

About this Software Reference

Introduction

This Software Reference is the complete reference to the configuration, management and operation of all Rapier i Layer 3 switches, and includes detailed descriptions of all management commands.

Rapier i Layer 3 switches provide efficient and cost-effective multiprotocol routing, terminal serving and integrated network management over wide area networks and LANs.

The switch provides wide area networking via

- Point-to-Point Protocol
- Frame Relay, and X.25, operating over synchronous links up to 2Mb/s (switches with NSM bay only).

Structure of this Software Reference

Part 1: Introduction and Setup

See this chapter...	For information about...
Chapter 1, Getting Started	how to start operating the switch.
Chapter 2, Using the Command Line Interface (CLI)	the structure of commands, command line editing, and aliases.
Chapter 3, Using the Graphical User Interface (GUI)	how to access the switch via the GUI, and an overview of the GUI's features and navigation.
Chapter 4, Configuring and Monitoring the System	the switch's system identification parameters and how to monitor system functionality and the switch's environment.
Chapter 5, Managing Configuration Files and Software Versions	how to save and edit the switch configuration, how to load files to and from the switch, and how to upgrade the switch software.
Chapter 6, Managing the File System	switch memory and how to create, edit, and delete files.

Part 2: LAN Switching and WAN Connections

See this chapter...	For information about...
Chapter 7, Overview of Layer 2 Switching	the Layer 2 and IP switching features on the switch, and how to configure some of them.
Chapter 8, Switching	how to configure the switch ports on the switch, their VLAN membership, filtering, and the ports' Quality of Service mapping.
Chapter 9, Spanning Trees	how to configure spanning tree protocols, including MSTP.
Chapter 10, Generic Attribute Registration Protocol (GARP)	the switch's implementation of the Generic Attribute Registration Protocol (GARP).
Chapter 11, Interfaces	the Ethernet, synchronous (switch with PIC bay only) and asynchronous network interfaces on the switch.
Chapter 12, Integrated Services Digital Network (ISDN)	the ISDN service provided by the switch, and how to configure ISDN interfaces (switch with PIC bay only). The switch offers Basic Rate and Primary Rate access to ISDN services, with dial-on-demand and channel aggregation.
Chapter 13, Time Division Multiplexing (TDM)	the switch's implementation of time division multiplexing over G.703 links (switch with PIC bay only).
Chapter 14, X.25	how to configure the switch's implementation of the ITU-T Recommendation X.25 protocol, and how to build an X.25 Packet Switched Network (routers with PIC bay only).
Chapter 15, Frame Relay	the switch's implementation of Frame Relay, and how to configure the switch's Frame Relay interfaces (routers with PIC bay only).
Chapter 16, Point-to-Point Protocol (PPP)	the switch's implementation of the Point-to-Point Protocol (PPP).
Chapter 17, Bridging	the switch's implementation of the IEEE 802.1D-1990 standard for MAC bridges and remote bridging and IEEE Standard 802.1G <i>Remote MAC Bridging</i> .
Chapter 18, Synchronous Tunnelling	the switch's mechanism for tunnelling synchronous (HDLC) data through a TCP/IP network (routers with PIC bay only).
Chapter 19, Transaction Packet Assembler Disassembler (TPAD)	the switch's method of exchanging credit card transaction information between a transaction terminal or back office server and a credit card authorisation service (routers with PIC bay only).
Chapter 20, Asynchronous Call Control	the switch's facilities for managing dial-in connections or interconnecting switches using the asynchronous ports.
Chapter 21, Layer Two Tunnelling Protocol (L2TP)	the switch's implementation of the Layer Two Tunnelling Protocol.

Part 3: Routing— IP and Other Protocols

See this chapter...	For information about...
Chapter 22, Overview of Layer 3	some of the routing protocols supported by the switch.
Chapter 23, Internet Protocol (IP)	implementation of the Internet Protocol (IP), which provides TCP/IP routing in hardware. This chapter also describes IP filters, RIP, and the address resolution protocols ARP, Proxy ARP, and Inverse ARP.

See this chapter...	For information about...
Chapter 24, Dynamic Host Configuration Protocol (DHCP)	implementation of the Dynamic Host Configuration Protocol. The switch can act as a DHCP server and automatically assign IP addresses and other configuration information to PCs and other hosts on TCP/IP networks.
Chapter 25, DHCP Snooping	implementation of DHCP Snooping, and how the switch snoops client DHCP lease information and records it in a DHCP snooping binding database.
Chapter 26, MAC-Forced Forwarding	implementation of MAC-Forced Forwarding, a method for subscriber separation on a network that works in conjunction with DHCP snooping.
Chapter 27, IP Multicasting	IP multicasting, including IGMP for group management, IGMP snooping, and DVMRP and PIM Sparse and Dense Mode for multicast routing.
Chapter 28, Routing Information Protocol (RIP)	implementation of the Routing Information Protocol (RIP), a simple routing protocol.
Chapter 29, Open Shortest Path First (OSPF)	implementation of the Open Shortest Path First (OSPF) routing protocol.
Chapter 30, Border Gateway Protocol version 4 (BGP-4)	implementation of BGP-4 and how to configure it on the switch.
Chapter 31, Filtering IP Routes	how to select which routes the switch imports, uses, and advertises.
Chapter 32, Voice over IP (VoIP)	how to configure Voice over IP on the switch.
Chapter 33, Generic Routing Encapsulation (GRE)	the switch implementation of the Generic Routing Encapsulation (GRE) protocol to connect private IP networks via public internets.
Chapter 34, Internet Protocol version 6 (IPv6)	implementation of IPv6, the next generation of the Internet Protocol, including stateless address autoconfiguration, RIPv6 and ICMPv6.
Chapter 35, Dynamic Host Configuration Protocol for IPv6 (DHCP6)	implementation of Dynamic Host Configuration Protocol for IPv6 and the support provided by the switch.
Chapter 36, IPv6 Multicasting	IPv6 multicasting, including MLDv2 for group management, and PIM Sparse and Dense Mode for multicast routing.
Chapter 37, AppleTalk	the switch's implementation of Apple Computer Inc.'s AppleTalk protocol.
Chapter 38, Novell IPX	the switch's implementation of Novell®'s IPX protocol, including RIP and SAP.

Part 4: Traffic Engineering

See this chapter...	For information about...
Chapter 39, Generic Packet Classifier	how the switch performs packet classification.
Chapter 40, Quality of Service (QoS) on Switch Ports	how the switch performs policy-based priority, queuing and bandwidth management operations on packets ingressing switch ports.
Chapter 41, Software Quality of Service (QoS)	how the switch performs policy-based priority, queuing and bandwidth management operations on packets egressing and ingressing WAN links, and over tunnels.

See this chapter...	For information about...
Chapter 42, Resource Reservation Protocol (RSVP)	implementation of the Resource Reservation Protocol, which allows receivers of traffic flow to reserve resources for the flow. RSVP delivers quality of service to application data streams.

Part 5: Security

See this chapter...	For information about...
Chapter 43, User Authentication	how to put the switch into secure mode, and how to authenticate users who access the switch. Authentication options include a built-in user database, and interaction with external servers such as RADIUS, TACACS and TACACS+.
Chapter 44, Compression and Encryption Services	the data compression and encryption services provided by the switch. This includes Van Jacobson's header compression, STAC LZS and Predictor compression, and hardware-based DES encryption.
Chapter 45, Port Authentication	how to configure 802.1x port authentication on the switch.
Chapter 46, Secure Shell	the switch's implementation of the Secure Shell protocol for secure remote management.
Chapter 47, Secure Sockets Layer (SSL)	the switch's implementation of SSL and how to configure it on the switch.
Chapter 48, Firewall	the switch's firewall, which is a fully featured, stateful inspection firewall, including proxies and URL filtering.
Chapter 49, IP Security (IPsec)	the switch's implementation of the <i>Internet Protocol Security Facility</i> (IPsec), the <i>Internet Security Association Key Management Protocol</i> (ISAKMP) and the <i>Internet Key Exchange</i> (IKE) protocol.
Chapter 50, Public Key Infrastructure (PKI)	the configuration of the switch for interaction with a Public Key Infrastructure (PKI).
Chapter 51, Link Compression and Encryption	the link compression and encryption facilities provided by the switch for Point-to-Point Protocol (PPP), Frame Relay and X.25 links.

Part 6: High Availability

See this chapter...	For information about...
Chapter 52, Server Load Balancing	how to configure server load balancing on the switch, for distributing traffic among multiple resources.
Chapter 53, Virtual Router Redundancy Protocol (VRRP)	implementation of the Virtual Router Redundancy Protocol (VRRP), a mechanism for combining backup switches into a single logical gateway.
Chapter 54, Ping Polling of Device Reachability	how to configure the switch to regularly check whether it can reach a device. The switch can also respond when a device or link goes up or down.

Part 7: Network Management and Utilities

See this chapter...	For information about...
Chapter 55, Simple Network Management Protocol (SNMP)	the switch's implementation of the Simple Network Management Protocol. Support for SNMP, combined with standard MIBs and the Allied Telesis Enterprise MIB, enables the switch to be managed by a separate SNMP management station.
Chapter 56, Link Layer Discovery Protocol (LLDP)	the switch's implementation of the Link Layer Discovery Protocol (LLDP) for receiving and processing Cisco® Discovery Protocol messages.
Chapter 57, Network Time Protocol (NTP)	the switch's implementation of the Network Time Protocol (NTP).
Chapter 58, Management Stacking	how to synchronise information across multiple switches and manage them as one logical device.
Chapter 59, Scripting	the switch's scripting facility for creating, storing and executing sequences of commands. Scripting enables automated configuration of switches and centralised management of configurations.
Chapter 60, Trigger Facility	the switch's automated trigger facility for timed execution of management commands in response to specific events.
Chapter 61, Logging Facility	the switch's flexible event logging capability and how to configure it to monitor switch activities. The advanced logging facility allows alarm notification to single or multiple management centres.
Chapter 62, Terminal Server	terminal services the switch provides and the switch's implementation of the Internet Telnet protocol. This includes using Telnet with local host nicknames.
Chapter 63, Line Printer Daemon (LPD)	the Line Printer Daemon (LPD) network printing services provided by the switch.
Chapter 64, Stream Printing	the stream printing services provided by the switch.
Chapter 65, Test Facility	describes the facilities built into the switch for testing the switch's interfaces, and how to execute and interpret the tests.

Support Information

See this section...	For...
Command Summary	an alphabetical list of all switch commands and their syntax.
Appendix A, Messages	informational, warning, and error messages generated by the switch.
Appendix B, Reference Tables	identifiers and return codes for a range of switch functions and network services.
Appendix C, SNMP MIBs	a description of the <i>Management Information Bases (MIBs)</i> and managed objects supported by the switch's SNMP agent, including the Allied Telesis Enterprise MIB.
Glossary	definitions of terms and concepts used in this Software Reference.
Index	a master index to topics and commands covered in this Software Reference.

Intended Audience

This Software Reference is intended for the system administrator, network manager, or communications technician who configure and maintain the Rapier i switch, or who manages a network of switches.

It is assumed that the reader is familiar with:

- The topology of the network in which the Rapier i switch is to be used.
- Basic principles of computer networking, protocols and routing, and interfaces.
- Administration and operation of a computer network.

This Software Reference is not intended for users who use the computer network to access network services from their terminal, personal computer, or workstation. Most of the commands require Manager privilege and can be entered only from a terminal or port that has been assigned Manager privilege.

Conventions

A number of symbols, typographic, and stylistic conventions are used throughout this Software Reference to aid learning and make information easier to find. The following table explains them.

This typeface...	Is used for...
<i>Italic</i>	Introducing and emphasising new terms. Referring to other documents by their title (for example, "RFC 2236, <i>Internet Group Management Protocol, version 2</i> ").
Monospace	Text as it appears on-screen, or something you must type.
bold	Names of commands, parameters and options, when they are written within a paragraph of text. Also sometimes used for emphasis.
0xFF	Numbers starting with the 0x prefix are hexadecimal values.
[Key]	A key on your keyboard. For example, "at the prompt, type a command and press [Enter]. Examples of keys include [Shift], [Alt], [Ctrl] and [Backspace]. Keys may also be referred to using the word "key" (for example, "Press the Ctrl key").
[Key+Key]	A pair of keys on your keyboard that should be pressed together. For example, [Ctrl+P] means to press and hold down the [Ctrl] key, and then press and release the [P] key. Then release the [Ctrl] key.
[Key,Key]	A sequence of keys that should be pressed in sequence. For example, [Break,T] means to press and release the [Break] key; and then press and release the [T] key. The [Key+Key] and [Key,Key] symbols can be combined. For example, [Ctrl+P,T] means to press and hold down the [Ctrl] key, press and release the [P] key, and release the [Ctrl] key; and then press and release the [T] key".
<i>Attention</i>	A special keystroke known as the attention character, which is either [Break] or [Ctrl/P].

Note. A note like this presents additional information, tips, or interesting sidelights.



Warning or Caution. A warning alerts you to situations in which you could hurt yourself. A caution alerts you to situations in which you could lose data or cause damage to the equipment.

Screen views show examples of the output resulting from particular commands or what the screen should look like at a particular time, for instance:

Configuration for ETH instance 0:

Module	Protocol	Format	Discrim	MAC address
-----	-----	-----	-----	-----
IPG	IP	Ethernet	0800	0000cd000027
IPG	ARP	Ethernet	0806	0000cd000027
IPX	Novell	Novell	-	0000cd000027
DNT	DECnet	Ethernet	6003	aa0004003908
Bridging	LAT	Ethernet	6004	-
Bridging	EtherTalk	SNAP	00000080f3	-
-----	-----	-----	-----	-----

Command Descriptions

Commands are described in the Command Reference section of the individual chapter for the protocol or feature. Each command is described in the format shown in [Figure 1](#).

Figure 1: Command format

Command name	add ip host	
The syntax of the command	Syntax	<p>ADD IP Host=<i>name</i> IPaddress=<i>ipadd</i></p> <p>where:</p> <ul style="list-style-type: none"> ■ <i>name</i> is a character string up to 60 characters in length. If the string contains spaces it must be enclosed in double quotes. ■ <i>ipadd</i> is an IP address in dotted decimal notation.
What the command does, and what each of the parameters mean	Description	<p>This command adds a user-defined name for an IP host to the host name table. The host name table makes it easier to Telnet to commonly accessed hosts by enabling the user to enter a shorter, easier to remember name for the host rather than the host's full IP address or domain name. The name can also be used with the ping command on page 12-116.</p> <p>The host parameter specifies the user-defined name for the IP host. A host with the same name must not already exist in the host name table. When a host name is specified in the Telnet command, the entire name will be used to match a name in the host name table. All characters are used in the comparison, including nonalphabetic characters if they are present.</p> <p>The ipaddress parameter specifies the IP address of the host.</p>
Examples show how the command is used	Examples	<p>To add the host name "zaphod" to the host name table for an IP host with an IP address of 172.16.1.5 and the domain name "zaphod.company.com", use:</p> <pre>add ip host=zaphod ip=172.16.1.5</pre> <p>To Telnet to the host, use any of the following commands:</p> <pre>telnet zaphod telnet zaphod.company.com telnet 172.16.1.5</pre>
References to related commands	Related Commands	<p>delete ip host set ip host set ip nameserver set ip secondary nameserver show ip host</p>

PREFACE1

Command syntax are explained with conventions in the following table.

Element	Description
Keywords in CAPS and lower case (mixed case)	The shortest valid command is denoted by capital letters. Exceptions are commands with profound effects such as <i>restart immediately</i> , which must be typed in full.
<i>italic</i>	A variable placeholder to be replaced by an actual value in a command.
[]	Square brackets enclose optional items. Enter the item or items but do not type the brackets.

Element	Description																								
	Vertical bars separate choices in a list—choose one of the items.																								
...	Ellipses indicate that the preceding element may be repeated any number of times.																								
{ }	Braces surround a choice of options that is required; you must choose one of the options listed.																								
n . .m	Defines a range of values—most often positive integers—from n to m inclusive.																								
<i>interface</i>	An interface type and one of the following: <table> <tr><td>SYNn</td><td>for Synchronous interfaces</td></tr> <tr><td>ASYNn</td><td>for Asynchronous interfaces</td></tr> <tr><td>BRIn</td><td>for Basic Rate ISDN interfaces</td></tr> <tr><td>PRIn</td><td>for Primary Rate ISDN interfaces</td></tr> <tr><td>PPPn</td><td>for Point-to-Point interfaces</td></tr> <tr><td>FRn</td><td>for Frame Relay interfaces</td></tr> <tr><td>LAPBn</td><td>for LAPB interfaces</td></tr> <tr><td>LAPDn</td><td>for LAPD interfaces</td></tr> <tr><td>X25Tn</td><td>for X.25 DTE interfaces</td></tr> <tr><td>SLIPn</td><td>for SLIP interfaces</td></tr> <tr><td>VLANn</td><td>for Virtual LAN interfaces</td></tr> <tr><td>n</td><td>when defining one of the above interface types. n is a non-negative, zero-based decimal number.</td></tr> </table>	SYNn	for Synchronous interfaces	ASYNn	for Asynchronous interfaces	BRIn	for Basic Rate ISDN interfaces	PRIn	for Primary Rate ISDN interfaces	PPPn	for Point-to-Point interfaces	FRn	for Frame Relay interfaces	LAPBn	for LAPB interfaces	LAPDn	for LAPD interfaces	X25Tn	for X.25 DTE interfaces	SLIPn	for SLIP interfaces	VLANn	for Virtual LAN interfaces	n	when defining one of the above interface types. n is a non-negative, zero-based decimal number.
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<i>ipadd</i>	IP address in dotted decimal form, such as 131.203.9.197. In some situations, an address in domain name format.																								
<i>macadd</i>	Hardware address, such as an Ethernet address, in the format XXXXXXXXXXXX, where XX is a two-digit hexadecimal number with leading zeros if necessary.																								

Where To Find More Information

The Documentation and Tools CD-ROM bundled with each switch contains the complete Document Set for your switch and, where applicable, its expansion options. The CD-ROM also includes tools for managing your switch.

The Document Set includes:

- The Safety Booklet for your switch, which provides safety and statutory information.
- The Quick Install Guide for your switch, which outlines the procedure for installing the switch.
- The Hardware Reference for your switch, which provides detailed information on the hardware features of Rapier i Layer 3 switches.
- The *Port Interface Card Quick Install Guide*, which outlines the procedure for installing PICs; and the *Port Interface Card Hardware Reference*, which provides detailed information on PICs.
- The *Network Service Module Quick Install Guide*, which outlines the procedure for installing an NSM; and the *Network Service Module Hardware Reference*, which provides detailed information on NSMs.

- The *Uplink Module Quick Install Guide*, which outlines the procedure for installing an ULM; and the *Uplink Module Hardware Reference*, which provides detailed information on ULMs.
- This Software Reference, which provides detailed information on configuring the switch and its software.

These documents can also be downloaded from <http://www.alliedtelesis.com>.

Obtaining Copies of Internet Protocols and Standards

The Internet Protocols are defined in *Requests For Comments* (RFCs). RFCs are developed and published under the auspices of the *Internet Engineering Steering Group* (IESG) of the *Internet Engineering Task Force* (IETF). For more information about the IESG and IETF, visit the IETF web site at <http://www.ietf.org/>. For more information about RFCs and Internet-Drafts (the starting point for RFCs), visit the RFC Editor web site at <http://www.rfc-editor.org/>. This site has information about the RFC standards process, archives of RFCs and current Internet Drafts, links to RFC indexes and search engines, and a list of other RFC repositories.

RFCs can be obtained electronically from many RFC repositories, mail servers, World Wide Web (WWW), Gopher or WAIS sites. A good starting point for finding the nearest RFC repository is to point your Web browser at <http://www.isi.edu/in-notes/rfc-retrieval.txt>.

To obtain a copy of an RFC using FTP, FTP to the host and login as user `anonymous`, and a password of either `guest` or your email address. The FTP server usually prompts you for one or the other. Use the `get` command to retrieve the desired RFC. Most sites have a file, usually `rfc-index.txt`, which lists the titles and file names of all available RFCs. Most sites have a file, usually `rfc-retrieval.txt`, which gives detailed information about RFC repositories and how to retrieve RFCs via FTP, mail servers, WWW, Gopher, and WAIS.

To learn how to obtain a copy of an RFC via email from a mail server, point your browser at <http://www.isi.edu/in-notes/rfc-editor/rfc-info.help>.

To obtain a copy of an RFC from a Web site, or to search RFC repositories for a specific RFC or all RFCs relating to a topic, point your Web browser at <http://www.rfc-editor.org/rfc.html>.

Publicly Accessible Documents

Allied Telesis maintains an online archive of documents and files that you can access in the following ways:

- WWW: <http://www.alliedtelesis.com>
- Anonymous FTP: <ftp.alliedtelesis.com>
Login as user “anonymous” and enter your email address as the password.

Allied Telesis Offices and Locations

With locations covering all of the established markets in North America, Latin America, Europe, Asia and the Pacific, Allied Telesis provides localized sales and technical support worldwide. To find our representative nearest you, visit Allied Telesis on the web at: <http://www.alliedtelesis.com>.