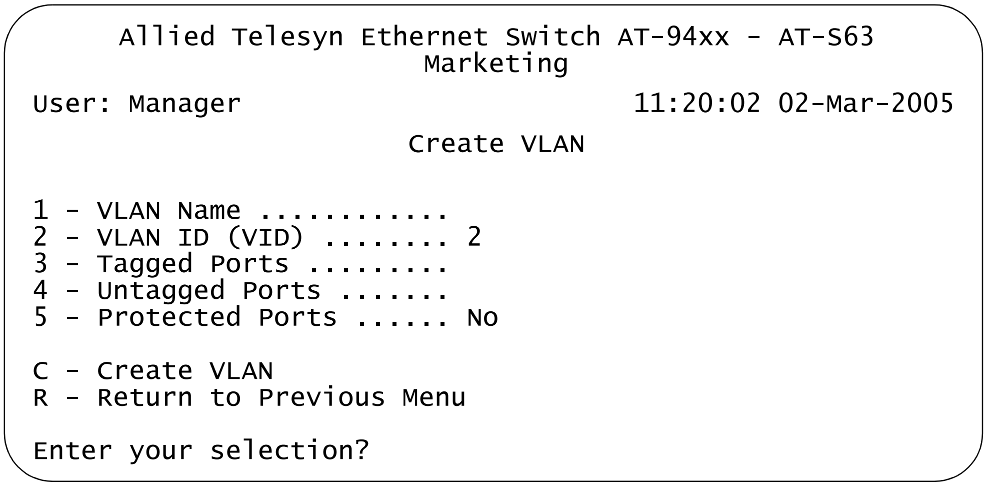


```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                        11:20:02 02-Mar-2005
                     Configure VLANs

1 - Create VLAN
2 - Modify VLAN
3 - Delete VLAN
4 - Reset to Default VLAN

R - Return to Previous Menu

Enter your selection?
```

Figure 199. Configure VLANs Menu

3. From the Configure VLANs menu, type **1** to select Create VLAN.

   The Create VLAN menu is shown in Figure 200.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                        11:20:02 02-Mar-2005
                       Create VLAN

1 - VLAN Name ............
2 - VLAN ID (VID) ........ 2
3 - Tagged Ports .........
4 - Untagged Ports .......
5 - Protected Ports ...... No

C - Create VLAN
R - Return to Previous Menu

Enter your selection?
```

Figure 200. Create VLAN Menu

Note

Option 5 - Protected Ports is described in Chapter 26, “Protected Ports VLANs” on page 619.

4. Type **1** to select VLAN Name.

   The following prompt is displayed:

   ```
   Enter new value ->
   ```

5. Type a name for the new VLAN.

The name can be from one to fifteen alphanumeric characters in length. The name should reflect the function of the nodes that will be a part of the VLAN (for example, Sales or Accounting). The name cannot contain spaces or special characters, such as asterisks (*) or exclamation points (!).

If the VLAN will be unique in your network, then the name should be unique as well. If the VLAN will be part of a larger VLAN that spans multiple switches, then the name for the VLAN should be the same on each switch where nodes of the VLAN are connected.

Note
A VLAN must be assigned a name.

6. Type **2** to select VLAN ID (VID.

   The following prompt is displayed:

   ```
   Enter new value -> [2 to 4094] ->
   ```

7. Type a VID value for the new VLAN. The range for the VID value is 1 to 4094.

   The AT-S63 management software uses the next available VID number on the switch as the default value. If this VLAN is unique in your network, then its VID should also be unique. If this VLAN is part of a larger VLAN that spans multiple switches, than the VID value for the VLAN should be the same on each switch. For example, if you are creating a VLAN called Sales that spans three switches, you should assign the Sales VLAN on each switch the same VID value.

   Note
   A VLAN must have a VID.

   It is important to note that the switch is only aware of the VIDs of the VLANs that exist on the device, and not those that might already be in use in the network. For example, if you add a new AT-9400 Series switch to a network that already contains VLANs that use VIDs 2 through 24, the AT-S63 management software still uses VID 2 as the default value when you create the first VLAN on the new switch, even though that VID number is already being used by another VLAN on the network. To prevent inadvertently using the same VID for two different VLANs, you should keep a list of all your network VLANs and their VID values.

8. If the VLAN will contain tagged ports, type **3** to select Tagged Ports and specify the ports. If this VLAN will not contain any tagged ports, leave this field empty.

You can specify the ports individually (e.g., 2,3,5), as a range (e.g., 7-9), or both (e.g., 2,5,7-9).

9. Type **4** to select Untagged Ports and specify the ports on the switch to function as untagged ports in the VLAN. If this VLAN will not contain any untagged ports, leave this field empty.

   You can specify the ports individually (e.g., 2,3,5), as a range (e.g., 7-9), or both (e.g., 2,5,7-9).

10. Type **C** to select Create VLAN.

    The following message is displayed:

    ```
    SUCCESS - Press any key to continue.
    ```

    The AT-S63 management software creates the new VLAN. The new VLAN is now ready for network use.

11. Press any key.

    The VLAN Configuration menu in Figure 198 on page 561 is redisplayed.

12. To verify that the VLAN was created correctly, type **6** to select Show VLANs.

13. Check to see that the VLAN contains the appropriate ports.

14. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

15. Repeat this procedure to create additional VLANs.

Note
When you create a new VLAN, ports designated as untagged ports of the new VLAN are automatically removed from their current untagged VLAN assignment. For example, if you are creating a new VLAN on a switch that contains only the Default_VLAN, the ports that you specify as untagged ports of the new VLAN are automatically removed from the Default_VLAN.

Tagged ports are not removed from any current VLAN assignments because tagged ports can belong to more than one VLAN at a time.

Example of Creating a Port-based VLAN

The following procedure creates the Sales VLAN illustrated in "Port-based Example 1" on page 552. This VLAN will be assigned a VID of 2 and will consist of four untagged ports, ports 1, 2, 4, and 6. The VLAN will not contain any tagged ports.

To create the Sales VLAN, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **4** to select Configure VLANs.

   The Configure VLANs menu is shown in Figure 199 on page 562.

3. From the Configure VLANs menu, type **1** to select Create VLAN.

   The Create VLAN menu is shown in Figure 200 on page 562.

4. From the Create VLAN menu, type **1** to select VLAN Name and enter "Sales".

5. Type **2** to select VLAN ID (VID) and enter "2". This is the VID value for the new VLAN.

6. Type **4** to select Untagged Ports and enter "1-2,4,6". These are the untagged ports of the VLAN. Press Return.

7. Type **C** to select Create VLAN.

8. After the switch displays the prompt notifying you that it created the VLAN, press any key.

   The new Sales VLAN has now been created.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Example of Creating a Tagged VLAN

The following procedure creates the Engineering VLAN in the top switch illustrated in “Tagged VLAN Example” on page 559. This VLAN will be assigned a VID of 3. It will consist of four untagged ports, ports 7 to 10, and two untagged ports, ports 5 and 6.

To create the example Engineering VLAN, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **4** to select Configure VLANs.

   The Configure VLANs menu is shown in Figure 199 on page 562.

3. From the Configure VLANs menu, type **1** to select Create VLAN.

   The Create VLAN menu is shown in Figure 200 on page 562.

4. From the Create VLAN menu, type **1** to select VLAN Name and enter “Engineering”.

5. Type **2** to select VLAN ID (VID) and enter “3”. This is the VID value for the new VLAN.

6. Type **3** to select Tagged Ports and enter “5,6”. These are the tagged ports of the VLAN on the switch.

7. Type **4** to select Untagged Ports and enter “7-10”. These are the untagged ports of the VLAN.

8. Type **C** to select Create VLAN.

9. After the switch displays the prompt notifying you that it created the VLAN, press any key.

   The new Engineering VLAN has now been created.

10. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a VLAN

Note
To modify a VLAN, you need to know its VID. To view VLAN VIDs, refer to "Displaying VLANs" on page 571.

To modify a VLAN, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

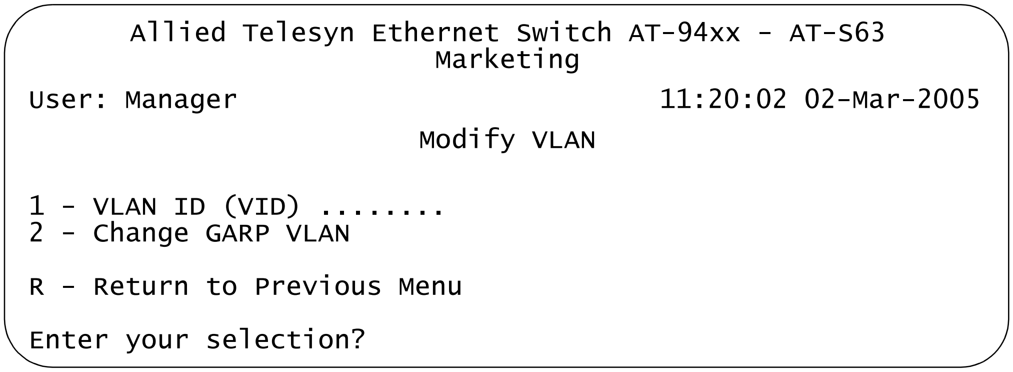
2. From the VLAN Configuration menu, type **4** to select Configure VLANs.

   The Configure VLANs menu is shown in Figure 199 on page 562.

Note
If selection 4, Configure VLANs, is not displayed in the menu, the switch is running a multiple VLAN mode. To change a switch's VLAN mode, refer to "Selecting a VLAN Mode" on page 616.

3. From the Configure VLANs menu, type **2** to select Modify VLAN.

   The Modify VLAN menu is shown in Figure 201.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                         Modify VLAN

1 - VLAN ID (VID) ........
2 - Change GARP VLAN

R - Return to Previous Menu

Enter your selection?
```

Figure 201. Modify VLAN Menu

Note
Selection 2, Change GARP VLAN, is described in Chapter 24, "GARP VLAN Registration Protocol" on page 583.

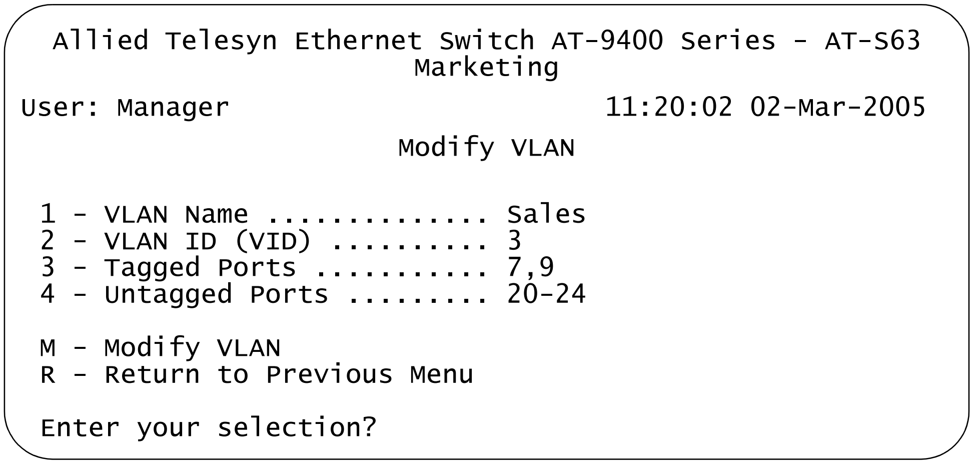
4. From the Modify VLAN menu, type **1** to select VLAN ID (VID).

   The following prompt is displayed:

```
Enter new value -> [1 to 4096] ->
```

5. Enter the VID of the VLAN you want to modify.

   The Modify VLAN menu expands to contain all relevant information about the VLAN, as shown in Figure 202.



```
  Allied Telesyn Ethernet Switch AT-9400 Series - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
                         Modify VLAN

 1 - VLAN Name .............. Sales
 2 - VLAN ID (VID) .......... 3
 3 - Tagged Ports ........... 7,9
 4 - Untagged Ports ......... 20-24

 M - Modify VLAN
 R - Return to Previous Menu

 Enter your selection?
```

Figure 202. Expanded Modify VLAN Menu

6. Adjust the following parameters as necessary.

   1 - VLAN Name
   This parameter changes the name of a VLAN. The name can be from one to fifteen alphanumeric characters in length. The name should reflect the function of the nodes that will be a part of the VLAN (for example, Sales or Accounting). The name cannot contain spaces or special characters, such as asterisks (*) or exclamation points (!).

   When you change a VLAN's name, observe the following guidelines:

   - A VLAN's new name cannot be the same as the name of another VLAN on the same switch. For example, if the switch already contains a VLAN called Sales, you cannot change an existing VLAN's name to Sales.
   - You cannot change the name of the Default_VLAN.

   Note
   A VLAN must have a name.

   2 - VLAN ID (VID)
   This is the VLAN's VID value. You cannot change this value.

   3 - Tagged Ports
   Use this selection to add or remove tagged ports from the VLAN. You can specify the ports individually (e.g., 2,3,5), as a range (e.g., 7-9), or both (e.g., 2,5,7-9).

When you add or remove tagged ports, observe the following guidelines:

- The new list of tagged ports will replace the existing tagged ports.
- If the VLAN contains tagged ports and you want to remove them all, enter 0 (zero) for this value.

4 - Untagged Ports
Use this selection to add or remove untagged ports from the VLAN. You can specify the ports individually (e.g., 2,3,5), as a range (e.g., 7-9), or both (e.g., 2,5,7-9).

When you add or remove untagged ports, observe the following guidelines:

- The new list of untagged ports will replace the existing untagged ports.
- If you want to remove all untagged ports from the VLAN, enter 0 (zero) for this value.
- You cannot change the name of the Default_VLAN, nor can you directly remove untagged ports from the Default_VLAN. Instead, you must assign the port as an untagged port to another VLAN.

An untagged port removed from a VLAN is automatically returned to the Default_VLAN as an untagged port.

7. After making the desired changes, type **M** to select Modify VLAN.

The following message is displayed:

```
SUCCESS
Please make sure to manually update any static
multicast MAC address(es) entries for this VLAN.
Press any key to continue...
```

The VLAN has been modified and is now ready for network operations.

Any untagged ports removed from a VLAN are automatically returned to the Default_VLAN as untagged ports.

If you added or removed from the VLAN a port with one or more static MAC addresses assigned to it, you must update the static addresses by deleting their entries from the MAC address table and reentering them again using the VID of the VLAN to which the port has been moved to. For information on how to add static MAC addresses, refer to "Adding Static Unicast and Multicast MAC Addresses" on page 678. For instructions on how to delete addresses, refer to "Deleting Unicast and Multicast MAC Addresses" on page 680.

8. Press any key.

The Modify VLAN menu in Figure 201 on page 567 is displayed again.

9. Repeat this procedure starting with Step 4 to modify other VLANs, or return to the Main Menu and type **S** to select Save Configuration Changes.

Displaying VLANs

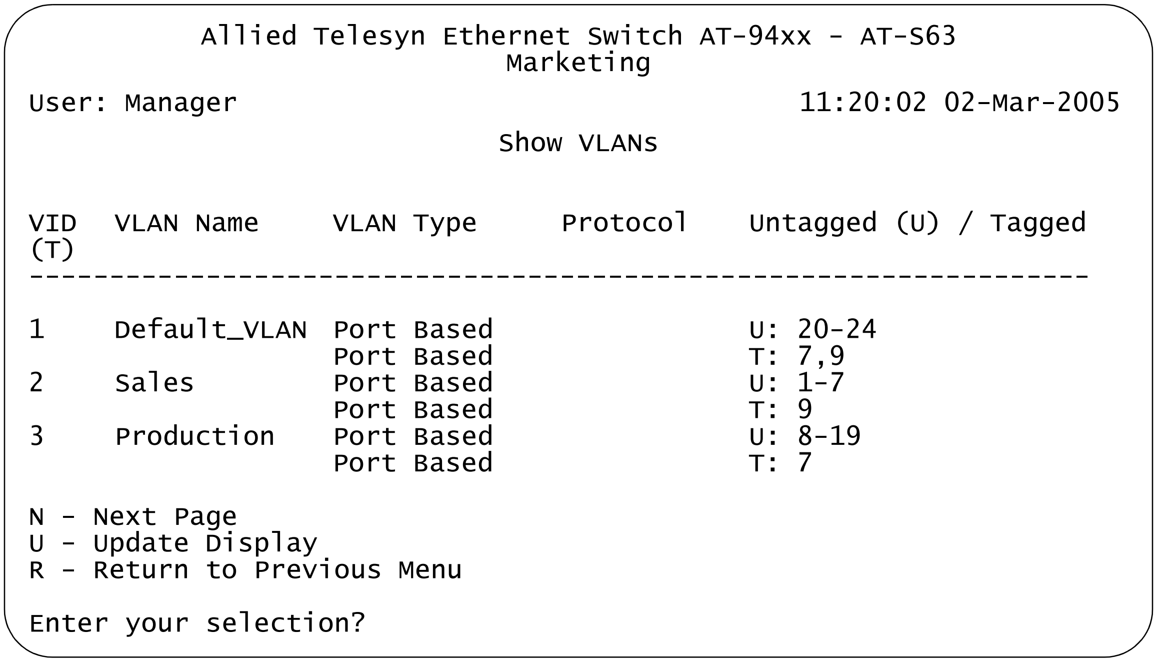
To view the name, VID number, and member ports of all the VLANs on a switch, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **5**to select Show VLANs.

   The Show VLANs menu is shown in Figure 203.



```
           Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing
User: Manager                                  11:20:02 02-Mar-2005
                              Show VLANs


VID  VLAN Name     VLAN Type     Protocol    Untagged (U) / Tagged
(T)
------------------------------------------------------------------

1    Default_VLAN  Port Based                U: 20-24
                   Port Based                T: 7,9
2    Sales         Port Based                U: 1-7
                   Port Based                T: 9
3    Production    Port Based                U: 8-19
                   Port Based                T: 7

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 203. Show VLANs Menu

The Show VLANs menu displays a table that contains the following columns of information:

VID
The VLAN ID.

VLAN Name
Name of the VLAN.

VLAN Type
The VLAN type. The possible settings are:

Port Based - The VLAN is a port-based or tagged VLAN.

GARP - The VLAN was automatically created by GARP.

Protocol
The protocol associated with this VLAN. The possible settings are:

Blank - The VLAN is a port-based or tagged VLAN.

GARP - The VLAN is a dynamic GVRP VLAN or the port is a dynamic GVRP port of a static VLAN.

Untagged (U) / Tagged (T)
The untagged and tagged ports that are part of the VLAN.

Deleting a VLAN

Note
To delete a VLAN, you need to know its VID. To view VLAN VIDs, refer to "Displaying VLANs" on page 571.

To delete a VLAN, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

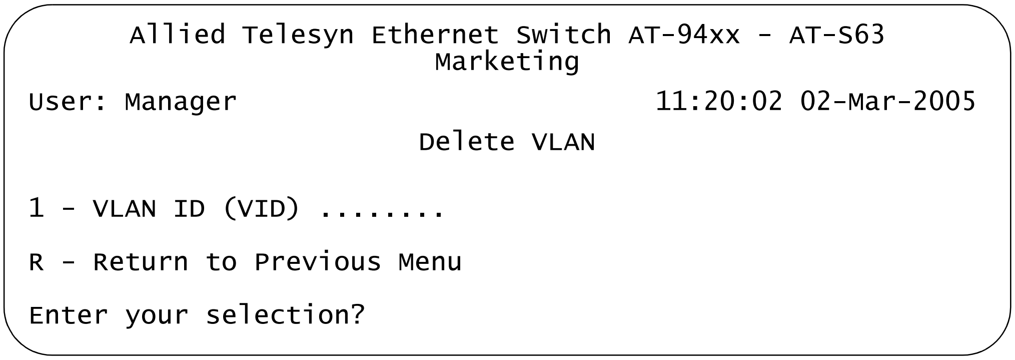
2. From the VLAN Configuration menu, type **4** to select Configure VLANs.

   The Configure VLANs menu is shown in Figure 199 on page 562.

Note
If option 4, Configure VLANs, is not displayed in the menu if the switch is running a multiple VLAN mode. To change a switch's VLAN mode, refer to "Selecting a VLAN Mode" on page 616.

3. From the Configure VLANs menu, type **3** to select Delete VLAN.

   The Delete VLAN menu is shown in Figure 204.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                          11:20:02 02-Mar-2005
                        Delete VLAN

1 - VLAN ID (VID) ........

R - Return to Previous Menu

Enter your selection?
```

Figure 204. Delete VLAN Menu

4. From the Delete VLAN menu, type **1** to select VLAN ID (VID).

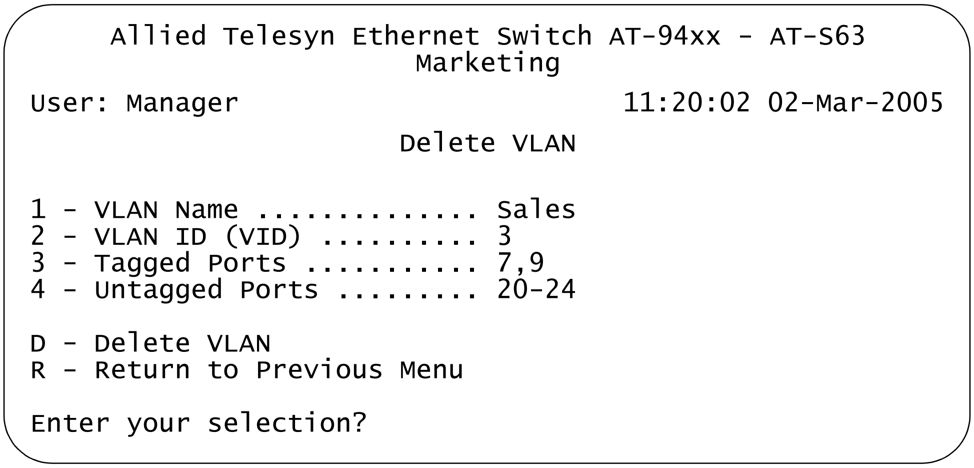
   The following prompt is displayed:

   ```
   Enter new value -> [2 to 4094] ->
   ```

5. Enter the VID of the VLAN you want to delete. You can specify only one VID at a time.

Note
You cannot delete the Default_VLAN, which has a VID of 1.

The Delete VLAN menu expands to contain all relevant information about the VLAN, as shown in Figure 205.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
                       Delete VLAN

1 - VLAN Name .............. Sales
2 - VLAN ID (VID) .......... 3
3 - Tagged Ports ........... 7,9
4 - Untagged Ports ......... 20-24

D - Delete VLAN
R - Return to Previous Menu

Enter your selection?
```

Figure 205. Expanded Delete VLAN Menu

6. Type **D** to delete the VLAN or **R** to cancel the procedure.

   If you select to delete the VLAN, the following confirmation prompt is displayed:

   ```
   Are you sure you want to delete this VLAN [Yes/No] ->
   ```

7. Type **Y** to delete the VLAN or **N** to cancel the procedure. Press Return.

   If you select Yes, the VLAN is deleted and the following message is displayed:

   ```
   SUCCESS
   Please make sure to manually delete any static multicast
   MAC address(es) entries for this VLAN
   Press any key to continue ...
   ```

   All untagged ports in the deleted VLAN are returned to the Default_VLAN as untagged ports.

   Any static addresses assigned to the ports of the VLAN are now obsolete, because the VLAN has been deleted. Those addresses should be deleted from the MAC address table. For instructions on how to delete addresses, refer to “Deleting Unicast and Multicast MAC Addresses” on page 680.

8. Press any key.

9. Repeat this procedure starting with Step 4 to delete other VLANs.

10. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Resetting to the Default VLAN

The following procedure for deletes all VLANs, except the Default_VLAN, on a switch. To delete selected VLANs, perform the procedure in “Deleting a VLAN” on page 573.

To return all ports to the default VLAN, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **4** to select Configure VLANs.

   The Configure VLANs menu is shown in Figure 199 on page 562.

   Note
   If selection 4, Configure VLANs, is not displayed in the menu, the switch is running in a multiple VLAN mode. To change a switch’s VLAN mode, refer to “Selecting a VLAN Mode” on page 616.

3. From the Configure VLANs menu, type **4** to select Reset to Default VLAN.

   The following prompt is displayed:

   ```
   This operation deletes ALL user created VLANs!
   Do you want to continue [Yes/No] ->
   ```

4. Type **Y** to delete all VLANs or **N** to cancel the procedure. Press Return.

   If you select Yes, all VLANs are deleted and the following message is displayed:

   ```
   SUCCESS
   Please make sure to manually update any static
   multicast MAC address(es) entries.
   Press any key to continue...
   ```

   All tagged and untagged ports are returned to the Default_VLAN as untagged ports.

   Any static addresses assigned to the ports of the VLANs are now obsolete, except for the Default_VLAN, because the VLANs have been deleted. Those addresses should be deleted from the MAC address table. For instructions on how to delete addresses, refer to “Deleting All Dynamic MAC Addresses” on page 681.

5. Press any key.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying PVIDs

The following procedure displays a menu that lists the PVIDs for all the ports on the switch.

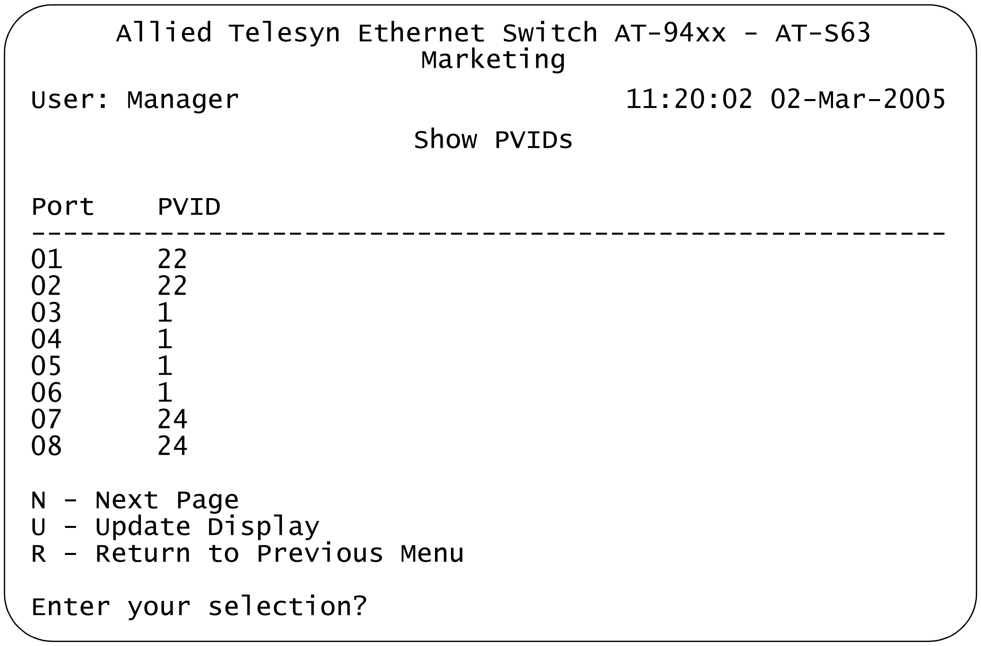
To display the PVID settings on the switch, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **6** to select Show PVIDs.

   The Show PVIDs menu is shown in Figure 206.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                        11:20:02 02-Mar-2005
                       Show PVIDs

Port    PVID
----------------------------------------------------------
01      22
02      22
03      1
04      1
05      1
06      1
07      24
08      24

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 206. Show PVIDs Menu

The PVID column displays the current PVID value for each switch port.

Enabling or Disabling Ingress Filtering

There are rules a switch follows when it receives and forwards an Ethernet frame. There are rules for frames as they enter a port (called *ingress rules*) and rules for when a frame is transmitted out a port (called *egress rules*). A switch does not accept and forward a frame unless the frame passes the ingress and egress rules.

There are many ingress and egress rules for Gigabit Ethernet switches. T this discussion reviews only the rules as they apply to tagged frames, because ingress filtering does not apply to untagged frames.

First, as a reminder, a tagged frame is an Ethernet frame that contains a tagged header. The header contains the VID of the VLAN to which the frame originated. For further information, refer to “Tagged VLAN Overview” on page 556.

The ingress rules are applied to tagged frames when ingress filtering is activated. The switch examines the tagged header of each tagged frame that enters a port and determines whether the tagged frame and the port that received the frame are members of the same VLAN. If they belong to the same VLAN, the port accepts the frame. If they belong to different VLANs, the port discards the frame.

As an example, assume that a tagged frame with a VID of 4 is received on a port that is a member of a VLAN also with a VID of 4. In this case, the port accepts the frame, because both the frame and the port belong to the same VLAN. If the frame and port belong to different VLANs, the frame is discarded.

How do the egress rules apply when ingress filtering is disabled? First, any tagged frame is accepted on any port on the switch. It does not matter whether the frame and the port belong to the same or different VLANs.

After the tagged frame is received, the switch examines the tagged header and determines if the VID in the header corresponds to any VLANs on the switch. If there is no corresponding VLAN, the switch discards the frame. If there is, the switch transmits the frame out the port to the destination node, assuming that the destination node’s MAC address is in the MAC address table, or floods the port to all ports on the VLAN if the MAC address is not in the table.

In addition, each tagged frame contains a priority tag that informs the switch about the importance of the frame. Frames with a high priority are handled ahead of frames with a low priority.

Activating or deactivating ingress filtering has no effect on the switch’s handling of priority tags. A switch will always examines a priority tag in a tagged frame, without regard to the status of ingress filtering.

In most cases, you will probably want to leave ingress filtering activated on the switch, which is the default. You can enable or disable ingress filtering on a per switch basis. You cannot set this per port.

To enable or disable ingress filtering, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **1** to select Ingress Filtering Status.

   The following prompt is displayed:

   ```
   Enter Ingress Filtering Status (E-Enable, D-Disable) ->
   ```

3. Type **E** to activate ingress filtering or **D** to disable the feature on the switch.

   A change to the status of ingress filtering is immediately activated on the switch.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Specifying a Management VLAN

The management VLAN is the VLAN on which an AT-9400 Series switch expects to receive management packets. This VLAN is important if you will be managing a switch remotely or using the enhanced stacking feature of the switch.

Management packets are packets generated by a management station when you manage a switch using the Telnet application protocol or a web browser. The switch acts upon the management packets only if they are received on the management VLAN.

The default management VLAN on an AT-9400 Series switch is the Default_VLAN. If you do not create any additional VLANs and link the switches together using untagged ports, then there is no need to specify a new management VLAN in order to remotely manage the devices.

However, if you create additional VLANs on your switches, it may be necessary for you to create a management communications path and then specify that path as the new management VLAN.

Below are several rules to observe when using this feature:

❐ The management VLAN must exist on each AT-9400 Series switch that you want to manage.

❐ Using the following procedure, you must specify the management VLAN in the AT-S63 management software on each slave and master switch of an enhanced stack.

❐ The uplink and downlink ports on each switch that are functioning as the tagged or untagged data links between the switches must be either tagged or untagged members of the management VLAN.

❐ The port on the switch to which the management station is connected must be a member of the management VLAN. (This rule does not apply when managing the switch locally through the RJ-45 terminal port.)

As an example, assume that you have an enhanced stack of seven AT-9400 Series switches with one master switch. If the uplink and downlink ports between the various switches are members of the Default_VLAN and if the management station is connected to a port of the Default_VLAN, you can manage all the switches because the Default_VLAN is the default management VLAN.

Now assume that you decide to create a VLAN called NMS with a VID of 24 for the sole purpose of remote network management. For this, you need to create the NMS VLAN on each AT-9400 Series switch that you want to manage remotely, being sure to assign each NMS VLAN the VID of 24. Then you need to be sure that the uplink and downlink ports connecting the switches together are either tagged or untagged members of the NMS VLAN. You also need to specify the NMS VLAN as the management VLAN on each switch using the AT-S63 management software. Finally, you must be sure to connect your management station to a port on a switch that is a tagged or untagged member of the management VLAN.

Note
You cannot specify a management VLAN when the switch is operating in a multiple VLAN mode.

To specify a management VLAN, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **3** to select Management VLAN.

   The following prompt is displayed:

   ```
   Enter Management VLAN ID [1 to 4094] ->
   ```

3. Specify the VID of the VLAN that is to function as the management VLAN. This VLAN must already exist on the switch.

   The following prompt is displayed:

   ```
   SUCCESS
   Press any key to continue ...
   ```

4. Press any key.

5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Chapter 24
GARP VLAN Registration Protocol

This chapter describes the GARP VLAN Registration Protocol (GVRP) and contains the following sections:

GARP VLAN Registration Protocol (GVRP) Overview

The GARP VLAN Registration Protocol (GVRP) allows network devices to share VLAN information. The main purpose of GVRP is to allow switches to automatically discover some of the VLAN information that would otherwise need to be manually configured in each switch. This is helpful in networks where VLANs span more than one switch. Without GVRP, you must manually configure your switches to ensure that the various parts of a VLAN can communicate across the different switches. GVRP, which is an application of the Generic Attribute Registration Protocol (GARP), does this for you automatically.

The AT-S63 management software uses GVRP protocol data units (PDUs) to share VLAN information among GVRP-active devices. The PDUs contain the VID numbers of the VLANs on the switch. A PDU contains the VIDs of all the VLANs on the switch, not just the VID of which the transmitting port is a member.

When a switch receives a GVRP PDU on a port, it examines the PDU to determine the VIDs of the VLANs on the device that sent it. It then does the following:

❒ If the VLAN does not exist on the switch, it creates the VLAN and adds the port as a tagged member to the VLAN. A VLAN created by GVRP is called a *dynamic GVRP VLAN*.

❒ If the VLAN already exists on the switch but the port is not a member of it, the switch adds the port as a tagged member. A port that has been added by GVRP to a static VLAN (that is a user-created VLAN) is called a *dynamic GVRP port*.

You cannot modify a dynamic GVRP VLAN. After it is created, only GVRP can modify or delete it. A dynamic GVRP VLAN exists only so long as there are active nodes in the network that belong to the VLAN. If all nodes of a dynamic GVRP VLAN are shut down and there are no active links, the VLAN is deleted from the switch.

A dynamic GVRP port in a static VLAN remains a member of the VLAN as long as there are active VLAN members. If all members of the VLAN become inactive or there are no active links, GVRP removes the dynamic port from the VLAN, but does not delete the VLAN if the VLAN is a static VLAN.

Figure 207 provides an example of how GVRP works.

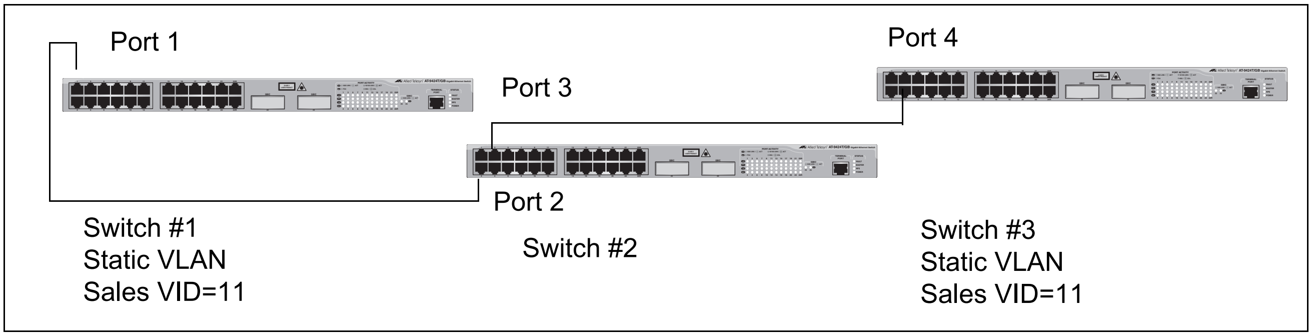


Figure 207. GVRP Example

Switches #1 and #3 contain the Sales VLAN, but switch #2 does not. Consequently, the end nodes of the two parts of the Sales VLANs are unable to communicate with each other.

Without GVRP, you would need to configure switch #2 by creating the Sales VLAN on the switch and adding ports 2 and 3 as members of the VLAN. If you happen to have a large network with a large number of VLANs, such manual configurations can be cumbersome and time consuming.

GVRP can make the configurations for you. Here is how GVRP would resolve the problem in the example.

1. Port 1 on switch #1 sends a PDU to port 2 on switch #2, containing the VIDs of all the VLANs on the switch. One of the VIDs in the PDU would be that of the Sales VLAN, VID 11.

2. Switch #2 examines the PDU it receives on port 2 and notes that it does not have a VLAN with a VID 11. So it creates the VLAN as a dynamic GVRP VLAN and assigns it a VID 11 and the name GVRP_VLAN_11. (The name of a dynamic GVRP VLAN has the prefix "GVRP_VLAN_", followed by the VID number.) The switch then adds port 2, the port that received the PDU, as a tagged member of the VLAN.

3. Switch #2 sends a PDU out port 3 containing all of the VIDs of the VLANs on the switch, including the new GVRP_VLAN_11 with its VID of 11. (Note that port 3 is not yet a member of the VLAN. Ports are added to VLANs when they receive, not send a PDU.)

4. Switch #3 receives the PDU on port 4 and, after examining it, notes that one of the VLANs on switch #2 has the VID 11, which matches the VID of an already existing VLAN on the switch. So it does not create the VLAN because it already exists. It then determines whether the

port that received the PDU, in this case port 4, is a member of the VLAN. If it is not a member, it automatically adds the port to the VLAN as an tagged dynamic GVRP port. If the port is already a member of the VLAN, then no change is made.

5. Switch #3 sends a PDU out port 4 to switch #2.

6. Switch #2 receives the PDU on port 3 and then adds the port as a tagged dynamic GVRP port to the dynamic GVRP_VLAN_11 VLAN.

There is now a communications path for the end nodes of the Sales VLAN on switches #1 and #3. GVRP created the new GVRP_VLAN_11 dynamic GVRP VLAN with a VID of 11 on switch #2 and added ports 2 and 3 to the VLAN as tagged dynamic GVRP ports.

Guidelines

Following are guidelines to observe when using this feature:

- GVRP is supported with STP and RSTP, or without spanning tree. However, GVRP is not supported with MSTP.
- GVRP is supported when the switch is operating in the tagged VLAN mode, which is the VLAN mode for creating your own tagged and port-based VLANs.
- GVRP is not supported when the switch is operating in either of the multiple VLAN modes.
- Both ports that constitute a data link between the switch and the other device must be running GVRP.
- You cannot modify or delete a dynamic GVRP VLAN.
- You cannot remove a dynamic GVRP port from a static or dynamic VLAN.
- GVRP is only aware of those VLANs that have active nodes, or where at least one end node of a VLAN has established a valid link with a switch. GVRP is not aware of a VLAN if there are no active end nodes or if no end nodes have established a link with the switch.
- Resetting a switch erases all dynamic GVRP VLANs and dynamic GVRP port assignments. The switch relearns the dynamic assignments as it receives PDUs from the other switches.
- GVRP has three timers that you can set: join timer, leave timer, and leave all timer. The values for these timers must be set the same on all switches running GVRP. Timers with different values on different switches can result in GVRP compatibility problems.
- You can convert dynamic GVRP VLANs and dynamic GVRP port assignments to static VLANs and static port assignments. The procedure for this is found in “Modifying a VLAN” on page 567.
- The default port settings on the switch for GVRP is active, meaning that the ports participate in GVRP. Allied Telesyn recommends

disabling GVRP on those ports that are connected to GVRP-inactive devices, meaning that they do not feature GVRP.

- PDUs are transmitted to only those switch ports where GVRP is enabled.

GVRP and Network Security

Use GVRP with caution because it can expose your network to unauthorized access. A network intruder can access restricted parts of the network by connecting to a switch port running GVRP and transmitting a bogus GVRP PDU containing VIDs of restricted VLANs. GVRP would make the switch port a member of the VLANs and that could give the intruder access to restricted areas of your network.

To protect against this type of network intrusion, consider the following:

- Activating GVRP only on those switch ports that are connected to other devices that support GVRP. Do not activate GVRP on ports that are connected to GVRP-inactive devices.
- Converting all dynamic GVRP VLANs and dynamic GVRP ports to static assignments, and then turning off GVRP on all switches. This preserves the new VLAN assignments while protecting against network intrusion.

GVRP-inactive Intermediate Switches

If two GVRP-active devices are separated by a GVRP-inactive switch, the GVRP-active devices may not be able to share VLAN information. There are two issues involved.

The first is whether the intermediate switch forwards the GVRP PDUs that it receives from the GVRP-active switches. GVRP PDUs are management frames, intended for a switch's CPU. In all likelihood, a GVRP-inactive switch discards the PDUs because it does not recognize them.

The second issue is that even if the GVRP-inactive switch forwards GVRP PDUs, it does not create the VLANs, at least not automatically. Consequently, even if the GVRP-active switches receive the PDUs and create the necessary VLANs, the intermediate switch may block the VLAN traffic, unless you modify its VLANs and port assignments manually.

Generic Attribute Registration Protocol (GARP) Overview

The following is a technical overview of GARP. An understanding of GARP may prove helpful when you use GVRP.

The purpose of the *Generic Attribute Registration Protocol* (GARP) is to provide a generic framework whereby devices in a bridged LAN, for example end stations and switches, can register and deregister *attribute* values, such as VLAN Identifiers, with each other. In doing so, the attributes are propagated to devices in the bridged LAN, and these devices form a "reachability" tree that is a subset of an active topology. For a bridged LAN, the active topology is normally that created and maintained by the Spanning Tree Protocol (STP).

To use GARP, a GARP application must be defined. The Layer 2 switch has one GARP application presently implemented, GVRP.

The GARP application specifies what the attribute represents.

GARP defines the architecture, rules of operation, state machines and variables for the registration and deregistration of attribute values. By itself, GARP is not directly used by devices in a bridged LAN. It is the applications of GARP that perform meaningful actions. The use of GVRP allows dynamic filter entries for VLAN membership to be distributed among the forwarding databases of VLAN-active switches.

A GARP participant in a switch or an end station consists of a GARP application component, and a *GARP Information Declaration* (GID) component associated with each port of the switch. One such GARP participant exists per port, per GARP application. The *GARP Information Propagation* (GIP) component propagates information between GARP participants for the same application in a switch. Protocol exchanges take place between GARP participants by means of LLC Type 1 services, using the group MAC address and PDU format defined for the GARP application concerned.

Every instance of a GARP application includes a database to store the values of the attributes. Within GARP, attributes are mapped to GID indexes.

GARP architecture is shown in Figure 208.

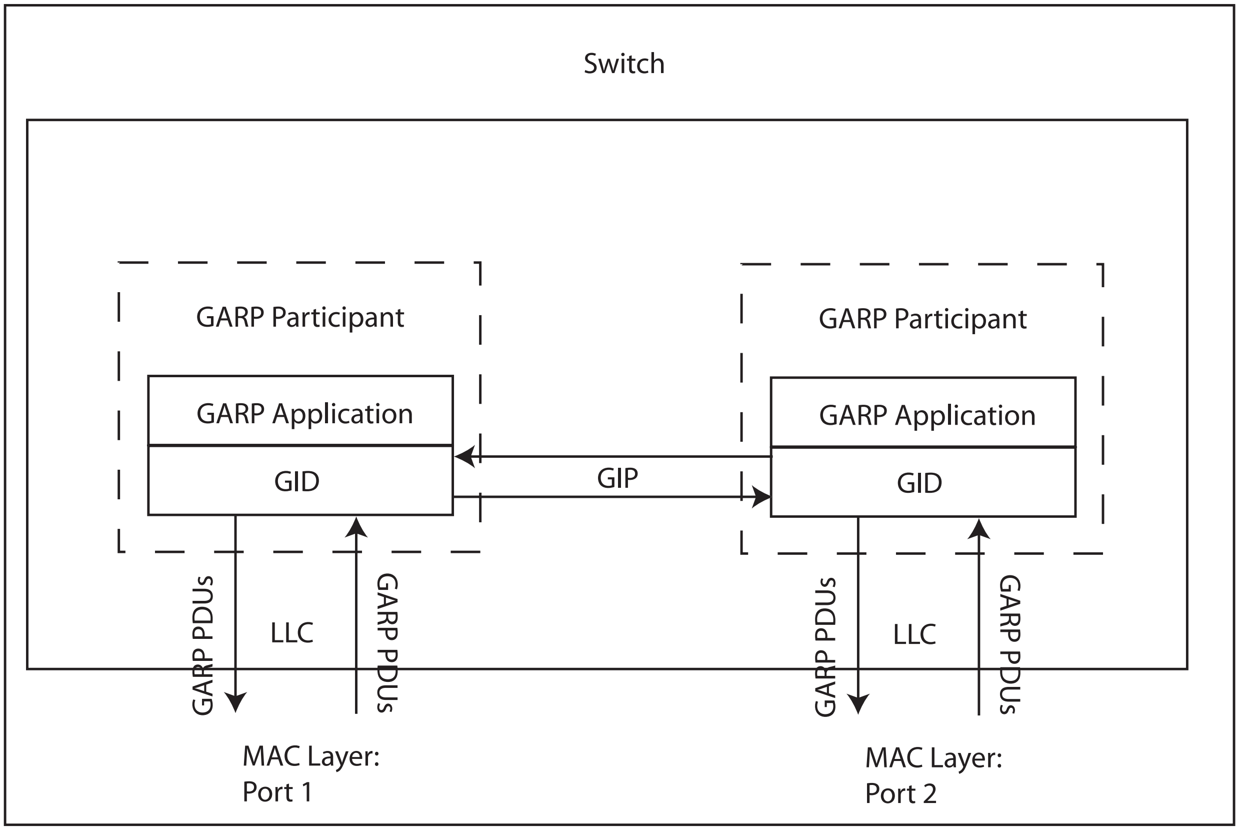


Figure 208. GARP Architecture

The GARP application component of the GARP participant is responsible for defining the semantics associated with the parameter values and operators received in GARP PDUs, and for generating GARP PDUs for transmission. The application uses the GID component, and the state machines associated with the operation of GID, in order to control its protocol interactions.

An instance of GID consists of the set of state machines that define the current registration and declaration state of all *attribute* values associated with the GARP participant. Separate state machines exist for the applicant and registrar. This is shown in Figure 209.

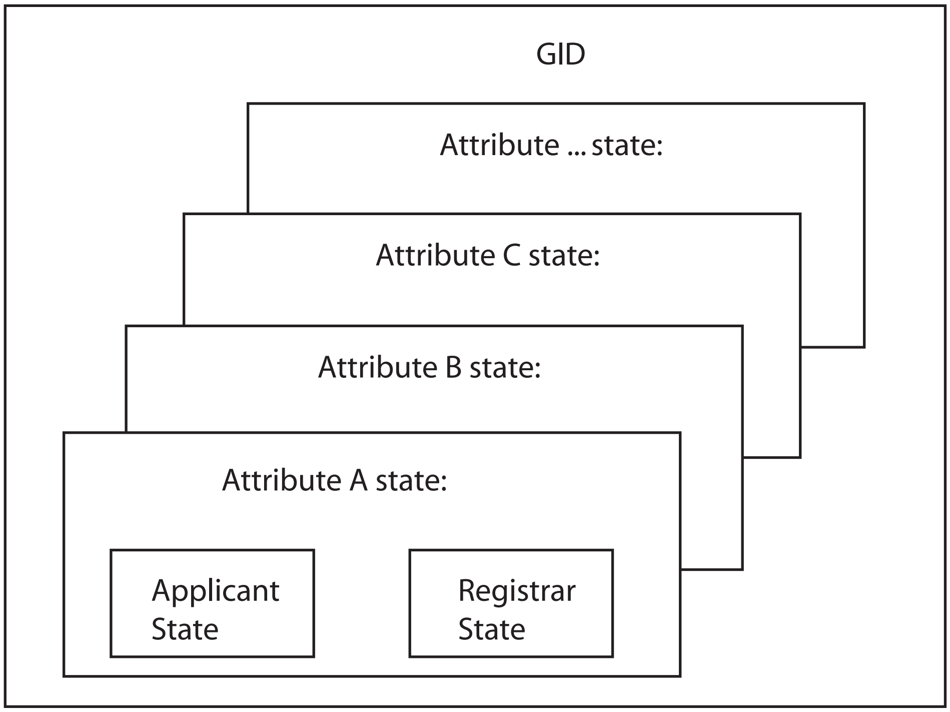


Figure 209. GID Architecture

GARP registers and deregisters *attribute* values through GARP messages sent at the GID level. A GARP participant that wishes to make a declaration (an applicant registering an *attribute* value) sends a JoinIn or JoinEmpty message. An applicant that wishes to withdraw a declaration (deregistering an *attribute* value) sends a LeaveEmpty or LeaveIn message. Following the de-registration of an *attribute* value, the applicant sends a number of Empty messages. The purpose of the Empty message is to prompt other applicants to send JoinIn/JoinEmpty messages. For the GARP protocol to be resilient against multiple lost messages, a LeaveAll message is available. Timers are used in the state machines to generate events and control state transitions.

The job of the applicant is twofold:

- ❐ To ensure that this participant's declarations are registered by other participants' registrars
- ❐ To ensure that other participants have a chance to redeclare (rejoin) after anyone withdraws a declaration (leaves).

The applicant is therefore looking after the interests of all would-be participants. This allows the registrar to be very simple.

The job of the registrar is to record whether an attribute is registered, in the process of being deregistered, or is not registered for an instance of GID.

To control the applicant state machine, an applicant administrative control parameter is provided. This parameter determines whether or not the applicant state machine participates in GARP protocol exchanges. The default value has the applicant participating in the exchanges.

To control the registrar state machine, a registrar administrative control parameter is provided. This parameter determines whether or not the registrar state machine listens to incoming GARP messages. The default value has the registrar listening to incoming GARP messages.

The propagation of information between GARP participants for the same application in a switch is carried out by the GIP component. The operation of GIP is dependent upon STP being enabled on a port, because only ports in the STP Forwarding state are eligible for membership to the GIP connected ring. Ports in the GIP connected ring propagate GID Join and Leave requests to notify each other of attribute registrations and deregistrations. The operation of GIP allows ports in the switch to share information between themselves and the LANs/end stations to which the ports are connected.

If a port enters the STP Forwarding state and the GARP application that the port belongs to is enabled, then the port is added to the GIP connected ring for the GARP application. All attributes registered by other ports in the GIP connected ring is propagated to the recently connected port. All attributes registered by the recently connected port is propagated to all other ports in the GIP connected ring.

Similarly, if a port leaves the STP Forwarding state and the GARP application that the port belongs to is enabled, then the port is removed from the GIP connected ring for the GARP application. Prior to removal, GID leave requests are propagated to all other ports in the GIP connected ring if the port to be removed has previously registered an attribute and no other port in the GIP connected ring has registered that attribute. You can enable or disable GIP operations.

Configuring GVRP

To configure GVRP, perform the following procedure:

Note
The timers in the following menus are in increments of centi seconds which is one hundredth of a second.

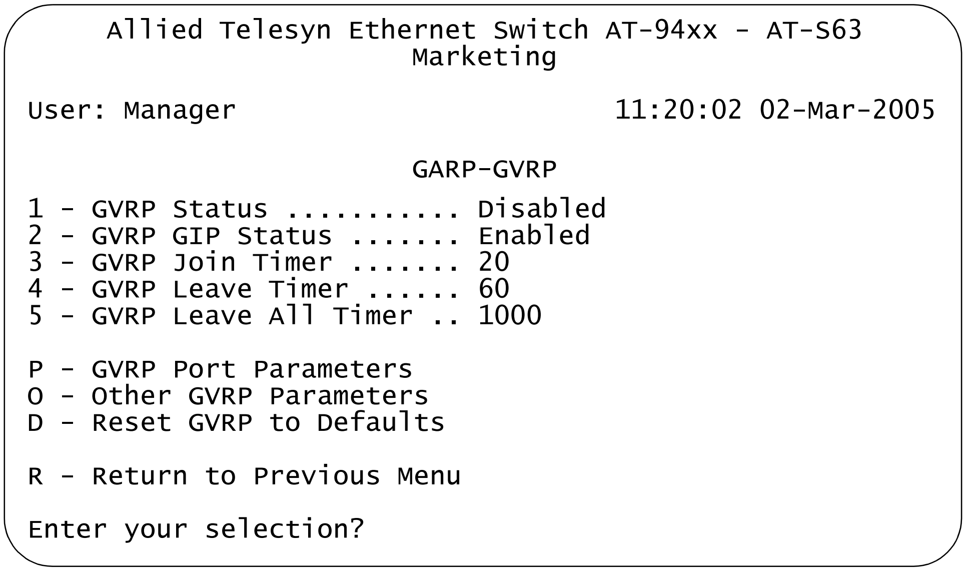
To configure GVRP, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **7** to select Configure GARP-GVRP.

   The GARP-GVRP menu is shown in Figure 210.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing

User: Manager                        11:20:02 02-Mar-2005

                          GARP-GVRP

1 - GVRP Status ........... Disabled
2 - GVRP GIP Status ....... Enabled
3 - GVRP Join Timer ....... 20
4 - GVRP Leave Timer ...... 60
5 - GVRP Leave All Timer .. 1000

P - GVRP Port Parameters
O - Other GVRP Parameters
D - Reset GVRP to Defaults

R - Return to Previous Menu

Enter your selection?
```

Figure 210. GARP-GVRP Menu

Note
Selection 8, Configure GARP-GVRP, is not shown in the VLAN Configuration menu when the VLAN mode is multiple VLANs.

3. From the GARP-GVRP menu, type **1** to select GVRP Status.

   The following prompt is displayed:

   ```
   Enter your new value (E-Enabled, D-Disabled):
   ```

4. Type **E** to enable GVRP or **D** to disable GVRP. The default setting is disabled.

5. Type **2** to select GVRP GIP Status.

   The following prompt is displayed:

   ```
   Enter your new value (E-Enabled, D-Disabled):
   ```

6. Type **E** to enable GIP or **D** to disable GIP.

   Note
   Do not disable GIP if you intend to use GVRP. GIP is required to propagate VLAN information among the ports of the switch.

   Caution
   The following steps change the three GVRP timers. Please note that the settings for these timers must be the same on all GVRP-active network devices.

7. Type **3** to select GVRP Join Timer.

   The following prompt is displayed:

   ```
   Enter new value (in centi seconds): [10 to 60] -> 20
   ```

8. Enter a new value for the Join Timer field in centi seconds which are one hundredths of a second. The default is 20 centiseconds.

   If you change this field, it must be in relation to the GVRP Leave Timer according to the following equation:

   Join Timer <= (2 x (GVRP Leave Timer))

9. Type **4** to select GVRP Leave Timer .

   The following prompt is displayed:

   ```
   Enter new value (in centi seconds): [30 to 180] -> 60
   ```

10. Type **5** to select GVRP Leave All Timer. The default is 60 centiseconds.

    The following prompt is displayed:

    ```
    Enter new value (in centi seconds): [500 to 3000] -> 1000
    ```

11. Enter a value in centiseconds. The default is 1000 centiseconds.

12. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Enabling or Disabling GVRP on a Port

This procedure enables and disables GVRP on a switch port. The default setting for GVRP on a port is enabled. Only those ports where GVRP is enabled transmit PDUs.

Note
Allied Telesyn recommends disabling GVRP on unused ports and those ports that are connected to GVRP-inactive devices. This protects against unauthorized access to restricted areas of your network. For further information, refer to “GVRP and Network Security” on page 587.

To enable or disable GVRP on a port, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

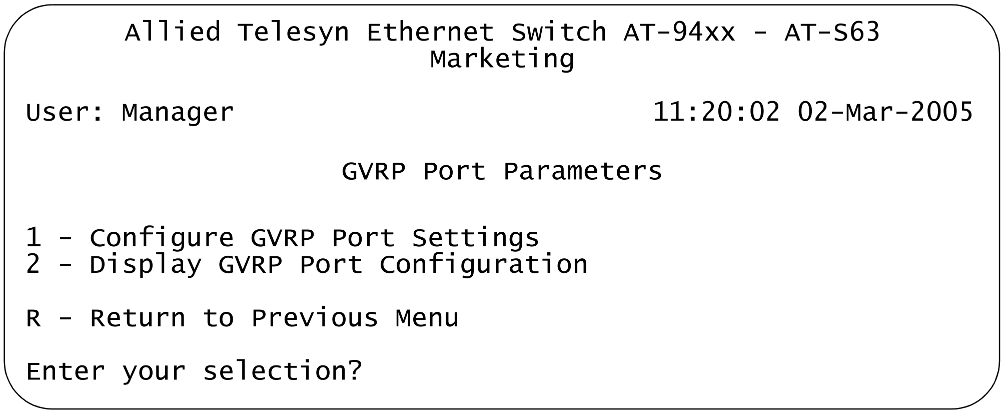
   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **7** to select Configure GARP-GVRP.

   The GARP-GVRP menu is shown in Figure 210 on page 592.

3. From the GARP-GVRP menu, type **P** to select GVRP Port Parameters.

   The GVRP Port Parameters menu is shown in Figure 211.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing

User: Manager                              11:20:02 02-Mar-2005

                     GVRP Port Parameters

1 - Configure GVRP Port Settings
2 - Display GVRP Port Configuration

R - Return to Previous Menu

Enter your selection?
```

Figure 211. GVRP Port Parameters Menu

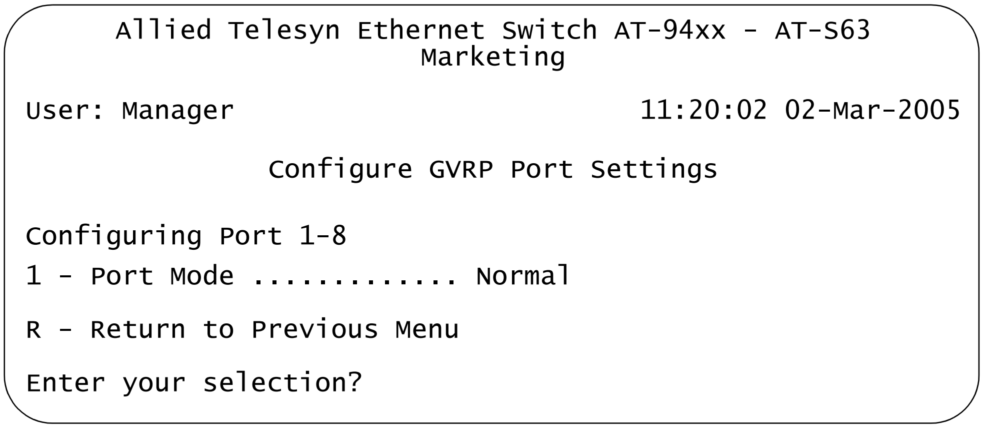
4. From the GVRP Port Parameters menu, type **1** to select Configure GVRP Port Settings.

   The following prompt is displayed:

```
Enter port-list:
```

5. Enter a port or a list of ports.

   The Configure GVRP Port Settings menu is shown in Figure 212.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing

User: Manager                         11:20:02 02-Mar-2005

               Configure GVRP Port Settings

Configuring Port 1-8
1 - Port Mode ............. Normal

R - Return to Previous Menu

Enter your selection?
```

Figure 212. Configure GVRP Port Settings Menu

6. Type **1** to select Port Mode.

   The following prompt is displayed:

```
Enter mode (0-Normal, 1-None): [0 to 1] -> 0
```

7. Type **0** to select Normal or **1** to select None. A setting of Normal means the port processes and propagates GVRP information. This is the default setting. A setting of None prevents the port from processing GVRP information and from transmitting PDUs.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying the GVRP Port Configuration

To display the GVRP port configuration, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

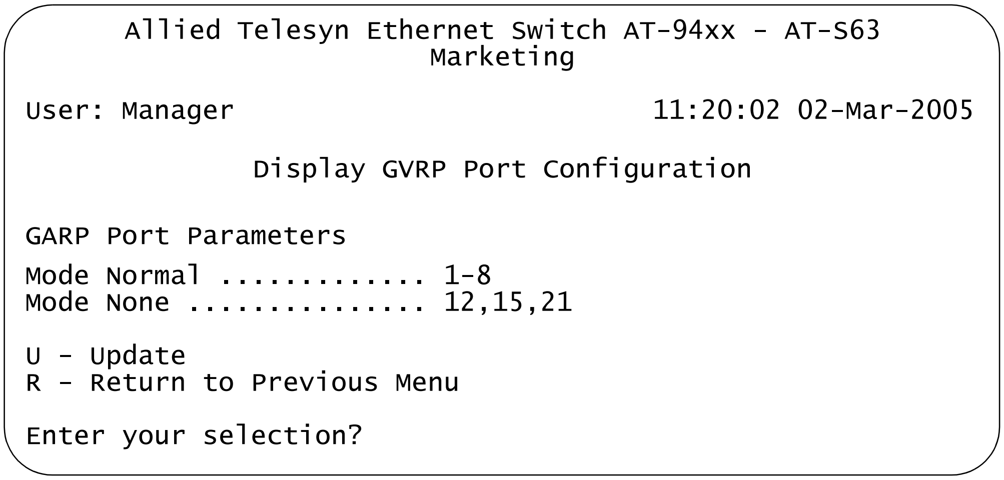
   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **7** to select Configure GARP-GVRP.

   The GARP-GVRP menu is shown in Figure 210 on page 592.

3. From the GVRP Port Parameters menu, type **2** to select Display GVRP Port Configuration.

   The Display GVRP Port Configuration menu is shown in Figure 213.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing

User: Manager                          11:20:02 02-Mar-2005

              Display GVRP Port Configuration

GARP Port Parameters

Mode Normal ............. 1-8
Mode None ............... 12,15,21

U - Update
R - Return to Previous Menu

Enter your selection?
```

Figure 213. Display GVRP Port Configuration Menu

The Display GVRP Port Configuration menu provides the following information:

Mode Normal
A list of ports that process and propagate GVRP information.

Mode None
A list of ports that do not process GVRP information or transmit PDUs.

Displaying GVRP Counters

To display GVRP counters, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

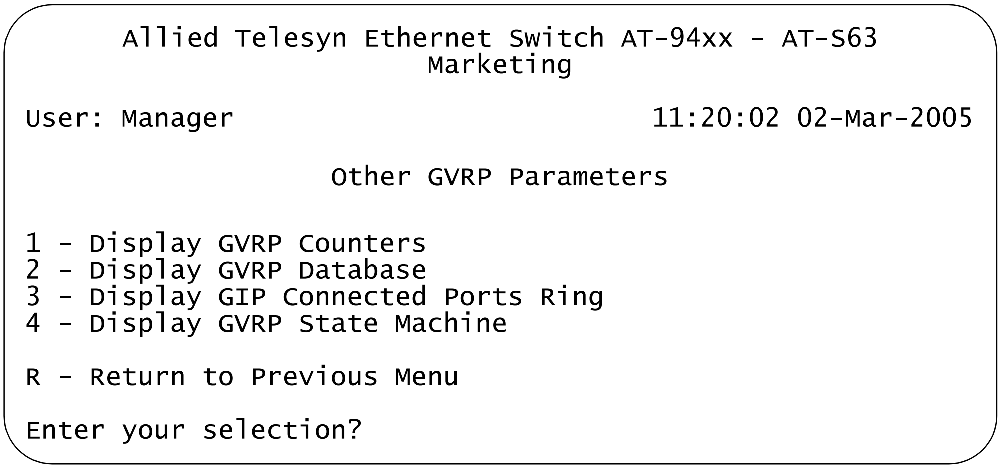
   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **7** to select Configure GARP-GVRP.

   The GARP-GVRP menu is shown in Figure 210 on page 592.

3. From the GARP-GVRP menu, type **O** to select Other GVRP Parameters.

   The Other GVRP Parameters menu is shown in Figure 214.

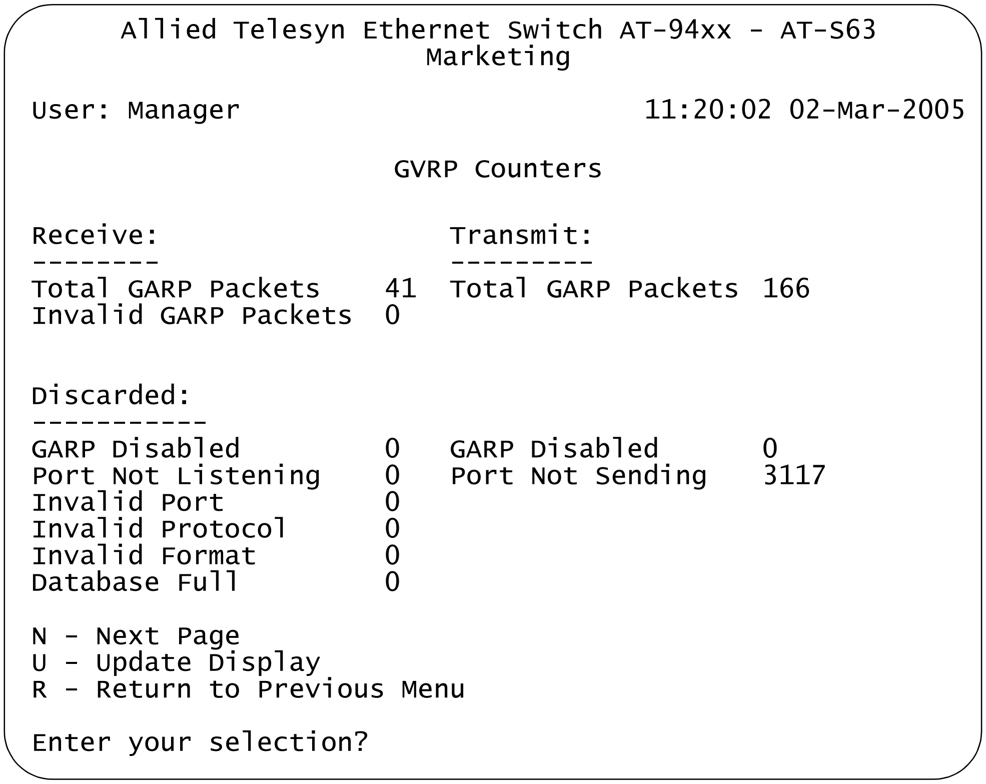


```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing

User: Manager                         11:20:02 02-Mar-2005

                    Other GVRP Parameters

1 - Display GVRP Counters
2 - Display GVRP Database
3 - Display GIP Connected Ports Ring
4 - Display GVRP State Machine

R - Return to Previous Menu

Enter your selection?
```

Figure 214. Other GVRP Parameters Menu

4. From the Other GARP Port Parameters menu, type 1 to select Display GVRP Counters.

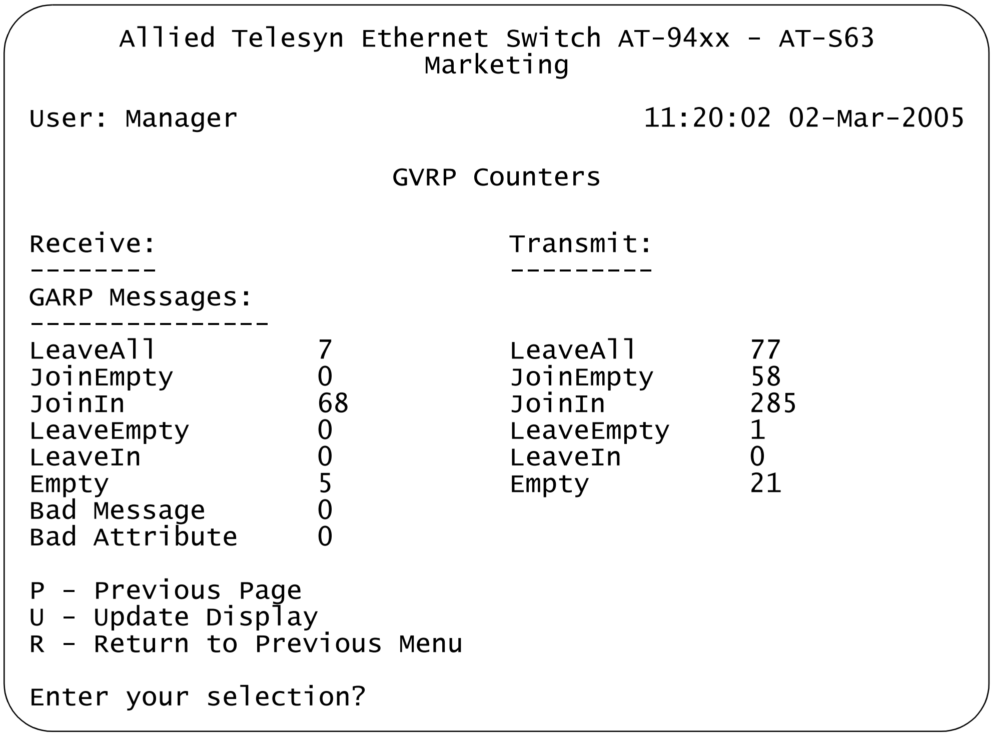
The GVRP Counters menu (page 1) is shown in Figure 215.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing

User: Manager                         11:20:02 02-Mar-2005

                      GVRP Counters

Receive:                    Transmit:
--------                    ---------
Total GARP Packets    41  Total GARP Packets  166
Invalid GARP Packets  0


Discarded:
-----------
GARP Disabled         0   GARP Disabled       0
Port Not Listening    0   Port Not Sending    3117
Invalid Port          0
Invalid Protocol      0
Invalid Format        0
Database Full         0

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 215. GVRP Counters Menu (page 1)

The statistics span two menus. To display the second menu, type **N** to select Next Page. The second menu is shown in Figure 216. The information in both menus is for display purposes only.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing

User: Manager                         11:20:02 02-Mar-2005

                      GVRP Counters

Receive:                      Transmit:
--------                      ---------
GARP Messages:
---------------
LeaveAll          7           LeaveAll       77
JoinEmpty         0           JoinEmpty      58
JoinIn            68          JoinIn         285
LeaveEmpty        0           LeaveEmpty     1
LeaveIn           0           LeaveIn        0
Empty             5           Empty          21
Bad Message       0
Bad Attribute     0

P - Previous Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 216. GVRP Counters Menu (page 2)

The GVRP counters in the menus are described in Table 19.

Table 19. GVRP Counters

Parameter	Meaning
Receive: Total GARP Packets	Total number of GARP PDUs received by this GARP application.
Transmit: Total GARP Packets	Total number of GARP PDUs transmitted by this GARP application.
Receive: Invalid GARP Packets	Number of invalid GARP PDUs received by this GARP application.
Receive Discarded: GARP Disabled	Number of received GARP PDUs discarded because the GARP application was disabled.
Transmit Discarded: GARP Disabled	Number of GARP PDUs discarded because the GARP application was disabled. This counter is incremented when ports are added to or deleted from the GARP application arising from port movements in the underlying VLAN or STP.

Table 19. GVRP Counters (Continued)

Parameter	Meaning
Receive Discarded: Port Not Listening	Number of GARP PDUs discarded because the port that received the PDUs was not listening, that is, MODE=NONE was set on the port.
Transmit Discarded: Port Not Sending	Number of GARP PDUs discarded because the port that the PDUs were to be transmitted on was not sending, that is, MODE=NONE was set on the port.
Receive Discarded: Invalid Port	Number of GARP PDUs discarded because the port that received the PDU does not belong to the GARP application.
Receive Discarded: Invalid Protocol	Number of GARP PDUs discarded because the GARP PDU contained an invalid protocol.
Receive Discarded: Invalid Format	Number of GARP PDUs discarded because the format of the GARP PDU was not recognized.
Receive Discarded: Database Full	Number of GARP PDUs discarded because the database for the GARP application was full, that is, the maximum number of attributes for the GARP application is in use.
Receive GARP Messages: LeaveAll	Number of GARP LeaveAll messages received by the GARP application.
Transmit: GARP Messages: LeaveAll	Number of GARP LeaveAll messages transmitted by the GARP application.
Receive GARP Messages: JoinEmpty	Total number of GARP JoinEmpty messages received for all attributes in the GARP application.
Transmit GARP Messages: JoinEmpty	Total number of GARP JoinEmpty messages transmitted for all attributes in the GARP application.
Receive GARP Messages: JoinIn	Total number of GARP JoinIn messages received for all attributes in the GARP application.
Transmit GARP Messages: JoinIn	Total number of GARP JoinIn messages transmitted for all attributes in the GARP application.
Receive GARP Messages: LeaveEmpty	Total number of GARP LeaveEmpty messages received for all attributes in the GARP application.

Table 19. GVRP Counters (Continued)

Parameter	Meaning
Transmit GARP Messages: LeaveEmpty	Total number of GARP LeaveEmpty messages transmitted for all attributes in the GARP application.
Receive GARP Messages: LeaveIn	Total number of GARP LeaveIn messages received for all attributes in the GARP application.
Transmit GARP Messages: LeaveIn	Total number of GARP LeaveIn messages transmitted for all attributes in the GARP application.
Receive GARP Messages: Empty	Total number of GARP Empty messages received for all attributes in the GARP application.
Transmit GARP Messages: Empty	Total number of GARP Empty messages transmitted for all attributes in the GARP application.
Receive GARP Messages: Bad Message	Number of GARP messages that had an invalid Attribute Type value, an invalid Attribute Length value or an invalid Attribute Event value.
Receive GARP Messages: Bad Attribute	Number of GARP messages that had an invalid Attribute Value value.

Displaying the GVRP Database

To display GVRP database, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **8** to select Configure GARP-GVRP*.*

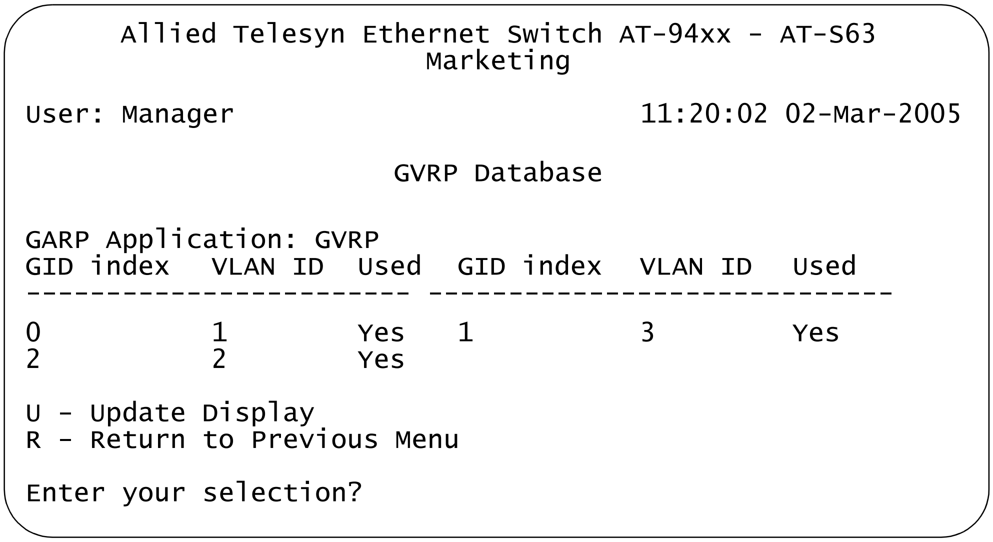
   The GARP-GVRP menu is shown in Figure 210 on page 592.

3. From the GARP-GVRP menu, type **O** to select Other GVRP Parameters menu.

   The Other GARP Port Parameters menu is shown in Figure 214 on page 597.

4. From the Other GARP Port Parameters menu, type **2** to select Display GVRP Database

   The GVRP Database menu is shown in Figure 217.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing

User: Manager                             11:20:02 02-Mar-2005

                        GVRP Database

GARP Application: GVRP
GID index   VLAN ID  Used  GID index   VLAN ID   Used
------------------------ ----------------------------
0           1        Yes   1           3         Yes
2           2        Yes

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 217. GVRP Database Menu

The GVRP Database menu displays a table that contains the following columns of information:

GARP Application
Identifies the GARP application, that is, “GVRP”.

GID index
Value of the GID index corresponding to the attribute. GID indexes

begin at 0. If the GARP application has no attributes presently registered, “No attributes have been registered” is displayed.

VLAN ID
The VLAN ID.

Used
Indicates whether the GID index is currently being used by any port in the GARP application. The definition of “used” is whether the Applicant and Registrar state machine for the GID index are in a non-initialized state, that is, not in {Vo, Mt} state. The value of this parameter is either “Yes” or “No”.

Displaying the GIP Connected Ports Ring

To display the GIP connected ports ring, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **8** to select Configure GARP-GVRP.

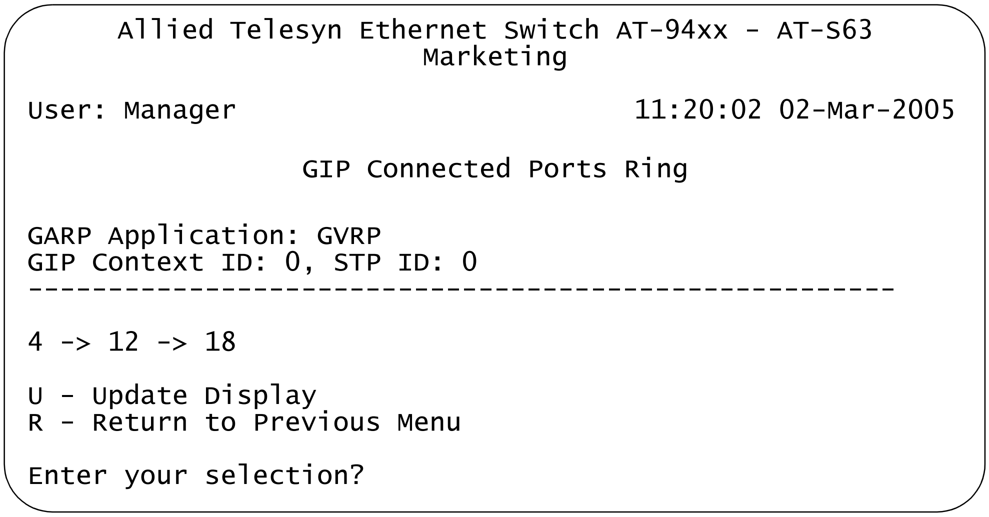
   The GARP-GVRP menu is shown in Figure 210 on page 592.

3. From the GARP-GVRP menu, type **O** to select Other GVRP Parameters menu.

   The Other GARP Parameters menu is shown in Figure 214 on page 597.

4. From the Other GARP Port Parameters menu, type **3** to select Display GIP Connected Ports Ring.

   The GIP Connected Ports Ring menu is shown in Figure 218.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing

User: Manager                         11:20:02 02-Mar-2005

                 GIP Connected Ports Ring

GARP Application: GVRP
GIP Context ID: 0, STP ID: 0
------------------------------------------------------

4 -> 12 -> 18

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 218. GIP Connected Ports Ring Menu

The GIP Connected Ports Ring menu displays the following information:

GARP Application
Identifies the GARP application, that is, “GVRP.”

GIP Context ID
A number assigned to the instance for the GIP context.

STP ID
Present if the GARP application is GVRP; identifies the spanning tree instance associated with the GIP context.

Connected Ring
The ring of connected ports. Only ports presently in the spanning tree Forwarding state are eligible for membership in the GIP connected ring. If no ports exist in the GIP connected ring, “No ports are connected” is displayed. If the GARP application has no ports, “No ports have been assigned” is displayed.

Displaying the GVRP State Machine

To display the GVRP state machine, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **7** to select Configure GARP-GVRP*.*

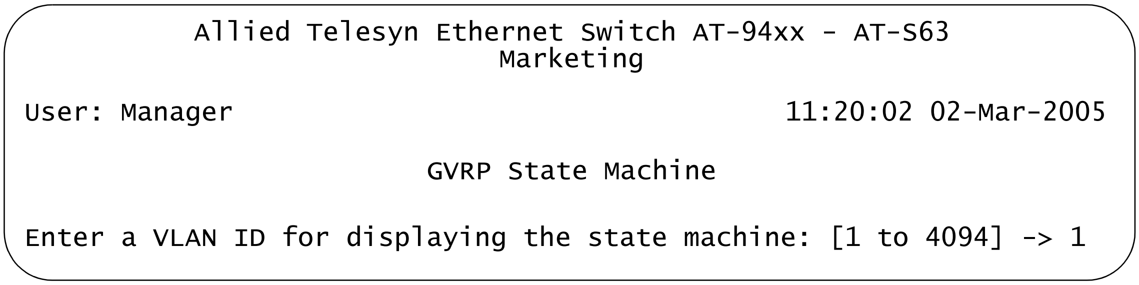
   The GARP-GVRP menu is shown in Figure 210 on page 592.

3. From the GARP-GVRP menu, type **O** to select Other GVRP Parameters menu.

   The Other GVRP Parameters menu is shown in Figure 214 on page 597.

4. From the Other GVRP Parameters menu, type **4** to Display GVRP State Machine.

   The GVRP State Machine menu (page 1) is shown in Figure 219.

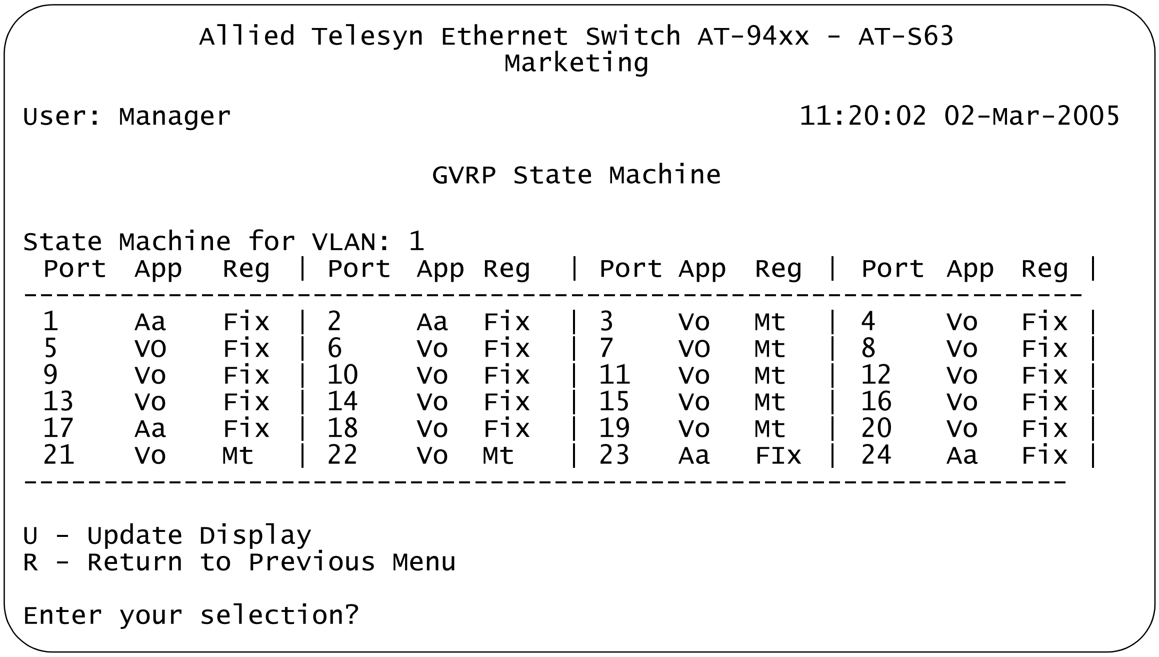


```
            Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing

User: Manager                                   11:20:02 02-Mar-2005

                            GVRP State Machine

Enter a VLAN ID for displaying the state machine: [1 to 4094] -> 1
```

Figure 219. GVRP State Machine Menu (page 1)

5. Enter a VLAN ID.

The GVRP State Machine menu (page 2) is displayed, as shown in Figure 220.



```
           Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing

User: Manager                                   11:20:02 02-Mar-2005

                           GVRP State Machine

State Machine for VLAN: 1
 Port  App   Reg | Port  App Reg   | Port App  Reg | Port  App  Reg |
------------------------------------------------------------------
 1     Aa    Fix | 2     Aa  Fix   | 3    Vo   Mt  | 4     Vo   Fix |
 5     VO    Fix | 6     Vo  Fix   | 7    VO   Mt  | 8     Vo   Fix |
 9     Vo    Fix | 10    Vo  Fix   | 11   Vo   Mt  | 12    Vo   Fix |
 13    Vo    Fix | 14    Vo  Fix   | 15   Vo   Mt  | 16    Vo   Fix |
 17    Aa    Fix | 18    Vo  Fix   | 19   Vo   Mt  | 20    Vo   Fix |
 21    Vo    Mt  | 22    Vo  Mt    | 23   Aa   FIx | 24    Aa   Fix |
-----------------------------------------------------------------

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 220. Display GVRP State Machine Menu (page 2)

The information in the menu is defined in Table 20. This information is for viewing purposes only.

Table 20. GVRP State Machine Parameters

Parameter	Meaning
Port	Port number on the switch; this port belongs to the GARP application. If the GARP application has no ports, “No ports have been assigned” is displayed.

Table 20. GVRP State Machine Parameters (Continued)

Parameter	Meaning
App	Applicant state machine for the GID index on that particular port. One of:
	Normal Participant Management state:
	“Vo” Very Anxious Observer
	“Ao” Anxious Observer
	“Qo” Quiet Observer
	“Lo” Leaving Observer
	“Vp” Very Anxious Passive Member
	“Ap” Anxious Passive Member
	“Qp” Quiet Passive Member
	“Va” Very Anxious Active Member
	“Aa” Anxious Active Member
	“Qa” Quiet Active Member
	“La” Leaving Active Member
App (*Continued*)	*Non-Participant Management state:*
	“Von” Very Anxious Observer
	“Aon” Anxious Observer
	“Qon” Quiet Observer
	“Lon” Leaving Observer
	“Vpn” Very Anxious Passive Member
	“Apn” Anxious Passive Member
	“Qpn” Quiet Passive Member
	“Van” Very Anxious Active Member
	“Aan” Anxious Active Member
	“Qan” Quiet Active Member
	“Lan” Leaving Active Member
	The initialized state for the Applicant is Vo.

Table 20. GVRP State Machine Parameters (Continued)

Parameter	Meaning	
Reg	Registrar state machine for the GID index on that particular port. One of:	
	“Mt”	Empty
	“Lv3”	Leaving substate 3 (final Leaving substate)
	“Lv2”	Leaving substate 2
	“Lv1”	Leaving substate 1
	“Lv”	Leaving substate (initial Leaving substate)
	“In”	In
	“Fix”	Registration Fixed
	“For”	Registration Forbidden
	The initialized state for the Registrar is Mt.	

Chapter 25

Multiple VLANs

This chapter describes the multiple VLAN modes and how to select a mode.

This chapter contains the following sections:

Multiple VLAN Mode Overview

The multiple VLAN modes are designed to simplify the task of configuring the switch in network environments that require a high degree of network segmentation. In a multiple VLAN mode, the ports on a switch are prohibited from forwarding traffic to each other and are only allowed to forward traffic to a user-designated uplink port. These configurations isolate the traffic on each port from all other ports, while providing access to the uplink port.

The AT-S63 management software supports two types of multiple VLAN modes:

- 802.1Q-compliant Multiple VLAN mode
- Multiple VLAN mode (also referred to as non-802.1Q compliant Multiple VLAN mode)

Each mode uses a different technique to isolate the ports and their traffic. The first method uses VLANs while the second uses port mapping. The uplink port is also different in each mode. In one the port is a tagged port and in the other untagged. This is explained in the following subsections.

Note
The multiple VLAN mode feature is supported only in single switch (i.e. edge switch) environments. This means that cascading of switches while in Multiple VLANs mode is not allowed.

Configuring multiple VLANs on a cascaded switch can possibly result in disconnection of network paths between switches unless the port used to link the switch (being configured for multiple VLANs mode) is configured as uplink VLAN port.

Configuring multiple VLANs on cascaded switches can also affect enhanced stacking because the master switch may not be able to detect member switches beyond the first cascaded switch.

802.1Q-Compliant Multiple VLAN Mode

In this mode, each port is placed into a separate VLAN as an untagged port. The VLAN names and VID numbers are based on the port numbers. For example, the VLAN for port 4 is named Client_VLAN_4 and is given the VID of 4, the VLAN for port 5 is named Client_VLAN_5 and has a VID of 5, and so on.

The VLAN configuration is accomplished automatically by the switch. After you select the mode and an uplink port, the switch forms the VLANs. It also assigns the PVID values as well. For example, the PVID for port 4 is assigned as 4, to match the VID of 4.

A user-designated port on the switch functions as an uplink port, which can be connected to a shared device such as a router for access to a WAN. This port is placed as a tagged port in each VLAN. Thus, while the switch ports are separated from each other in their individual VLANs, they all have access to the uplink port.

The uplink port also has its own VLAN, where it is an untagged member. This VLAN is called Uplink_VLAN.

Note
In 802.1Q Multiple VLAN mode, the device connected to the uplink port must be IEEE 802.1Q-compliant.

An example of the 802.1Q-compliant VLAN mode is shown in Table 21. The table shows the VLANs on an AT-9400 Series switch where port 22 has been selected as the uplink port.

Table 21. 802.1Q-Compliant Multiple VLAN Example

VLAN Name	VID	Untagged Port	Tagged Port
Client_VLAN_1	1	1	22
Client_VLAN_2	2	2	22
Client_VLAN_3	3	3	22
Client_VLAN_4	4	4	22
Client_VLAN_5	5	5	22
Client_VLAN_6	6	6	22
Client_VLAN_7	7	7	22
Client_VLAN_8	8	8	22
Client_VLAN_9	9	9	22
Client_VLAN_10	10	10	22
Client_VLAN_11	11	11	22
Client_VLAN_12	12	12	22
Client_VLAN_13	13	13	22
Client_VLAN_14	14	14	22
Client_VLAN_15	15	15	22
Client_VLAN_16	16	16	22
Client_VLAN_17	17	17	22
Client_VLAN_18	18	18	22

Table 21. 802.1Q-Compliant Multiple VLAN Example (Continued)

VLAN Name	VID	Untagged Port	Tagged Port
Client_VLAN_19	19	19	22
Client_VLAN_20	20	20	22
Client_VLAN_21	21	21	22
Uplink_VLAN	22	22	
Client_VLAN_23	23	23	22
Client_VLAN_24	24	24	22

This highly segmented configuration is useful in situations where traffic generated by each end node or network segment connected to a port on the switch needs to be kept separate from all other network traffic, while still allowing access to an uplink to a WAN. Unicast traffic received by the uplink port is effectively directed to the appropriate port and end node and is not directed to any other port on the switch.

The 802.1Q Multiple VLAN configuration is appropriate when the device connected to the uplink port is IEEE 802.1Q compatible, meaning that it can handle tagged packets.

When you select the 802.1Q-compliant VLAN mode, you are asked to specify the uplink VLAN port. You can specify only one uplink port. The switch automatically configures the ports into the separate VLANs.

Note
The uplink VLAN is the management VLAN. Any remote management of the switch must be made through the uplink VLAN.

Non-802.1Q Compliant Multiple VLAN Mode

Unlike the 802.1Q-compliant VLAN mode, which isolates port traffic by placing each port in a separate VLAN, this mode forms one VLAN with a VID of 1 that encompasses all ports. To establish traffic isolation, it uses port mapping. The result, however, is the same. Ports are permitted to forward traffic only to the designated uplink port and to no other port, even when they receive a broadcast packet.

Another difference with this mode is that the uplink port is untagged. Consequently, you would use this mode when the device connected to the uplink port is not IEEE 802.1Q compatible, meaning that the device cannot handle tagged packets.

Note

When the uplink port receives a packet with a destination MAC address that is not in the MAC address table, the port broadcasts the packet to all switch ports. This can result in ports receiving packets that are not intended for them.

Also note that a switch operating in this mode can be remotely managed through any port on the switch, not just the uplink port.

Selecting a VLAN Mode

The following procedure explains how to select a VLAN mode. Available modes are:

- User-configured VLAN mode (port-based and tagged VLANs)
- IEEE 802.1Q Compliant Multiple VLAN mode
- Non-IEEE 802.1Q Compliant Multiple VLAN mode

Note
Any port-based or tagged VLANs you created are not retained when you change the VLAN mode from the user-configured mode to a multiple VLAN mode and, at some point, reset the switch. The user-configured VLAN information is lost and must be recreated if you later return the switch to the user-configured VLAN mode.

To select a VLAN mode, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **2** to select VLANs Mode.

   The following prompt is displayed:

   ```
   Enter VLAN Mode (U-UserConfig, M-Multiple, Q-802.1Q
   Multiple VLANs) ->
   ```

3. Type **Q** to activate 802.1Q Multiple VLAN mode, **M** for Non-802.1Q compliant multiple VLAN mode, or **U** to create your own port-based and tagged VLANs. User-configured is the default setting.

   If you enter **Q** or **M**, the following prompt is displayed:

   ```
   Enter Uplink VLAN Port number -> [1 to 24] ->
   ```

4. Enter the port number on the switch that will function as the uplink port for the other ports. You can specify only one port.

   The following prompt is displayed:

   ```
   SUCCESS
   Press any key to continue ...
   ```

   The new VLAN mode is now active on the switch.

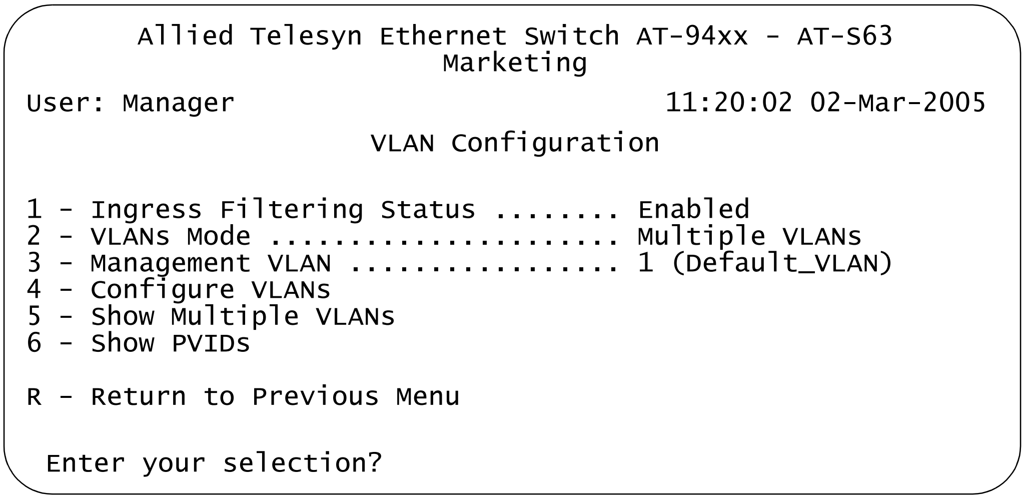
5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying VLAN Information

To view the VLANs on the switch while the unit is operating in Multiple VLAN mode, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu (multiple VLAN mode) is shown in Figure 221.

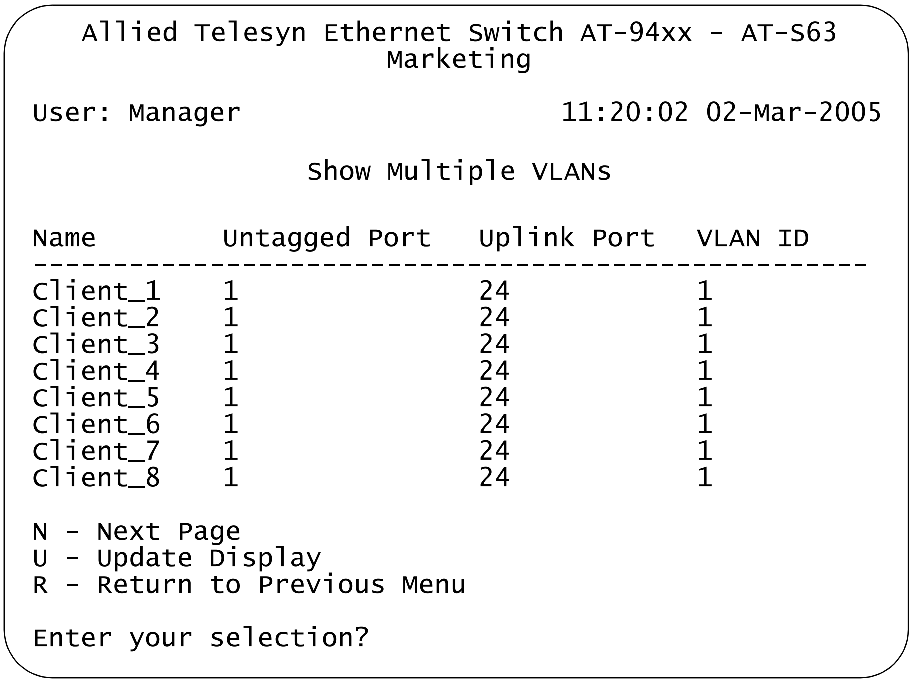


```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                    VLAN Configuration

1 - Ingress Filtering Status ........ Enabled
2 - VLANs Mode ...................... Multiple VLANs
3 - Management VLAN ................. 1 (Default_VLAN)
4 - Configure VLANs
5 - Show Multiple VLANs
6 - Show PVIDs

R - Return to Previous Menu

 Enter your selection?
```

Figure 221. VLAN Configuration Menu (Multiple VLAN Mode)

2. From the VLAN Configuration menu, type **5** to select Show Multiple VLANs.

The Show Multiple VLANs menu is shown in Figure 222.



```
   Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                      Marketing

User: Manager                    11:20:02 02-Mar-2005

                 Show Multiple VLANs

Name        Untagged Port   Uplink Port   VLAN ID
----------------------------------------------------
Client_1    1               24            1
Client_2    1               24            1
Client_3    1               24            1
Client_4    1               24            1
Client_5    1               24            1
Client_6    1               24            1
Client_7    1               24            1
Client_8    1               24            1

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 222. Show VLANs Menu, Multiple VLANS

The Show Multiple VLANs menu displays a table that contains the following columns of information:

Name
Name of the VLAN.

Untagged Port
The untagged ports that are part of the VLAN.

Uplink Port
The uplink port for the VLAN.

VLAN ID
The VLAN ID.

Chapter 26

Protected Ports VLANs

This chapter explains protected ports VLANs. It contains the following sections:

Protected Ports VLAN Overview

The purpose of a protected ports VLAN is to allow multiple ports on the switch to share the same uplink port but not share traffic with each other.

This feature has some of the same characteristics as the multiple VLAN modes described in the previous chapter. In a protected ports VLAN, each port is considered a separate LAN segment that can only communicate with an uplink port. The result is a configuration appropriate in network environments that require a great deal of segmentation.

One of the advantages of a protected ports VLAN is that it offers more flexibility. With the multiple VLAN modes, you can select only one uplink port which is shared by all the other ports. Also, you are not allowed to modify the configuration.

With protected ports VLANs, you can create LAN segments that consist of more than one port and you can specify multiple uplink ports.

Another advantage is that the switch can support protected ports VLANs as well as port-based and tagged VLANs simultaneously, something that is not allowed with the multiple VLAN modes.

An important concept of this feature is *groups*. A group is a selection of one or more ports that function as a LAN segment within the VLAN. The ports in each group are independent of the ports in the other groups of the VLAN. The ports of a group can share traffic only amongst themselves and with the uplink port, but not with ports in other groups of the VLAN.

A protected ports VLAN can consist of two or more groups and a group can consist of one or more ports. The ports of a group can be either tagged or untagged.

This type of VLAN also shares some common features with tagged VLANs, where one or more ports are shared by different LAN segments. But there are significant differences. First, all the ports in a tagged VLAN are considered a LAN segment, while the ports in a protected ports VLAN, though residing within a single VLAN, are subdivided into the smaller unit of groups, which represent the LAN segments.

Second, a tagged VLAN, by its nature, contains one or more tagged ports. These are the ports that are shared among one or more tagged VLANs. The device connected to a tagged port must be 802.1Q compliant and it must be able to handle tagged packets.

In contrast, the uplink port in a protected ports VLAN, which is shared by the ports in the different groups, can be either tagged or untagged. The device connected to it does not necessarily need to be 802.1Q compliant.

Note
For explanations of VIDs and tagged and untagged ports, refer to Chapter 23, "Port-based and Tagged VLANs" on page 547.

To create a protected ports VLAN, you perform many of the same steps that you do when you create a new port-based or tagged VLAN. You give it a name and a unique VID, and you indicate which of the ports will be tagged and untagged. What makes creating this type of VLAN different is that you must assign the ports of the VLAN to their respective groups.

Following is an example of a protected ports VLAN. The first table lists the name of the VLAN, the VID, and the tagged and untagged ports. It also indicates which port will function as the uplink port, in this case port 22. The second table lists the different groups in the VLAN and the ports for each group.

Name	Internet_VLAN_1
VID	8
Untagged Ports in VLAN	1-10, 25
Tagged Ports in VLAN	none
Uplink Port(s)	22

Group Number	Port(s)
1	1-2
2	3
3	4
4	5-7
5	8
6	9-10

Allied Telesyn recommends that you create tables similar to this before you create your own protected ports VLAN. You are prompted for this information when you create the VLAN, and having the tables handy will make the job easier.

Protected Ports VLAN Guidelines

Following are some guidelines for implementing protected ports VLANS:

❒ A switch can contain multiple protected ports VLANs.

- A protected ports VLAN should contain a minimum of two groups. A protected ports VLAN of only one group has little value. Create a port-based or tagged VLAN instead.
- A protected ports VLAN can contain any number of groups.
- A group can contain any number of ports.
- The ports of a group can be tagged or untagged.
- Each group must be assigned a unique group number on the switch. The number can be from 1 to 256.
- A protected ports VLAN can contain more than one uplink port.
- An uplink port can be either tagged or untagged.
- Uplink ports can be shared among more than one protected ports VLAN, but only if they are tagged.
- A switch can contain a combination of port-based and tagged VLANs and protected ports VLANs.
- A port that is a member of a group in a protected ports VLAN cannot be a member of a port-based or tagged VLAN.
- A group can be a member of more than one protected ports VLAN at a time. However, the port members of the group must be identical in both VLANs and the ports must be tagged.
- You cannot create protected ports VLANs when the switch is operating in a multiple VLAN mode.
- A port that is already an untagged member of a protected ports VLAN cannot be made an untagged member of another VLAN until it is first removed from its current VLAN assignment and returned to the Default_VLAN.

Creating a Protected Ports VLAN

To create a new protected ports VLAN, perform the following procedure:

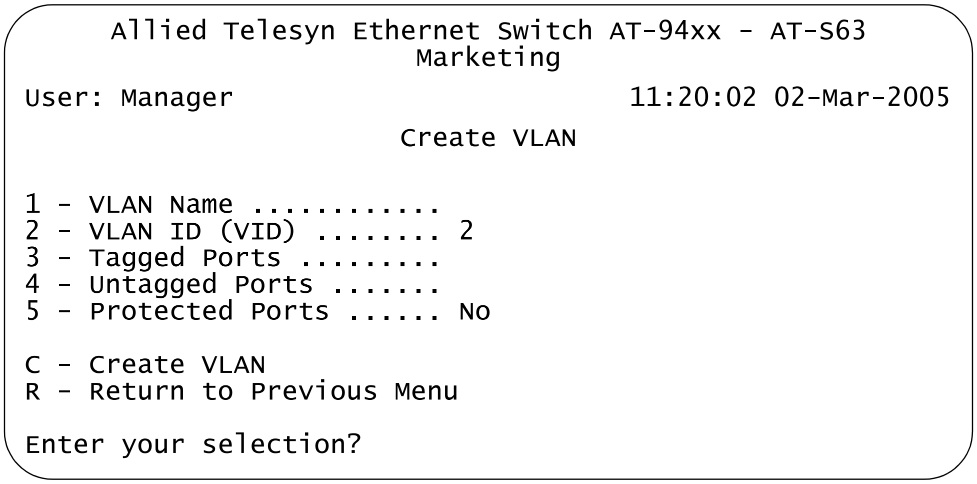
1. From the Main Menu, type **2** to select VLAN Configuration.

2. From the VLAN Configuration menu, type **4** to select Configure VLANs.

Note
If the menu does not include selection 4, Configure VLANs, the switch is running a multiple VLAN mode. To change the switch's VLAN mode, refer to "Selecting a VLAN Mode" on page 616.

3. From the Configure VLANs menu, type **1** to select Create VLAN.

   The Create VLAN menu is shown in Figure 223.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                         Create VLAN

1 - VLAN Name ............
2 - VLAN ID (VID) ........ 2
3 - Tagged Ports .........
4 - Untagged Ports .......
5 - Protected Ports ...... No

C - Create VLAN
R - Return to Previous Menu

Enter your selection?
```

Figure 223. Create VLAN Menu

4. Type **1** to select VLAN Name.

   The following prompt is displayed:

   ```
   Enter new value ->
   ```

5. Type a name for the new protected ports VLAN.

   The name can be from one to fifteen alphanumeric characters in length. The name should reflect the function of the nodes that will be a part of the protected ports VLAN (for example, InternetGroups). The name cannot contain spaces or special characters, such as asterisks (*) or exclamation points (!).

Note
A VLAN must be assigned a name.

6. Type **2** to select VLAN ID (VID.

   The following prompt is displayed:

   ```
   Enter new value -> [2 to 4094] ->
   ```

7. Type a VID value for the new VLAN. The range for the VID value is 1 to 4094.

   The AT-S63 management software uses the next available VID number on the switch as the default value. It is important to note that the switch is only aware of the VIDs of the VLANs that exist on the device, and not those that might already be in use in the network. For example, if you add a new AT-9400 Series switch to a network that already contains VLANs that use VIDs 2 through 24, the AT-S63 management software still uses VID 2 as the default value when you create the first VLAN on the new switch, even though that VID number is already being used by another VLAN on the network. To prevent inadvertently using the same VID for two different VLANs, you should keep a list of all your network VLANs and their VID values.

   Note
   A VLAN must have a VID.

8. If the VLAN will contain tagged ports, type **3** to select Tagged Ports and specify the ports. If this VLAN will not contain any tagged ports, leave this field empty.

   You can specify the ports individually (e.g., 2,3,5), as a range (e.g., 7-9), or both (e.g., 2,5,7-9).

9. Type **4** to select Untagged Ports and specify the ports on the switch to function as untagged ports in the VLAN. If this VLAN will not contain any untagged ports, leave this field empty.

   You can specify the ports individually (e.g., 2,3,5), as a range (e.g., 7-9), or both (e.g., 2,5,7-9).

10. Type **5** to select Protected Ports**.**

    The following prompt is displayed:

    ```
    Enter New Value [Yes/No] ->
    ```

11. To make this a protected ports VLAN, type **Y**. If you do not want this to be a protected ports VLAN and want it to be a port-based or tagged VLAN, type **N**.

12. Type **C** to select Create VLAN**.**

    The following prompt is displayed:

    ```
    Enter Uplink Ports (4 - 12) ->
    ```

    The prompt will shown the ports that you specified as belonging to the VLAN.

13. Enter the port in the VLAN that will function as the uplink port for the different VLAN groups. You can select more than one uplink port.

    The following prompt is displayed:

    ```
    Enter Group Ports (4 - 11) ->
    ```

    The prompt lists the ports in the VLAN, minus the uplink port you specified in the previous step.

14. Specify the ports of one of the groups of the protected ports VLAN. This can be a few as one port or as many as all the remaining ports of the VLAN. You can specify the ports of the group individually (e.g., 2,3,5), as a range (e.g., 7-9), or both (e.g., 2,5,7-9).

    The following prompt is displayed:

    ```
    Enter Group Number ->
    ```

15. Enter a group number for the port(s). Each group on the switch must be have a unique group number. The range is 1 to 256.

16. If there are ports within the VLAN that still need to be assigned to a group, the prompt in Step 13 is displayed again, showing the unassigned ports. You must repeat Steps 14 and 15, creating additional groups, until all of the ports in the VLAN have been assigned to a group.

    After you create all of the groups, the following prompt is displayed:

    ```
    SUCCESS - Press any key to continue.
    Press any key to continue.
    ```

    The new protected ports VLAN and its groups are now active on the switch.

17. Press any key to return to the Configure VLANs menu.

18. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a Protected Ports VLAN

Please note the following before you perform this procedure:

❒ To modify this type of VLAN, you must recreate it by reselecting the uplink port(s) and reassigning the ports to the groups. For this reason Allied Telesyn recommends that before you perform this procedure you first display the details of the protected ports VLAN you want to modify and write down on paper the VLAN's current configuration (i.e., uplink port and port to group assignments). This provides information that allows you to recreate the current configuration, with whatever modifications you want to make, when you perform the procedure. To display a VLAN's configuration, refer to "Displaying a Protected Ports VLAN" on page 630.

❒ If you are adding untagged ports, the ports must be untagged members of the Default_VLAN or a port-based or tagged VLAN. They cannot be members of another protected ports VLAN.

❒ An untagged port removed from a VLAN is automatically returned to the Default_VLAN.

❒ A port that is already an untagged member of a protected ports VLAN cannot be made an untagged member of another VLAN until it is first removed from its current VLAN assignment and returned to the Default_VLAN.

Note
To modify a VLAN, you need to know its VID. To view VLAN VIDs, refer to "Displaying a Protected Ports VLAN" on page 630.

To modify a protected ports VLAN, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **4** to select Configure VLANs.

   The Configure VLANs menu is shown in Figure 199 on page 562.

   Note
   If selection 4, Configure VLANs, is not displayed in the menu, the switch is running a multiple VLAN mode. To change a switch's VLAN mode, refer to "Selecting a VLAN Mode" on page 616.

3. From the Configure VLANs menu, type **2** to select Modify VLAN.

The Modify VLAN menu is shown in Figure 201 on page 567.

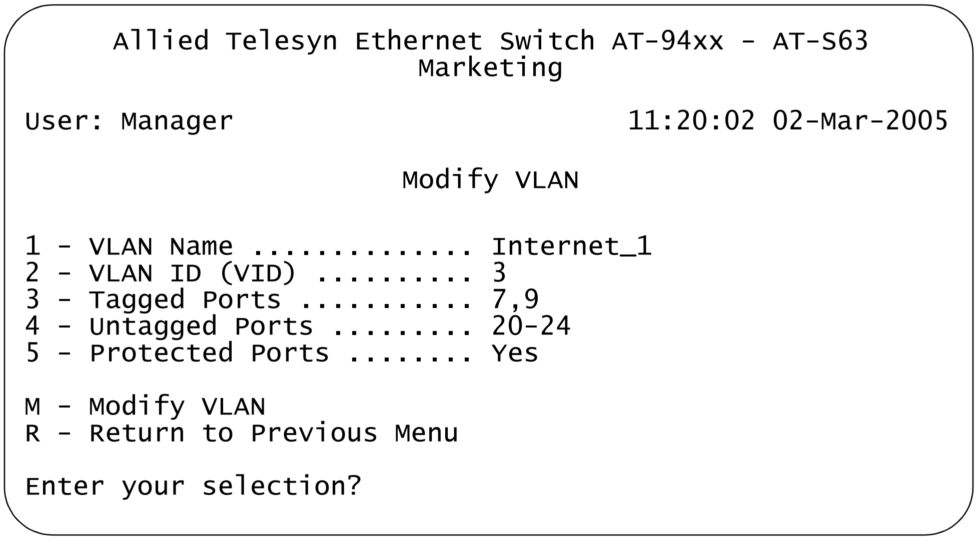
4. Type **1** to select VLAN ID (VID).

   The following prompt is displayed:

   ```
   Enter new value -> [1 to 4096] ->
   ```

5. Enter the VID of the VLAN you want to modify.

   The Modify VLAN menu expands to contain all relevant information about the VLAN, as shown in Figure 224.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing

User: Manager                        11:20:02 02-Mar-2005

                        Modify VLAN

1 - VLAN Name .............. Internet_1
2 - VLAN ID (VID) .......... 3
3 - Tagged Ports ........... 7,9
4 - Untagged Ports ......... 20-24
5 - Protected Ports ........ Yes

M - Modify VLAN
R - Return to Previous Menu

Enter your selection?
```

Figure 224. Expanded Modify VLAN Menu

6. Adjust the following parameters as necessary.

   1 - VLAN Name
   Use this selection to change the name of a VLAN. The name can be from one to fifteen alphanumeric characters in length. The name cannot contain spaces or special characters, such as asterisks (*) or exclamation points (!).

   When you change a VLAN's name, observe the following guidelines:

   - A VLAN's new name cannot be the same as the name of another VLAN on the same switch.
   - You cannot change the name of the Default_VLAN.

   Note
   A VLAN must have a name.

   2 - VLAN ID (VID)
   This is the VLAN's VID value. You cannot change this value.

3 - Tagged Ports
Use this selection to add or remove tagged ports from the VLAN. You can specify the ports individually (e.g., 2,3,5), as a range (e.g., 7-9), or both (e.g., 2,5,7-9). The new list of tagged ports will replace the existing tagged ports.

4 - Untagged Ports
Use this selection to add or remove untagged ports from the VLAN. You can specify the ports individually (e.g., 2,3,5), as a range (e.g., 7-9), or both (e.g., 2,5,7-9). The new list of untagged ports will replace the existing list of untagged ports.

5 - Protected Ports
This option cannot be changed. To convert a protected ports VLAN into a tagged or port-based VLAN, you must first delete it and then recreate it as a tagged or port-based VLAN.

7. After making the desired changes, type **M** to select Modify VLAN.

   The following prompt is displayed:

   ```
   Enter Uplink Ports (4 - 12) ->
   ```

   This prompt will differ depending on the ports you specified as part of the protected ports VLAN.

8. Enter the port in the VLAN that will function as the uplink port for the different VLAN groups. You can select more than one uplink port.

   The following prompt is displayed:

   ```
   Enter Group Ports (4 - 11) ->
   ```

   The prompt now lists the ports in the VLAN, minus the uplink port you specified in the previous step.

9. Specify the ports of one of the groups of the protected ports VLAN. This can be a small as one port or as many as all the remaining ports of the VLAN. You can specify the ports of the group individually (e.g., 2,3,5), as a range (e.g., 7-9), or both (e.g., 2,5,7-9).

   The following prompt is displayed:

   ```
   Enter Group Number ->
   ```

10. Enter a group number for the port(s). Each group on the switch must be given a unique group number.

11. If there are ports within the VLAN that still need to be assigned to a group, the prompt in Step 8 is displayed again, showing the unassigned ports. You must repeat Steps 9 and 10, creating additional groups, until all of the ports in the VLAN have been assigned to a group.

After you have created all of the groups, this prompt is displayed:

```
SUCCESS - Press any key to continue.
Press any key to continue.
```

The modified protected ports VLAN and its groups are now active on the switch.

12. Press any key to return to the Configure VLANs menu.

13. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying a Protected Ports VLAN

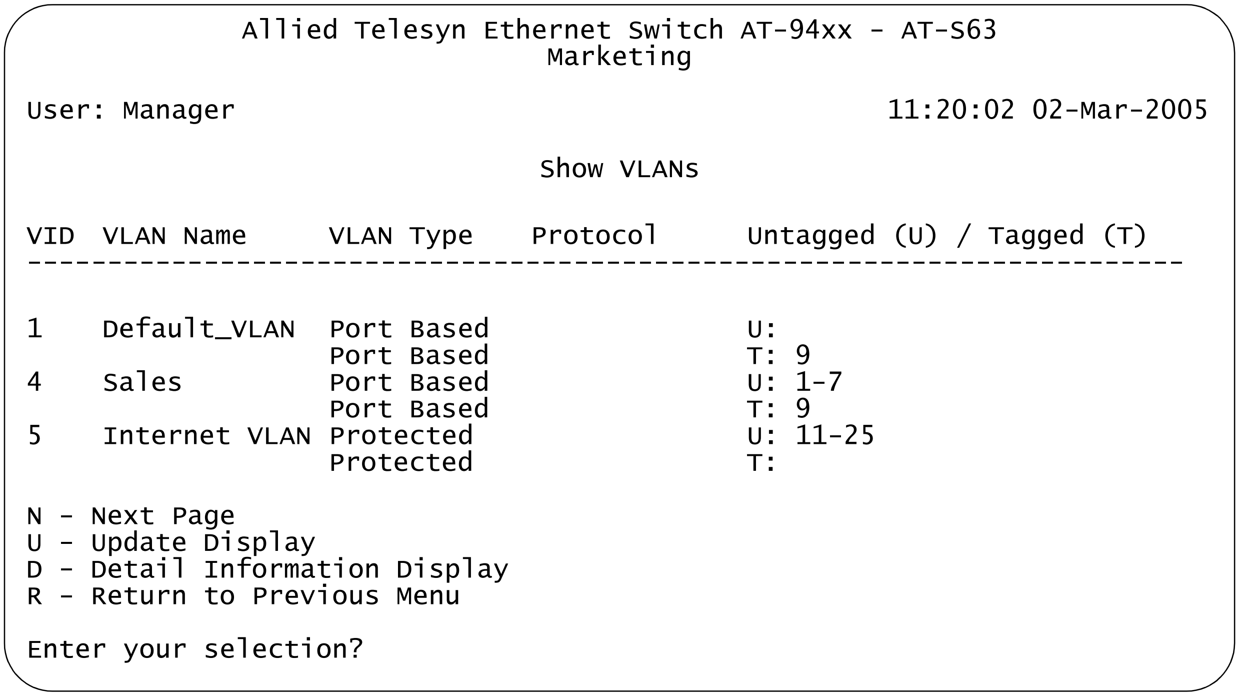
To view the name, VID number, and member ports of all the VLANs on a switch, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

2. From the VLAN Configuration menu, type **6** to select Show VLANs.

   The Show VLANs menu is shown in Figure 225.



```
             Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                Marketing

User: Manager                                         11:20:02 02-Mar-2005

                                Show VLANs

VID  VLAN Name     VLAN Type    Protocol      Untagged (U) / Tagged (T)
------------------------------------------------------------------------

1    Default_VLAN  Port Based                 U:
                   Port Based                 T: 9
4    Sales         Port Based                 U: 1-7
                   Port Based                 T: 9
5    Internet VLAN Protected                  U: 11-25
                   Protected                  T:

N - Next Page
U - Update Display
D - Detail Information Display
R - Return to Previous Menu

Enter your selection?
```

Figure 225. Show VLANs Menu

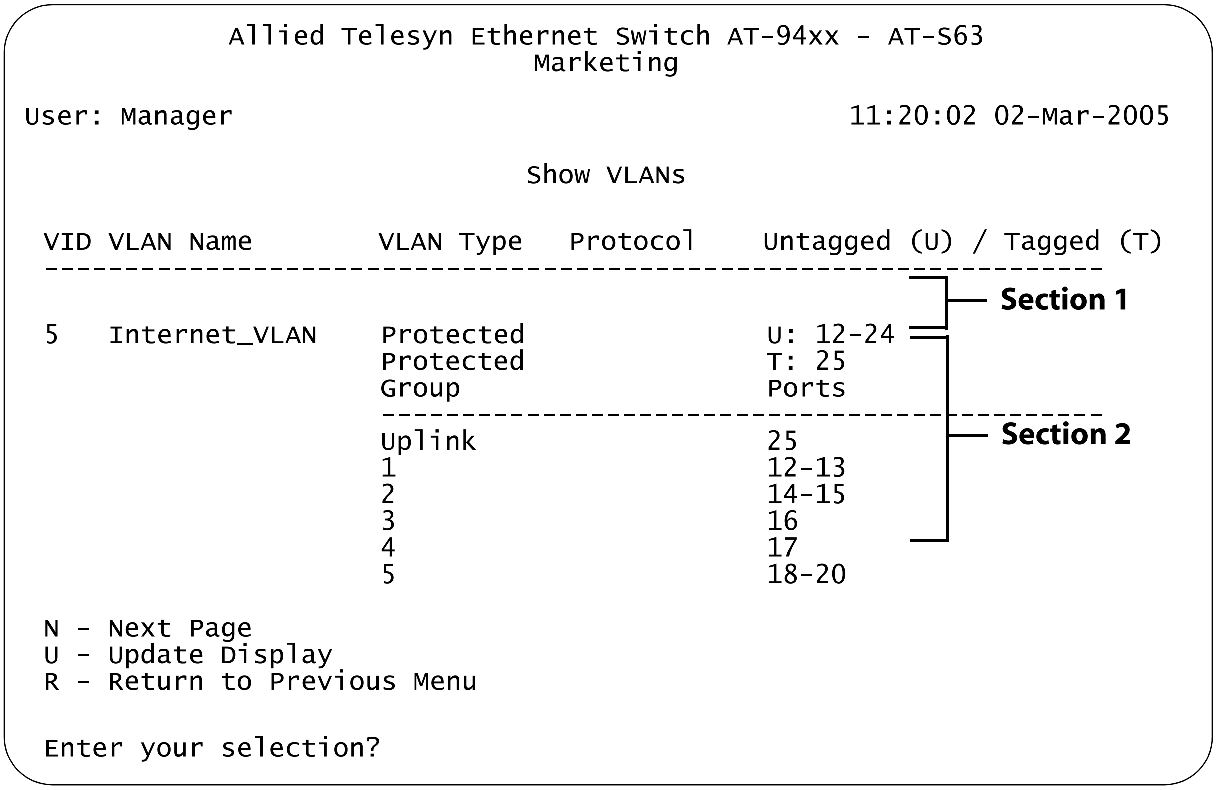
3. To view additional information about a particular protected ports VLAN, type **D** to select Detail Information Display.

   The following prompt is displayed:

   ```
   Enter new value ->
   ```

4. Enter the VID of the protected ports VLAN whose information you want to view.

An example of the Show VLANs window is shown in Figure 226.



```
              Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                 Marketing

User: Manager                                         11:20:02 02-Mar-2005

                                 Show VLANs

 VID VLAN Name        VLAN Type   Protocol    Untagged (U) / Tagged (T)
 -----------------------------------------------------------------

 5   Internet_VLAN    Protected               U: 12-24
                      Protected               T: 25
                      Group                   Ports
                      ------------------------------------------
                      Uplink                  25
                      1                       12-13
                      2                       14-15
                      3                       16
                      4                       17
                      5                       18-20

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 226. Show VLANs Menu

Section 1 lists all the tagged and untagged ports in the protected ports VLAN.

Section 2 lists each group in the VLAN, starting with the uplink port(s). The groups are listed by group number followed by the port numbers. For example, in Figure 226 the uplink port for the VLAN is port 25 and Group 1 consists of ports 12 and 13.

Deleting a Protected Ports VLAN

All untagged ports in a deleted protected ports VLAN are automatically returned to the Default_VLAN.

To delete a protected ports VLAN, perform the following procedure:

1. From the Main Menu, type **2** to select VLAN Configuration.

   The VLAN Configuration menu is shown in Figure 198 on page 561.

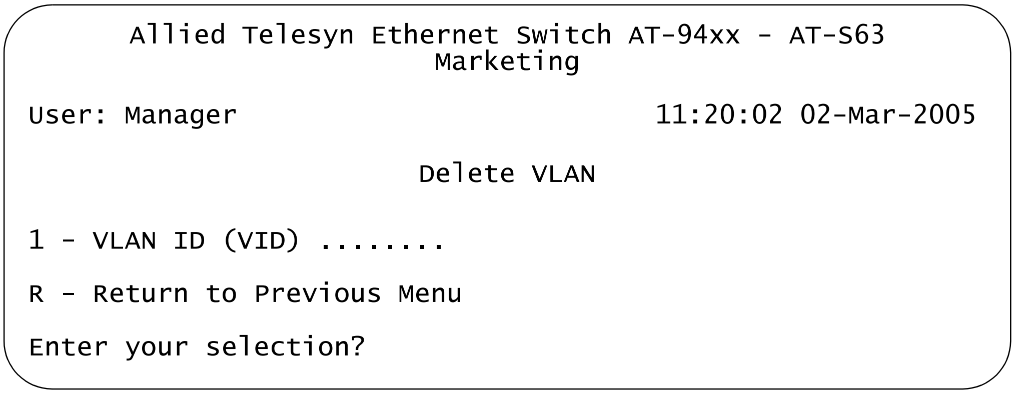
2. From the VLAN Configuration menu, type **4** to select Configure VLANs.

   The Configure VLANs menu is shown in Figure 199 on page 562.

   > **Note**
   > If option 4, Configure VLANs, is not displayed in the menu if the switch is running a multiple VLAN mode. To change a switch's VLAN mode, refer to "Selecting a VLAN Mode" on page 616.

3. From the Configure VLANs menu, type **3** to select Delete VLAN.

   The Delete VLAN menu is shown in Figure 227.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing

User: Manager                           11:20:02 02-Mar-2005

                         Delete VLAN

1 - VLAN ID (VID) ........

R - Return to Previous Menu

Enter your selection?
```

Figure 227. Delete VLAN Menu

4. Type **1** to select VLAN ID (VID).

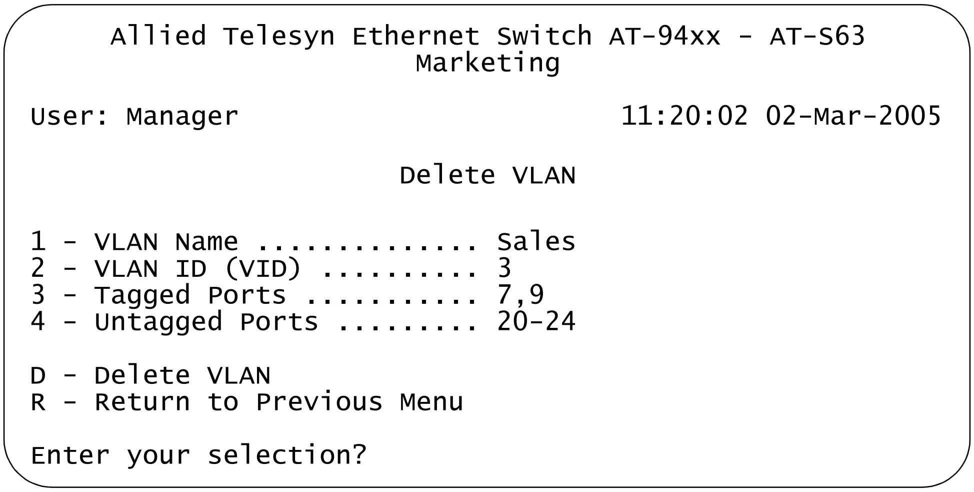
   The following prompt is displayed:

   ```
   Enter new value -> [2 to 4094] ->
   ```

5. Enter the VID of the VLAN you want to delete. You can specify only one VID at a time.

Note
You cannot delete the Default_VLAN, which has a VID of 1.

The Delete VLAN menu expands to contain all relevant information about the VLAN, as shown in Figure 228.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing

User: Manager                       11:20:02 02-Mar-2005

                       Delete VLAN

1 - VLAN Name .............. Sales
2 - VLAN ID (VID) .......... 3
3 - Tagged Ports ........... 7,9
4 - Untagged Ports ......... 20-24

D - Delete VLAN
R - Return to Previous Menu

Enter your selection?
```

Figure 228. Expanded Delete VLAN Menu

6. Type **D** to delete the VLAN or **R** to cancel the procedure.

   If you select to delete the VLAN, the following confirmation prompt is displayed:

   ```
   Are you sure you want to delete this VLAN [Yes/No] ->
   ```

7. Type **Y** to delete the VLAN or **N** to cancel the procedure. Press Return.

   If you select Yes, the VLAN is deleted and the following message is displayed:

   ```
   SUCCESS
   Please make sure to manually delete any static multicast
   MAC address(es) entries for this VLAN
   Press any key to continue ...
   ```

   All untagged ports in the deleted VLAN are returned to the Default_VLAN as untagged ports.

   Any static addresses assigned to the ports of the VLAN are now obsolete, because the VLAN has been deleted. Those addresses should be deleted from the MAC address table. For instructions on how to delete addresses, refer to “Deleting Unicast and Multicast MAC Addresses” on page 680.

8. Press any key.

9. Repeat this procedure starting with Step 4 to delete other VLANs.

10. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Section VI

Port Security

The chapters in this section provide information and procedures for basic switch setup using the AT-S63 management software. The chapters include:

Chapter 27

Port Security

This chapter explains how you can use the dynamic and static MAC addresses learned on the ports of the switch to control which end nodes can forward packets through the device. The sections in this chapter include:

Note
This type of port security does not apply to ports located on optional GBIC and SFP modules.

MAC Address Security Overview

This feature can enhance the security of your network. You can use it to control which end nodes can forward frames through the switch, and so prevent unauthorized individuals from accessing your network or particular parts of the network.

This type of network security uses a frame's source MAC address to determine whether the switch should forward a frame or discard it. The source address is the MAC address of the end node that sent the frame.

There are four levels of port security:

❒ Automatic

❒ Limited

❒ Secured

❒ Locked

You set port security on a per port basis. Only one security level can be active on a port at a time.

Automatic

The Automatic security mode disables port security on a port. This is the default security level for a port.

A dynamic MAC address learned by a port operating with this security level is deleted from the MAC address table after the end node is inactive for a specified period of time. This prevents the table from becoming full of MAC addresses of inactive nodes. The length of time an inactive dynamic MAC address remains in the table is determined by the MAC aging time.

Limited

The Limited security level allows you to specify the maximum number of dynamic MAC addresses a port can learn. After a port has learned its maximum number of addresses, it discards all ingress frames with source MAC addresses not already learned.

When the Limited security mode is initially activated on a port, all dynamic MAC addresses learned by the port are deleted from the MAC address table. The port then begins to learn new addresses, up to the maximum allowed. After the port has learned its maximum number of addresses, it does not learn any new addresses, even when end nodes are inactive.

A dynamic MAC address learned on a port operating in the Limited security mode never times out from the MAC address table, even when the corresponding end node is inactive.

Static MAC addresses are retained by the port and are not included in the count of maximum dynamic addresses. You can continue to add static MAC addresses to a port operating with this security level, even after the port has already learned its maximum number of dynamic MAC addresses. A switch port can have up to 255 dynamic and static MAC addresses.

Secured

The Secured security level instructs a port to forward frames using only static MAC address. The port does not learn any dynamic MAC addresses and deletes any dynamic addressees that it has already learned. Only those end nodes whose MAC addresses have been entered as static addresses are able to forward frames through the port.

After you have activated this security level, you must enter the static MAC addresses of the end nodes that will be allowed to forward frames through the port.

Locked

The Locked security level causes a port to immediately stop learning new dynamic MAC addresses. Frames are forwarded using the dynamic MAC addresses that the port has already learned and any static MAC addresses assigned to the port.

Dynamic MAC addresses learned by the port prior to the activation of this security level never time out from the MAC address table, even when the corresponding end nodes are inactive. However, the port does not learn new dynamic addresses.

You can continue to add new static MAC addresses to a port operating under this security level.

Note
For background information on MAC addresses and aging time, refer to "MAC Address Overview" on page 672.

Security Violations and Intrusion Actions

When a port receives an invalid frame, it has to decide what action it takes. This is what is referred to as *intrusion action*.

Before defining the intrusion actions, it helps to understand what constitutes an invalid frame. This differs for each security level, as explained here:

- Limited Security Level - An invalid frame for this security level is an ingress frame with a source MAC address not already learned by a port after the port had reached its maximum number of dynamic MAC addresses, or that was not assigned to the port as a static address.
- Secured Security Level - An invalid frame for this security level is an ingress frame with a source MAC address that was not entered as a static address on the port.
- Locked - An invalid frame for this security level is an ingress frame with a source MAC address that the port has not already learned or that was not assigned as a static address.

Intrusion action defines what a port does when it receives an invalid frame. For a port operating under either the Secured or Locked security mode, the intrusion action is always the same. The port discards the frame.

But with the Limited security mode you can specify an intrusion action. Here are the options:

- Discard the invalid frame.
- Discard the invalid frame and send an SNMP trap. (SNMP must be enabled on the switch for the trap to be sent.)
- Discard the invalid frame, send an SNMP trap, and disable the port.

MAC Address Security Guidelines

Following are several general guidelines to keep in mind when using this type of port security:

- The filtering of a packet occurs on the ingress port, not on the egress port.
- MAC address security can be set from a local or Telnet management session, but not from a web browser management session.
- You cannot use MAC address security and port-based access control on the same port.

Configuring MAC Address Port Security

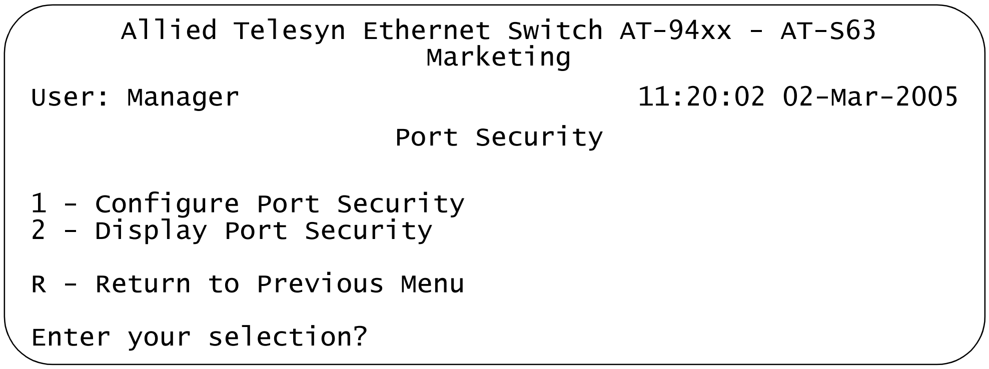
To set the port security level, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **5** to select Port Security.

   The Port Security menu is shown in Figure 229.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                        11:20:02 02-Mar-2005
                     Port Security

1 - Configure Port Security
2 - Display Port Security

R - Return to Previous Menu

Enter your selection?
```

Figure 229. Port Security Menu

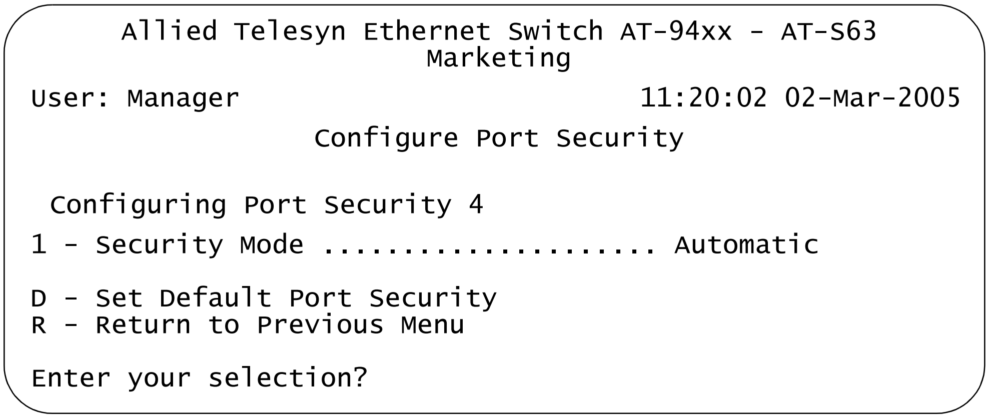
3. From the Port Security menu, type **1** to select Configure Port Security.

   The following prompt is displayed:

   ```
   Enter Port-List:
   ```

4. Enter the port where you want to set port security. You can specify one port or a range or ports (for example, 4-8).

   The Configure Port Security menu is shown in Figure 230.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                        11:20:02 02-Mar-2005
                Configure Port Security

 Configuring Port Security 4
1 - Security Mode .................... Automatic

D - Set Default Port Security
R - Return to Previous Menu

Enter your selection?
```

Figure 230. Configure Port Security Menu #1

5. From the Configure Port Security menu, type **1** to select Security Mode.

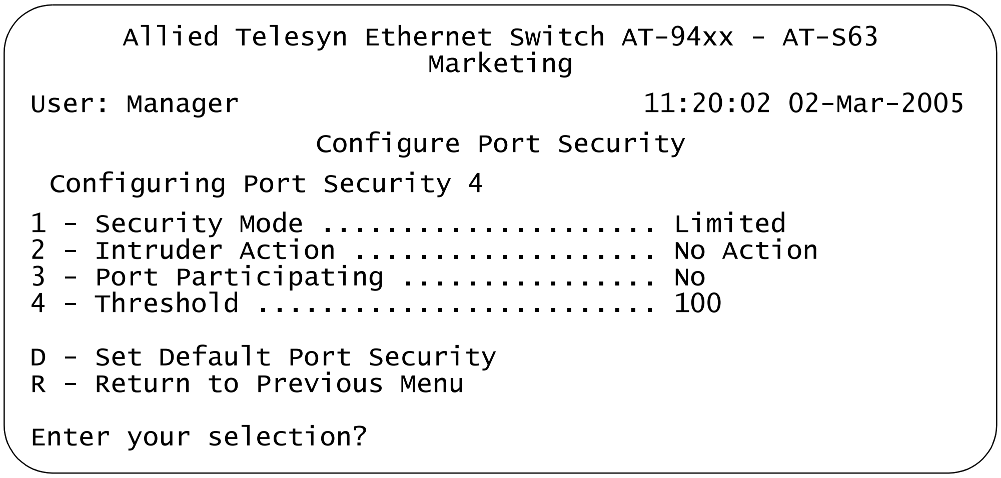
   The following prompt is displayed:

   ```
   Enter new mode (A-Automatic, L-Limited, S-Secured, K-
   locKed):
   ```

6. Select the desired security level. For definitions of the security levels, refer to “MAC Address Security Overview” on page 638.

   If you select Automatic, which disables port security on the port, return to the Main Menu to save your change.

   If you selected Limited, several new menu options are added to the Configure Port Security menu, as shown in Figure 231.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                            11:20:02 02-Mar-2005
                  Configure Port Security
 Configuring Port Security 4

1 - Security Mode ..................... Limited
2 - Intruder Action ................... No Action
3 - Port Participating ................ No
4 - Threshold ......................... 100

D - Set Default Port Security
R - Return to Previous Menu

Enter your selection?
```

Figure 231. Configure Port Security Menu #2

Note
If you selected Limited, go to the next step. If you selected the Secured or Locked mode, repeat this procedure to configure other ports or go to step 10 to save your changes.

7. To set the intrusion action for the port, do the following:

   a. Type **2** to select Intruder Action.

      The following prompt is displayed:

      ```
      Enter intrusion action: (N-No Action(Discard), T-Trap,
      D-Disable):
      ```

   b. Select the desired intrusion action:

N - No Action (Discard): The port discards invalid frames. This is the default.

T - Trap: The port discards invalid frames and sends an SNMP trap.

D - Disable: The port discards invalid frames, sends an SNMP trap, and disables the port.

8. If you selected the trap or disable intrusion action, type **3** to toggle the Port Participating option to Yes.

   Option 3, Port Participating, applies only when the intrusion action is set to trap or disable. This option does not apply when intrusion action is set to No Action (discard). If this option is set to No when intrusion action is set to trap or disable, the port discards invalid packets, but it does not send an SNMP trap or disable the port. If you want the switch to send a trap and/or disable the port, be sure to sent this option to Yes.

9. If you selected the Limited security mode for the port, do the following to specify the maximum number of dynamic MAC addresses you want the port to be able to learn:

   a. Type **4** to select Threshold.

      The following prompt is displayed:

      ```
      Enter port security threshold: [1 to 256] -> 100
      ```

   b. Enter the maximum number of dynamic MAC addresses you want the port to be able to learn. The range is 1 to 256. The default is 100.

Note
Option D, Select Default Port Security, sets the security mode for the port to the default value of Automatic.

10. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

11. If you configured a port for Secure security level, remember to enter the static MAC addresses of the end nodes that can send packets through the port. For instructions on how to add static MAC addresses, refer to "Adding Static Unicast and Multicast MAC Addresses" on page 678.

Displaying Port Security Levels

To view the current security levels for the ports on the switch, perform the following procedure:

1. From the Main Menu, type **1** to select Port Configuration.

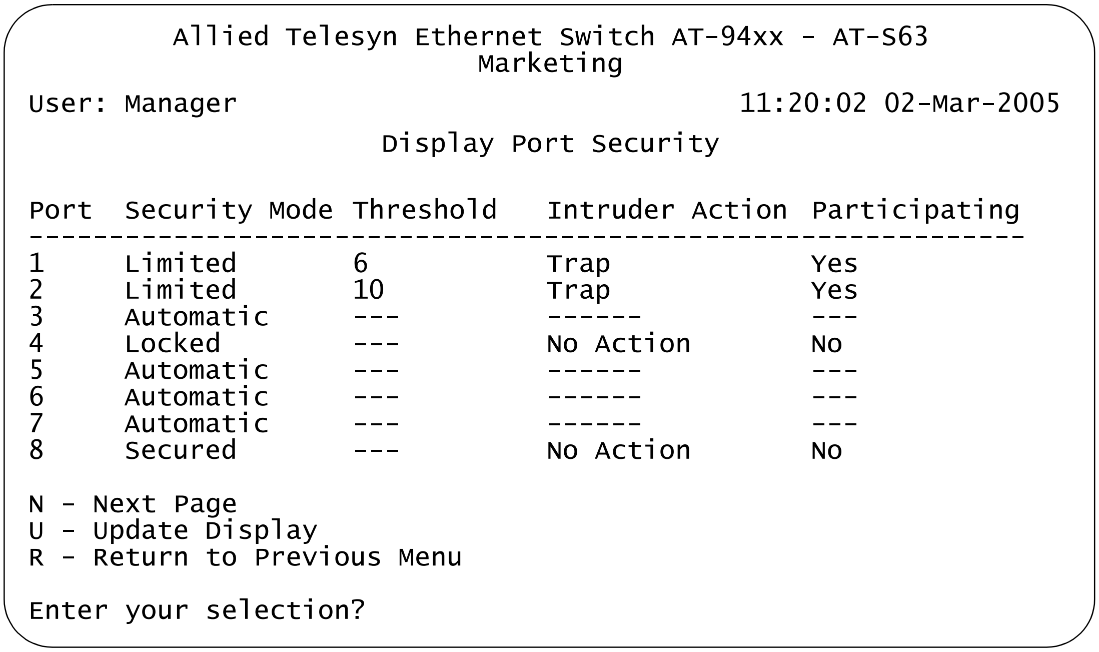
   The Port Configuration menu is shown in Figure 25 on page 102.

2. From the Port Configuration menu, type **5** to select Port Security.

   The Port Security menu is shown in Figure 229 on page 641.

3. From the Port Security menu, type **2** to select Display Port Security.

   The Display Port Security menu is shown in Figure 232.



```
          Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                             Marketing
User: Manager                                  11:20:02 02-Mar-2005
                       Display Port Security

Port  Security Mode Threshold   Intruder Action Participating
--------------------------------------------------------------
1     Limited       6           Trap            Yes
2     Limited       10          Trap            Yes
3     Automatic     ---         ------          ---
4     Locked        ---         No Action       No
5     Automatic     ---         ------          ---
6     Automatic     ---         ------          ---
7     Automatic     ---         ------          ---
8     Secured       ---         No Action       No

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 232. Display Port Security Menu

The Display Port Security menu displays a table that contains the following columns of information:

Port
The number of the port.

Security Mode
The active security mode on the port.

Threshold
The maximum number of dynamic MAC addresses the port learns. It only applies when a port is operating in the Limited security mode.

Intruder Action
The action taken by the switch if a port receives an invalid frame. The possible settings are:

No Action (Discard) - The port discards invalid frames. This is the default.

Trap - The port discards invalid frames and sends a trap. This applies only to the Limited security mode.

Trap/Disable - The port discards invalid frames, sends a trap, and disables the port. This applies only to the Limited security mode.

Participating
This column applies only when the intrusion action for a port is set to trap or disable. This option does not apply when intrusion action is set to No Action (discard). If this option is set to No when intrusion action is set to trap or disable, the port discards invalid packets, but it does not send a trap or disable the port.

Chapter 28

802.1x Port-based Network Access Control

This chapter explains 802.1x Port-based Network Access Control and how you can use this feature to restrict access to the network ports on the switch. Sections are as follows:

IEEE 802.1x Port-based Network Access Control Overview

The AT-S63 management software offers you several different methods for protecting your network and its resources from unauthorized access. For instance, Chapter 27, “Port Security” on page 637, explains how you can restrict network access using the MAC addresses that belong to the end nodes of your network.

This chapter explains yet another way. This method is referred to as Port-based Network Access Control (IEEE 802.1x). It uses the RADIUS protocol to control who can send traffic through and receive traffic from a switch port. With this feature, the switch does not allow an end node to send or receive traffic through a port until the user of the node has logged on by entering a username and password that the RADIUS server has validated.

The benefit of this type of network security is obvious. This feature can prevent an unauthorized individual from connecting a computer to a switch port or using an unattended workstation to access your network resources. Only those users to whom you have assigned valid usernames and passwords are able to use the switch to access the network.

This port security method uses the RADIUS authentication protocol. The AT-S63 management software is shipped with RADIUS client software. If you have already read Chapter 34, “TACACS+ and RADIUS Protocols” on page 761, then you know that you can use the RADIUS client software on the switch, along with a RADIUS server on your network, to create new manager accounts that control who can manage and change the AT-S63 parameter on the switch.

Note
RADIUS with Extensible Authentication Protocol (EAP) extensions is the only supported authentication server for this feature. This feature is not supported with the TACACS+ authentication protocol. The switch supports only one authentication protocol at a time. Therefore, if you want to implement IEEE 802.1 port access control and also create new manager accounts as explained in Chapter 34, “TACACS+ and RADIUS Protocols” on page 761, you must use the RADIUS protocol.

Following are several terms to keep in mind when you use this feature.

❒ Supplicant - A supplicant is an end user or end node that wants to access the network through a switch port. A supplicant is also referred to as a client.

- Authenticator - The authenticator is a port on the switch that prohibits network access by a supplicant until the network user has entered a valid username and password.
- Authentication server - The authentication server is the network device that has the RADIUS server software. This is the device that does the actual authenticating of the user names and password from the supplicants.

The AT-9400 Series switch does not authenticate any of the username and passwords from the end users. Rather, it acts as an intermediary between a supplicant and the authentication server during the authentication process.

Authentication Process

Below is a brief overview of the authentication process that occurs between a supplicant, authenticator, and authentication server. For further details, refer to the IEEE 802.1x standard.

- Either the authenticator (that is, a switch port) or the supplicant initiates an authentication message exchange. The switch initiates an exchange when it detects a change in the status of a port (such as when the port transitions from no link to valid link), or if it receives a packet on the port with a source MAC address not in the MAC address table.
- An authenticator starts the exchange by sending an EAP-Request/ Identity packet. A supplicant starts the exchange with an EAPOL-Start packet, to which the authenticator responds with a EAP-Request/ Identity packet.
- The supplicant responds with an EAP-Response/Identity packet to the authentication server via the authenticator.
- The authentication server responds with an EAP-Request packet to the supplicant via the authenticator.
- The supplicant responds with an EAP-Response/MDS packet containing a username and password.
- The authentication server sends either an EAP-Success packet or EAP-Reject packet to the supplicant.
- Upon successful authorization of the supplicant by the authentication server, the switch adds the supplicant's MAC address to the MAC address as an authorized address and begins forwarding network traffic to and from the port.
- When the supplicant sends an EAPOL-Logoff message, the switch removes the supplicant's MAC address from the MAC address table, preventing the supplicant from sending or receiving any further traffic from the port.

Port Roles

Part of the task of implementing this feature is specifying the roles of the ports on the switch. A port can have one of three roles:

- None
- Authenticator
- Supplicant

None Role

A switch port in the None role does not participate in port-based access control. Any device can connect to the port and send traffic through it and receive traffic from it without providing a username and password. This is the default setting for the switch ports.

Set a port to this role if you do not want to require its client to log on to use the network. This is also the correct role for a port that is connected to an authentication server. Because an authentication server cannot authenticate itself, the switch port to which it is connected must be set to this role.

Authenticator Role

Placing a switch port in the authenticator role activates port access control on the port. A port in the role of authenticator does not forward network traffic to or from the end node until the client has entered a username and password and the authentication server has validated them.

Determining whether a switch port should be set to the authenticator role is straightforward. If you want the user of the end node connected to the port to log in before using the network, then you should set the switch port to the authenticator role.

Figure 233 illustrates this concept. Port 2 on the switch has been set to the authenticator role because it is connected to an end node with 802.1x client software. The end user at the workstation must log on to use the network.

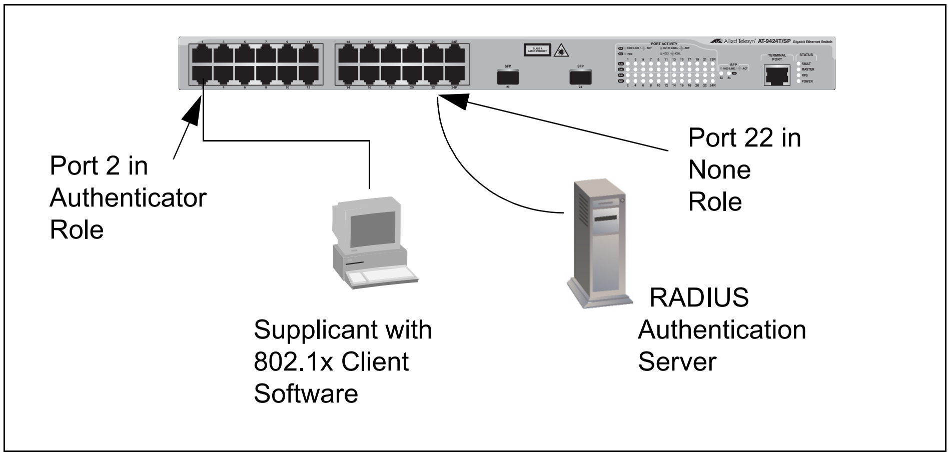


Figure 233. Example of the Authenticator Role

As mentioned earlier, the switch itself does not authenticate the user names and passwords from the clients. That is the responsibility of the authentication server, which contains the RADIUS server software. Instead, a switch acts as an intermediary for the authentication server by denying access to the network by the client until the client has provided a valid username and password, which the authentication server validates.

Supplicant Role

A switch port in the supplicant role acts as a client. The port assumes it must log in by providing a valid user name and password to whatever device it is connected to, typically another switch port.

Figure 234 illustrates the port role. Port 11 on switch B has been set to the supplicant role. Now, whenever switch B is power cycled or reset and initiates a link with switch A, it must log on by providing a username and password. (You enter this information when you configure the port for the supplicant role.)

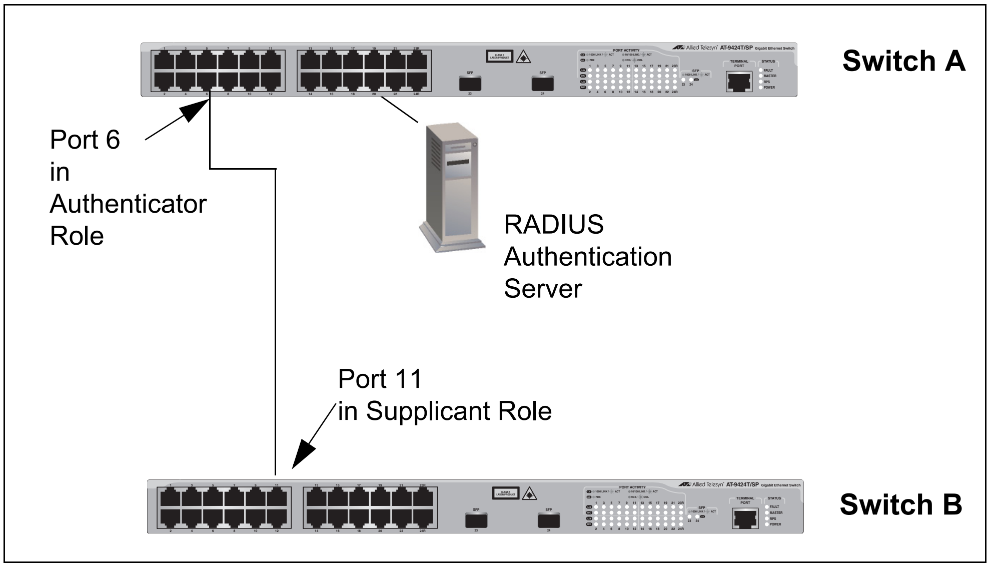


Figure 234. Example of the Supplicant Role

Note
Strictly limit the use of this port role. Otherwise, undesirable switch operation may result. Use this port role only when the link will carry traffic from just one client or only management traffic. Set ports used to interconnect switches to the none role.

RADIUS Accounting

The AT-S63 management software supports RADIUS accounting for switch ports set to the Authenticator role. This feature allows the switch to send information to the RADIUS server about the status of its supplicants. You can view this information on the RADIUS server to monitor network activity and use.

The switch sends accounting information to the RADIUS server when one of the following events occur:

- Supplicant logs on
- Supplicant logs off
- A change in the status of an Authenticator port during an active Supplicant session (for example, the port is reset or is changed from the Authenticator role to None role while a Supplicant is logged on)

The information sent by the switch to the RADIUS server for an event includes:

- Port number where the event occurred
- The date and time when the event occurred

❒ The number of packets transmitted and received by the switch port during a supplicant's session. (This information is sent only when the client logs off.)

You can also configure the accounting feature to send interim updates so you can monitor which clients are still active.

Here are a few guidelines to using the accounting feature:

❒ The AT-S63 management software supports the Network level of accounting, but not the System or Exec.

❒ This feature is only available for ports operating in the Authenticator role. No accounting is provided for ports operating in the Supplicant or None role.

❒ You must configure 802.1x Port-based Network Access Control as explained in this chapter and designate the Authenticator ports.

❒ You must also specify from one to three RADIUS servers. The instructions for this are in "Configuring RADIUS" on page 771.

For instructions on configuring this feature, refer to "Configuring RADIUS Accounting" on page 669.

General Steps

Following are the general steps for implementing 802.1x Port-based Network Access Control and RADIUS accounting on the switch:

1. You must install RADIUS server software on one or more of your network servers or management stations. Authentication protocol server software is not available from Allied Telesyn. Funk Software Steel-Belted Radius and Free Radius have been verified as fully compatible with the AT-S63 management software.

Note
This feature is not supported with the TACACS+ authentication protocol.

2. You need to install 802.1x client software on those workstations that are to be supplicants. Microsoft WinXP client software and Meeting House Aegis client software have been verified as fully compatible with the AT-S63 management software.

3. You must configure and activate the RADIUS client software in the AT-S63 management software. The default setting for the authentication protocol is disabled. You will need to provide the following information:

   ❒ The IP addresses of up to three RADIUS servers.

   ❒ The encryption key used by the authentication servers.

The instructions for this step are in “Configuring TACACS+” on page 767.

4. Next, you must configure the port access control settings on the switch. This involves the following:

   - Specifying the port roles.
   - Configuring 802.1x port parameters.
   - Enabling 802.1x Port-based Network Access Control.

   The instructions for this step are found in this chapter.

5. Finally, if you want to use RADIUS accounting to monitor the supplicants connected to the switch ports, you must configure the service on the switch, as explained in “Configuring RADIUS Accounting” on page 669.

Port-based Network Access Control Guidelines

Following are the guidelines for using this feature:

- Ports operating under port-based access control do not support port trunking or dynamic MAC address learning.
- The appropriate port role for a port on an AT-9400 Series switch connected to an authentication server is None.
- The authentication server must be a member of the management VLAN. For information about management VLANs, refer to “Specifying a Management VLAN” on page 581.
- Allied Telesyn does not support connecting more than one supplicant to an authenticator port on the switch. The switch allows only one supplicant to log on per port.

Note
Connecting multiple supplicants to a switch port set to the authenticator role does not conform to the IEEE 802.1x standard. This can introduce security risks and can result in undesired switch behavior. To avoid this, Allied Telesyn recommends not applying the authenticator role to a port that is connected to more than one end node, such as a port connected to another switch or to a hub.

- If a switch port set to the supplicant role is connected to a port on another switch that is not set to authenticator, the port, after a timeout period, assumes that it can send traffic without having to log on.
- A username and password combination is not tied to the MAC address of an end node. This allows end users to use the same username and password when working at different workstations.
- After a supplicant has successfully logged on, the MAC address of the end node is added to the switch’s MAC address table as an authenticated address. It remains in the table until the end user logs off

the network. Only then is the address removed. The address is not timed out, even if the end node becomes inactive.

Note
End users of port-based access control should be instructed to always log off when they are finished with a work session. This prevents unauthorized individuals from accessing the network through unattended network workstations.

- ❐ You cannot use the MAC address port security feature, described in Chapter 27, “Port Security” on page 637, on switch ports that are set to the authenticator or supplicant role. A port's MAC address security level must be Automatic.
- ❐ There should be only one port in the authenticator role between a client and the authentication server.
- ❐ A switch port in the authenticator role transmits broadcast and multicast traffic even when the client connected to the port has not logged on.
- ❐ An authenticator port can be tagged or untagged.
- ❐ Set ports used to interconnect switches to the none role. This is illustrated in Figure 235.

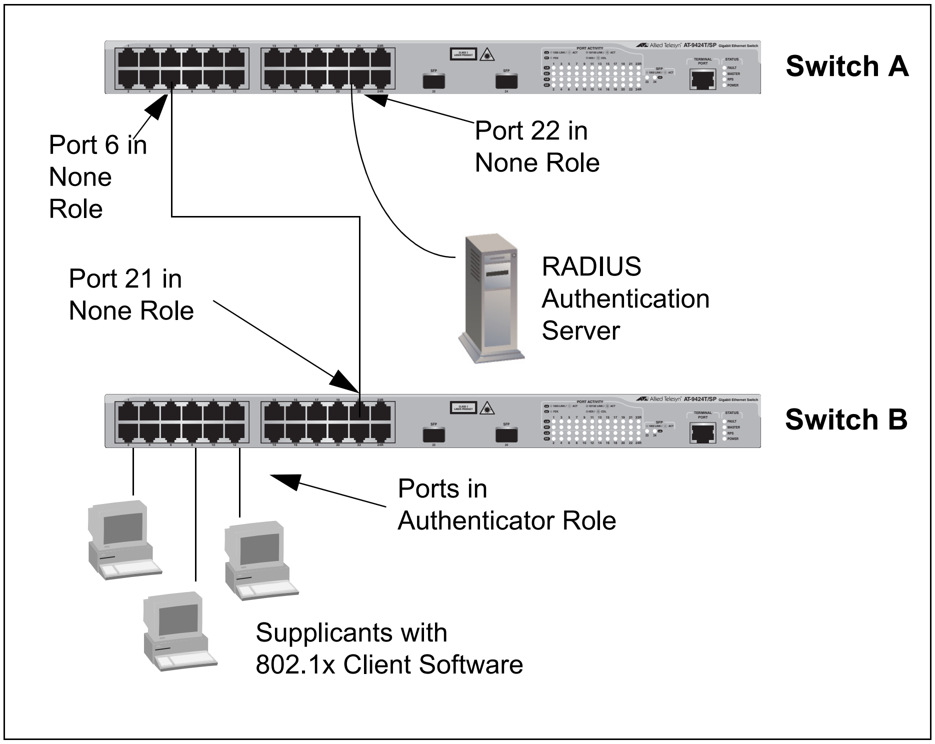

Switch A
Port 6 in None Role
Port 22 in None Role
RADIUS Authentication Server
Port 21 in None Role
Switch B
Ports in Authenticator Role
Supplicants with 802.1x Client Software

Figure 235. Port-based Authentication Across Multiple Switches

- When 802.1x Port-based Network Access Control is activated on a switch, the feature polls all RADIUS servers specified in the RADIUS configuration. If three servers have been configured, the switch polls all three. If server 1 responds, all future requests go only to that server. If server 1 stops responding, the switch again polls all RADIUS servers. If server 2 responds, but not server 1, then all future requests go to servers 1 and 2. If only server 3 responds, then all future requests go to all three servers.

Setting Port Roles

This procedure sets port roles. For an explanation of port roles, refer to “Port Roles” on page 650. You must set up the port roles before you enable port access control.

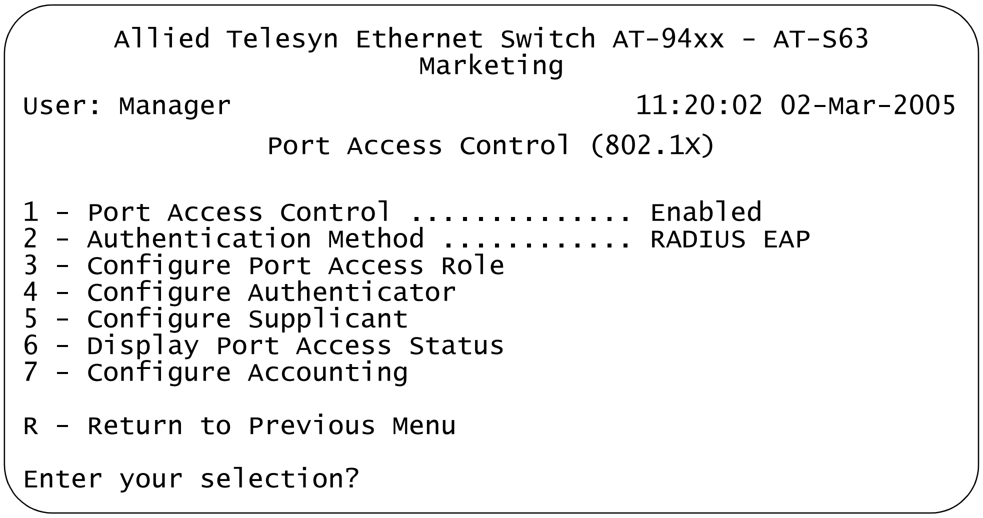
To set port roles, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security Configuration menu, type **1** to select Port Access Control (802.1X).

   The Port Access Control (802.1X) menu is shown in Figure 236.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                         11:20:02 02-Mar-2005
               Port Access Control (802.1X)

1 - Port Access Control ............. Enabled
2 - Authentication Method ............ RADIUS EAP
3 - Configure Port Access Role
4 - Configure Authenticator
5 - Configure Supplicant
6 - Display Port Access Status
7 - Configure Accounting

R - Return to Previous Menu

Enter your selection?
```

Figure 236. Port Access Control (802.1X) Menu

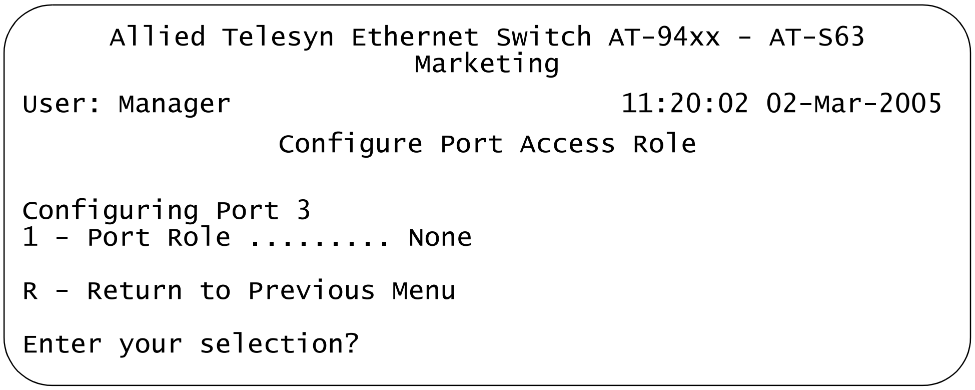
3. From the Port Access Control menu, type **3** to select Configure Port Access Role.

   The following prompt is displayed:

   ```
   Enter port list ->
   ```

4. Enter the port whose role you want to change. You can specify one port or a range of ports (for example, 4-8), but not nonconsecutive ports (for example, 4,6,11).

The Configure Port Access Role menu is shown in Figure 237.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                Configure Port Access Role

Configuring Port 3
1 - Port Role ......... None

R - Return to Previous Menu

Enter your selection?
```

Figure 237. Configure Port Access Role Menu

5. Type **1** to select Port Role.

   The following prompt is displayed:

   ```
   Enter new Port Role [N-None, A-Authenticator,
   S-Supplicant] ->
   ```

6. If you type **N** for None, the port does not participate in port access control. This is the default setting. If the port is connected to a supplicant, type **A** to set the port's role to Authenticator. If the port is connected to an authenticator, type **S** to set the port's roles to Supplicant.

7. Repeat this procedure starting with Step 3 to configure the role of the other ports on the switch.

   After you have set port roles, go to “Enabling or Disabling 802.1x Port-based Network Access Control” on page 659 and activate the feature.

Enabling or Disabling 802.1x Port-based Network Access Control

This procedure explains how to enable and disable port-based access control on the switch. If you have not assigned port roles and configured the parameter settings, you should skip this procedure and go first to "Setting Port Roles" on page 657.

To enable or disable 802.1x Port-based Network Access Control, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security Configuration menu, type **1** to select Port Access Control (802.1X).

   The Port Access Control (802.1X) menu is shown in Figure 236 on page 657.

3. From the Port Access Control menu, type **1** to select Port Access Control.

   The following prompt is displayed:

   ```
   Port Access Control (E-Enable, D-Disable):
   ```

4. Type **E** to enable port access control, or **D** to disable port access control.

5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring Authenticator Port Parameters

To configure authenticator port parameters, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

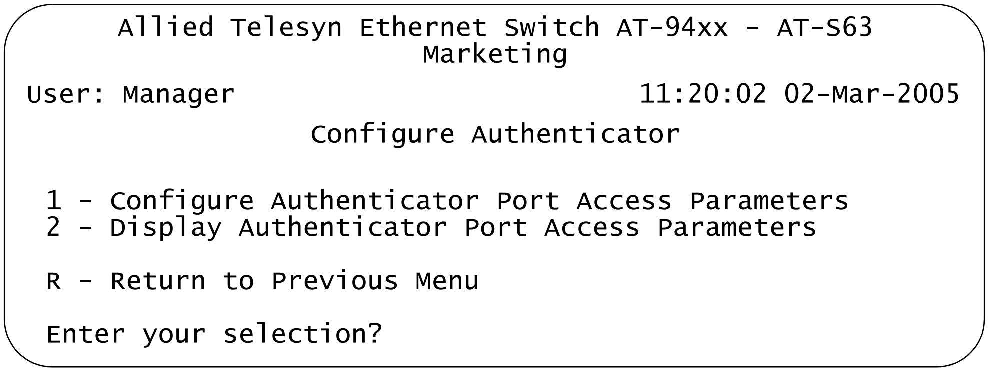
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security Configuration menu, type **1** to select Port Access Control (802.1X).

   The Port Access Control (802.1X) menu is shown in Figure 236 on page 657.

3. From the Port Access Control menu, type **4** to select Configure Authenticator.

   The Configure Authenticator menu is shown in Figure 238.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
                  Configure Authenticator

 1 - Configure Authenticator Port Access Parameters
 2 - Display Authenticator Port Access Parameters

 R - Return to Previous Menu

 Enter your selection?
```

Figure 238. Configure Authenticator Menu

4. From the Configure Authenticator menu, type **1** to select Configure Authenticator Port Access Parameters.

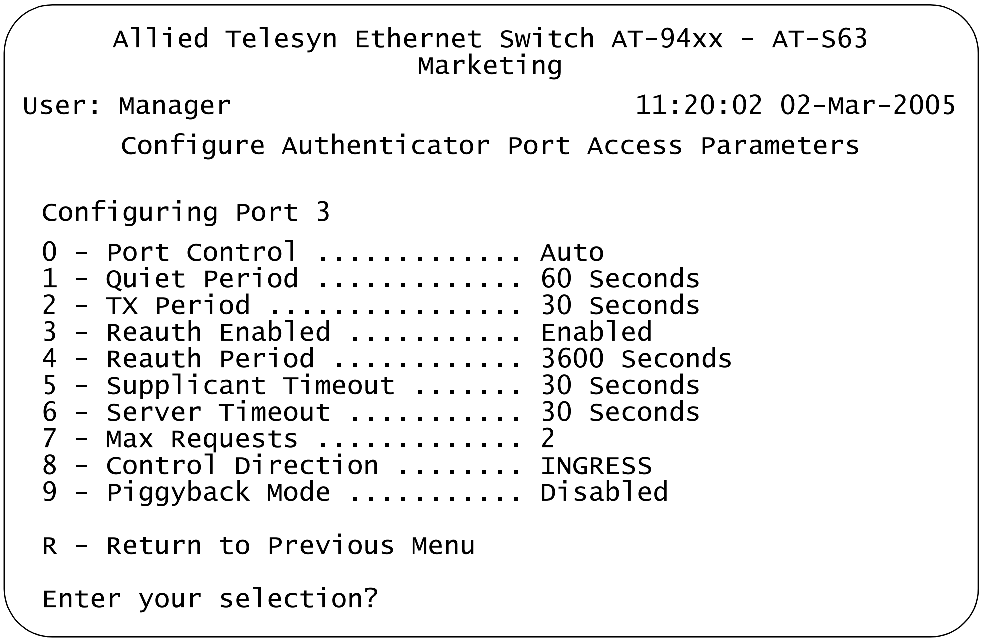
   The following prompt is displayed:

   ```
   Enter port list ->
   ```

5. Enter the authenticator port number whose parameters you want to change. You can specify one port or a range of ports (for example, 4-8), but not nonconsecutive ports (for example, 4,6,11).

Note
A port must already be configured as an authenticator before you can configure its settings. For instructions on how to change the role of a port, refer to “Setting Port Roles” on page 657.

The Configure Authenticator Port Access Parameters menu is shown in Figure 239.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                         11:20:02 02-Mar-2005
      Configure Authenticator Port Access Parameters

 Configuring Port 3
 0 - Port Control ............ Auto
 1 - Quiet Period ............ 60 Seconds
 2 - TX Period ............... 30 Seconds
 3 - Reauth Enabled .......... Enabled
 4 - Reauth Period ........... 3600 Seconds
 5 - Supplicant Timeout ...... 30 Seconds
 6 - Server Timeout .......... 30 Seconds
 7 - Max Requests ............ 2
 8 - Control Direction ....... INGRESS
 9 - Piggyback Mode .......... Disabled

 R - Return to Previous Menu

 Enter your selection?
```

Figure 239. Configure Authenticator Port Access Parameters Menu

6. Adjust the following parameters as necessary.

0 - Port Control
The possible settings for this parameter are:

Force-authorized - Disables IEEE 802.1X port-based authentication and causes the port to transition to the authorized state without any authentication exchange required. The port transmits and receives normal traffic without 802.1x-based authentication of the client. This is the default setting

Force-unauthorized - Causes the port to remain in the unauthorized state, ignoring all attempts by the client to authenticate. The switch cannot provide authentication services to the client through the interface

Auto - Enables 802.1x port-based authentication and causes the port to begin in the unauthorized state, allowing only EAPOL frames to be sent and received through the port. The authentication process begins when the link state of the port changes or the port receives an EAPOL-Start packet from a supplicant. The switch requests the identity of the client and begins relaying authentication messages between the client and the authentication server. Each client that attempts to access the network is uniquely identified by the switch using the client's MAC address.

1 - Quiet Period
The quiet period is the number of seconds that the port remains in the quiet state following a failed authentication exchange with the client. The default value is 60 seconds. The range is 0 to 65,535 seconds.

2 - TX Period
This parameter sets the number of seconds that the switch waits for a response to an EAP-request/identity frame from the client before retransmitting the request. The default value is 30 seconds. The range is 1 to 65,535 seconds.

3 - Reauth Enabled
Specifies if reauthentication should occur according to the reauthentication period. The options are Enabled or Disabled.

4 - Reauth Period
The reauth period enables periodic reauthentication of the client, which is disabled by default. The default value is 3600 seconds. The range is 1 to 65,535 seconds.

5 - Supplicant Timeout
This parameter sets the switch-to-client retransmission time for the EAP-request frame. The default value for this parameter is 30 seconds. The range is 1 to 600 seconds.

6 - Server Timeout
This parameter sets the timer used by the switch to determine authentication server timeout conditions. The default value for this parameter is 30 seconds. The range is 1 to 65,535 seconds.

7 - Max Requests
This parameter specifies the maximum number of times that the switch retransmits an EAP Request packet to the client before it times out the authentication session. The default value for this parameter is 2 retransmissions. The range is 1 to 10 retransmissions.

8 - Control Direction
This parameter specifies how the port handles ingress and egress broadcast and multicast packets when in the unauthorized state. When a port is set to the Authenticator role, it remains in the unauthorized state until the client logs on by providing a username and password combination. In the unauthorized state, the port only accepts EAP packets from the client. All other ingress packets that the port might receive from the client, including multicast and broadcast traffic, is discarded until the supplicant has logged in. The options are:

Ingress - A port, when in the unauthorized state, discards all ingress broadcast and multicast packets from the client, but forwards all egress broadcast and multicast traffic to the same client.

Both - A port, when in the unauthorized state, does not forward ingress or egress broadcast and multicast packets from or to the same client until the client logs in. This is the default.

9 - Piggyback Mode
This parameter opens up the port after authentication to all other unauthenticated devices and closes the port when reauthentication takes place. The options are Enabled or Disabled.

7. Repeat this procedure starting with Step 4 to configure additional authenticator ports on the switch.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring Supplicant Port Parameters

To configure supplicant port parameters, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

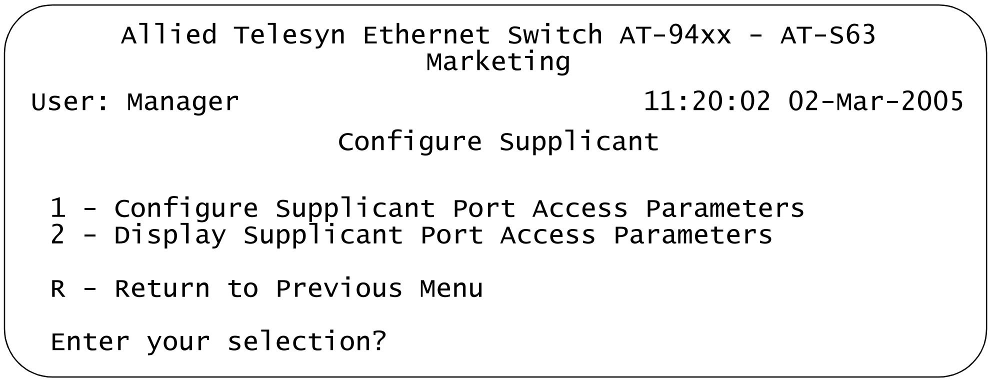
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security Configuration menu, type **1** to select Port Access Control (802.1X).

   The Port Access Control (802.1X) menu is shown in Figure 236 on page 657.

3. From the Port Access Control menu, type **5** to select Configure Supplicant.

   The Configure Supplicant menu is shown in Figure 238.



```
          Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing
User: Manager                               11:20:02 02-Mar-2005
                        Configure Supplicant

 1 - Configure Supplicant Port Access Parameters
 2 - Display Supplicant Port Access Parameters

 R - Return to Previous Menu

 Enter your selection?
```

Figure 240. Configure Supplicant Menu

4. From the Configure Supplicant menu, type **1** to select Configure Authenticator Port Access Parameters.

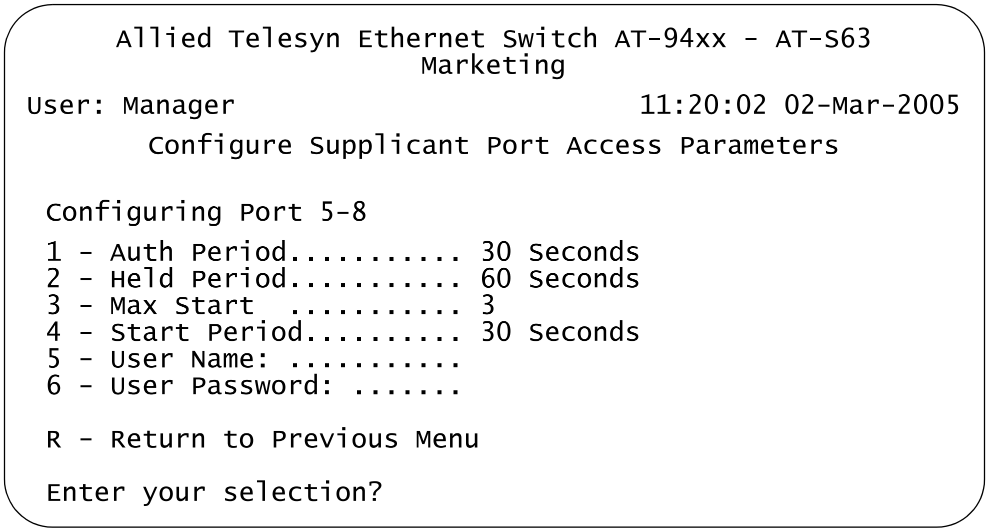
   The following prompt is displayed:

   ```
   Enter port list ->
   ```

5. Enter the supplicant port number whose parameters you want to change. You can specify one port or a range of ports (for example, 4-8), but not multiple individual ports (for example, 4,6,11).

   Note
   A port must already be configured as an supplicant before you can configure its settings. For instructions on how to change the role of a port, refer to “Setting Port Roles” on page 657.

The Configure Supplicant Port Access Parameters menu is shown in Figure 239.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
        Configure Supplicant Port Access Parameters

 Configuring Port 5-8

 1 - Auth Period........... 30 Seconds
 2 - Held Period........... 60 Seconds
 3 - Max Start  ........... 3
 4 - Start Period.......... 30 Seconds
 5 - User Name: ...........
 6 - User Password: .......

 R - Return to Previous Menu

 Enter your selection?
```

Figure 241. Configure Supplicant Port Access Parameters Menu

6. Adjust the following parameters as necessary.

1 - Auth Period
This parameter specifies the period of time in seconds that the supplicant waits for a reply from the authenticator after sending an EAP-Response frame. The range is 1 to 60 seconds. The default is 30 seconds.

2 - Held Period
The held period specifies the amount of time in seconds the supplicant is to refrain from retrying to re-contact the authenticator in the event the end user provides an invalid username and/or password. After the time period has expired, the supplicant can attempt to log on again. The range is 0 to 65,535. The default value is 60.

3 - Max Start
Max start is the maximum number of times the supplicant sends EAPOL-Start frames before assuming that there is no authenticator present. The range is 1 to 10. The default is 3.

4 - Start Period
The start period is the time period in seconds between successive attempts by the supplicant to establish contact with an authenticator when there is no reply. The range is 1 to 60. The default is 30.

5 - User Name
The user name is the username for the switch port. The port sends the name to the authentication server for verification when the port logs on to the network. The username can be from 1 to 16 alphanumeric characters (A to Z, a to z, 1 to 9). Do not use spaces or special

characters, such as asterisks or exclamation points. The username is case sensitive.

6 - User Password
This parameter specifies the password for the switch port. The port sends the password to the authentication server for verification when the port logs on to the network. The password can be from 1 to 16 alphanumeric characters (A to Z, a to z, 1 to 9). Do not use spaces or special characters, such as asterisks or exclamation points. The password is case sensitive.

7. Repeat this procedure starting with Step 4 to configure additional supplicant ports on the switch.

8. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying the Port Access Parameters

To display the port access parameters for the ports on the switch, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

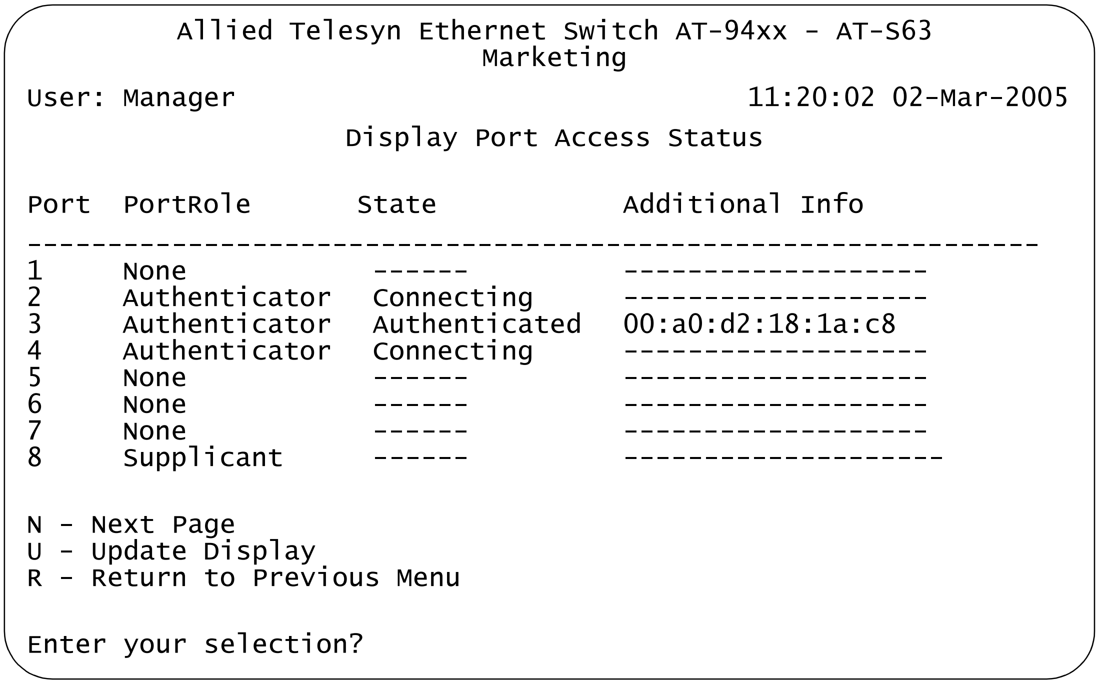
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security Configuration menu, type **1** to select Port Access Control (802.1X).

   The Port Access Control (802.1X) menu is shown in Figure 236 on page 657.

3. From the Port Access Control menu, type **6** to select Display Port Access status.

   The Display Port Access Status menu is shown in Figure 242.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                            Marketing
User: Manager                                11:20:02 02-Mar-2005
                    Display Port Access Status

Port  PortRole      State           Additional Info
---------------------------------------------------------------
1     None           ------         -------------------
2     Authenticator  Connecting     -------------------
3     Authenticator  Authenticated  00:a0:d2:18:1a:c8
4     Authenticator  Connecting     -------------------
5     None           ------         -------------------
6     None           ------         -------------------
7     None           ------         -------------------
8     Supplicant     ------         --------------------

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 242. Display Port Access Status Menu

The Display Port Access Status menu displays a table that contains the following columns of information:

Port
Port number.

Port Role
Port access role configured for the port. The possible settings are None, Authenticator, or Supplicant.

State
State of the port. The state field is dependent on whether a port is configured as an authenticator or a supplicant.

When you configure a port with an Authenticator Role, the State field can have the following values:

Aborting
Authenticated
Authenticating
Connecting
Disconnected
Force_Auth
Force_Unauth
Held
Initialize

When you configure a port with a Supplicant role, the State field can have the following values:

Acquired
Authenticated
Authenticating
Connecting
Disconnected
Held
Logoff

Additional Info
When you assign a port the role of Authenticator and it has a status of Authenticated, this field also displays the MAC address of the Authenticator.

Configuring RADIUS Accounting

The AT-S63 management software supports RADIUS accounting for ports operating in the Authenticator role. The accounting information sent by the switch to a RADIUS server includes the date and time when clients log on and log off, as well as the number of packets sent and received by a switch port during a client session. For background information on this feature, refer to "RADIUS Accounting" on page 652. This feature is disabled by default on the switch.

To configure this feature, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

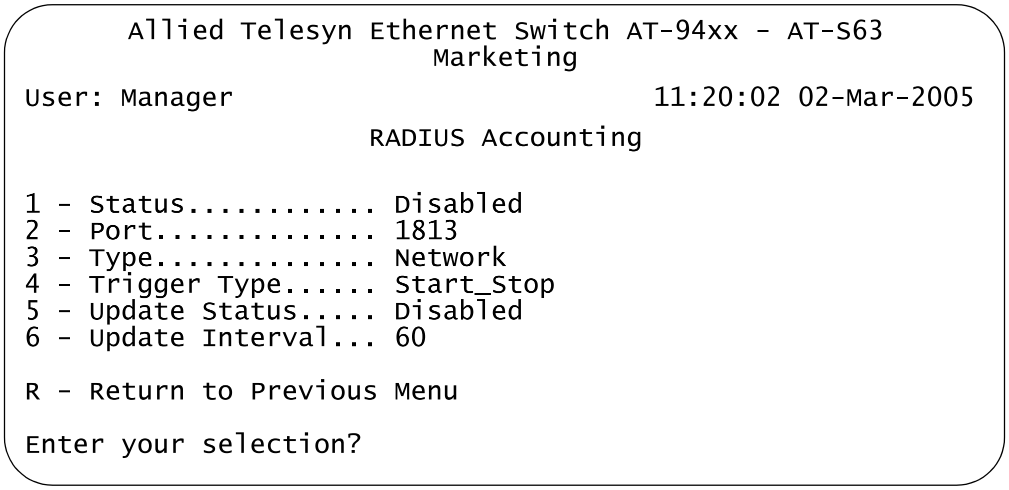
2. From the Security Configuration menu, type **1** to select Port Access Control (802.1X).

3. From the Security Configuration menu, type **1** to select Port Access Control (802.1X).

   The Port Access Control (802.1X) menu is shown in Figure 236 on page 657.

4. From the Port Access Control (802.1X) menu, type **7** to select Configure Accounting.

   The RADIUS Accounting menu is shown in Figure 243.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
                    RADIUS Accounting

1 - Status............ Disabled
2 - Port.............. 1813
3 - Type.............. Network
4 - Trigger Type...... Start_Stop
5 - Update Status..... Disabled
6 - Update Interval... 60

R - Return to Previous Menu

Enter your selection?
```

Figure 243. Radius Accounting Menu

5. Adjust the following parameters as necessary.

1 - Status
This parameter activates or deactivates RADIUS accounting on the switch. Select Enabled to activate the feature or Disabled to deactivate it. The default is Disabled.

2 - Port
This parameter specifies the UDP port for RADIUS accounting. The default is port 1813.

3 - Type
This parameter specifies the type of RADIUS accounting. The default is Network. This value cannot be changed.

4 - Trigger Type
This parameter specifies the action that causes the switch to send accounting information to the RADIUS server. The options are:

Start_Stop
The switch sends accounting information whenever a client logs on or logs off the network. This is the default.

Stop
The switch sends accounting information only when a client logs off.

5 - Update Status
This parameter controls whether the switch is to send interim accounting updates to the RADIUS server. The default is disabled. If you enable this feature, use the next option in the menu to specify the intervals at which the switch is to send the accounting updates.

6 - Update Interval
This parameter specifies the intervals at which the switch sends interim accounting updates to the RADIUS server. The range is 30 to 300 seconds. The default is 60 seconds.

6. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Chapter 29

MAC Address Table

This chapter contains the procedures for viewing the static and dynamic MAC address table.

This chapter contains the following sections:

MAC Address Overview

Each hardware device that you connect to your Ethernet network has a unique MAC address assigned to it by the device's manufacturer. For example, every network interface card (NIC) that you use to connect your computers to your network has a MAC address assigned to it by the adapter's manufacturer.

The AT-9400 Series switch contains a MAC address table with a storage capacity of 16,000 entries. The switch uses the table to store the MAC addresses of the network nodes connected to its ports, along with the port number on which each address was learned.

The switch learns the MAC addresses of the end nodes by examining the source address of each packet received on a port. It adds the address and port on which the packet was received to the MAC table if the address has not already been entered in the table. The result is a table that contains all the MAC addresses of the devices that are connected to the switch's ports, and the port number where each address was learned.

When the switch receives a packet, it also examines the destination address and, by referring to its MAC address table, determines the port where the destination node is connected. It then forwards the packet to the appropriate port and on to the end node. This increases network bandwidth by limiting each frame to the appropriate port when the intended end node is located, freeing the other switch ports for receiving and transmitting data.

If the switch receives a packet with a destination address that is not in the MAC address table, it floods the packet to all the ports on the switch. If the ports have been grouped into virtual LANs, the switch floods the packet only to those ports which belong to the same VLAN as the port on which the packet was received. This prevents packets from being forwarded onto inappropriate LAN segments and increases network security. When the destination node responds, the switch adds its MAC address and port number to the table.

If the switch receives a packet with a destination address that is on the same port on which the packet was received, it discards the packet without forwarding it on to any port. Because both the source node and the destination node for the packet are located on the same port on the switch, there is no reason for the switch to forward the packet. This too increases network performance by preventing frames from being forwarded unnecessarily to other network devices.

The type of MAC address described above is referred to as a *dynamic MAC address*. Dynamic MAC addresses are addresses that the switch learns by examining the source MAC addresses of the frames received on the ports.

Dynamic MAC addresses are not stored indefinitely in the MAC address table. The switch deletes a dynamic MAC address from the table if it does not receive any frames from the node after a specified period of time. The switch assumes that the node with that MAC address is no longer active and that its MAC address can be purged from the table. This prevents the MAC address table from becoming filled with addresses of nodes that are no longer active.

The period of time that the switch waits before purging an inactive dynamic MAC address is called the *aging time*. This value is adjustable on the AT-9400 Series switch. The default value is 300 seconds (5 minutes). For instructions on changing the aging timer, refer to "Changing the Aging Time" on page 682.

The MAC address table can also store *static MAC addresses*. A static MAC address is a MAC address of an end node that you assign to a switch port manually. A static MAC address, after being entered in the table, remains in the table indefinitely and is never deleted, even when the end node is inactive.

You might need to enter static MAC addresses of end nodes the switch does not learn in its normal dynamic learning process, or if you want a MAC address to remain permanently in the table, even when the end node is inactive.

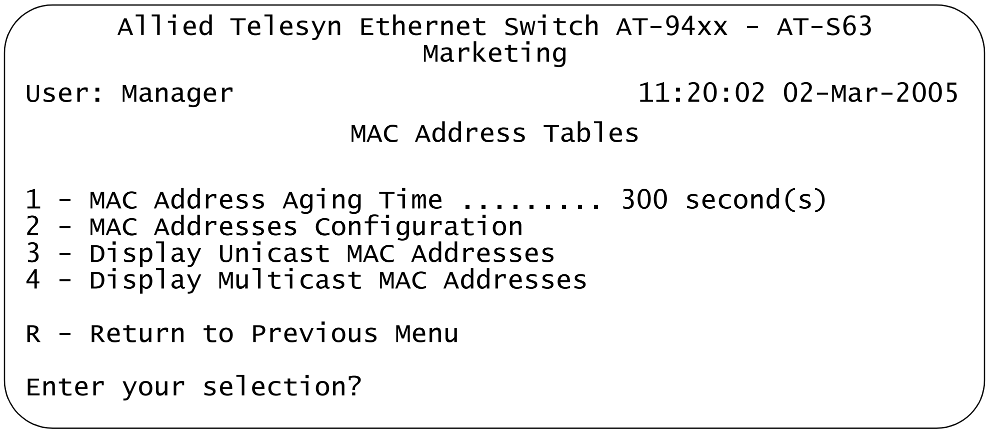
Displaying the MAC Address Tables

The AT-S63 management software has two menu selections for displaying the MAC addresses of a switch. One selection displays the static and dynamic unicast MAC addresses while the other displays the static and dynamic multicast addresses.

To display the MAC address tables, perform the following procedure:

1. From the Main Menu, type **4** to select MAC Address Tables.

   The MAC Address Tables menu is shown in Figure 244.

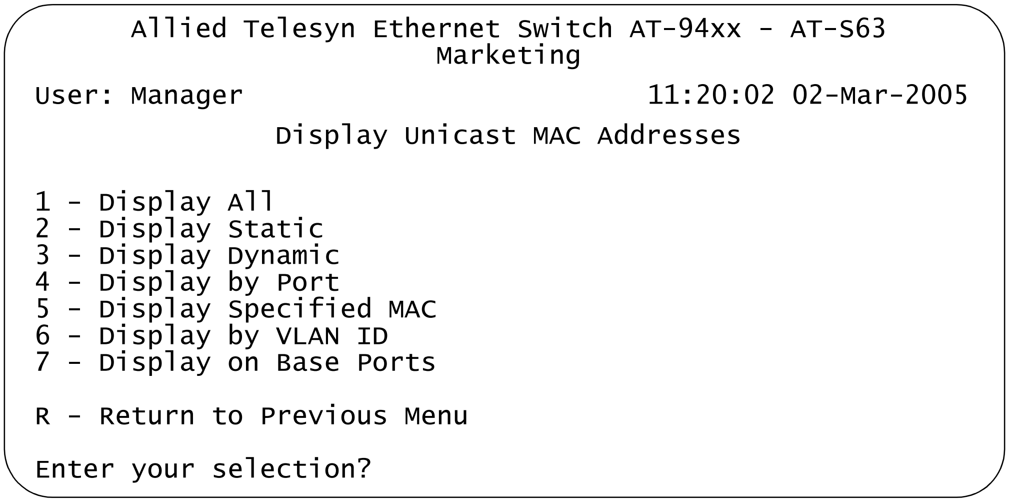


```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
                    MAC Address Tables

1 - MAC Address Aging Time ......... 300 second(s)
2 - MAC Addresses Configuration
3 - Display Unicast MAC Addresses
4 - Display Multicast MAC Addresses

R - Return to Previous Menu

Enter your selection?
```

Figure 244. MAC Address Tables Menu

2. From the MAC Address Tables menu, type **3** to select Display Unicast MAC Addresses or **4** to select Display Multicast MAC Addresses.

The Display Unicast MAC Addresses menu is shown in Figure 245. The Display Multicast MAC Addresses menu contains the same selections.

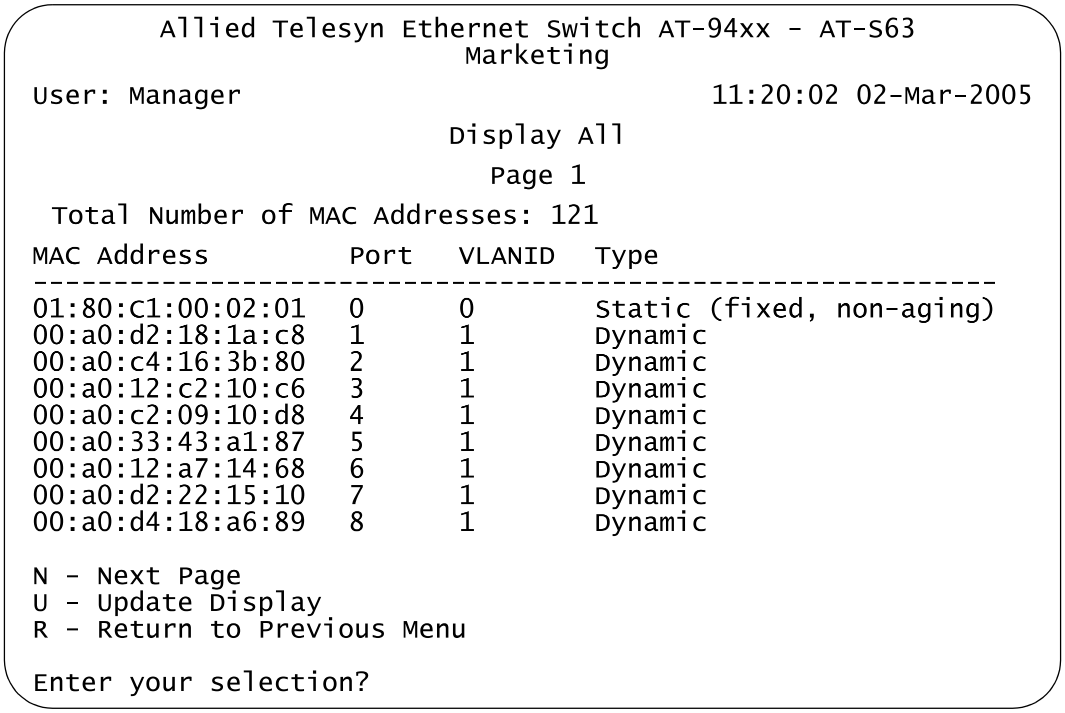


```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                            11:20:02 02-Mar-2005
                 Display Unicast MAC Addresses

1 - Display All
2 - Display Static
3 - Display Dynamic
4 - Display by Port
5 - Display Specified MAC
6 - Display by VLAN ID
7 - Display on Base Ports

R - Return to Previous Menu

Enter your selection?
```

Figure 245. Display Unicast MAC Addresses Menu

Choose one of the following display types.

1 - Display All
This selection displays all dynamic addresses learned on the ports of the switch and all static addresses that have been assigned to the ports. An example of a unicast MAC address table is shown in Figure 246.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                               11:20:02 02-Mar-2005
                         Display All
                           Page 1
 Total Number of MAC Addresses: 121
MAC Address        Port   VLANID   Type
------------------------------------------------------------
01:80:C1:00:02:01   0      0       Static (fixed, non-aging)
00:a0:d2:18:1a:c8   1      1       Dynamic
00:a0:c4:16:3b:80   2      1       Dynamic
00:a0:12:c2:10:c6   3      1       Dynamic
00:a0:c2:09:10:d8   4      1       Dynamic
00:a0:33:43:a1:87   5      1       Dynamic
00:a0:12:a7:14:68   6      1       Dynamic
00:a0:d2:22:15:10   7      1       Dynamic
00:a0:d4:18:a6:89   8      1       Dynamic

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 246. Display All Menu - Unicast MAC Addresses

Note
The first address in the unicast MAC address table is the address of the switch.

A unicast MAC address table contains the following columns of information:

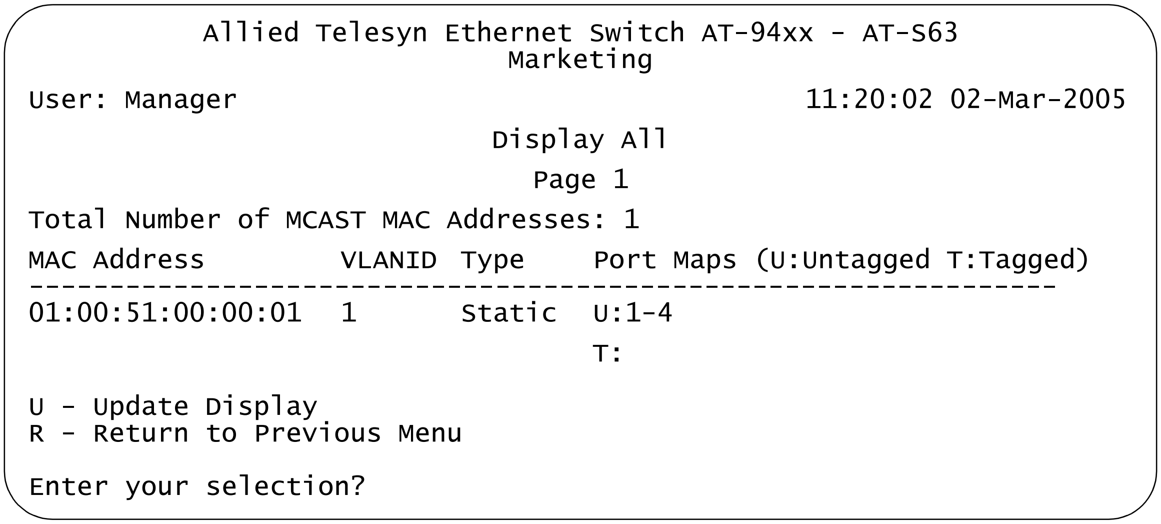
MAC
The static or dynamic multicast MAC address.

Port
The port where the address was learned or assigned. The MAC address with port 0 is the address of the switch.

VLAN ID
The ID number of the VLAN where the port is an untagged member.

Type
The type of the address: static or dynamic.

An example of a multicast MAC address table is shown in Figure 247.



```
            Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing

User: Manager                                    11:20:02 02-Mar-2005

                             Display All

                               Page 1

Total Number of MCAST MAC Addresses: 1

MAC Address        VLANID  Type    Port Maps (U:Untagged T:Tagged)
----------------------------------------------------------------
01:00:51:00:00:01  1       Static  U:1-4
                                   T:

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 247. Display All Menu - Multicast MAC Addresses

The multicast MAC address table contains the following columns of information:

MAC Address
The static or dynamic unicast MAC address.

VLAN ID
The ID number of the VLAN where the port is an untagged member.

Type
The type of the address: static or dynamic.

Port Maps
The tagged and untagged ports on the switch that are members of a multicast group. This column is useful in determining which ports belong to different groups.

The other selections on the menu are:

2 - Display Static
This selection displays only the static addresses assigned to the ports on the switch.

3 - Display Dynamic
This selection displays only the dynamic addresses learned on the ports on the switch.

4 - Display by Port
This selection displays the dynamic and static MAC addresses of a particular port. When you select this option, you are prompted for a port number. You can specify more than one port at a time.

5 - Display Specified MAC
This selection displays the port number on which a MAC address was assigned or learned.

If you want to know on which port a particular MAC address was learned, you can display the MAC address table and scroll through the list looking for the MAC address. But if the switch is part of a large network, finding the address could prove difficult.

When you use the Display Specified MAC selection, you specify the MAC address and the AT-S63 management software automatically locates the port on the switch where the device is connected.

6 - Display by VLAN ID
Displays all the static and dynamic addresses learned on the tagged and untagged ports of a specific VLAN. When you select this option, you are prompted for the VLAN ID number of the VLAN. You can specify only one VLAN at a time

7 - Display on Base Ports
This selection displays the static and dynamic MAC addresses learned on the base ports on the AT-9400 Series switch. It does not display any addresses assigned or learned on any uplink ports.

Adding Static Unicast and Multicast MAC Addresses

This section contains the procedure for adding static unicast and multicast MAC addresses to the switch. You can assign up to 255 static addresses per port on an AT-9400 Series switch.

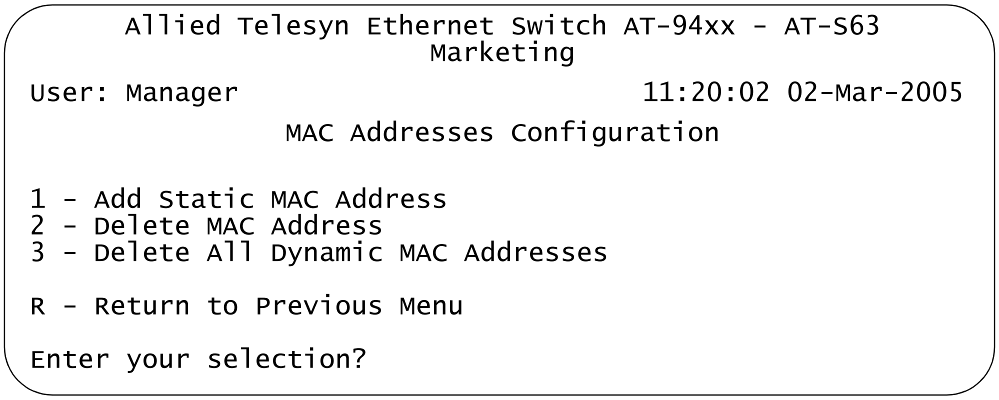
To add a static MAC address, perform the following procedure:

1. From the Main Menu, type **4** to select MAC Address Tables.

   The MAC Address Tables menu is shown in Figure 244 on page 674.

2. From the MAC Address Tables menu, type **2** to select MAC Addresses Configuration.

   The MAC Addresses Configuration menu is shown in Figure 248.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                        11:20:02 02-Mar-2005
                MAC Addresses Configuration

1 - Add Static MAC Address
2 - Delete MAC Address
3 - Delete All Dynamic MAC Addresses

R - Return to Previous Menu

Enter your selection?
```

Figure 248. MAC Addresses Configuration Menu

3. From the MAC Addresses Configuration menu, type **1** to select Add static MAC address.

   The following prompt is displayed:

   ```
   Please enter MAC address ->
   ```

4. Enter the static unicast or multicast MAC address in the following format:

   ```
   XXXXXX XXXXXX
   ```

   After you have specified the MAC address, the following prompt is displayed:

   ```
   Enter port-list: [1 to 24] ->
   ```

5. Enter the number of the port on the switch where you want to assign the static address. If you are adding a static unicast address, you can specify only one port.

   If you are entering a static multicast address, you must specify the port when the multicast application is located as well as the ports where the host nodes are connected. Assigning the address only to the port where the multicast application is located will result in the failure of the multicast packets to be properly forwarded to the host nodes. You can specify the ports individually (e.g., 1,4,5), as a range (e.g., 11-14) or both (e.g., 15-17,22,24).

   The following prompt is displayed:

   ```
   Please enter VLAN ID: [1 to 4094] -> 1
   ```

6. Enter the VLAN ID where the port is a member.

7. Repeat this procedure starting with Step 3 to enter additional static unicast or multicast MAC addresses.

Deleting Unicast and Multicast MAC Addresses

To delete a dynamic or static unicast or multicast address from the MAC address table, perform the following procedure:

1. From the Main Menu, type **4** to select MAC Address Tables.

   The MAC Address Tables menu is shown in Figure 244 on page 674.

2. From the MAC Address Tables menu, type **2** to select MAC Addresses Configuration.

   The MAC Addresses Configuration menu is shown in Figure 248 on page 678.

3. From the MAC Addresses Configuration menu, type **2** to select Delete MAC Address.

   The following prompt is displayed:

   ```
   Please enter a MAC address ->
   ```

4. Enter the unicast or multicast MAC address to be deleted in the following format:

   ```
   XXXXXX XXXXXX
   ```

   After you have entered the MAC address, the following prompt is displayed:

   ```
   Please enter VLAN ID -> [1 to 4094] -> 1
   ```

5. Enter the VLAN ID of the port where the address was assigned or learned.

   The MAC address is deleted from the switch’s MAC address table.

   Note
   You cannot delete a switch’s MAC address, an STP BPDU MAC address, or a broadcast address.

6. Repeat the procedure to delete additional MAC addresses.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting All Dynamic MAC Addresses

To delete all dynamic unicast and multicast MAC address from the MAC address table, perform the following procedure:

1. From the Main Menu, type **4** to select MAC Address Tables.

   The MAC Address Tables menu is shown in Figure 244 on page 674.

2. From the MAC Address Tables menu, type **2** to select MAC Addresses Configuration.

   The MAC Addresses Configuration menu is shown in Figure 248 on page 678.

3. From the MAC Addresses Configuration menu, type **3** to select Delete All Dynamic MAC Addresses.

   The following prompt is displayed:

   ```
   All learned MAC (non-static) addresses will be deleted
   Do you want to continue? [Yes/No] ->
   ```

4. Type **Y** to delete the addresses or **N** to cancel the procedure.

   If you respond with yes, all dynamic unicast and multicast addresses are deleted from the table, and the switch begins to learn new addresses.

Changing the Aging Time

The switch uses the aging time to delete inactive dynamic MAC addresses from the MAC address table. When the switch detects that no packets have been sent to or received from a particular MAC address in the table after the period specified by the aging time, the switch deletes the address. This prevents the table from becoming full of addresses of nodes that are no longer active.

The default setting for the aging time is 300 seconds (5 minutes).

To adjust the aging time, perform the following procedure:

1. From the Main Menu, type **4** to select MAC Address Tables.

   The MAC Address Tables menu is shown in Figure 244 on page 674.

2. From the MAC Address Tables menu, type **1** to select MAC Address Aging Time.

   The following prompt is displayed:

   ```
   Enter MAC address aging time -> [8 to 512]
   ```

3. Enter a new value in seconds.

   The range is 8 to 512 seconds. The default is 300 seconds (5 minutes).

   The new value is immediately activated on the switch.

4. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Section VII

Management Security

The chapters in this section provide information and procedures for basic switch setup using the AT-S63 management software. The chapters include:

Chapter 30

Web Server

The chapter provides an overview of the web server feature and procedures to configure the server. It contains the following sections:

Web Server Overview

The AT-S63 management software is shipped with web server software. The software is available so that you can remotely manage the switch with a web browser from any management station on your network. (The instructions for managing a switch with a web browser are described in the *AT-S63 Network Management Web Browser Interface User's Guide*.)

The web server can operate in two modes. The first is referred to as non-secure HTTP mode. In this mode, packets sent between the switch and the web browser during a management session are transmitted in plaintext. Anyone monitoring your network with a sniffer can view the contents of the management packets.

The web server can also operate in the secure HTTPS mode where all communications between the switch and a web browser are encrypted. This feature uses the Secure Sockets Layer (SSL) protocol. It can help protect your switch from intruders who might be monitoring your network.

If you intend to use the secure HTTPS mode of the web server, there are several procedures you need to perform before you can configure the web server. You must create an encryption key, as explained in Chapter 31, "Encryption Keys" on page 693. You must also create a certificate and add the certificate to the certificate database. This latter part is explained in Chapter 32, "PKI Certificates and SSL" on page 719.

The default setting for the web server is enabled, with the non-secure HTTP mode as the default active mode.

Note
To use SSL in an enhanced stack, all switches in the stack must use SSL. For further information, refer to "SSL and Enhanced Stacking" on page 695.

Supported Protocols

The switch supports the following HTTP and HTTPs protocols:

❒ HTTP v1.0 and v1.1 protocols

❒ HTTPS v1.0 and v1.1 protocols running over SSL

The switch supports the following SSL protocols:

❒ SSL version 2.0

❒ SSL version 3.0

❒ TLS (Transmission Layer Security) version 1.0

Configuring the Web Server

This procedure explains how to enable and disable the web server and how to configure the HTTP and HTTPS settings from a local or Telnet management session. The default setting for the web server is enabled, with the non-secure HTTP mode as the active web server mode.

Before you configure the web server, please note the following:

❒ You cannot make any changes to the HTTP or HTTPS settings while the web server is enabled. You must first disable the web server before making changes.

❒ To configure the web server for the HTTPS secure mode, you must first create an encryption key and a certificate, and add the certificate to the certificate database. The AT-S63 management software does not allow you to configure the web server for the HTTPS secure mode until those steps have been completed. For instructions, refer to Chapter 31, “Encryption Keys” on page 693, and Chapter 32, “PKI Certificates and SSL” on page 719.

❒ To make a change to an HTTP or HTTPS setting, you must perform the entire procedure. For example, to change the port number for HTTP, you must first disable the web server and then reselect HTTP.

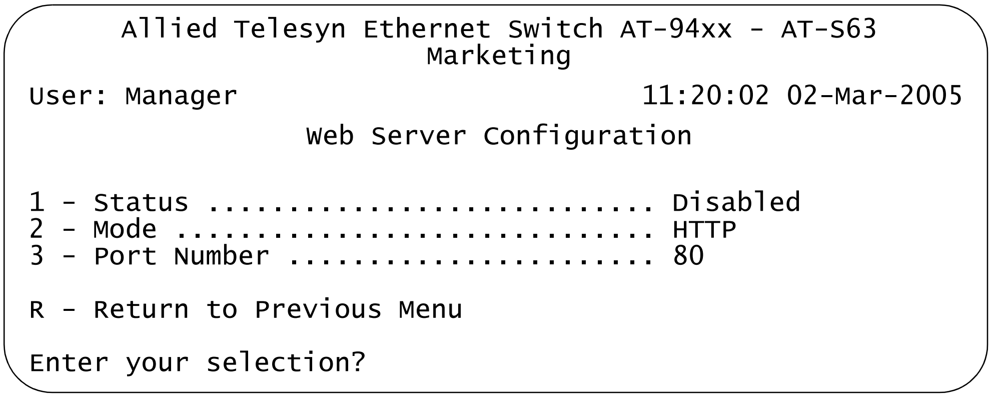
To configure the web server, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **4** to select Web Server Configuration.

The Web Server Configuration menu is shown in Figure 249.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                  Web Server Configuration

1 - Status ........................... Disabled
2 - Mode ............................. HTTP
3 - Port Number ...................... 80

R - Return to Previous Menu

Enter your selection?
```

Figure 249. Web Server Configuration Menu

3. Type **1** to select Status to enable or disable the web server. To configure the web server, you must first disable it.

   Toggle between the following values:

   Enabled - Enables the web server. This is the default setting.

   Disabled - Disables the web server. (If you are making any changes to the web server settings, you must first disable it.)

4. Type **2** to select Mode to set the mode of the web server.

   The following prompt is displayed:

   ```
   Enter Web Server Mode (1 - HTTP, 2 - HTTPS):
   [1 to 2] ->
   ```

1. Choose one of the following:

   1 - HTTP to select the non-secure HTTP mode for the web server. This is the default value.

   2 - HTTPS to select the secure HTTPS mode. This setting activates the SSL protocol on the web server.

   When you choose HTTPS, the following prompt is displayed:

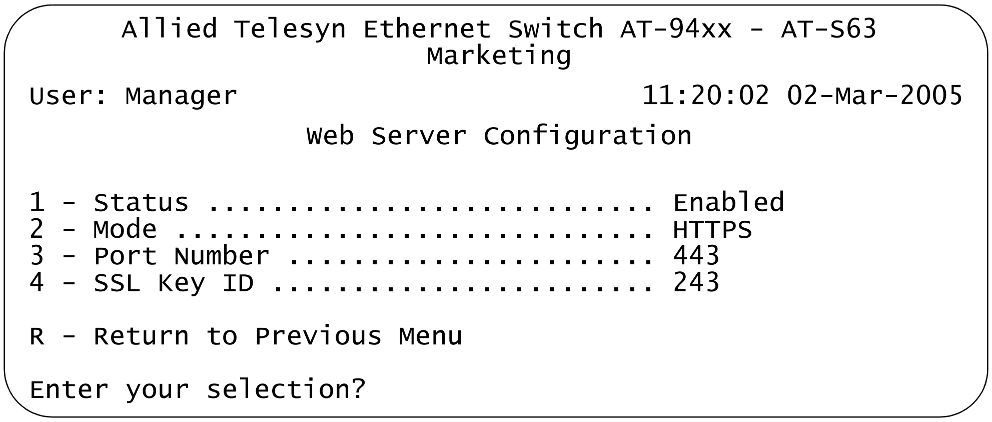
   ```
   Enter SSL Key ID ->
   ```

2. Enter an SSL Key ID.

   Enter the ID number of an encryption key on the switch. (To view the encryption key IDs, refer to “Creating an Encryption Key” on page 705.) You must have already created the encryption key and a certificate using the key. You must also have already added the certificate to the certificate database.

3. To enable the web server, type **1** to toggle Status to **Enabled**.

   The Web Server Configuration menu is redisplayed. Figure 250 shows an example of the menu configured for HTTPS that contains the SSL Key ID.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
                 Web Server Configuration

1 - Status ............................ Enabled
2 - Mode .............................. HTTPS
3 - Port Number ....................... 443
4 - SSL Key ID ........................ 243

R - Return to Previous Menu

Enter your selection?
```

Figure 250. Web Server Configuration Menu Configured for HTTPS

   The default port number for HTTP is 80. The default port number for HTTPS is 443.

1. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

General Steps for Configuring the Web Server for Encryption

There are several procedures you need to perform in order to implement HTTPS and web browser encryption on the switch. This section is here to provide you with the general steps that you need to do to and the procedures for performing them. There is a section for configuring the web server with a self-signed certificate and another for a public or private CA certificate.

General Steps for a Self-signed Certificate

Below are the general steps for setting up the web server with a self-signed certificate.

1. Set the switch's date and time. You must do this before you create a certificate because the date and time are stamped in the digital document. For instructions, refer to "Setting the System Time" on page 58.

2. Create a public and private key pair, as explained in "Creating an Encryption Key" on page 705.

3. Create a self-signed certificate using the key pair, as explained in "Creating a Self-signed Certificate" on page 729.

4. Add the certificate to the certificate database, as explained in "Adding a Certificate to the Database" on page 733.

5. Configure the web server on the switch by activating HTTPS and specifying the key pair used to create the certificate as the active key. This step is explained in "Configuring the Web Server" on page 687.

General Steps for a Public or Private CA Certificate

Below are the steps for setting up the web server with a public or private CA certificate. This requires generating an enrollment request.

1. Set the switch's date and time. You must do this before you create the enrollment request. The date and time at stamped in the request. The instructions for this are in "Setting the System Time" on page 58.

2. Create a key pair, as explained in "Creating an Encryption Key" on page 705.

3. Generate an enrollment request, as explained in "Generating an Enrollment Request" on page 744.

4. Upload the enrollment request from the AT-S63 file system onto your management station or a TFTP server, as explained in "Uploading a System File" on page 222.

5. Submit the enrollment request to the public or private CA.

6. After you have received the appropriate certificates back from the CA, download them into the AT-S63 file system from your management station or a TFTP server, as explained in "Downloading a System File" on page 216.

7. Add the certificates to the certificate database, as explained in "Adding a Certificate to the Database" on page 733.

8. Configure the web server on the switch by activating HTTPS and specifying the key pair used to create the enrollment request as the active key. This step is explained in "Configuring the Web Server" on page 687.

Chapter 31

Encryption Keys

This chapter describes encryption keys and how you can use keys to improve the security of your switches. Because of the complexity of the feature, this chapter contains several overview sections. The Basic Overview section offers a general review of the purpose of this feature along with relevant guidelines. For additional information, refer to the two Technical Overview sections. The sections in this chapter include:

Note
This feature is only supported in the version of AT-S63 management software that features the Secure Sockets Layer (SSL) protocol and Public Key Infrastructure (PKI).

For an overview of the procedures to configuring the switch’s web server for encryption, refer to “General Steps for Configuring the Web Server for Encryption” on page 690.

Basic Overview

Protecting your managed switches from unauthorized management access is an important role for a network manager. Network operations and security can be severely compromised if an intruder gains access to critical switch information, such as a manager's login username and password, and uses that information to alter a switch's configuration settings.

One way an intruder could covertly obtain critical switch information is by monitoring network traffic with a network analyzer, such as a sniffer, and capturing management packets from remote Telnet or web browser management sessions. The payload in the packets exchanged during remote management sessions is transmitted in plaintext, which can be easily deciphered. The information obtained from the management packets could enable an intruder to access a switch.

A way to prevent this type assault is by encrypting the payload in the packets exchanged during a remote management session between a management station and a switch. Encryption makes the packets unintelligible to an outside agent. Only the remote workstation and the switch engaged in the management session are able to decode each other's packets.

The fundamental part of encryption is the encryption key. The key converts plaintext into encrypted text, and back again. A key consists of two separate keys: a private key and a public key. Together they create a *key pair.*

The AT-S63 management software supports encryption for remote web browser management sessions using the Secure Sockets Layer (SSL) protocol. Adding encryption to your web browser management sessions involves creating one key pair and adding the public key of the key pair to a certificate, a digital document stored on the switch. You can have the switch create the certificate itself or you can have a public or private certificate authority (CA) create it for you. For an overview of the steps for adding encryption to your web browser management sessions, refer to "General Steps for Configuring the Web Server for Encryption" on page 690.

The Telnet protocol does not support encryption. To have encryption when you remotely manage a switch using the menus interface, you must first obtain a Secure Shell (SSH) protocol application. SSH offers the same function as Telnet, but with encryption.

SSH encryption requires that you create two key pairs on the switch— a server key pair and a host key pair and then configure the Secure Shell protocol server software on the switch, as explained in Chapter 33, "Secure Shell (SSH)" on page 751.

Encryption Key Length

To create a key pair, you must specify its length. The length is given in bits. The range is 512 to 1,536 bits, in increments of 256 bits. The default is 512 bits.

The general rule on key lengths is that the longer the key, the more difficult it is for someone to break (decipher). So if you are particularly concerned about the safety of your management sessions, use a longer key length than the default, although the default will be more than sufficient.

Creating a key is a very CPU intensive operation for the switch. The switch does not stop forwarding packets between the ports, but the process can impact the CPU’s handling of network events, such as the processing of spanning tree BPDU packets. This can result in unexpected and unwanted switch behavior.

A key with the default length should take the switch less than a minute to create. Longer keys can take up to 15 minutes. Consider this information when you create a key so that you do not to impact the operations of your network. If you want a longer key, consider creating it before you connect the switch to the network, or during periods of low network traffic.

Encryption Key Guidelines

Below are guidelines to observe when creating an encryption key pair:

- Web browser encryption requires only one key pair.
- SSH encryption requires two key pairs. The keys must be of different lengths of at least one increment (256 bits) apart. The recommended size for the server key is 768 bits and the recommended size for the host key is 1024 bits.
- An AT-9400 Series switch can only use those key pairs it has generated itself. The switch cannot use a key created on another system and imported onto the switch.
- The AT-S63 management software does not allow you to copy or export a private key from a switch. However, you can export a public key.
- The AT-S63 management software uses the RSA public key algorithm.
- Web browser and SSH encryption can share a key pair.

SSL and Enhanced Stacking

Secure Sockets Layer (SSL) is supported in an enhanced stack, but only when all switches in the stack are using the feature.

When a switch’s web server is operating in HTTP, management packets are transmitted in plaintext. When it operates in HTTPS, management packets are sent encrypted. The web server on an AT-9400 Series switch, can operate in either mode. Enhanced stacking switches that do not support SSL, such as the AT-8000 Series switches, use HTTP exclusively.

A web browser management session of the switches in an enhanced stack cannot alternate between the different security modes during a session.

The management session assumes that the web server mode that the master switch is using is the same for all the switches in the stack. As an example, if the master switch is using HTTPS, a web browser management session assumes that all the other switches in the stack are also using HTTPS, and it does not allow you to manage any switches running HTTP.

For those networks that consist of enhanced stacking switches where some switches support SSL and others do not, there are two approaches you can take. One is to create different enhanced stacks for the different switches. You could create one enhanced stack for those switches that support SSL and another stack for those that do not. You create different enhanced stacks by assigning switches to different Management VLANs. For information, refer to “Specifying a Management VLAN” on page 581.

Another workaround is to leave the switches in one enhanced stack, but designate two master switches. One master switch could be using HTTP and the other HTTPS. When you want to use your web browser to manage those switches that support SSL, you would start the management session on the master switch whose server mode is set to HTTPS. To manage those switch not supporting SSL, you would start the management session on the master switch whose web server is set to HTTP.

To implement SSL in an enhanced stack, you must create an encryption key pair and a certificate on each switch. When you start a web browser management session on the master switch of an enhanced stack, the management session uses the certificate and key pair on the master switch. When you change to another switch in the stack, the management session starts to use the certificate and key pair on that switch, and so forth.

Technical Overview of Secure Sockets Layer

This section describes the Secure Sockets Layer (SSL) feature, a security protocol that provides a secure and private TCP connection between a client and server.

SSL can be used with many higher layer protocols including HTTP, File Transfer Protocol (FTP) and Net News Transfer Protocol (NNTP). Most web browsers and servers support SSL, and its most common deployment is for secure connections between a client and server over the Internet.

The switch supports SSL versions 2.0 (client hello only) and 3.0 which were developed by Netscape, and the Internet Engineering Task Force (IETF) standard for SSL, known as SSL version 3.1 or Transport Layer Security (TLS).

Within the Ethernet protocol stack, SSL is a Layer 4 protocol that is in between the HTTP and TCP protocol layers. HTTP communicates with SSL in the same way as with TCP. In other words, TCP processes SSL requests like any other protocol requesting its services.

SSL provides a secure connection over which web pages can be accessed from an HTTP server. The operation of SSL is transparent to the end user who is accessing a web site with the following exceptions:

❐ The site's URL changes from HTTP to HTTPS.

❐ The browser indicates that it is a secured connection by displaying an icon, such as a padlock icon.

By default, HTTP and HTTPS use the separate well-known ports 80 and 443, respectively. Secure connections over the Internet are important when transmitting confidential data such as credit card details or passwords. SSL allows the client to verify the server's identity before either side sends any sensitive information. SSL also prevents a third party from interfering with the message because only trusted devices have access to the unprotected data.

SSL Encryption

SSL uses *encryption* to ensure the security of data transmission. Encryption is a process that uses an algorithm to encode data so it can only be accessed by a trusted device. An encrypted message remains confidential.

All application data messages are authenticated by SSL with a *message authentication code* (MAC). The MAC is a checksum that is created by the sender and is sent as part of the encrypted message. The recipient re-calculates the MAC, and if the values match, the sender's identity is verified. The MAC also ensures that the message has not been tampered with by a third party because any change to the message changes the

MAC.

SSL uses *asymmetrical (Public Key)* encryption to establish a connection between client and server, and *symmetrical (Secret Key)* encryption for the data transfer phase.

User Verification

An SSL connection has two phases: *handshake* and *data transfer*. The *handshake* initiates the SSL *session*, during which data is securely transmitted between a client and server. During the handshake, the following occurs:

- The client and server establish the SSL version they are to use.
- The client and server negotiate the *cipher suite* for the session, which includes encryption, authentication, and key exchange algorithms.
- The *symmetrical key* is exchanged.
- The client authenticates the server (optionally, the server authenticates the client).

SSL messages are encapsulated by the *Record Layer* before being passed to TCP for transmission. Four types of SSL messages exist, they are:

- Handshake
- Change Cipher Spec
- Alert
- Application data (HTTP, FTP or NNTP)

As discussed previously, the Handshake message initiates the SSL session.

The *Change Cipher Spec* message informs the receiving party that all subsequent messages are encrypted using previously negotiated security options. The parties use the strongest cryptographic systems that they both support.

The *Alert* message is used if the client or server detects an error. Alert messages also inform the other end that the session is about to close. In addition, the Alert message contains a severity rating and a description of the alert. For example, an alert message is sent if either party receives an invalid certificate or an unexpected message.

The *Application data* message encapsulates the encrypted application data.

Authentication

Authentication is the process of ensuring that both the web site and the end user are genuine. In other words, they are not imposters. Both the server and an individual users need to be authenticated. This is especially important when transmitting secure data over the Internet.

To verify the authenticity of a server, the server has a public and private key. The public key is given to the user.

SSL uses *certificates* for authentication. A certificate binds a public key to a server name. A certification authority (CA) issues certificates after checking that a public key belongs to its claimed owner. There are several agencies that are trusted to issue certificates. Individual browsers have approved Root CAs that are built in to the browser.

Technical Overview of Encryption

The encryption feature provides the following data security services:

- Data encryption
- Data authentication
- Key exchange algorithms
- Key creation and storage

Data Encryption

Data encryption for switches is driven by the need for organizations to keep sensitive data private and secure. Data encryption operates by applying an encryption algorithm and key to the original data (the plaintext) to convert it into an encrypted form (the ciphertext). The ciphertext produced by encryption is a function of the algorithm used and the key. Because it is easy to discover what type of algorithm is being used, the security of an encryption system relies on the secrecy of its key information. When the ciphertext is received by the remote router, the decryption algorithm and key are used to recover the original plaintext. Often, a checksum is added to the data before encryption. The checksum allows the validity of the data to be checked on decryption.

There are two main classes of encryption algorithm in use: symmetrical encryption and asymmetrical encryption.

Symmetrical Encryption

Symmetrical encryption refers to algorithms in which a single key is used for both the encryption and decryption processes. Anyone who has access to the key used to encrypt the plaintext can decrypt the ciphertext. Because the encryption key must be kept secret to protect the data, these algorithms are also called private, or secret key algorithms. The key can be any value of the appropriate length.

DES Encryption Algorithms

The most common symmetrical encryption system is the *Data Encryption Standard* (DES) algorithm (FIPS PUB 46). The DES algorithm has withstood the test of time and proved itself to be a highly secure encryption algorithm. To fully conform to the DES standard, the actual data encryption operations must be carried out in hardware. Software implementations can only be DES-compatible, not DES-compliant. The DES algorithm has a key length of 56 bits and operates on 64-bit blocks of data. DES can be used in the following modes:

- **Electronic Code Book (ECB)** is the fundamental DES function. Plaintext is divided into 64-bit blocks which are encrypted with the DES algorithm and key. For a given input block of plaintext ECB always produces the same block of ciphertext.

- **Cipher Block Chaining (CBC)** is the most popular form of DES encryption. CBC also operates on 64-bit blocks of data, but includes a feedback step which chains consecutive blocks so that repetitive plaintext data, such as ASCII blanks, does not yield identical ciphertext. CBC also introduces a dependency between data blocks which protects against fraudulent data insertion and replay attacks. The feedback for the first block of data is provided by a 64-bit Initialization Vector (IV). This is the DES mode used for the switch's data encryption process.
- **Cipher FeedBack (CFB)** is an additive-stream-cipher method which uses DES to generate a pseudo-random binary stream that is combined with the plaintext to produce the ciphertext. The ciphertext is then fed back to form a portion of the next DES input block.
- **Output FeedBack (OFB)** combines the first IV DES algorithms with the plaintext to form ciphertext. The ciphertext is then used as the next IV.

The DES algorithm has been optimized to produce very high speed hardware implementations, making it ideal for networks where high throughput and low latency are essential.

Triple DES Encryption Algorithms

The Triple DES (3DES) encryption algorithm is a simple variant on the DES CBC algorithm. The DES function is replaced by three rounds of that function, an encryption followed by a decryption followed by an encryption. This can be done by using either two DES keys (112-bit key) or three DES keys (168-bit key).

The two-key algorithm encrypts the data with the first key, decrypts it with the second key and then encrypts the data again with the first key. The three-key algorithm uses a different key for each step. The three-key algorithm is the most secure algorithm due to the long key length.

There are several modes in which Triple DES encryption can be performed. The two most common modes are:

- **Inner CBC mode** encrypts the entire packet in CBC mode three times and requires three different initial is at ion vectors (IV's).
- **Outer CBC mode** triple encrypts each 8-byte block of a packet in CBC mode three times and requires one IV.

Asymmetrical (Public Key) Encryption

Asymmetrical encryption algorithms use two keys—one for encryption and one for decryption. The encryption key is called the public key because it cannot be used to decrypt a message and therefore does not need be kept secret. Only the decryption, or private key, needs to be kept secret. The other name for this type of algorithm is public key encryption. The public and private key pair cannot be randomly assigned, but must be generated together. In a typical scenario, a decryption station generates a key pair and then distributes the public key to encrypting stations. This distribution does not need to be kept secret, but it must be protected against the substitution of the public key by a malicious third party. Another use for asymmetrical encryption is as a digital signature. The signature station publishes its public key, and then signs its messages by encrypting them with its private key. To verify the source of a message, the receiver decrypts the messages with the published public key. If the message that results is valid, then the signing station is authenticated as the source of the message.

The most common asymmetrical encryption algorithm is RSA. This algorithm uses mathematical operations which are relatively easy to calculate in one direction, but which have no known reverse solution. The security of RSA relies on the difficulty of factoring the modulus of the RSA key. Because key lengths of 512 bits or greater are used in public key encryption systems, decrypting RSA encrypted messages is almost impossible using current technology. The AT-S63 management software uses the RSA algorithm.

Asymmetrical encryption algorithms require enormous computational resources, making them very slow when compared to symmetrical algorithms. For this reason they are normally only used on small blocks of data (for example, exchanging symmetrical algorithm keys), and not for entire data streams.

Data Authentication

Data authentication for switches is driven by the need for organizations to verify that sensitive data has not been altered.

Data authentication operates by calculating a message authentication code (MAC), commonly referred to as a *hash*, of the original data and appending it to the message. The MAC produced is a function of the algorithm used and the key. Because it is easy to discover what type of algorithm is being used, the security of an authentication system relies on the secrecy of its key information. When the message is received by the remote switch, another MAC is calculated and checked against the MAC appended to the message. If the two MACs are identical, the message is authentic.

Typically a MAC is calculated using a keyed one-way hash algorithm. A keyed one-way hash function operates on an arbitrary-length message and a key. It returns a fixed length hash. The properties which make the hash function one-way are:

❒ It is easy to calculate the hash from the message and the key

❒ It is very hard to compute the message and the key from the hash

❐ It is very hard to find another message and key which give the same hash

The two most commonly used one-way hash algorithms are MD5 (Message Digest 5, defined in RFC 1321) and SHA-1 (Secure Hash Algorithm, defined in FIPS-180-1). MD5 returns a 128-bit hash and SHA-1 returns a 160-bit hash. MD5 is faster in software than SHA-1, but SHA-1 is generally regarded to be slightly more secure.

HMAC is a mechanism for calculating a keyed Message Authentication Code which can use any one-way hash function. It allows for keys to be handled the same way for all hash functions and it allows for different sized hashes to be returned.

Another method of calculating a MAC is to use a symmetric block cypher such as DES in CBC mode. This is done by encrypting the message and using the last encrypted block as the MAC and appending this to the original message (plain-text). Using CBC mode ensures that the whole message affects the resulting MAC.

Key Exchange Algorithms

Key exchange algorithms are used by switches to securely generate and exchange encryption and authentication keys with other switches. Without key exchange algorithms, encryption and authentication session keys must be manually changed by the system administrator. Often, it is not practical to change the session keys manually. Key exchange algorithms enable switches to re-generate session keys automatically and on a frequent basis.

The most important property of any key exchange algorithm is that only the negotiating parties are able to decode, or generate, the shared secret. Because of this requirement, public key cryptography plays an important role in key exchange algorithms. Public key cryptography provides a method of encrypting a message which can only be decrypted by one party. A switch can generate a session key, encrypt the key using public key cryptography, transmit the key over an insecure channel, and be certain that the key can only be decrypted by the intended recipient. Symmetrical encryption algorithms can also be used for key exchange, but commonly require an initial shared secret to be manually entered into all switches in the secure network.

The *Diffie-Hellman* algorithm, which is used by the AT-S63 management software, is one of the more commonly used key exchange algorithms. It is not an encryption algorithm because messages cannot be encrypted using Diffie-Hellman. Instead, it provides a method for two parties to generate the same shared secret with the knowledge that no other party can generate that same value. It uses public key cryptography and is commonly known as the first public key algorithm. Its security is based on the difficulty of solving the *discrete logarithm problem*, which can be compared to the difficulty of factoring very large integers.

A Diffie-Hellman algorithm requires more processing overhead than RSA-based key exchange schemes, but it does not need the initial exchange of public keys. Instead, it uses published and well tested public key values. The security of the Diffie-Hellman algorithm depends on these values. Public key values less than 768 bits in length are considered to be insecure.

A Diffie-Hellman exchange starts with both parties generating a large random number. These values are kept secret, while the result of a public key operation on the random number is transmitted to the other party. A second public key operation, this time using the random number and the exchanged value, results in the shared secret. As long as no other party knows either of the random values, the secret is safe.

Creating an Encryption Key

This section contains the procedure for creating an encryption key pair.

Caution
Key generation is a CPU-intensive process. Because this process may affect switch behavior, Allied Telesyn recommends creating keys when the switch is not connected to a network or during periods of low network activity.

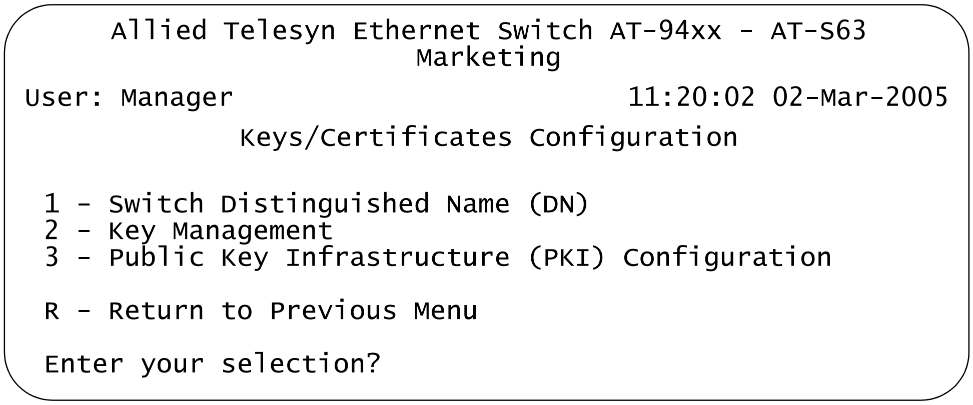
To create an encryption key, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/Certificate Configuration.

   The Keys/Certificate Configuration menu is shown in Figure 251.

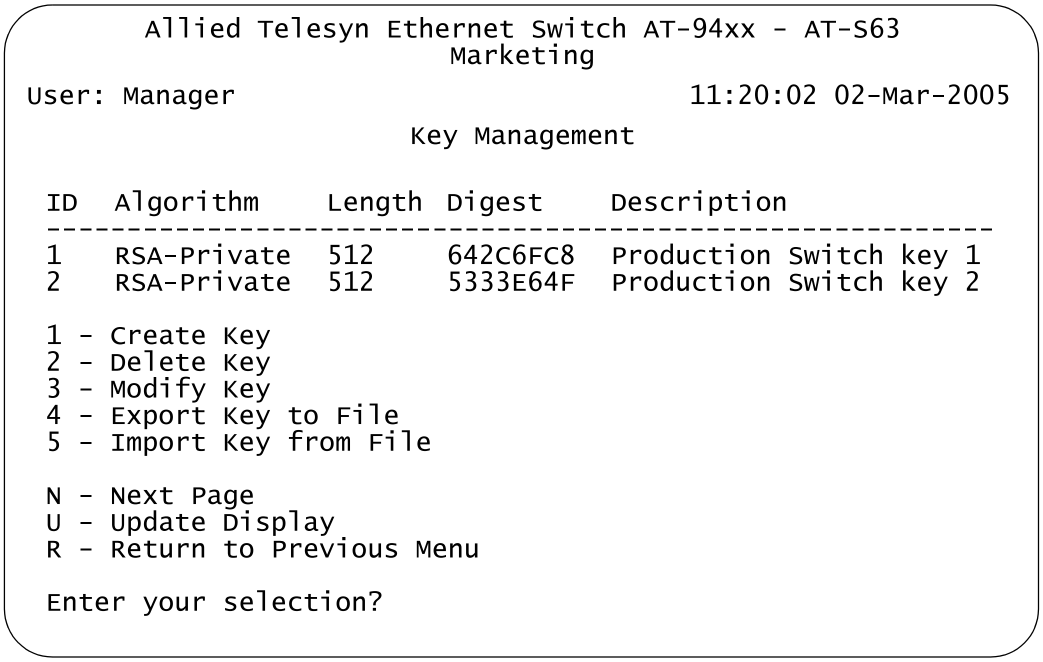


```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                         11:20:02 02-Mar-2005
              Keys/Certificates Configuration

 1 - Switch Distinguished Name (DN)
 2 - Key Management
 3 - Public Key Infrastructure (PKI) Configuration

 R - Return to Previous Menu

 Enter your selection?
```

Figure 251. Keys/Certificate Configuration Menu

3. From the Keys/Certificates Configuration menu, type **2** to select Key Management.

The Key Management menu is shown in Figure 252.

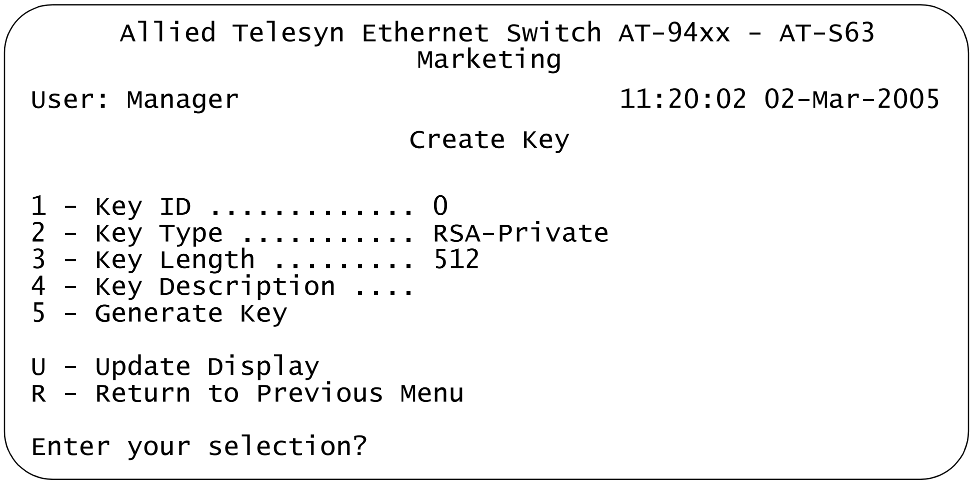


```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                             11:20:02 02-Mar-2005
                        Key Management

 ID  Algorithm    Length Digest    Description
 -----------------------------------------------------------
 1   RSA-Private  512    642C6FC8  Production Switch key 1
 2   RSA-Private  512    5333E64F  Production Switch key 2

 1 - Create Key
 2 - Delete Key
 3 - Modify Key
 4 - Export Key to File
 5 - Import Key from File

 N - Next Page
 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

Figure 252. Key Management Menu

4. Type **1** to select Create Key.

   The Create Key menu is shown in Figure 253.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                         11:20:02 02-Mar-2005
                       Create Key

1 - Key ID ............ 0
2 - Key Type .......... RSA-Private
3 - Key Length ........ 512
4 - Key Description ....
5 - Generate Key

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 253. Create Key Menu

5. From the Create Key menu, type **1** to select Key ID.

   The following prompt is displayed:

```
Enter Key Id -> [0 to 65535] -> 0
```

6. Enter an identification number for the key. This number can be from 0 to 65,535. This number is used only for identification purposes and not in generating the actual encryption key. The ID for each key on the switch must be unique.

   Note
   You cannot change the value for option 2, Key Type. This value is always RSA - Private.

7. Type **3** to select Key Length.

   The following prompt is displayed:

   ```
   Enter Key Length ->[512 to 1536] -> 512
   ```

8. Enter a key length. The range is 512 to 1,536 bits, in increments of 256 bits (for example, 512, 768, 1024, etc). Before selecting a key length, note the following

   - For SSL and web browser encryption, key length can be any valid value within the range.
   - For SSH host and server key pairs, the two keys must be created separately and be of different lengths of at least one increment (256 bits) apart. The recommended length for the server key is 768 bits and the recommended length for the host key is 1024 bits.

9. Type **4** to select Key Description.

   The following prompt is displayed:

   ```
   Enter new Description ->
   ```

10. Enter a description for the key. For instance, the description could reflect the name of the switch (for example, Production switch web server key). You can enter up to 40 alphanumeric values including spaces.

11. Type **5** to select Generate Key.

    The following message is displayed:

    ```
    Key generation will take some time. Please wait...
    ```

    The AT-S63 management software begins to create the key. This process can take over a minute if you specified a long key length. After the key is created, you will see this message:

    ```
    Press any key to continue ...
    ```

12. Press any key.

The new key is added to the list of keys in the Key Management menu.

Returning to the Main Menu to save your changes is not necessary with this procedure. This type of change is automatically saved by the management software.

To create a self-signed certificate using the new encryption key, go to “Creating a Self-signed Certificate” on page 729. To create an enrollment request, go to “Generating an Enrollment Request” on page 744.

If you created server and host keys for SSH encryption, go to “Configuring SSH” on page 756 to configure the SSH server software on the switch.

Deleting an Encryption Key

This section contains the procedure for deleting an encryption key pair from the switch. Note the following before performing this procedure.

- Deleting a key pair from the key management database also deletes the key's corresponding ".ukf" file from the AT-S63 file system.
- You cannot delete a key pair if it is being used by SSL or SSH. You must either disable the SSL or SSH server software or reconfigure the software by specifying another key.
- Deleting a key pair used in creating an SSL certificate voids the certificate.

To delete a public and private key pair, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/Certificate Configuration.

   The Keys/Certificate Configuration menu is shown in Figure 251 on page 705.

3. From the Keys/Certificates Configuration menu, type **2** to select Key Management.

   The Key Management menu is shown in Figure 252 on page 706.

4. From the Key Management menu, type **2** to select Delete Key.

   The following prompt is displayed:

   ```
   Enter Key Id to delete -> [0 to 65535] -> 0
   ```

5. Enter the ID number of the key you want to delete.

   The key pair is deleted from the key database and its corresponding ".UKF" file is deleted from the file system.

   Returning to the Main Menu to save your changes is not necessary with this procedure. This type of change is automatically saved by the management software.

Modifying an Encryption Key

The Key Management menu has a selection for modifying the description of an encryption key. This is the only item of a key that you can modify. You cannot change a key's ID, type, or length.

To change the description of a key, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/Certificate Configuration.

   The Keys/Certificate Configuration menu is shown in Figure 251 on page 705.

3. From the Keys/Certificates Configuration menu, type **2** to select Key Management.

   The Key Management menu is shown in Figure 252 on page 706.

4. From the Key Management menu, type, type **3** to select Modify Key.

   The following prompt is displayed:

   ```
   Enter Key Id to modify -> [0 to 65535] -> 0
   ```

5. Enter the ID of the key whose description you want to modify.

   The following prompt is displayed.

   ```
   Enter new Description ->
   ```

6. Enter the new description for the key. The description can be up to 40 alphanumeric characters including spaces. To help identify the key, you might make the description the name of the web server the key will be used to protect (for example, Production switch web server).

   The following prompt is displayed:

   ```
   Press any key to continue ...
   ```

   The key has been modified.

7. Press any key to return to the Key Management menu.

   Returning to the Main Menu to save your changes is not necessary with this procedure. This type of change is automatically saved by the management software.

Exporting an Encryption Key

The following procedure exports the public key of a key pair into the AT-S62 file system. (The management software does not allow you to export a private key.) Before performing this procedure, please note the following:

- ❒ The only circumstance in which you are likely to perform this procedure is if you are using an SSH client that does not download the key automatically when you start an SSH management session. In that situation, you can use this procedure to export the SSH client key from the key database into the AT-S62 file system, from where you can download it onto the SSH management session for incorporation in your SSH client software.
- ❒ You should not use this procedure to export an SSL public key. Typically, an SSL public key only has value when incorporated into a certificate or enrollment request.

To export a public key into the file system, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/Certificate Configuration.

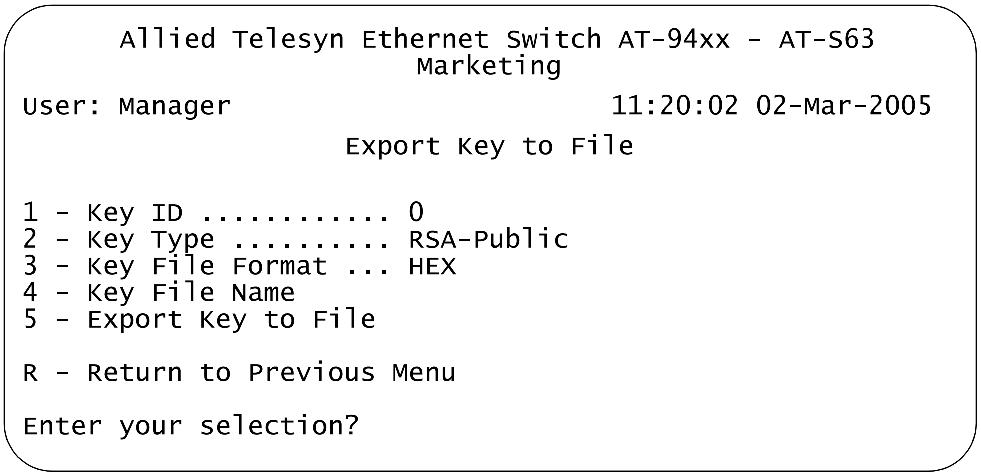
   The Keys/Certificate Configuration menu is shown in Figure 251 on page 705.

3. From the Keys/Certificates Configuration menu, type **2** to select Key Management.

   The Key Management menu is shown in Figure 252 on page 706.

4. From the Key Management menu, type, type **4** to select Export Key to File.

The Export Key to File menu is shown in Figure 254.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
                    Export Key to File

1 - Key ID ........... 0
2 - Key Type ......... RSA-Public
3 - Key File Format ... HEX
4 - Key File Name
5 - Export Key to File

R - Return to Previous Menu

Enter your selection?
```

Figure 254. Export Key to File Menu

5. From the Export Key to File menu, type **1** to select Key ID.

   The following prompt is displayed:

   ```
   Enter Key ID -> [0 to 65535] ->
   ```

6. Enter the key ID of the public key you want to export into the file system.

   Note
   Key Type is a read-only field. You cannot change this value.

7. Type **3** to toggle Key File Format to specify the format of the key. Possible options are:

   HEX - An internal format for storing files. Select this option for SSL configuration. This is the default.

   SSH - A format for a Secure Shell (SSH) environment. Select this option for a SSH server or client.

8. Type **4** to select Key File Name.

   The following prompt is displayed:

   ```
   Enter filename (*.key) ->
   ```

9. Specify the file name of the key. The file name can be from one to eight alphanumeric characters, not including the extension. Spaces are allowed. The file name must include the extension “.key”.

10. Type **5** to select Export Key to File to export the key to a file.

The following message is displayed:

```
Key Export in Progress. Please wait...Done
```

11. Press any key to return to the Key Management menu.

To view the public key in the switch’s file system, refer to “Displaying System Files” on page 195.

Returning to the Main Menu to save your changes is not necessary with this procedure. This type of change is automatically saved by the management software.

Importing an Encryption Key

Use the following procedure to import a public key from the AT-S62 file system into the key management database. If a file contains both public and private keys, only the public key is imported. The private key is ignored.

Note
It is unlikely that you will ever need to perform this procedure for an SSL public key. A switch can only use those SSL public keys that it has generated itself.

This procedure starts from the Key Management menu. If you are unsure how to display the menu, perform steps 1 to 3 in “Creating an Encryption Key” on page 705.

To import a public key, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/Certificate Configuration.

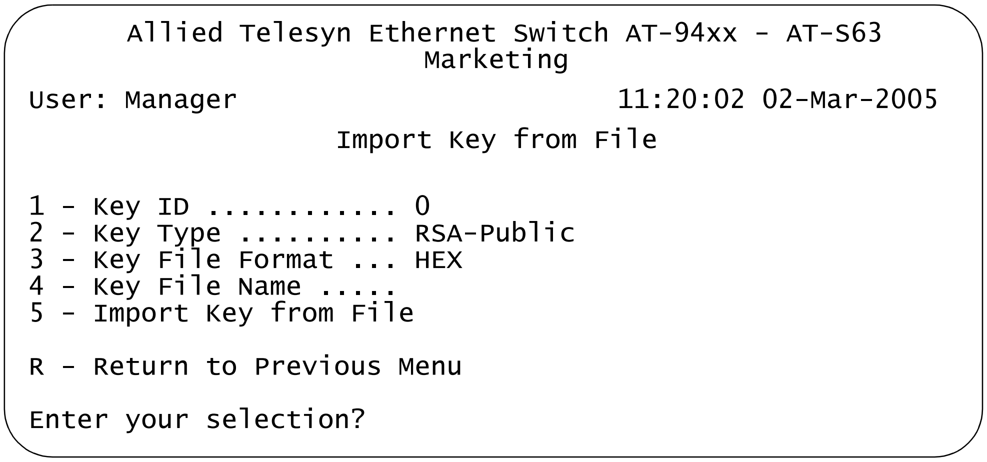
   The Keys/Certificate Configuration menu is shown in Figure 251 on page 705.

3. From the Keys/Certificates Configuration menu, type **2** to select Key Management.

   The Key Management menu is shown in Figure 252 on page 706.

4. From the Key Management menu, type **5** to select Import Key From File to import an RSA - Public key.

The Import Key from File menu is shown in Figure 255.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                       11:20:02 02-Mar-2005
                   Import Key from File

1 - Key ID ........... 0
2 - Key Type .......... RSA-Public
3 - Key File Format ... HEX
4 - Key File Name .....
5 - Import Key from File

R - Return to Previous Menu

Enter your selection?
```

Figure 255. Import Key from File Menu

5. From the Import Key from File menu, type **1** to select Key ID.

   The following prompt is displayed:

   ```
   Enter Key ID -> [0 to 65535] ->
   ```

6. Enter a key ID for the public key.

   This must be an unused key ID. It cannot match any of the key IDs that are already in use on the switch.

   Note
   You cannot change Option 2, Key Type.

7. Type **3** to select Key File Format to choose the format of the key. The possible options are:

   HEX - An internal format for storing files. Select this option for SSL configuration. This is the default.

   SSH - A format for a Secure Shell (SSH) environment. Select this option for a SSH server or client.

8. Type **4** to select Key File Name.

   The following prompt is displayed:

   ```
   Enter filename (*.key) ->
   ```

9. Specify the file name of the key.

The key file name must include the “.key” extension. If you are unsure of the file name, display the files in the switch’s file system by referring to “Displaying System Files” on page 195.

10. Type **5** to select Import Key From File to import a key to the switch from an external file.

    The following message is displayed:

    ```
    Key Import in Progress. Please wait...Done
    ```

    After you receive this message, the key is added to the Key Management database. See the Key Management menu in Figure 252 on page 706.

    Returning to the Main Menu to save your changes is not necessary with this procedure. This type of change is automatically saved by the management software.

Displaying the Encryption Keys

To display the encryption keys, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

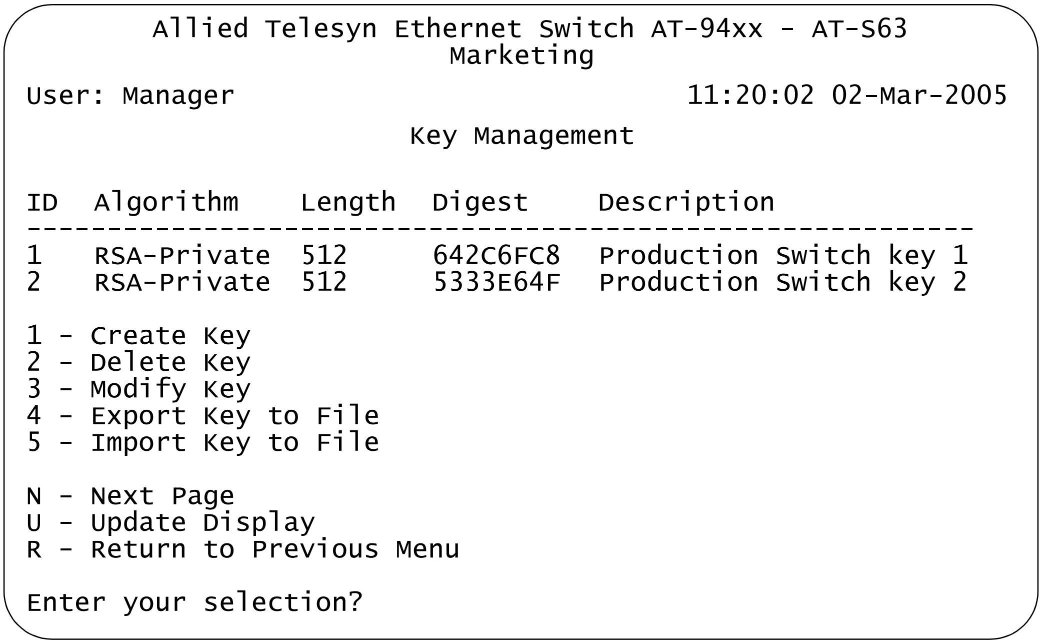
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/Certificate Configuration.

   The Keys/Certificate Configuration menu is shown in Figure 251 on page 705.

3. From the Keys/Certificates Configuration menu, type **2** to select Key Management.

   The Key Management Menu is shown in Figure 256.



```
         Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                           Marketing
User: Manager                                11:20:02 02-Mar-2005
                         Key Management

ID  Algorithm    Length  Digest    Description
-----------------------------------------------------------
1   RSA-Private  512     642C6FC8  Production Switch key 1
2   RSA-Private  512     5333E64F  Production Switch key 2

1 - Create Key
2 - Delete Key
3 - Modify Key
4 - Export Key to File
5 - Import Key to File

N - Next Page
U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 256. Key Management Menu

The Key Management menu displays a table that contains the following columns of information:

ID
The identification number of the key.

Algorithm
The algorithm used in creating the encryption. This is always RSA-Private.

Length
The length of the key in bits.

Digest
The CRC32 value of the MD5 digest of the public key.

Description
The key’s description.

Chapter 32

PKI Certificates and SSL

This chapter contains the procedures for creating public key infrastructure (PKI) certificates for web server security. Because of the complexity of this feature, two overview sections are provided. The Basic Overview section offers a general review of the purpose of certificates along with relevant guidelines. For additional information refer to the Technical Overview section. This chapter contains the following sections:

Note
This feature is only supported on the version of AT-S63 management software that features secure sockets layer (SSL) and public key infrastructure (PKI).

Basic Overview

This chapter describes the second part of the encryption feature of the AT-S63 management software—PKI certificates. The first part is explained in Chapter 31, “Encryption Keys” on page 693. Encryption keys and certificates allow you to encrypt the communications between your management station and a switch when you manage the device with a web browser. Encryption helps protect your switch from any intruder who might be using a sniffer to monitor the network.

Types of Certificates

As explained in the previous chapter, an encryption key is used to encrypt the information in the frames that are exchanged between a switch and a web browser during a web browser management session.

An encryption key consists of two parts: a private key and a public key. The private key remains on the switch and is used by the device to encrypt its messages.

The public key is incorporated into a certificate. This is the key that your management station uses when you perform a web browser management session. Your web browser downloads the certificate from the switch when you begin a management session.

The quickest and easiest way to create a certificate is to have the switch create it itself. This type of certificate is called a *self-signed certificate*. If you have a small to medium sized network, then this might be the way to go. The procedure for creating this kind of certificate can be found in “Creating a Self-signed Certificate” on page 729. To review all the steps to configuring the web server for this type of certificate, refer to “General Steps for Configuring the Web Server for Encryption” on page 690.

Another option is to create the key but have someone else issue the certificate. That person, group, or organization is called a *certification authority* (CA).

There are two kinds of CAs: public and private. A public CA issues certificates for other companies and organizations. A prominent example of a public CA is VeriSign. A public CA requires proof of the identify of the company or organization that wants a certificate before it issues it.

Public CAs issue certificates that are typically intended for use by the general public. Because a certificate for an AT-9400 Series switch is used only by you and other network managers, you might decide that it is not necessary to have a public CA issue an AT-9400 Series switch certificate.

Some large companies have private CAs. This is a person or group within the company that is responsible for issuing certificates for the company’s network equipment. The value of a private CA is that the company can keep track of the certificates and control access to various network devices.

If your company is large enough, it might have a private CA and you might want that group to issue any AT-9400 Series switch certificates, if for no other reason than to follow company policy.

What is required to create a certificate by a public or private CA? First, you must create a key pair. After you have done that you need to generate an digital document called an *enrollment request*. The request contains the public key that you want the CA to use to create the certificate, along with other information.

Before you send an enrollment request to a CA, it is best to first contact the CA to determine what other documents or procedures might be required in order for the CA to create the certificate. This is particularly important with public CAs, which typically have strict guidelines on issuing certificates.

Distinguished Names

Part of the task of creating a self-signed certificate or enrollment request is selecting a *distinguished name*. A distinguished name is integrated into a certificate along with the key. A distinguished name can have up to five parts. The parts are:

❒ cn - common name

This can be the name of the person who will use the certificate.

❒ ou - organizational unit

This is the name of a department, such as Network Support or IT.

❒ o - organization

This is the name of the company.

❒ st - state

This is the state.

❒ c - country

This is the country

A certificate name does not need to contain all of these parts. You can use as many or as few as you want. You separate the parts with a comma. You can use alphanumeric characters, as well as spaces in the name strings. You cannot use quotation marks. To use the following special characters {=,+<>#;\<CR>}, type a "\" before the character.

Following are a few examples. This distinguished name contains only one part, the name of the switch:

cn=Production Switch

This distinguished name omits the common name, but includes everything else:

ou=Network Support,o=XYZ Inc.,st=CA,c=US

So what would be a good distinguished name for a certificate for an AT-8524M switch? If the switch has an IP address, such as a master switch, you could use its address as the name. The following example is a distinguished name for a certificate for a master switch with the IP address 149.11.11.11:

cn=149.11.11.11

If your network has a Domain Name System and you mapped a name to the IP address of a switch, you can specify the switch’s name instead of the IP address as the distinguished name.

For those switches that do not have an IP address, such as slave switches, you could assign their certificates a distinguished name using the IP address of the master switch of the enhanced stack.

There is a benefit to giving a certificate a distinguished name equivalent to a master switch’s IP address or domain name. This relates to what happens when you start a web browser management session with a switch using SSL. The web browser on your management station checks to see if the name to whom the certificate was issued matches the name of the web site. In the case of a master or slave AT-9400 Series switch, the web site’s name is the master switch’s IP address or domain name. If the names do not match, the web browser displays a security warning. Of course, even if you see the security warning, you can close the warning prompt and still configure the switch using your web browser.

Note
If the certificate will be issued by a private or public CA, you should check with the CA to see if they have any rules or guidelines on distinguished names for the certificates they issue.

Guidelines

The guidelines for creating certificates are:

- A certificate can have only one key.
- A switch can use only those certificates that contain a key that was generated on the switch.
- You can create multiple certificates on a switch, but the device uses the certificate whose key pair has been designated as the active key pair for the switch’s web server.

Technical Overview

The public key infrastructure (PKI) feature is part of the switch's suite of security modules, and consists of a set of tools for managing and using certificates. The tools that make up the PKI allow the switch to securely exchange public keys, while being sure of the identity of the key holder.

The switch acts as an End Entity (EE) in a certificate-based PKI. More specifically, the switch can communicate with Certification Authorities (CAs) and Certificate Repositories to request, retrieve and verify certificates.The switch allows protocols running on the switch, such as ISAKMP, access to these certificates. The following sections of this chapter summarize these concepts and describe the switch's implementation of them.

Public Keys

Public key encryption involves the generation of two keys for each user, one private and one public. Material encrypted with a private key can only be decrypted with the corresponding public key, and vice versa. An individual's private key must be kept secret, but the public key may be distributed as widely as desired, because it is impossible to calculate the private key from the public key. The advantage of public key encryption is that the private key need never be exchanged, and so can be kept secure more easily than a shared secret key.

Message Encryption

One of the two main services provided by public key encryption is the exchange of encrypted messages. For example, user 1 can send a secure message to user 2 by encrypting it with user 2's public key. Only user 2 can decrypt it, because only user 2 has access to the corresponding private key.

Digital Signatures

The second main service provided by public key encryption is digital signing. Digital signatures both confirm the identity of the message's supposed sender and protect the message from tampering. Therefore they provide message authentication and non-repudiation. It is very difficult for the signer of a message to claim that the message was corrupted, or to deny that it was sent.

Both the exchange of encrypted messages and digital signatures are secure only if the public key used for encryption or decryption belongs to the message's expected recipient. If a public key is insecurely distributed, it is possible a malicious agent could intercept it and replace it with the malicious agent's public key (the Man-in-the-Middle attack). To prevent this, and other attacks, PKI provides a means for secure transfer of public keys by linking an identity and that identity's public key in a secure certificate.

⚠ **Caution**
Although a certificate binds a public key to a subject to ensure the public key's security, it does not guarantee that the security of the associated private key has not been breached. A secure system is dependent upon private keys being kept secret, by protecting them from malicious physical and virtual access.

Certificates

A *certificate* is an electronic identity document. To create a certificate for a subject, a trusted third party (known as the Certification Authority) verifies the subject's identity, binds a public key to that identity, and digitally signs the certificate. A person receiving a copy of the certificate can verify the Certification Authority's digital signature and be sure that the public key is owned by the identity in it.

The switch can generate a self-signed certificate but this should only be used with an SSL enabled HTTP server, or where third party trust is not required.

X.509 Certificates

The X.509 specification specifies a format for certificates. Almost all certificates use the X.509 version 3 format, described in RFC 2459, *Internet X.509 Public Key Infrastructure Certificate and CRL Profile*. This is the format which is supported by the switch.

An X.509 v3 certificate consists of:

- A serial number, which distinguishes the certificate from all others issued by that issuer. This serial number is used to identify the certificate in a Certificate Revocation List, if necessary.
- The owner's identity details, such as name, company and address.
- The owner's public key, and information about the algorithm with which it was produced.
- The identity details of the organization which issued the certificate.
- The issuer's digital signature and the algorithm used to produce it.
- The period for which the certificate is valid.
- Optional information is included, such as the type of application with which the certificate is intended to be used.

The issuing organization's digital signature is included in order to authenticate the certificate. As a result, if a certificate is tampered with during transmission, the tampering is detected.

Elements of a Public Key Infrastructure

A public key infrastructure is a set of applications which manage the creation, retrieval, validation and storage of certificates. A PKI consists of the following key elements:

❒ At least one certification authority (CA), which issues and revokes certificates.

❒ At least one publicly accessible repository, which stores certificates and Certificate Revocation Lists.

❒ At least one end entity (EE), which retrieves certificates from the repository, validates them and uses them.

End Entities (EE)

End entities own public keys and may use them for encryption and digital signing. An entity which uses its private key to digitally sign certificates is not considered to be an end entity, but is a certification authority.

The switch acts as an end entity.

Certification Authorities

A certification authority is an entity which issues, updates, revokes and otherwise manages public keys and their certificates. A CA receives requests for certification, validates the requester’s identity according to the CA’s requirements, and issues the certificate, signed with one of the CA’s keys. CAs may also perform the functions of end entities, in that they may make use of other CAs’ certificates for message encryption and verification of digital signatures.

An organization may own a certification authority and issue certificates for use within its own networks. In addition, an organization’s certificates may be accepted by another network, after an exchange of certificates has validated a certificate for use by both parties. As an alternative, an outside CA may be used. The switch can interact with the CA, whether a CA is part of the organization or not, by sending the CA requests for certification.

The usefulness of certificates depends on how much you trust the source of the certificate. You must be able to trust the issuing CA to verify identities reliably. The level of verification required in a given situation depends on the organization’s security needs.

Certificate Validation

To validate a certificate, the end entity verifies the signature in the certificate, using the public key of the CA who issued the certificate.

CA Hierarchies and Certificate Chains

It may not be practical for every individual certificate in an organization to be signed by one certification authority. A certification hierarchy may be formed, in which one CA (for example, national headquarters) is declared to be the root CA. This CA issues certificates to the next level down in the hierarchy (for example, regional headquarters), who become subordinate CAs and issue certificates to the next level down, and so on. A hierarchy may have as many levels as needed.

Certificate hierarchies allow validation of certificates through certificate chains and cross-certification. If a switch X, which holds a certificate signed by CA X, wishes to communicate securely with a switch Y, which holds a certificate signed by CA Y, there are two ways in which the switches can validate each other’s certificates. Cross-certification occurs when switch X validates switch Y's CA (CA Y) by obtaining a certificate for switch Y's CA which has been issued by its own CA (CA X). A certificate chain is formed if both CA X and CA Y hold a certificate signed by a root CA Z, which the switches have verified out of band. Switch X can validate switch Y’s certificate (and vice versa) by following the chain up to CA Z.

Root CA Certificates

A root CA must sign its own certificate. The root CA is the most critical link in the certification chain, because the validity of all certificates issued by any CA in the hierarchy depends on the root CA’s validity. Therefore, every device which uses the root CA’s certificate must verify it out-of-band.

Out-of-band verification involves both the owner of a certificate and the user who wishes to verify that certificate generating a one-way hash (a fingerprint) of the certificate. These two hashes must then be compared using at least one non-network-based communication method. Examples of suitable communication methods are mail, telephone, fax, or transfer by hand from a storage device such as a smart card or floppy disk. If the two hashes are the same, the certificate can be considered valid.

Certificate Revocation Lists (CRLs)

A certificate may become invalid because some of the details in it change (for example, the address changes), because the relationship between the Certification Authority (CA) and the subject changes (for example, an employee leaves a company), or because the associated private key is compromised. Every CA is required to keep a publicly accessible list of its certificates which have been revoked.

PKI Implementation

The following sections discuss Allied Telesyn’s implementation of PKI for the AT-9400 Series switches. The following topics are covered:

- PKI Standards
- Certificate Retrieval and Storage
- Certificate Validation
- Root CA Certificates

PKI Standards

The following standards are supported by the switch:

- draft-ietf-pkix-roadmap-05 — *PKIX Roadmap*
- RFC 1779 — *A String Representation of Distinguished Names*
- RFC 2459 — *PKIX Certificate and CRL Profile*
- RFC 2511 — *PKIX Certificate Request Message Format*
- PKCS #10 v1.7 — *Certification Request Syntax Standard*

Certificate Retrieval and Storage

Certificates are stored by CAs in publicly accessible repositories for retrieval by end entities. The following repositories used in PKI are commonly accessed via the following protocols: *Hypertext Transfer Protocol* (HTTP), *File Transfer Protocol* (FTP).

Before the switch can use a certificate, it must be retrieved and manually added to the switch's certificate database, which is stored in RAM memory. The switch attempts to validate the certificate, and if validation is successful the certificate's public key is available for use.

Root CA Certificate Validation

Root CA certificates are verified out of band by comparing the certificate's *fingerprint* (the encrypted one-way hash with which the issuing CA signs the certificate) with the fingerprint which the CA has supplied by a non-network-based method. To view a certificate's fingerprint, use the procedure described in "Viewing a Certificate" on page 741.

Creating a Self-signed Certificate

This section contains the procedure for creating a self-signed certificate. Please review the following before you perform the procedure:

- The switch’s time and date must be set before you create a certificate. You can set this manually or you can configure the switch to obtain the date and time from an SNTP server on your network. For instructions, refer to “Setting the System Time” on page 58.
- You must generate an encryption key pair before you create a certificate. For instructions, refer to “Creating an Encryption Key” on page 705.
- During this procedure you are prompted to enter the ID number of the encryption key pair you want to use to create the certificate. If you have forgotten the ID number of the key, refer to “Creating an Encryption Key” on page 705 to view key ID numbers.

To create a self-signed certificate, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

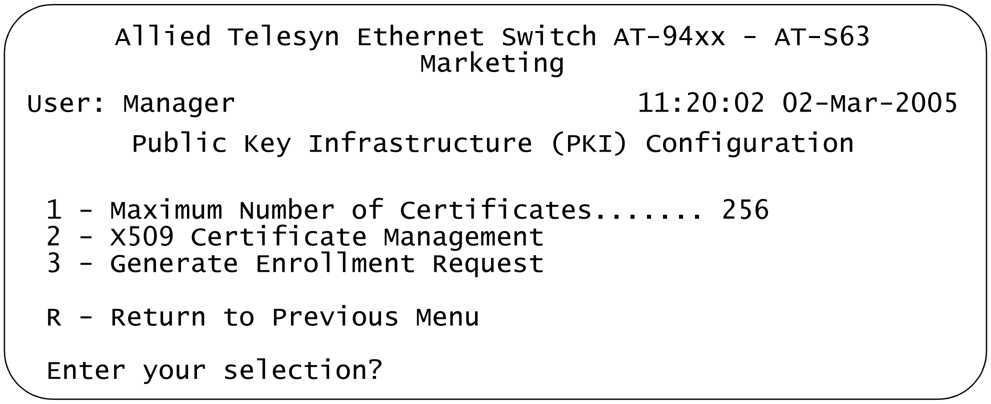
2. From the Security and Services menu, type **7** to select Keys/ Certificates Configuration.

   The Keys/Certificates Configuration menu is shown in Figure 251 on page 705.

   Note
   You can specify the distinguished name for the certificate from this menu by selecting option 1, Distinguished Name, in the Keys/ Certificates Configuration menu and entering the name. Or, you can wait and specify the distinguished name later in this procedure. For information about distinguished names, refer to “Distinguished Names” on page 721.

3. From the Keys/Certificate menu, type **3** to select Public Key Infrastructure (PKI) Configuration.

The Public Key Infrastructure (PKI) Configuration menu is shown in Figure 257.

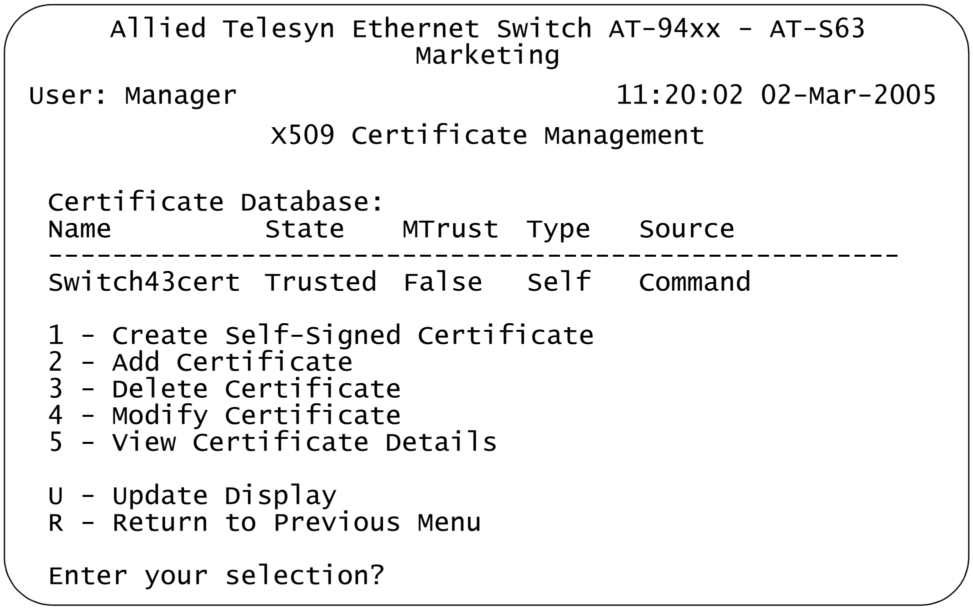


```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                          11:20:02 02-Mar-2005
      Public Key Infrastructure (PKI) Configuration

 1 - Maximum Number of Certificates....... 256
 2 - X509 Certificate Management
 3 - Generate Enrollment Request

 R - Return to Previous Menu

 Enter your selection?
```

Figure 257. Public Key Infrastructure (PKI) Configuration Menu

4. From the Public Key Infrastructure (PKI) Configuration menu, type **2** to select X509 Certificate Management.

   The X509 Certificate Management menu is shown in Figure 258.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                       Marketing
User: Manager                          11:20:02 02-Mar-2005
               X509 Certificate Management

 Certificate Database:
 Name          State    MTrust  Type   Source
 -----------------------------------------------------
 Switch43cert  Trusted  False   Self   Command

 1 - Create Self-Signed Certificate
 2 - Add Certificate
 3 - Delete Certificate
 4 - Modify Certificate
 5 - View Certificate Details

 U - Update Display
 R - Return to Previous Menu

 Enter your selection?
```

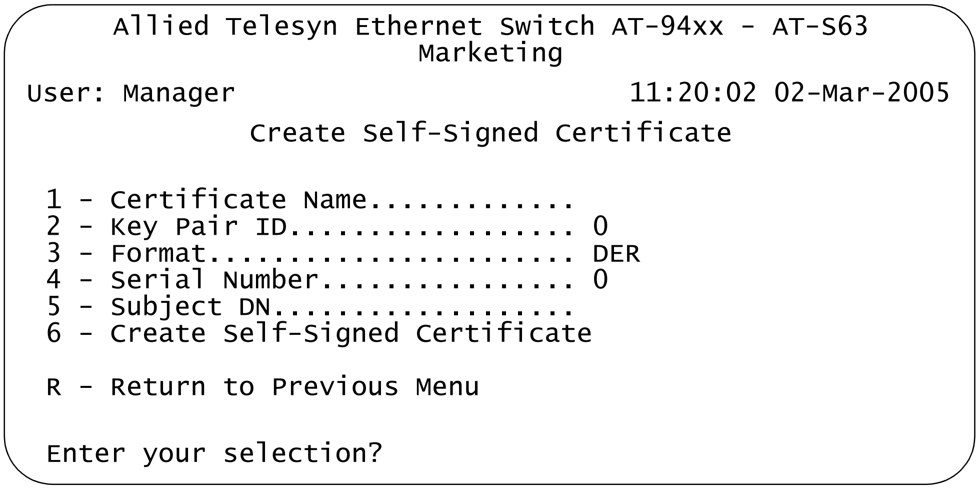
Figure 258. X509 Certificate Management Menu

The Certificate Database portion of the menu lists the certificates that you created (or had a CA create) and added to the database. The switch's web server can only use a certificate if it is in the database.

Note
In the X509 Certificate Management menu, MTrust means manually trusted. This field indicates that you verified the certificate. The Source field indicates the certificate was generated on the switch. Both MTrust and Source are read-only fields.

5. Type **1** to select Create Self-Signed Certificate.

   The Create Self-Signed Certificate menu is shown in Figure 259.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                        11:20:02 02-Mar-2005
              Create Self-Signed Certificate


 1 - Certificate Name.............
 2 - Key Pair ID................. 0
 3 - Format...................... DER
 4 - Serial Number............... 0
 5 - Subject DN..................
 6 - Create Self-Signed Certificate

 R - Return to Previous Menu


 Enter your selection?
```

Figure 259. Create Self-Signed Certificate Menu

6. Type **1** to select Certificate Name to enter a file name for the certificate.

   The following prompt is displayed:

   ```
   Enter certificate name (24 char max) ->
   ```

7. Enter a file name for the certificate. This is the file name under which the certificate will be stored in the AT-S63 file system. The name can be up to 24 alphanumeric characters. Spaces are allowed.

Note
The AT-S63 management software automatically adds a ".cer" extension to the filename.

8. Type **2** to select Key Pair ID.

   The following prompt is displayed:

   ```
   Enter certificate Key Pair ID -> [0 to 65535] ->
   ```

9. Enter the ID number of the encryption key that you want to use to create this certificate. The encryption key must already exist on the switch. (If you have forgotten the key ID number, return to the Key Management menu to view the keys on the switch.) The value can be from 0 to 65,535.

10. Type **3** to select Format to choose the encoding format for the certificate. The possible options are:

    DER - Indicates the certificate contents are in a binary format. This is the default.

    PEM - Indicates the certificate are in the Privacy Enhanced Mail (PEM) format which is an ASCII format.

11. Type **4** to select Serial Number.

    The following prompt is displayed:

    ```
    Enter certificate serial number->[0 to 2147483647] -> 0
    ```

12. Enter a value between 0 and 2,147,483,647.

    Self-signed certificates are usually assigned a serial number of 0.

13. Type **5** to select Subject DN and enter a distinguished name for the certificate. (Do not enclose the distinguished name in quotes.)

    Note
    If you did not enter a distinguished name in step 2, then you need to enter one here. A certificate must have a distinguished name. For further information, refer to “Distinguished Names” on page 721. If you enter a name both here and in Step 2, the certificate will contain the name entered here.

14. Type **6** to select Create Self-Signed Certificate.

    The following prompt is displayed:

    ```
    Please wait while certificate is generated...Done!
    ```

15. Press any key.

    The X509 Certificate Management menu is displayed again.

    The certificate is automatically saved in the AT-S63 file system. You do not need to return to the Main Menu to permanently save the new certificate.

16. Go to the next procedure to add the certificate to the certificate database.

Adding a Certificate to the Database

After you have created a certificate or received a certificate from a public or private CA, you need to add it into the certificate database to make it available for use by the switch's web server. After you add a certificate to the certificate database, it appears in the X509 Certificate Management menu.

To add a certificate to the certificate database, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/ Certificates Configuration.

   The Keys/Certificates Configuration menu is shown in Figure 251 on page 705.

3. From the Keys/Certificate menu, type **3** to select Public Key Infrastructure (PKI) Configuration.

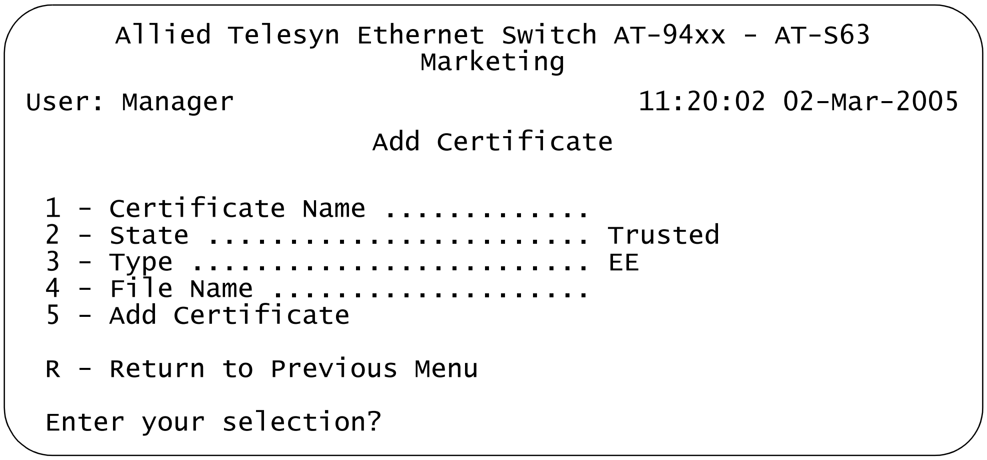
   The Public Key Infrastructure (PKI) Configuration menu is shown in Figure 257 on page 730.

4. From the Public Key Infrastructure (PKI) Configuration menu, type **2** to select X509 Certificate Management.

   The X509 Certificate Management menu is shown in Figure 258 on page 730.

5. From the X509 Certificate Management menu, type **2** to select Add Certificate.

The Add Certificate menu is shown in Figure 260.



```
                 Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                   Marketing
User: Manager                                       11:20:02 02-Mar-2005
                                Add Certificate

 1 - Certificate Name .............
 2 - State ........................ Trusted
 3 - Type ......................... EE
 4 - File Name ...................
 5 - Add Certificate

 R - Return to Previous Menu

 Enter your selection?
```

Figure 260. Add Certificate Menu

6. Type **1** to select Certificate Name.

   The following prompt is displayed:

   ```
   Enter file name (*.key) ->
   ```

7. Enter a name for the certificate.

   This is the name for the certificate as it will appear in the certificate database list. You can enter up to 24 alphanumeric characters. Spaces are allowed. No extension is needed.

   You might want the name to include the filename of the certificate in the file system. This will make it easier for you to correlate a certificate in the database with its corresponding file in the file system. Here is an example:

   ```
   Switch 12 - sw12.cer
   ```

8. Type **2** to select (certificate) State. The possible settings are:

   Trusted
   This value indicates you have verified that the certificate is from a trusted CA. This is the default.

   Untrusted
   This value indicates the certificate is from an untrusted CA either because you have not verified the CA or you have verified the CA is untrusted.

Note
This parameter has no affect on the operation of a certificate. The parameter is included only for informational purposes when the certificate is displayed in the certificate database.

9. Type **3** to select Type (of certificate). The possible settings are:

   EE
   The certificate was issued by a CA, such as VeriSign. This is the default.

   CA
   The certificate belongs to a CA.

   Self
   This certificate is a self-signed certificate. The switch treats this type of certificate as its own.

Note
This parameter has no affect on the operation of a certificate. The parameter is included only for informational purposes when the certificate is displayed in the certificate database.

10. Type **4** to select File Name.

    The following prompt is displayed:

```
Enter file name (*.key) ->
```

11. Specify the filename of the certificate.

    This is the filename of the certificate in the AT-S63 file system. The filename has a “.cer” extension. For example, if you created a self-signed certificate and gave it the name “webserver127”, the filename of the certificate would be “webserver127.cer”. If you have forgotten the filename of the certificate, refer to “Displaying System Files” on page 195.

12. Type **5** to select Add Certificate to add the certificate to the certificate database.

    The AT-S63 management software adds the certificate to the database, a process that requires only a few seconds.

13. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Modifying a Certificate

The procedure in this section modifies a certificate. (The certificate to be modified must be in the certificate database.) Here are the certificate items you can modify:

- State - trusted or untrusted
- Type - EE, CA, or Self

> **Note**
> These parameters have no affect on the operation of a certificate. They are included only for informational purposes when the certificate is displayed in the certificate database.

This procedure starts from the X509 Certificate Management menu. If you are unsure how to access the menu, perform steps 1 to 4 in the procedure “Adding a Certificate to the Database” on page 733.

To modify a certificate, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/ Certificates Configuration.

   The Keys/Certificates Configuration menu is shown in Figure 251 on page 705.

3. From the Keys/Certificate menu, type **3** to select Public Key Infrastructure (PKI) Configuration.

   The Public Key Infrastructure (PKI) Configuration menu is shown in Figure 257 on page 730.

4. From the Public Key Infrastructure (PKI) Configuration menu, type **2** to select X509 Certificate Management.

   The X509 Certificate Management menu is shown in Figure 258 on page 730.

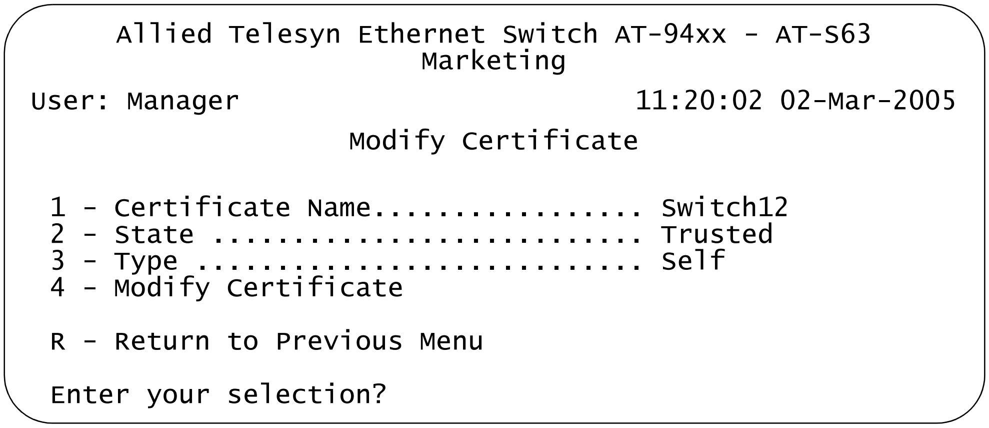
5. From the X509 Certificate Management menu, type **4** to select Modify Certificate.

   The following prompt is displayed:

   ```
   Enter a certificate name ->
   ```

6. Enter the name of the certificate you want to modify. (This field is case sensitive.)

   The Modify Certificate menu is shown in Figure 261.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                          11:20:02 02-Mar-2005
                    Modify Certificate

 1 - Certificate Name................. Switch12
 2 - State ........................... Trusted
 3 - Type ............................ Self
 4 - Modify Certificate

 R - Return to Previous Menu

 Enter your selection?
```

Figure 261. Modify Certificate Menu

> **Note**
> You cannot change selection 1, Certificate Name.

7. Type **2** to select State. The possible settings are:

   Trusted
   This value indicates you have verified that the certificate is from a trusted CA. This is the default.

   Untrusted
   This value indicates the certificate is from an untrusted CA either because you have not verified the CA or you have verified the CA is untrusted.

8. Type **3** to select Type. The possible settings are:

   EE
   The certificate was issued by a CA, such as VeriSign. This is the default.

   CA
   The certificate belongs to a CA.

   Self
   This certificate is a self-signed certificate. The switch treats this type of certificate as its own.

9. Type **4** to select Modify Certificate.

   Your changes are implement in the certificate.

The following message is displayed:

```
Please wait while certificate is updated...Done.
```

10. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Deleting a Certificate

The procedure in this section deletes a certificate from the certificate database. Please note the following before performing this procedure:

- ❒ Deleting a certificate from the database does not delete it from the switch. It continues to reside in the AT-S63 file system. To completely remove a certificate from the switch, you must also delete it from the file system. For instructions, refer to “Copying a System File” on page 190.
- ❒ You cannot delete a certificate from the database if you specified its corresponding encryption key as the active key in the web server configuration. The switch will consider the certificate as in use and will not allow you to delete it. You must first configure the web server with another encryption key pair for a different certificate. For instructions, refer to “Configuring the Web Server” on page 687.

This procedure starts from the X509 Certificate Management menu. If you are unsure how to access the menu, perform steps 1 to 4 in the procedure “Adding a Certificate to the Database” on page 733.

To delete a certificate from the certificate database, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/ Certificates Configuration.

   The Keys/Certificates Configuration menu is shown in Figure 251 on page 705.

3. From the Keys/Certificate menu, type **3** to select Public Key Infrastructure (PKI) Configuration.

   The Public Key Infrastructure (PKI) Configuration menu is shown in Figure 257 on page 730.

4. From the Public Key Infrastructure (PKI) Configuration menu, type **2** to select X509 Certificate Management.

   The X509 Certificate Management menu is shown in Figure 258 on page 730.

5. From the X509 Certificate Management menu, type **3** to select Delete Certificate.

   The following prompt is displayed:

```
Enter certificate name (ALL - delete all) ->
```

6. Enter the name of the certificate you want to delete. (This field is case sensitive.) To delete all the certificates, enter ALL.

7. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Viewing a Certificate

This procedure displays information about a certificate, such as its distinguished name and serial number.

This procedure starts from the X509 Certificate Management menu. If you are unsure how to access the menu, perform steps 1 to 4 in the procedure “Adding a Certificate to the Database” on page 733.

To view the details of a certificate, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/ Certificates Configuration.

   The Keys/Certificates Configuration menu is shown in Figure 251 on page 705.

3. From the Keys/Certificate menu, type **3** to select Public Key Infrastructure (PKI) Configuration.

   The Public Key Infrastructure (PKI) Configuration menu is shown in Figure 257 on page 730.

4. From the Public Key Infrastructure (PKI) Configuration menu, type **2** to select X509 Certificate Management.

   The X509 Certificate Management menu is shown in Figure 258 on page 730.

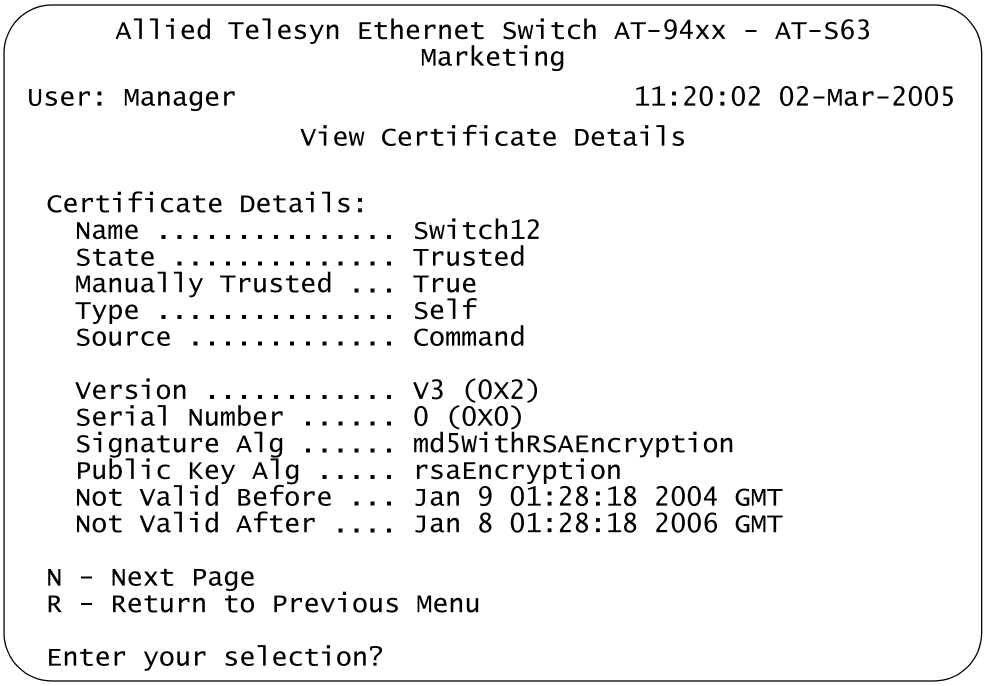
5. From the X509 Certificate Management menu, type **5** to select View Certificate Details.

   The following prompt is displayed:

   ```
   Enter certificate name ->
   ```

6. Enter a name of the certificate you want to view. (This field is case sensitive.)

The View Certificate Details menu (page 1) is shown in Figure 262.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
                 View Certificate Details

 Certificate Details:
   Name .............. Switch12
   State ............. Trusted
   Manually Trusted ... True
   Type .............. Self
   Source ............ Command

   Version ........... V3 (0X2)
   Serial Number ...... 0 (0X0)
   Signature Alg ...... md5WithRSAEncryption
   Public Key Alg ..... rsaEncryption
   Not Valid Before ... Jan 9 01:28:18 2004 GMT
   Not Valid After .... Jan 8 01:28:18 2006 GMT

 N - Next Page
 R - Return to Previous Menu

 Enter your selection?
```

Figure 262. View Certificate Details Menu (page 1)

The following information is displayed in page 1:

Name
The name of the certificate.

State
Whether the certificate is Trusted or Untrusted.

Manually Trusted
You verified the certificate is from a trusted or untrusted authority.

Type
The type of the certificate. The options are EE, SELF, and CA.

Source
The certificate was created on the switch.

Version
The version number of the AT-S63 management software.

Serial Number
The certificate’s serial number.

Signature Alg
The signature algorithm of the certificate.

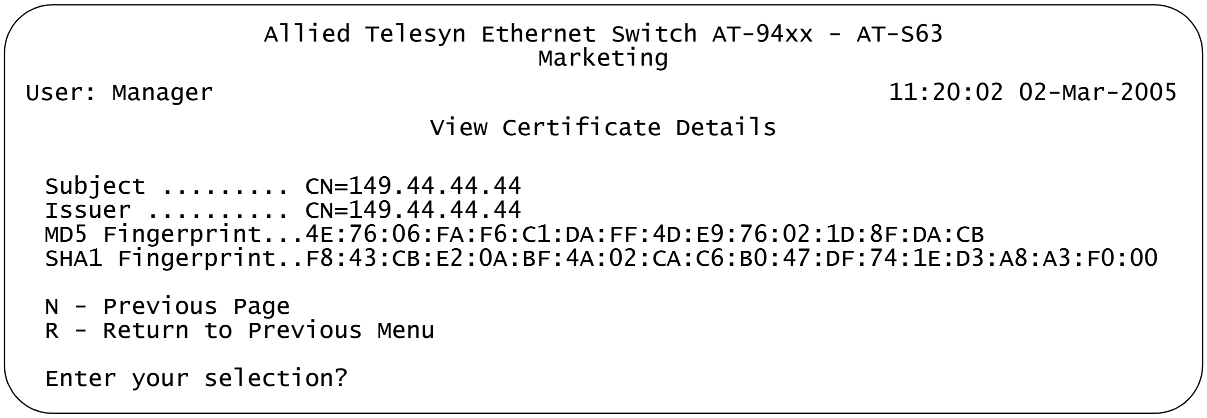
Public Key Alg
The public key algorithm.

Not Valid Before
The date the certificate became active.

Not Valid After
The date the certificate expires. Self-signed certificates are valid for two years.

7. Type **N** to see the second page of certificate details.

   The View Certificate Details menu (page 2) is shown in Figure 263.



```
                  Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                     Marketing
User: Manager                                                  11:20:02 02-Mar-2005
                              View Certificate Details

 Subject ......... CN=149.44.44.44
 Issuer .......... CN=149.44.44.44
 MD5 Fingerprint...4E:76:06:FA:F6:C1:DA:FF:4D:E9:76:02:1D:8F:DA:CB
 SHA1 Fingerprint..F8:43:CB:E2:0A:BF:4A:02:CA:C6:B0:47:DF:74:1E:D3:A8:A3:F0:00

 N - Previous Page
 R - Return to Previous Menu

 Enter your selection?
```

Figure 263. View Certificate Details Menu (page 2)

The following information is displayed in page 2:

Subject
The Subject distinguished name.

Issuer
The certificate issuer’s distinguished name.

MD5 Fingerprint
The MD5 algorithm. This value provides a unique sequence for each certificate consisting of 16 bytes.

SHA1 Fingerprint
The Secure Hash Algorithm. This value provides a unique sequence for each certificate consisting of 20 bytes.

Generating an Enrollment Request

To request a certificate from a CA, you need to generate an enrollment request. The request contains the public key for the certificate, a distinguished name, and other information. The request is stored as a file with a ".csr" extension in the AT-S63 file system, from where you can upload it onto your management station or FTP server for submission to the CA. (For a review of all the steps to creating an enrollment request and downloading a certificate from a CA onto a switch, refer to "General Steps for a Public or Private CA Certificate" on page 690. You must first create a key pair before you perform this procedure. For instructions, refer to "Creating an Encryption Key" on page 705.

To generate an enrollment request, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **7** to select Keys/Certificates Configuration.

   The Keys/Certificates Configuration menu is shown in Figure 251 on page 705.

3. From the Keys/Certificates Configuration menu, type **1** to select Switch Distinguished Name (DN).

   The following prompt is displayed:

   ```
   Enter new DN (128 chars max) ->
   ```

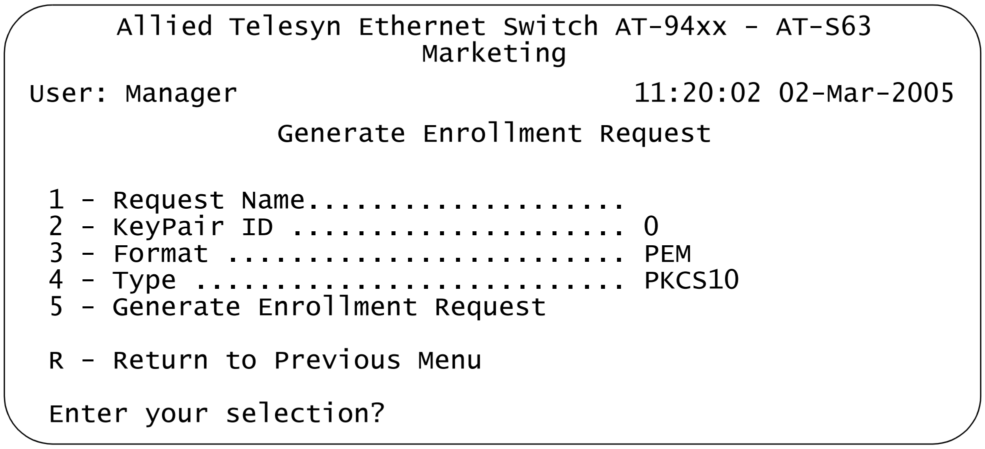
4. Enter a name. An enrollment request must have a distinguished name. For information, refer to "Distinguished Names" on page 721.

5. Type **3** to select Public Key Infrastructure (PKI) Configuration.

   The Public Key Infrastructure (PKI) Configuration menu is shown in Figure 257 on page 730.

6. From the Public Key Infrastructure (PKI) Configuration menu, type **3** to select Generate Enrollment Request.

The Generate Enrollment Request menu is shown in Figure 264.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                         11:20:02 02-Mar-2005
               Generate Enrollment Request

 1 - Request Name....................
 2 - KeyPair ID ..................... 0
 3 - Format ......................... PEM
 4 - Type ........................... PKCS10
 5 - Generate Enrollment Request

 R - Return to Previous Menu

 Enter your selection?
```

Figure 264. Generate Enrollment Request Menu

7. Type **1** to select Request Name.

   The following prompt is displayed:

   ```
   Enter enrollment request name (24 chars max) ->
   ```

8. Enter a name of up to 24 alphanumeric characters for the enrollment request. Spaces are allowed.

   The name is used to create the filename of the enrollment request when it is stored in the AT-S63 file system. The full filename consists of the enrollment request name followed by “.csr” extension, which the management software adds automatically. For example, if you enter “certificate75” as the enrollment request name, the enrollment request’s filename will be “certificate75.csr”.

9. Type **2** to select KeyPair ID.

   The following prompt is displayed:

   ```
   Enter keypair ID -> [0 to 65535] -> 0
   ```

10. Enter a KeyPair ID between 0 and 65,535.

11. Type **3** to toggle the Format selection between the following options:

    DER - Creates the certificate in a binary format. This is the default.

    PEM - Creates the certificate in the Privacy Enhanced Mail (PEM) format which is an ASCII format.

Note
You cannot change option 4, Type. The PKCS10 value indicates the internal format of an enrollment request.

12. Type **5** to select Generate Enrollment Request.

    After the switch has finished generating the request, a message similar to the following is displayed:

    ```
    Enrollment request is being generated. Please wait
    ...Done.
    Enrollment Request available in file [Switch 12.csr].
    Press any key to continue ...
    ```

    The enrollment request is now stored in the AT-S63 file system. To see the file, refer to “Displaying System Files” on page 195.

13. Press any key to return to the Public Key Infrastructure (PKI) Configuration menu.

14. To submit the request to a CA, you must upload the enrollment request from the file system on the switch to your management station or to an FTP server on your network. For instructions, refer to “Uploading a System File” on page 222.

    When you submit an enrollment request, be sure to follow the rules and guidelines of the CA. Failure to follow their guidelines may delay the issuing of the certificate.

Installing CA Certificates onto a Switch

This section lists the procedures that you will need to perform if the switch's certificate was created by a public or private CA. It should be noted that a CA generated certificate actually consists of several certificates. There is a minimum of two. All the certificates from the CA must be installed on the switch.

Note
A certificate from a CA can only be used on the switch where you created the encryption key pair and enrollment request. Do not install the certificate on any other switch.

To install CA certificates on a switch, perform the following procedure:

1. Download the certificates from your management station or FTP server to the AT-S63 file system on the switch. For instructions, refer to "Downloading a System File" on page 216.

2. Load the certificates into the certificate database. For instructions, refer to "Adding a Certificate to the Database" on page 733.

3. Activate HTTPS on the switch by configuring the web server and specifying the key pair used to create the enrollment request as the active key pair. For instructions, refer to "Configuring the Web Server" on page 687.

Viewing or Configuring the Number of Certificates in the Database

The maximum number of certificates you can add to the certificate database is 12 to 256. The default value is 256. There should be little cause or need for you to adjust this value.

To view or change the number of certificates in the certificate database, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security Configuration menu is shown in Figure 82 on page 259.

2. From the Security Configuration menu, type **7** to select Keys/ Certificates Configuration.

   The Keys/Certificates Configuration menu is shown in Figure 251 on page 705. Selection 1, Maximum Number of Certificates, shows the current setting.

   Note
   You can specify the distinguished name for the certificate from this menu by selecting option 1, Distinguished Name, in the Keys/ Certificates Configuration menu and entering the name. Or, you can wait and specify the distinguished name later in this procedure. For information about distinguished names, refer to “Distinguished Names” on page 721.

3. To change the maximum number of certificates, type **1** to select Maximum Number of Certificates.

   The following prompt is displayed:

   ```
   Enter certificate limit -> [12 to 256] 256
   ```

4. Enter a new number and press Return.

5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring SSL

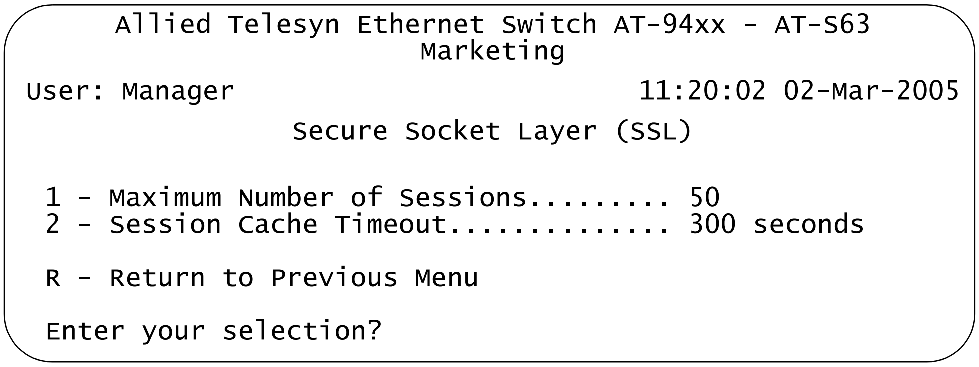
To configure the SSL protocol, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **9** to select Secure Socket Layer (SSL).

   The Secure Socket Layer (SSL) menu is shown in Figure 265.



```
        Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                 Secure Socket Layer (SSL)

 1 - Maximum Number of Sessions......... 50
 2 - Session Cache Timeout.............. 300 seconds

 R - Return to Previous Menu

 Enter your selection?
```

Figure 265. Secure Socket Layer (SSL) Menu

3. Type **1** to select Maximum Number of Sessions to increase the number of sessions.

   The following prompt is displayed:

   ```
   Enter maximum SSL sessions value -> [1 to 100] 50
   ```

   Enter a value from 1 to 100. The maximum number of sessions is used to speed up a connection. By increasing the number of sessions, you increase HTTPS performance. However, increasing the number of sessions also increases the memory requirements. The default is 50.

4. Type **2** to select Session Cache Timeout to increase or decrease the timer that determines when the session cache times out.

   The following prompt is displayed:

   ```
   Enter Cache timeout value -> [1 to 600] 300
   ```

   Enter a value, in seconds, from 1 to 600. The default is 300 seconds.

5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Chapter 33

Secure Shell (SSH)

The chapter contains overview information about the Secure Shell (SSH) protocol as well a procedure for configuring this protocol on a switch using a local or Telnet management session. It contains the following sections:

SSH Overview

Secure management is increasingly important in modern networks, as the ability to easily and effectively manage switches and the requirement for security are two universal requirements. Switches are often remotely managed using remote sessions via the Telnet protocol. This method, however, has a serious security problem—it is only protected by plaintext usernames and passwords which are vulnerable to wiretapping and password guessing.

The Secure Shell (SSH) protocol provides encrypted and strongly authenticated remote login sessions, similar to the Telnet and rlogin protocols, between a host running a Secure Shell server and a machine with a Secure Shell client.

The AT-S63 management software features Secure Shell server software to enable network managers to securely manage the switch over an insecure network. It offers the benefit of cryptographic authentication and encryption. Secure Shell can replace Telnet for remote management sessions.

Support for SSH

The AT-S63 implementation of the SSH protocol is compliant with the SSH protocol versions 1.3, 1.5, and 2.0.

In addition, the following SSH options and features are supported:

- Inbound SSH connections (server mode) is supported.
- The following security algorithms are supported:
  - 128-bit Advanced Encryption Standard (AES), 192-bit AES, and 256-bit AES
  - Arcfour (RC4) security algorithm is supported.
  - Triple-DES (3DES) encryption for SSH sessions is supported.
- RSA public keys with lengths of 512 to 2048 bits are supported. Keys are stored in a format compatible with other Secure Shell implementations, and mechanisms are provided to copy keys to and from the switch.
- Compression of SSH traffic.

The following SSH options and features are **not** supported:

- IDEA or Blowfish encryption
- Nonencrypted Secure Shell sessions
- Tunnelling of TCP/IP traffic

Note
Non-encrypted Secure Shell sessions serve no purpose.

SSH Server

When the SSH server is enabled, connections from SSH clients are accepted. When the SSH server is disabled, connections from SSH clients are rejected by the switch. Within the switch, the AT-S63 management software uses well-known port 22 as the SSH default port.

Note
If your switch is in a network that is protected by a firewall, you may need to configure the firewall to permit SSH connections.

The SSH server accepts connections from configured users only. Acceptable users are those with a Manager or Operator login as well as users configured with the RADIUS and TACACS+ protocols. You can add, delete, and modify users with the RADIUS and TACACS+ feature. For information about how to configure RADIUS and TACACS+, see “Enabling or Disabling TACACS+ or RADIUS” on page 765.

SSH encryption key management is implemented by the Encryption (ENCO) protocol. You can import and export RSA public keys to and from the single-line ASCII format used by all SSH implementations. For information on how to configure the Encryption protocol, see Chapter 31, “Encryption Keys” on page 693.

SSH Clients

The SSH protocol provides a secure connection between the switch and SSH clients. After you have configured the SSH server, you need to install SSH client software on your management PC. The AT-S63 management software supports both SSH1 and SSH2 clients.

You can download client software from the Internet. Two popular SSH clients are PuTTY and CYGWIN. To install SSH client software, follow the directions from the vendor.

After you have configured the SSH client software, you can use the client software to log in to the SSH server as a manager, operator, or as RADIUS/TACACS+ users. The SSH server supports multiple client connections. The maximum number of SSH clients allowed is 10 users with one manager login.

SSH and Enhanced Stacking

The AT-S63 management software allows for encrypted SSH management sessions between a management station and a master switch of an enhanced stack, but not with slave switches, as explained in this section.

When you remotely manage a slave switch, all management communications are conducted through the master switch using the enhanced stacking feature. Management packets from your workstation are first directed to the master switch before being forwarded to the slave switch. The reverse is true as well. Management packets from a slave switch first pass through the master switch before reaching your management station.

Enhanced stacking uses a proprietary protocol different from Telnet and SSH protocols. Consequently, there is no encryption between a master switch and a slave switch. The result is that SSH encryption can only occur between your workstation and the master switch, not between your workstation and a slave switch.

This is illustrated in Figure 266. The figure shows an SSH management station that is managing a slave switch of an enhanced stack. The packets exchanged between the slave switch and the master switch are transmitted in plaintext and those exchanged between the master switch and the SSH management station are encrypted

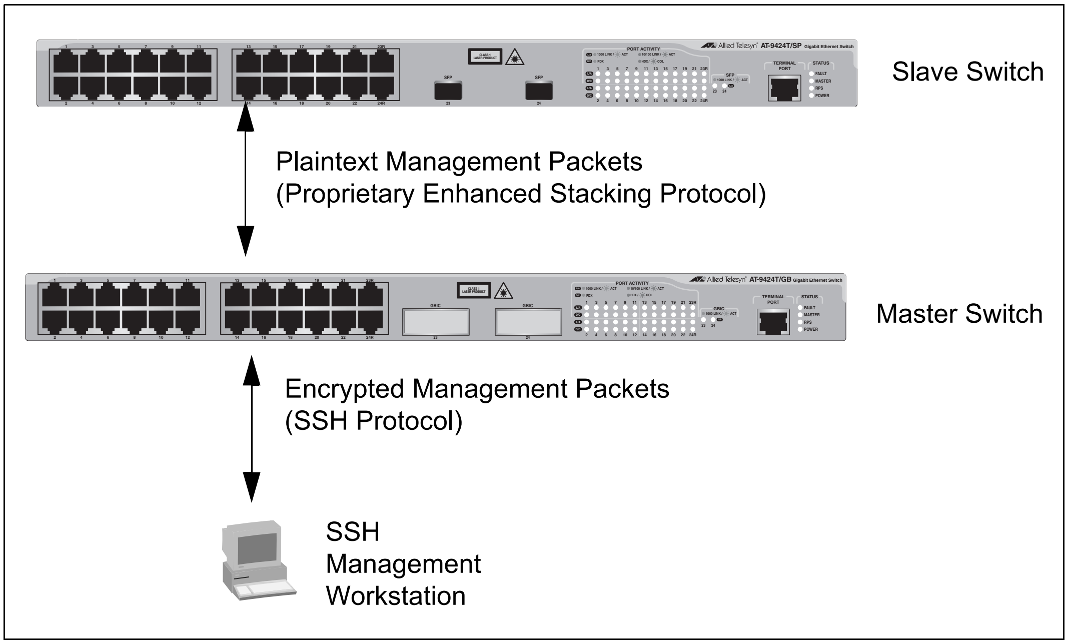

Slave Switch
Plaintext Management Packets
(Proprietary Enhanced Stacking Protocol)
Master Switch
Encrypted Management Packets
(SSH Protocol)
SSH
Management
Workstation

Figure 266 SSH Remote Management of a Slave Switch

Because enhanced stacking does not allow for SSH encrypted management sessions between a management station and a slave switch, you configure SSH only on the master switch of a stack. Activating SSH on a slave switch has no affect.

SSH Configuration Guidelines

Below are the guidelines to observe when you configure SSH:

- ❐ SSH requires two encryption key pairs. One key pair will function as the host key and the other the server key. For instructions on creating keys, refer to "Creating an Encryption Key" on page 705.
- ❐ The two encryption key pairs must be of different lengths of at least one increment (256 bits) apart. The recommended bit size for a server key is 768 bits. The recommended size for the host key is 1024 bits.
- ❐ You activate and configure SSH on the master switch of an enhanced stack, not on slave switches.
- ❐ The AT-S63 software uses well-known port 22 as the SSH default port.

General Steps for Configuring SSH

Configuring the SSH server involves several procedures. This section lists the procedures you need to complete to configure the SSH feature.

1. Create two encryption key pairs on the master switch of the enhanced switch. One pair will function as the host key and the other the server key.

2. Configure and activate the Secure Shell server on the switch by specifying the two encryption keys in the server software.

   For instructions, see "Configuring SSH" on page 756.

3. Install SSH client software on your management station.

   Follow the directions provided with the client software. You can download SSH client software from the Internet. Two popular SSH clients are PuTTY and CYGWIN.

4. Disable the Telnet server.

   Although the switch allows the SSH and Telnet servers to be enabled simultaneously, allowing Telnet to be enabled negates the security of the SSH feature. To disable the Telnet server, see "Enabling or Disabling the Telnet Server" on page 64.

5. Log in to the switch from your SSH management station.

Configuring SSH

This section describes how to configure the switch as an SSH server. For a description of all the steps required to configure an SSH server, see "General Steps for Configuring SSH" on page 755.

Before you begin this procedure, you need to configure a host and server keys for SSH. See Chapter 31, "Encryption Keys" on page 693. The minimum bit size of the server key is 512 bits. The recommended bit size for a server key is 768 bits. The recommended size for the host key is 1024 bits. In addition, the bit size of the host and server keys must differ by 128 bits.

While you are configuring the SSH feature, you must disable the SSH server. When you have completed your configuration changes, enable the SSH server to permit SSH client connections.

Note
Allied Telesyn recommends disabling the Telnet server before you enable SSH. Otherwise, the security functions provided by SSH are lost. See "Enabling or Disabling the Telnet Server" on page 64.

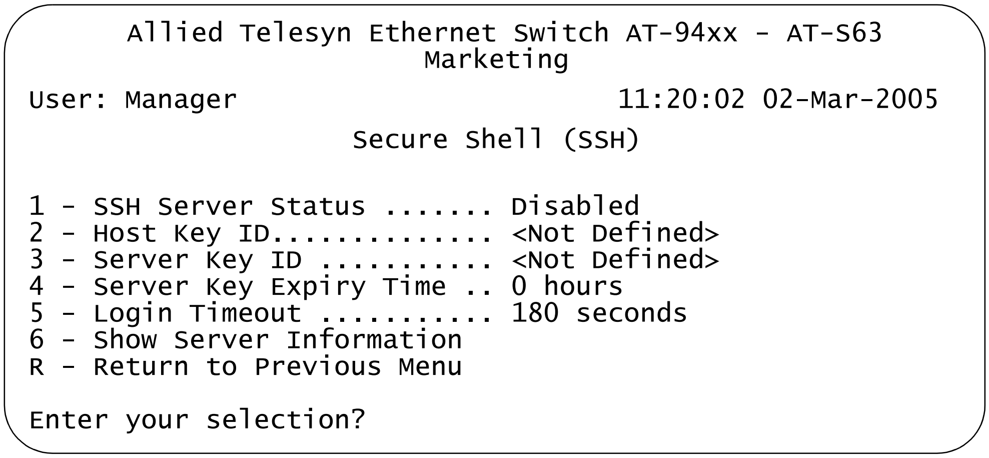
To configure the SSH protocol, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **8** to select Secure Shell (SSH).

   The Secure Shell (SSH) menu is shown in Figure 267.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
                     Secure Shell (SSH)

1 - SSH Server Status ....... Disabled
2 - Host Key ID............. <Not Defined>
3 - Server Key ID .......... <Not Defined>
4 - Server Key Expiry Time .. 0 hours
5 - Login Timeout .......... 180 seconds
6 - Show Server Information
R - Return to Previous Menu

Enter your selection?
```

Figure 267. Secure Shell (SSH) Menu

3. Type **2** to select Host Key ID.

   The following prompt is displayed:

   ```
   Enter Host Key ID [0 to 65535] -> 0
   ```

   Enter a host key ID. The default is Not Defined. Enter a value that you configured in the encryption menus. See Chapter 31, "Encryption Keys" on page 693.

4. Type **3** to select Server Key ID.

   The following prompt is displayed:

   ```
   Enter Server vKey ID [0 to 65535 -> 0
   ```

   Enter a server key ID. The default is Not Defined. Enter a value that you configured in the encryption menus. See Chapter 31, "Encryption Keys" on page 693.

5. Type **4** to select Server Key Expiry Time to set the time, in hours, for the server key to expire.

   The following prompt is displayed:

   ```
   Enter Server Key Expiry Time [0 to 5] -> 0
   ```

   This timer determines how often the server key is regenerated. A server key is regenerated for security purposes. A server key is only valid for the time period configured in the Server Key Expiry (Expiration) Time timer. Allied Telesyn recommends you set this field to 1. With this setting, a new key is generated every hour.

   The default is 0 hours which means the server key never expires. The range is 0 to 5 hours.

6. Type **5** to select Login Timeout.

   The following prompt is displayed:

   ```
   Enter Login Timeout [60 to 600] -> 180
   ```

   This is the time it takes to release the SSH server from an incomplete SSH client connection. Enter a time in seconds. The default is 180 seconds (3 minutes). The range is 60 to 600 seconds.

7. Type **1** to select SSH Server Status to enable or disable the SSH server.

   The following prompt is displayed:

   ```
   SSH Server Status [E-Enabled, D-Disabled] ->
   ```

Type **E** to enable the SSH server. Select this value after you have finished configuring SSH and want to log on to the server. Or, type D to disable SSH while you are configuring the protocol. SSH must be disabled while you are configuring the protocol. This is the default.

Note
When there are active SSH connections, you cannot disable the SSH server. If you attempt to disable the SSH server when it is in this state, you receive a warning message.

Note
Allied Telesyn recommends disabling the Telnet server before you enable SSH. Otherwise, the security provided by SSH is lost.

8. After making changes, type **R** to until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying SSH Information

To display SSH server information, perform the following procedure:

1. From the Main Menu, type **7** to select Security and Services.

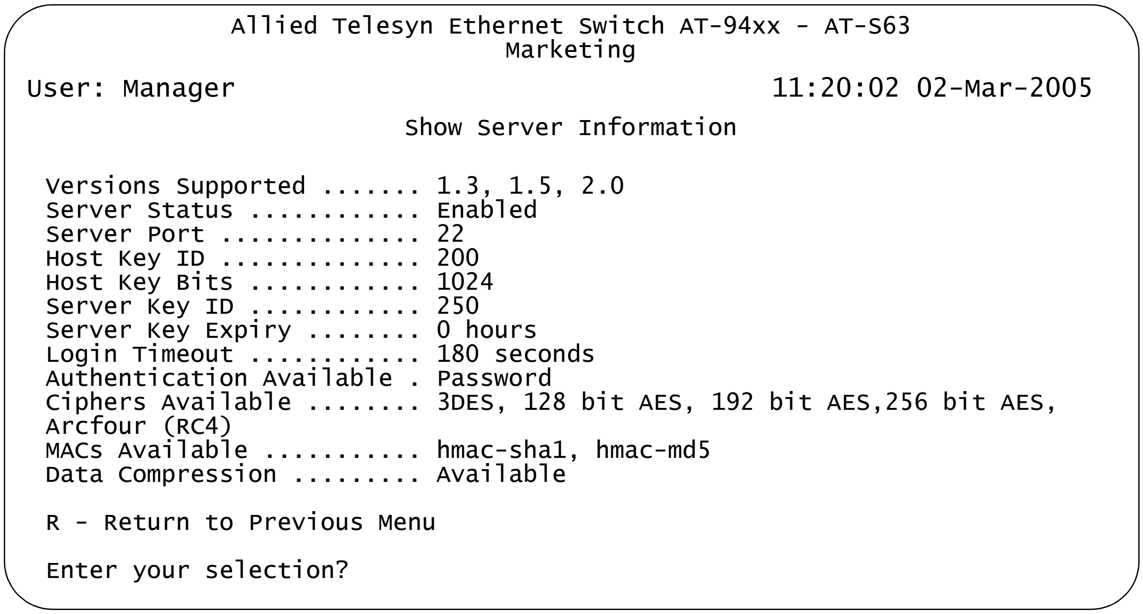
   The Security and Services menu is shown in Figure 82 on page 259.

2. From the Security and Services menu, type **8** to select Secure Shell (SSH).

   The Secure Shell (SSH) menu is shown in Figure 267 on page 756.

3. From the Secure Shell (SSH) menu, type **6** to select Show Server Information.

   The Show Server Information menu is shown in Figure 268.



```
               Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                                  Marketing
User: Manager                                    11:20:02 02-Mar-2005
                         Show Server Information

 Versions Supported ....... 1.3, 1.5, 2.0
 Server Status ............ Enabled
 Server Port .............. 22
 Host Key ID .............. 200
 Host Key Bits ............ 1024
 Server Key ID ............ 250
 Server Key Expiry ........ 0 hours
 Login Timeout ............ 180 seconds
 Authentication Available . Password
 Ciphers Available ........ 3DES, 128 bit AES, 192 bit AES,256 bit AES,
 Arcfour (RC4)
 MACs Available ........... hmac-sha1, hmac-md5
 Data Compression ......... Available

 R - Return to Previous Menu

 Enter your selection?
```

Figure 268. Show Server Information Menu

The Show Server Information menu provides the following information:

Versions Supported
The versions of SSH which are supported by the AT-S63 management software.

Server Status
Whether or not the SSH server is enabled or disabled.

Server Port
The well-known port for SSH. The default is port 22.

Host Key ID
The host key ID defined for SSH.

Host Key Bits
Number of bits in the host key.

Server Key ID
Server key ID defined for SSH.

Server Key Expiry
Length of time, in hours, until the server key is regenerated. The default is 0 hours which means the server key is not regenerated.

Login Timeout
Time, in seconds, until a SSH server is released from an incomplete connection with a SSH client.

Authentication Available
Authentication method available. Currently, password authentication is the only supported method.

Ciphers Available
SSH ciphers that are available on the switch.

MACs Available
Message Authorization Code (MAC) that is used to validate incoming SSH messages to the server. Two algorithms are supported.

Data Compression
Whether or not data compression is available on the switch. Data compression is useful for networks that have a slow throughput speed.

Chapter 34

TACACS+ and RADIUS Protocols

This chapter describes how you can use two authentication protocols, TACACS+ and RADIUS, to control who can log onto a switch to manage it. Sections in the chapter include:

TACACS+ and RADIUS Overview

The AT-S63 management software has two standard manager login accounts: manager and operator. The manager account lets you change a switch's parameter settings while the operator account lets you view the settings, but not change them. Each account has its own password. The manager account has a default password of "friend" and the operator account has a default password "operator."

For those networks that are managed by just one or two network managers, the standard accounts may be all you need. However, for larger networks managed by several network managers, you might want to give each manager his or her own management login account rather than have them share an account.

This is where TACACS+ and RADIUS can be useful. TACACS+ is an acronym for Terminal Access Controller Access Control System. RADIUS is an acronym for Remote Authentication Dial In User Services. These are authentication protocols. You can use them to transfer the task of validating management access from an AT-9400 Series switch to an authentication protocol server.

With the protocols you can create a series of username and password combinations that define who can manage an AT-9400 Series switch.

There are three basic functions an authentication protocol provides:

❒ Authentication

❒ Authorization

❒ Accounting

When a network manager logs in to a switch to manage the device, the switch passes the username and password entered by the manager to the authentication protocol server. The server checks to see if the username and password are valid for that switch. This is referred to as authentication.

If the combination is valid, the authentication protocol server notifies the switch and the switch completes the login process, allowing the manager to manage the switch.

If the username and password are invalid, the authentication protocol server notifies the switch and the switch cancels the login.

Authorization defines what a manager can do after logging in to a switch. You assign an authorization level to each username and password combination that you create on the server software. The access level can either Manager or Operator.

The final function of an authentication protocol is accounting, which keeps track of user activity on network devices. The AT-S63 management software does not support RADIUS or TACACS+ accounting as part of manager accounts. However, it does support RADIUS accounting with the 802.1x Port-based Network Access Control feature, as explained in Chapter 28, “802.1x Port-based Network Access Control” on page 647.

Note
The AT-S63 management software does not support the two earlier versions of the TACACS+ protocol, TACACS and XTACACS.

TACACS+ and RADIUS Implementation Guidelines

What do you need to use the TACACS+ and RADIUS protocols? Following are the main points.

❒ First, you need to install TACACS+ or RADIUS server software on one or more of your network servers or management stations. Authentication protocol server software is not available from Allied Telesyn.

❒ The authentication protocol server can be on the same subnet or a different subnet as the AT-9400 Series switch. If the server and switch are on different subnets, be sure to specify a default gateway in the System Configuration menu (Figure 5 on page 47) so that the switch and server can communicate with each other.

❒ You need to configure the TACACS+ or RADIUS software on the authentication server. This involves the following:

– Specifying the username and password combinations. The maximum length for a username is 38 alphnumeric characters and spaces, and the maximum length for a password is 16 alphnumeric characters and spaces.

– Assigning each combination an authorization level. How this is achieved differs depending on the server software you are using. TACACS+ controls this through the sixteen (0 to 15) different levels of the Privilege attribute. A privilege level of “0” gives the combination Operator status. Any value from 1 to 15 gives the combination Manager status.

For RADIUS, management level is controlled by the Service Type attribute. This attribute has 11 different values; only two apply to the AT-S63 management software. A value of Administrative for this attribute gives the username and password combination Manager access. A value of NAS Prompt assigns the combination Operator status.

Note
This manual does not explain how to configure TACACS+ or RADIUS server software. For that you need to refer to the documentation that came with the software.

- ❒ You must activate the TACACS+ or RADIUS client software on the switch using the AT-S63 management software and configure the settings, which includes the IP addresses of up to three authentication server. The procedure for this step is found in this chapter.

By default, authentication protocol is disabled in the AT-S63 management software. After you activate it, you need to provide the following information:

- ❒ Which authentication protocol you want to use. Only one authentication protocol can be active on a switch at a time.
- ❒ IP addresses of up to three authentication servers.
- ❒ The encryption key used by the authentication servers.

You can specify up to three RADIUS or TACACS+ servers. Specifying multiple servers adds redundancy to your network. For example, removing an authentication server from the network for maintenance does not prevent network managers from logging into switches if there are one or two other authentication servers on the network.

When a switch receives a username and password combination from a network manager, it sends the combination to the first authentication server in its list. If the server fails to respond, the switch sends the combination to the next server in the list, and so on.

If no authentication server responds or if no servers have been defined and you are managing the switch locally, the AT-S63 management software defaults to the standard manager and operator accounts.

Note
For more information on TACACS+, refer to the RFC 1492 standard. For more information on RADIUS, refer to the RFC 2865 standard.

Enabling or Disabling TACACS+ or RADIUS

To enable or disable the server-based authentication feature on the switch and to configure the RADIUS or TACACS+ settings, perform one of the following procedures.

Enabling TACACS+ or RADIUS

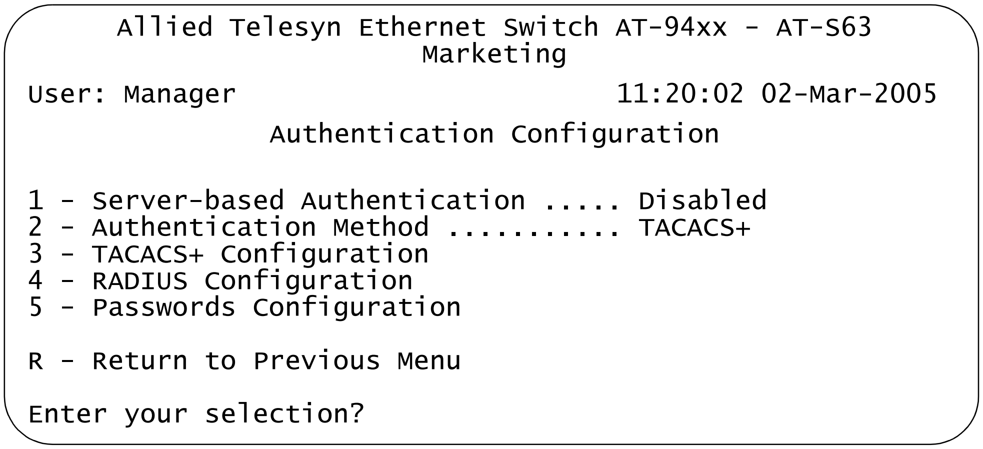
To enable TACACS+ or RADIUS, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **6** to select Authentication Configuration.

   The Authentication Configuration menu is shown in Figure 269.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                         Marketing
User: Manager                       11:20:02 02-Mar-2005
               Authentication Configuration

1 - Server-based Authentication ..... Disabled
2 - Authentication Method ........... TACACS+
3 - TACACS+ Configuration
4 - RADIUS Configuration
5 - Passwords Configuration

R - Return to Previous Menu

Enter your selection?
```

Figure 269. Authentication Configuration Menu

Note
Selection 5, Passwords Configuration, is described in “Working With the Manager and Operator Passwords” on page 55.

3. To select the active authentication protocol, type **2** to select Authentication Method.

   The following prompt is displayed:

   ```
   Enter T-TACACS+, R-RADIUS ->
   ```

4. Type **T** to select TACACS+ or **R** for RADIUS. The default is TACACS+. Only one protocol can be active on the switch at a time.

Note
Before enabling server-based authentication on the switch, you should first configure the TACACS+ or RADIUS settings. If you selected TACACS+, go to “Configuring TACACS+” on page 767. If you selected RADIUS, go to “Configuring RADIUS” on page 771.

Disabling TACACS+ or RADIUS

To disable the authentication feature on the switch, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **6** to select Authentication Configuration.

   The Authentication Configuration menu is shown in Figure 269 on page 765.

3. From the Authentication Configuration menu, type **1** to select Server-based Authentication.

   The following prompt is displayed:

   ```
   Server Based User Authentication (E-Enabled,
   D-Disabled) ->
   ```

4. Type **D** to disable the feature. The default is disabled.

5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Configuring TACACS+

To configure the TACACS+ client software, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

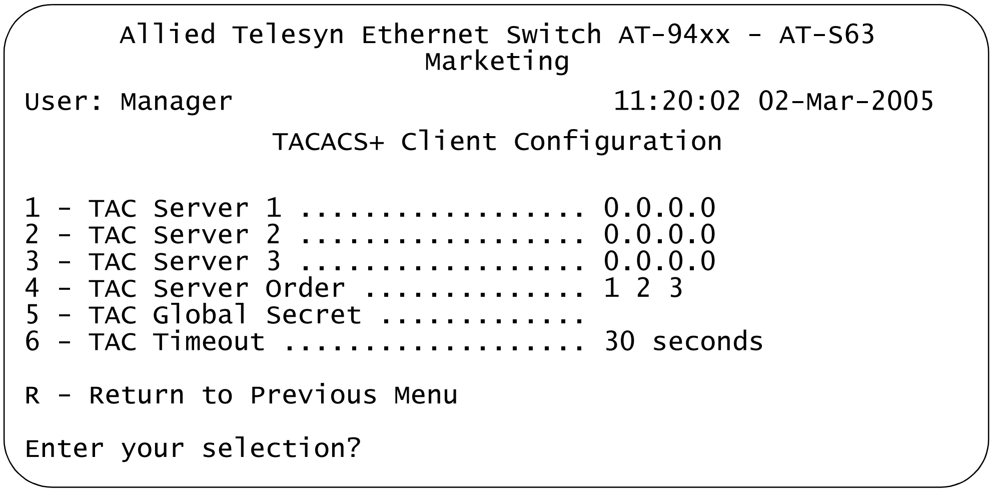
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **6** to select Authentication Configuration.

   The Authentication Configuration menu is shown in Figure 269 on page 765.

3. From the Authentication Configuration menu, type **3** to select TACACS+ Configuration.

   The TACACS+ Client Configuration menu is shown in Figure 270.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                       11:20:02 02-Mar-2005
               TACACS+ Client Configuration

1 - TAC Server 1 ................. 0.0.0.0
2 - TAC Server 2 ................. 0.0.0.0
3 - TAC Server 3 ................. 0.0.0.0
4 - TAC Server Order ............. 1 2 3
5 - TAC Global Secret ............
6 - TAC Timeout .................. 30 seconds

R - Return to Previous Menu

Enter your selection?
```

Figure 270. TACACS+ Client Configuration Menu

4. Adjust the following parameters as necessary.

   1 - TAC Server 1
   2 - TAC Server 2
   3 - TAC Server 3
   Use these parameters to specify the IP addresses of up to three network servers containing TACACS+ server software. After you have entered an IP address, you will see the following prompt:

   ```
   Use per-server secret [Y/N] ->
   ```

   If you will be specifying more than one TACACS+ server and if all of the servers use the same encryption secret, you can answer No to this prompt and enter the encryption secret using the TAC Global Secret parameter.

However, if you are specifying only one TACACS+ server or if the servers have difference encryption secrets, then respond with Yes to this prompt. You will see:

```
Enter per-server secret [max 40 characters] ->
```

Use this prompt to enter the encryption secret for the TACACS+ server whose IP address you are specifying.

4 - TAC Server Order
Use this selection to indicate the order in which you want the switch to query the TACACS+ servers for logon authentication. Of course, you can skip this option if you specified only one IP address. The default is 1, 2, and 3, in that order.

5 - TAC Global Secret
If all of the TACACS+ servers have the same encryption secret, rather then entering the same secret when you enter the IP addresses, you can use this option to enter the secret only once.

3 - TAC Timeout
This parameter specifies the maximum amount of time the switch waits for a response from a TACACS+ server before assuming the server is not responding. If the timeout expires and the server has not responded, the switch queries the next TACACS+ server in the list. If there are no more servers, the switch defaults to the standard Manager and Operator accounts. The default is 30 seconds. The range is 1 to 300 seconds.

5. After you have finished configuring the parameters in the TACACS+ Client Configuration menu, type **R** to return to the Authentication Configuration menu, shown in Figure 269 on page 765.

6. From the Authentication Configuration menu, type **1** to select Server-based Authentication.

   The following prompt is displayed:

   ```
   Server Based User Authentication (E-Enabled,
   D-Disabled) ->
   ```

7. Type **E** to enable server-based authentication on the switch.

8. The TACACS+ client software is now active on the switch.

9. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying the TACACS+ Settings

To display the TACACS+ settings, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

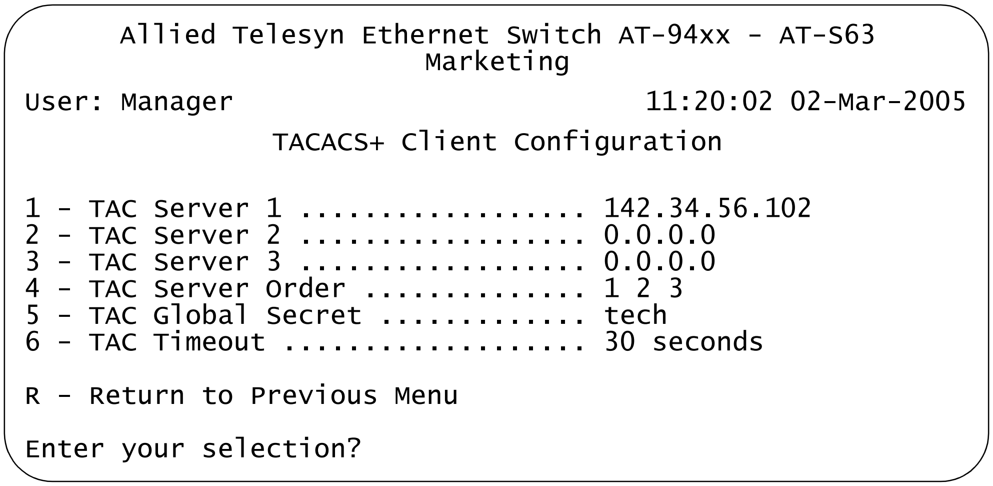
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **6** to select Authentication Configuration.

   The Authentication Configuration menu is shown in Figure 269 on page 765.

3. Type **3** to select TACACS+ Configuration.

   The TACACS+ Client Configuration menu is shown in Figure 271.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                           11:20:02 02-Mar-2005
                TACACS+ Client Configuration

1 - TAC Server 1 .................. 142.34.56.102
2 - TAC Server 2 .................. 0.0.0.0
3 - TAC Server 3 .................. 0.0.0.0
4 - TAC Server Order .............. 1 2 3
5 - TAC Global Secret ............. tech
6 - TAC Timeout ................... 30 seconds

R - Return to Previous Menu

Enter your selection?
```

Figure 271. TACACS+ Client Configuration Menu

The TACACS+ Client Configuration menu provides the following information:

TAC Server 1
TAC Server 2
TAC Server 3
The IP addresses of the TACACS+ servers.

TAC Server Order
The order in which the switch to queries the TACACS+ servers for logon authentication.

TAC Global Secret
Global encryption secret if all the servers use the same one.

TAC Timeout

The maximum amount of time the switch waits for a response from a TACACS+ server before assuming the server is not responding.

Configuring RADIUS

To configure the RADIUS protocol, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

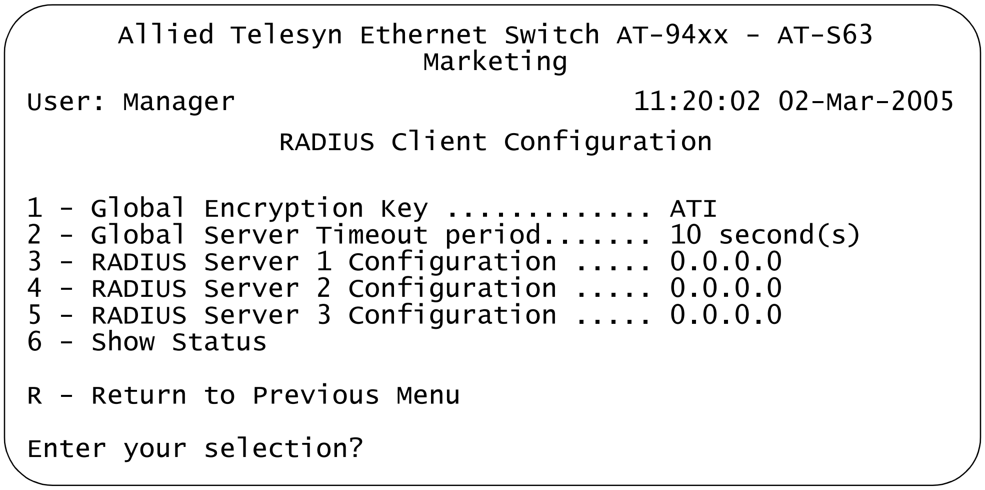
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **6** to select Authentication Configuration.

   The Authentication Configuration menu is shown in Figure 269 on page 765.

3. Type **4** to select RADIUS Configuration.

   The RADIUS Client Configuration menu is shown in Figure 272.



```
     Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                        Marketing
User: Manager                        11:20:02 02-Mar-2005
               RADIUS Client Configuration

1 - Global Encryption Key ............. ATI
2 - Global Server Timeout period....... 10 second(s)
3 - RADIUS Server 1 Configuration ..... 0.0.0.0
4 - RADIUS Server 2 Configuration ..... 0.0.0.0
5 - RADIUS Server 3 Configuration ..... 0.0.0.0
6 - Show Status

R - Return to Previous Menu

Enter your selection?
```

Figure 272. RADIUS Client Configuration

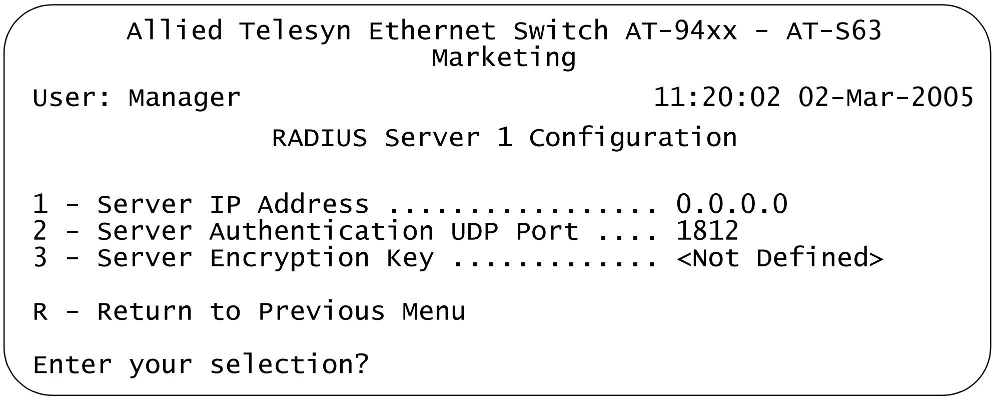
4. Adjust the following parameters as necessary.

   Global Encryption Key
   This parameter specifies the encryption key for the RADIUS servers. This option is useful if you will be entering more than one RADIUS server and all the servers share the same encryption key. The default is ATI.

   Global Server Timeout period
   This parameter specifies the maximum amount of time the switch waits for a response from a RADIUS server before assuming that the server does not respond. If the timeout expires and the server has not responded, the switch queries the next RADIUS server in the list. If there are no more servers, then the switch defaults to the standard

Manager and Operator accounts. The default is 10 seconds. The range is 1 to 60 seconds.

3 - RADIUS Server 1 Configuration
4 - RADIUS Server 1 Configuration
5 - RADIUS Server 1 Configuration
Use these parameters to specify the IP addresses of up to three network servers containing the RADIUS server software. Selecting one of the options displays the RADIUS Server Configuration menu, shown in Figure 273.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                          11:20:02 02-Mar-2005
              RADIUS Server 1 Configuration

1 - Server IP Address ................. 0.0.0.0
2 - Server Authentication UDP Port .... 1812
3 - Server Encryption Key ............. <Not Defined>

R - Return to Previous Menu

Enter your selection?
```

Figure 273. RADIUS Server Configuration

Adjust the following parameters as necessary:

1 - Server IP Address
Use this option to specify the IP address of the RADIUS server.

2 - Server Authentication UDP Port
Use this option to specify the UDP port of the RADIUS protocol.

3 - Server Encryption Key
Use this option to specify the encryption key for the RADIUS server.

5. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Displaying RADIUS Status and Settings

To display the RADIUS status and settings, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **6** to select Authentication Configuration.

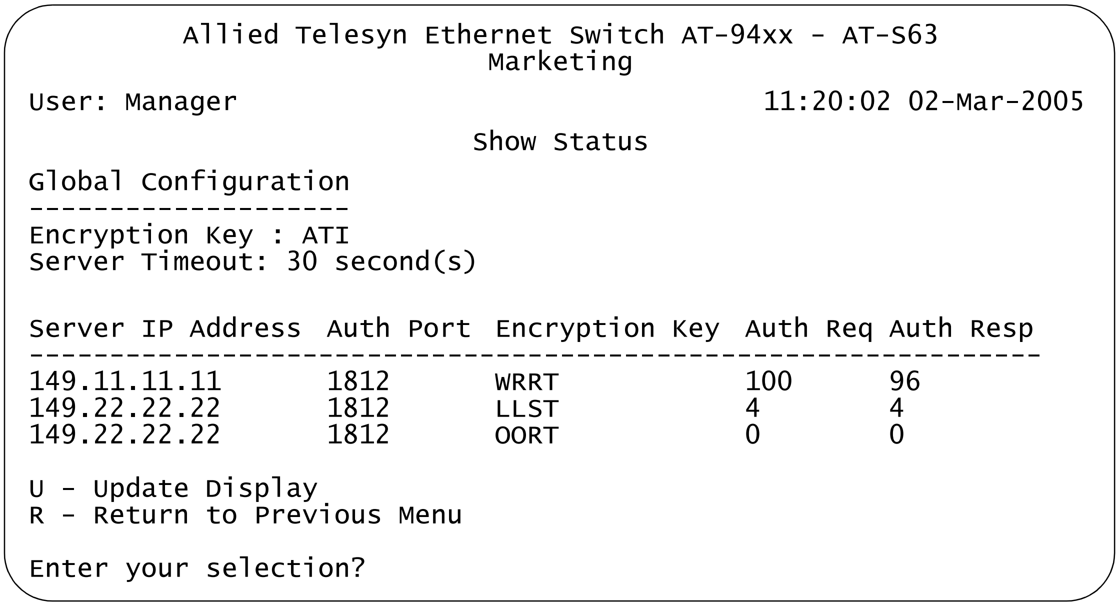
   The Authentication Configuration menu is shown in Figure 269 on page 765.

3. From the Authentication Configuration menu, type **4** to select RADIUS Configuration.

   The RADIUS Client Configuration menu is shown in Figure 272 on page 771.

4. From the RADIUS Client Configuration menu, type **6** to select Show Status.

   The Show Status menu is shown in Figure 274.



```
           Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                              Marketing
User: Manager                                 11:20:02 02-Mar-2005
                             Show Status
Global Configuration
--------------------
Encryption Key : ATI
Server Timeout: 30 second(s)

Server IP Address  Auth Port  Encryption Key  Auth Req Auth Resp
---------------------------------------------------------------
149.11.11.11       1812       WRRT            100      96
149.22.22.22       1812       LLST            4        4
149.22.22.22       1812       OORT            0        0

U - Update Display
R - Return to Previous Menu

Enter your selection?
```

Figure 274. Show Status Menu

The Show Status menu displays a table that contains the following columns of information:

Server IP Address
IP address of the RADIUS server.

Auth Port
UDP port of the RADIUS protocol.

Encryption Key
Encryption key for the RADIUS server.

Auth Req
Number of authentication requests the switch has made to the RADIUS server.

Auth Resp
Number of responses that the switch has received back from the server.

Chapter 35

Management Access Control Lists

This chapter explains how to create an access control list (ACL) to restrict Telnet and web browser management access to the switch. Sections in this chapter include:

Management ACL Security Overview

This chapter explains how to restrict remote management access of a switch by creating a management access control list (management ACL). This feature controls which management stations can remotely manage the device using the Telnet application protocol or a web browser.

The switch uses the management ACL to filter the management packets that it receives. The switch accepts and processes only those management packets that meet the criteria stated in the ACL. Those management packets that do not meet the criteria are discarded.

The benefit of this feature is that you can prevent unauthorized access to the switch by controlling which workstations are to have remote management access. You can even control which method, Telnet or web browser, that a remote manager can use.

For example, you can create a management ACL that allows the switch to accept management packets only from the management stations in one subnet or from just one or two specific management stations.

An access control list (ACL) is a list of one or more statements that define which management packets the switch accepts. Each statement, referred to as an access control entry (ACE), contains criteria that the switch uses in making the determination.

An ACE in a management ACL is an implicit “permit” statement. This means that a management packet that meets the criteria of an ACE is processed by the switch. Consequently, the ACEs that you enter into the management ACL should specify which management packets you want the switch to process. Packets that do not meet any of the ACEs in the management ACL are discarded.

Parts of a Management ACE

An ACE in a management ACL has the following four parts:

- IP address
- Subnet mask
- Protocol
- Interface

IP Address

You can specify the IP address of a specific management station or a subnet.

Mask

You need to enter a mask that indicates the parts of the IP address the switch should filter on. A binary "1" indicates the switch should filter on the corresponding bit of the address, while a "0" indicates that it should not. If you are filtering on a specific IP address, use the mask 255.255.255.255. If you are filtering on a subnet, enter the appropriate mask. For example, to allow all management stations in the subnet 149.11.11.0 to manage the switch, you would enter the mask 255.255.255.0.

Protocol

The AT-S63 management software allows you to choose TCP, UDP, or both as the protocol for the management packets. However, because Telnet and web browser management packets for an AT-9400 Series switch are exclusively TCP, specify only that protocol.

Interface

The interface parameter allows you control whether the remote management station can manage the switch using Telnet, a web browser, or both. For example, you might create an ACE that states that a particular remote management station can only use a web browser to manage the switch.

Management ACL Guidelines

Below are guidelines to observe when you create a management ACL:

- The default setting for this feature is disabled.
- A switch can have only one management ACL.
- A management ACL can have up to 256 ACEs.
- An ACE must have an IP address and mask.
- All management ACEs are implicit "permit" statements. A management packet that meets the criteria of an ACE is accepted by the switch. Consequently, the ACEs that you enter into the management ACL should specify which management packets you want the switch to process. Management packets that do not meet any of the ACEs in the management ACL are discarded.
- A management packet that meets an ACE is immediately processed by the switch and is not compared against any remaining ACEs in the management ACL.
- The ACEs are performed in the order in which they are entered in the ACL. Because all ACEs in a management ACL are implicit permit statements, it does not matter in which order you enter them.
- The protocol is always TCP.
- The management ACL does not control local management or remote SNMP management of a switch.

- Activating this feature without specifying any ACEs prohibits you from managing the switch remotely using a Telnet application or web browser because the switch discards all Telnet and web browser management packets.
- You can apply management ACLs to both master and slave switches in an enhanced stack. A management ACL on a master switch filters management packets intended for the master switch as well as those intended for any slave switches that you manage through the master switch. A management ACL applied to a slave switch filters only those management packets directed to the slave switch.

Examples

Following are several examples of management ACLs and ACEs:.

This ACE allows the management station with the IP address 149.11.11.11 to remotely manage the switch using either the Telnet application protocol or a web browser:

IP Address	149.11.11.11
Mask	255.255.255.255
Protocol	TCP
Interface	All

If the management ACL contained only the above ACE, then only the management station specified in the ACE would be allowed to manage the switch.

This ACE allows all management stations in the subnet 149.11.11.0 to remotely manage the switch using either the Telnet application or a web browser:

IP Address	149.11.11.0
Mask	255.255.255.0
Protocol	TCP
Interface	All

This ACE allows all management stations in the subnet 149.11.11.0 to remotely manage the switch using a web browser, but not the Telnet application:

IP Address	149.11.11.0
Mask	255.255.255.0
Protocol	TCP
Interface	Web

A management ACL can contain multiple ACEs. The two ACEs in this ACL allow all management packets from the subnets 149.11.11.0 and 149.22.22.0 to manage the switch using the Telnet application, but not a web browser:

ACE #1

IP Address	149.11.11.0
Subnet Mask	255.255.255.0
Protocol	TCP
Interface	Telnet

ACE #2

IP Address	149.22.22.0
Subnet Mask	255.255.255.0
Protocol	TCP
Interface	Telnet

The two ACEs in this management ACL permit remote management from the management station with the IP address 149.11.11.11 and all management stations in the subnet 149.22.22.0:

ACE #1

IP Address	149.11.11.11
Mask	255.255.255.255
Protocol	TCP
Interface	All

ACE #2

IP Address	149.22.22.0
Mask	255.255.255.0
Protocol	TCP
Interface	All

Creating the Management ACL

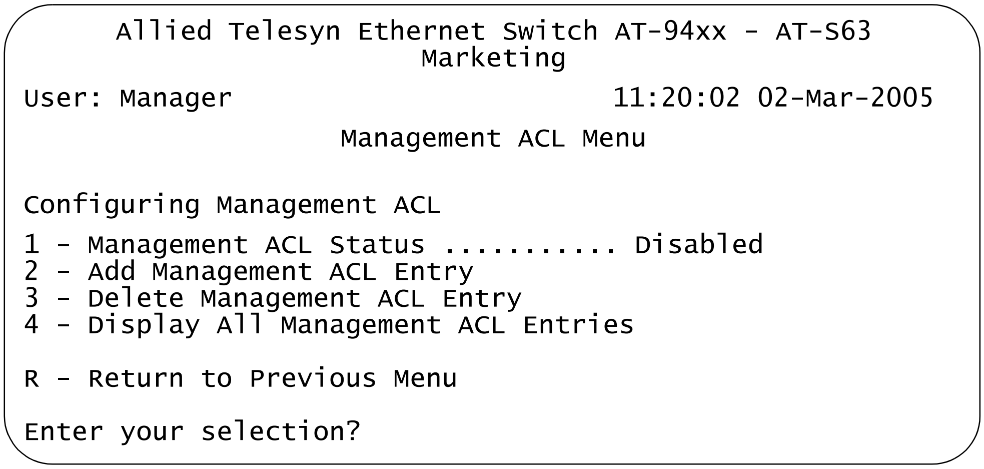
To create a management ACL, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **7** to select Management ACL.

   The Management ACL menu is shown in Figure 275.



```
       Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                        11:20:02 02-Mar-2005
                     Management ACL Menu

Configuring Management ACL
1 - Management ACL Status ........... Disabled
2 - Add Management ACL Entry
3 - Delete Management ACL Entry
4 - Display All Management ACL Entries

R - Return to Previous Menu

Enter your selection?
```

Figure 275. Management ACL Menu

Note
If you are managing the switch through a Telnet management session, do not enable this feature until after you have entered the ACE(s). Doing otherwise ends your management session.

3. From the Management ACL menu, type **2** to select Add Management ACL Entry.

   The following prompt is displayed:

   ```
   Enter the IP address:
   ```

4. Enter the IP address of a specific management station (for example, 149.11.11.11) or a subnet (for example, 149.11.11.0). You must enter an IP address.

   The following prompt is displayed:

   ```
   Enter the Mask:
   ```

5. Enter a mask that indicates the parts of the IP address the switch should filter on. A binary "1" indicates the switch should filter on the corresponding bit of the address, while a "0" indicates that it should not. If you are filtering on a specific IP address, use the mask 255.255.255.255. If you are filtering on a subnet, enter the appropriate mask. For example, to allow all management stations in the subnet 149.11.11.0 to manage the switch, you would enter the mask 255.255.255.0.

   The following prompt is displayed:

   ```
   Enter the Protocol [TCP/UDP/ALL]:
   ```

6. Enter either **TCP** or **ALL**.

   The AT-S63 management software allows you to select UDP, but because management packets from Telnet and web browser management sessions are TCP, you should specify TCP or ALL.

   The following prompt is displayed:

   ```
   Enter the Interface [TELNET/WEB/ALL]:
   ```

7. Specify which interface you want the management station to be able to use when managing the switch. The options are:

   Telnet - Allows Telnet management packets.

   Web - Allows web browser management packets.

   All - Allows both Telnet and web browser management packets.

8. If needed, repeat this procedure starting with Step 3 to add more ACEs to the management ACL.

9. After you have added all of the ACEs, type **1** to select Management ACL Status.

   The following message is displayed:

   ```
   You are enabling MGMT ACL. All existing Web and Telnet
   would be blocked. Do you wish to continue? [Yes/No]
   ```

10. Type **Y** for Yes or **N** for No to cancel the process.

Note
If you activate this feature without specifying any ACEs, all Telnet and web browser management packets are discarded by the switch and you cannot manage the device remotely.

The management ACL is now active on the switch.

11. After making changes, type **R** until you return to the Main Menu. Then type **S** to select Save Configuration Changes.

Adding an ACE

To add an ACE, repeat the procedure in "Creating the Management ACL" on page 780. The new ACEs that you enter are added to the ACEs that are already in the management ACL.

Deleting an ACE

To delete an ACE, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **7** to select Management ACL menu.

   The Management ACL menu is shown in Figure 275 on page 780.

3. From the Management ACL menu, type **3** to select Delete Management ACL Entry.

   The following prompt is displayed:

   ```
   Enter the IP Address:
   ```

4. Enter the IP address for the ACE you want to delete.

The AT-S63 management software prompts you to enter the specifics of the ACE that you want to delete. (It can help to first display the contents of the management ACL, using the procedure in ”Displaying the ACEs”, next, and jot down on paper the IP address, mask, protocol, and Interface information on the ACE you want to delete. In that way you will have the information when the software prompts you for it.)

Displaying the ACEs

To display the ACEs, perform the following procedure:

1. From the Main Menu, type **5** to select System Administration.

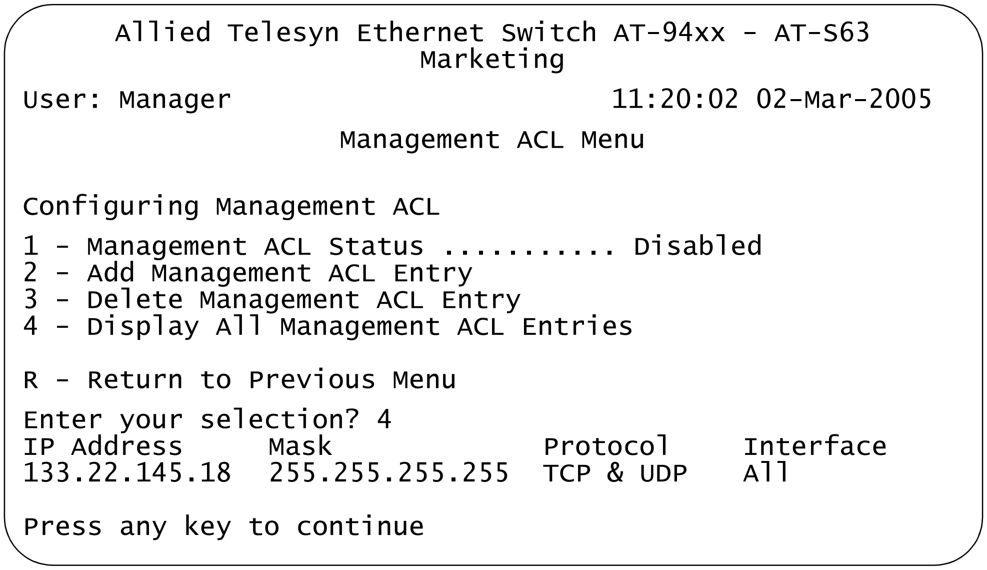
   The System Administration menu is shown in Figure 4 on page 46.

2. From the System Administration menu, type **7** to select Management ACL menu.

   The Management ACL menu is shown in Figure 275 on page 780.

3. From the Management ACL menu, type **4** to select Display All Management ACL Entries.

   A list of the ACEs along with the specifics of each ACE is displayed at the bottom of the Management ACL menu, as shown in Figure 276.



```
      Allied Telesyn Ethernet Switch AT-94xx - AT-S63
                          Marketing
User: Manager                        11:20:02 02-Mar-2005
                    Management ACL Menu

Configuring Management ACL
1 - Management ACL Status ........... Disabled
2 - Add Management ACL Entry
3 - Delete Management ACL Entry
4 - Display All Management ACL Entries

R - Return to Previous Menu
Enter your selection? 4
IP Address     Mask             Protocol    Interface
133.22.145.18  255.255.255.255  TCP & UDP   All

Press any key to continue
```

Figure 276. Management ACL Menu with ACEs Display

The Management ACL menu provides the following information about the ACEs:

IP Address
The IP address of a management station.

Mask
The parts of the IP address the switch is filtering on.

Protocol
The protocol used for management packets.

Interface
The interface that the management station uses to manage the switch. The options are Telnet, Web, and All (both Telnet and Web.)

Appendix A

AT-S63 Default Settings

This appendix lists the AT-S63 factory default settings. It contains the following sections in alphabetical order:

Basic Switch Default Settings

This section lists the default settings for basic switch parameters. The following topics are covered:

- ❒ “Boot Configuration File Default Setting” on page 788
- ❒ “Management Access Default Settings” on page 788
- ❒ “Management Interface Default Settings” on page 788
- ❒ “RJ-45 Serial Terminal Port Default Settings” on page 789
- ❒ “SNTP Default Settings” on page 789
- ❒ “Switch Administration Default Settings” on page 790
- ❒ “System Software Default Settings” on page 790

Boot Configuration File Default Setting

The following table lists the File menu default setting.

File Menu Setting	Default
Default Configuration File	boot.cfg

Management Access Default Settings

The following table lists the management access default settings.

Remote Management Access Setting	Default
Telnet	Enabled
SNMP	Disabled
TFTP	Enabled
Web Server	Enabled

Management Interface Default Settings

The following table lists the management interface default settings.

Management Interface Setting	Default
Manager Login Name	manager
Manager Password	friend
Operator Login Name	operator
Operator Password	operator
Console Disconnect Timer Interval	10 minutes

Note
Login names and passwords are case sensitive.

RJ-45 Serial Terminal Port Default Settings

The following table lists the RJ-45 serial terminal port default settings.

RJ-45 Serial Terminal Port Setting	Default
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	None
Baud Rate	9600 bps

SNTP Default Settings

The following table lists the SNTP default settings.

SNTP Setting	Default
System Time	00:00:00 on January 1, 1970
SNTP Status	Disabled
SNTP Server	0.0.0.0
UTC Offset	+0
Daylight Savings Time (DST)	Enabled
Poll Interval	600 seconds

Switch Administration Default Settings

The following table describes the switch administration default settings.

Administration Setting	Default
IP Address	0.0.0.0
Subnet Mask	0.0.0.0
Gateway Address	0.0.0.0
System Name	None
Administrator	None
Comments	None
BOOTP/DHCP	Disabled
MAC Address Aging Time	300 seconds

System Software Default Settings

The following table lists the system software default settings.

System Software Setting	Default
Console Startup Mode	CLI

Enhanced Stacking Default Setting

The following table lists the enhanced stacking default setting.

Enhanced Stacking Setting	Default
Switch State	Slave

SNMP Default Settings

The following table describes the SNMP default settings.

SNMP Communities Setting	Default
SNMP Status	Disabled
Authentication Failure Trap Status	Disabled
Community Name	public (Read only)
Community Name	private (Read|Write)
Status (public)	Enabled
Status (private)	Enabled
Open Status (public	Yes
Open Status (private)	Yes

Port Configuration Default Settings

The following table lists the port configuration default settings.

Port Configuration Setting	Default
Status	Enabled
Broadcast Filter	Disabled
Override Priority	No override
HOL Blocking	Disabled
Back Pressure	Disabled
Flow Control	Auto
Flow Control/Back Pressure Limit	7935
Speed	Auto-Negotiation
Duplex Mode	Auto-Negotiation
MDI/MDI-X	Auto-MDI/MDIX

Event Log Default Settings

The following table lists the event log default settings.

Event Log Setting	Default
Status	Enabled
Full Log Action	Wrap

Quality of Service

The following table lists the default mappings of IEEE 802.1p priority levels to egress port priority queues

IEEE 802.1p Priority Level	Port Priority Queue
0 or 1	Q0 (lowest)
2 or 3	Q1
4 or 5	Q2
6 or 7	Q3 (highest)

IGMP Snooping Default Settings

The following table lists the IGMP Snooping default settings.

IGMP Snooping Setting	Default
IGMP Snooping Status	Disabled
Multicast Host Topology	Single Host/ Port (Edge)
Host/Router Timeout Interval	260 seconds
Maximum Multicast Groups	64
Multicast Router Ports Mode	Auto Detect

Denial of Service Prevention Default Settings

The following table lists the default settings for the Denial of Service prevention feature.

Denial of Service Prevention Setting	Default
IP Address	0.0.0.0
Subnet Mask	0.0.0.0
Uplink Port	26
SYN Flood Defense	Disabled
Smurf Defense	Disabled
Land Defense	Disabled
Teardrop Defense	Disabled
Ping of Death Defense	Disabled
IP Options Defense	Disabled

STP, RSTP, and MSTP Default Settings

This section provides the spanning tree, STP RSTP, and MSTP, default settings.

Spanning Tree Switch Settings

The following table describes the Spanning Tree Protocol default settings for the switch.

STP Switch Setting	Default
Spanning Tree Status	Disabled
Active Protocol Version	RSTP

STP Default Settings

The following table describes the STP default settings.

STP Setting	Default
Bridge Priority	32768
Bridge Hello Time	2
Bridge Forwarding	15
Bridge Max Age	20
Port Cost	Automatic -Update
Port Priority	128

RSTP Default Settings

The following table describes the RSTP default settings.

RSTP Setting	Default
Force Version	RSTP
Bridge Priority	32768
Bridge Hello Time	2
Bridge Forwarding	15
Bridge Max Age	20
Edge Port	Yes
Point-to-Point	Auto Detect
Port Cost	Automatic Update
Port Priority	128

MSTP Default Settings

The following table lists the MSTP default settings..

MSTP Setting	Default
Status	Disabled
Force Version	MSTP
Bridge Hello Time	2
Bridge Forwarding Delay	15
Bridge Max Age	20
Maximum Hops	20
Configuration Name	null
Revision Level	0
CIST Priority	Increment 8 (32768)
Port Priority	Increment 8 (128)
Port Internal Path Cost	Auto Update
Port External Path Cost	Auto Detect
Point-to-Point	Auto Detect
Edge Port	Yes

VLAN Default Settings

This section provides the VLAN default settings.

VLAN Setting	Default
Default VLAN Name	Default_VLAN (all ports)
Management VLAN ID	1 (Default_VLAN)
VLAN Mode	User Configured
Uplink Port	None

GVRP Default Settings

This section provides the default settings for GVRP.

GVRP Setting	Default
Status	Disabled
GIP Status	Enabled
Join Timer	20 centiseconds
Leave Timer	60 centiseconds
Leave All Timer	1000 centiseconds
Port Mode	Normal

Port Security Default Settings

The following table lists the port security default settings.

Port Security Setting	Default
Security Mode	Automatic (no security)
Intrusion Action	Discard
Participating	No
MAC Limit	No Limit

802.1x Port-Based Network Access Control Default Settings

The following table describes the 802.1x Port-based Network Access Control default settings.

802.1x Port-based Network Access Control Settings	Default
Port Access Control	Disabled
Authentication Method	RADIUS EAP
Port Role	None

The following table lists the default settings for RADIUS accounting.

RADIUS Accounting Settings	Default
Status	Disabled
Port	1813
Type	Network
Trigger Type	Start_Stop
Update Status	Disabled
Update Interval	60

Web Server Default Settings

The following table lists the web server default settings.

Web Server Configuration Setting	Default
Status	Enabled
Mode	HTTP
Port Number	80
SSL Key ID	None

SSL Default Settings

The following table lists the SSL default settings.

SSL Setting	Default
Maximum Number of Sessions	50
Session Cache Timeout	300 seconds

PKI Default Settings

The following table lists the PKI default settings, including the generate enrollment request settings.

PKI Setting	Default
Switch Distinguished Name	None
Maximum Number of Certificates	256
Request Name	None
Key Pair ID	0
Format	PEM
Type	PKCS10

SSH Default Settings

The following table lists the SSH default settings.

SSH Setting	Default
Status	Disabled
Host Key ID	Not Defined
Server Key ID	Not Defined
Server Key Expiry Time	0 hours
Login Timeout	180 seconds

Server-Based Authentication Default Settings

This section describes the server-based authentication, RADIUS, and TACACS+ client default settings.

Server-Based Authentication Default Settings

The following table describes the server-based authentication default settings.

Server-based Authentication Setting	Default
Server-based Authentication	Disabled
Active Authentication Method	TACACS+

RADIUS Default Settings

The following table lists the RADIUS configuration default settings.

RADIUS Configuration Setting	Default
Global Encryption Key	ATI
Global Server Timeout Period	30 seconds
RADIUS Server 1 Configuration	0.0.0.0
RADIUS Server 2 Configuration	0.0.0.0
RADIUS Server 3 Configuration	0.0.0.0
Auth Port	1812
Encryption Key	Not Defined

TACACS+ Client Default Settings

The following table lists the TACACS+ client configuration default settings.

TACACS+ Client Configuration Setting	Default
TAC Server 1	0.0.0.0
TAC Server 2	0.0.0.0
TAC Server 3	0.0.0.0
TAC Server Order	1 2 3
TAC Global Secret	None
TAC Timeout	30 seconds

Management Access Control List Default Setting

The following table lists the default setting for the Management Access Control List.

Management ACL Setting	Default
Status	Disabled

Index