RS 1000 Switch Router Getting Started Guide

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RiverSTONE NETWORKS™

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Santa Clara, CA 95054

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SAFETY

UL 1950; CSA C22.2, No. 950; 73/23/EEC; EN 60950; IEC 950

ELECTROMAGNETIC

FCC Part 15; CSA C108.8; 89/336/EEC; EN 55022; EN 61000-3-2

COMPATIBILITY (EMC)

EN 61000-3-3; EN 50082-1, AS/NZS 3548; VCCI V-3

REGULATORY COMPLIANCE STATEMENTS

Note Complies with Part 68, FCC rules.
FCC Registration Number 6TGUSA-46505-DE-N
Riverstone Networks, Inc.
Model WICT1-12
Made in U.S.A.

FCC COMPLIANCE STATEMENT

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment uses, generates, and can radiate radio frequency energy and if not installed in accordance with the operator's manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his own expense.

Warning Changes or modifications made to this device that are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

INDUSTRY CANADA COMPLIANCE STATEMENT

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

NOTICE: The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational, and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

NOTICE: The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

VCCI COMPLIANCE STATEMENT

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

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SAFETY INFORMATION: CLASS 1 LASER TRANSCEIVERS

This product may use Class 1 laser transceivers. Read the following safety information before installing or operating this product.

The Class 1 laser transceivers use an optical feedback loop to maintain Class 1 operation limits. This control loop eliminates the need for maintenance checks or adjustments. The output is factory set and does not allow any user adjustment. Class 1 laser transceivers comply with the following safety standards:

- 21 CFR 1040.10 and 1040.11, U.S. Department of Health and Human Services (FDA)
- IEC Publication 825 (International Electrotechnical Commission)
- CENELEC EN 60825 (European Committee for Electrotechnical Standardization)

When operating within their performance limitations, laser transceiver output meets the Class 1 accessible emission limit of all three standards. Class 1 levels of laser radiation are not considered hazardous.

LASER RADIATION AND CONNECTORS

When the connector is in place, all laser radiation remains within the fiber. The maximum amount of radiant power exiting the fiber (under normal conditions) is –12.6 dBm or 55 x 10^{-6} watts.

Removing the optical connector from the transceiver allows laser radiation to emit directly from the optical port. The maximum radiance from the optical port (under worst case conditions) is 0.8 W cm^{-2} or 8 x 10^{3} W m^{2} sr–1.

Do not use optical instruments to view the laser output. The use of optical instruments to view laser output increases eye hazard. When viewing the output optical port, power must be removed from the network adapter.

SAFETY INFORMATION: WICT1-12 T1 CARD

Warning To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.

CONSUMER INFORMATION AND FCC REQUIREMENTS

1. This equipment complies with Part 68 of the FCC rules, FCC Registration Number 6TGUSA-46505-DE-N Riverstone Networks Inc. Model WICT1-12 Made in the USA. On the DS1/E1 WAN Module of this equipment is a label that contains, among other information, the FCC registration number and Ringer Equivalence Number (REN) for this equipment. If requested, provide this information to your telephone company.
2. The REN is useful to determine the quantity of devices you may connect to your telephone and still have all those devices ring when your number is called. In most, but not all areas, the sum of the REN's of all devices should not exceed five (5.0). To be certain of the number of devices you may connect to your line, as determined by the REN, you should call your local telephone company to determine the maximum REN for your calling area.
3. If your DS1/E1 WAN Module causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.
4. Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.
5. If you experience trouble with this equipment DS1/E1 WAN Module, please contact Riverstone Networks Inc., 5200 Great America Parkway, Santa Clara, CA 95054, 408 878-6500, for repair/warranty information. The Telephone Company may ask you to disconnect this equipment from the network until the problem has been corrected or you are sure that the equipment is not malfunctioning.
6. There are no repairs that can be made by the customer to the DS1/E1 WAN Module.
7. This equipment may not be used on coin service provided by the Telephone Company. Connection to party lines is subject to state tariffs. (Contact your state public utility commission or corporation commission for information).

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Caution: Users should not attempt to make connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

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Manufacturer's Name	Riverstone Networks, Inc.
Manufacturer's Address	5200 Great America Parkway Santa Clara, CA 95054
Conformance to Directive(s)/Product Standards	EC Directive 89/336/EEC EC Directive 73/23/EEC EN 55022 EN 50082-1 EN 60950
Equipment Type/Environment	Networking equipment for use in a commercial or light-industrial environment

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This guide provides a general overview of the hardware and software features, and provides procedures for initial installation and set up of the RS 1000.

1.1 HOW TO USE THIS GUIDE

If You Want To...	See...
Get an overview of the RS 1000 software and hardware features and specifications	Chapter 2, *"Introduction"*
Install the RS 1000 hardware	Chapter 3, *"Hardware Installation"*
Install the RS 1000 software, boot the software, and set up the unit	Chapter 4, *"Initial Configuration"*
Upgrade system software	Chapter 5, *"Managing Software"*
Troubleshoot installation problems	Appendix A, *"Troubleshooting"*

1.2 RELATED DOCUMENTATION

The Riverstone documentation set includes the following items. Refer to these other documents to learn more about this product.

For Information About...	See the...
How to configure and manage the RS 1000	*Riverstone RS Switch Router User Guide*
The complete syntax for all Command Line Interface (CLI) commands	*Riverstone RS Switch Router Command Line Interface Reference Manual*
Console and SYSLOG messages	*Riverstone RS Switch Router Message Reference Manual*

2 INTRODUCTION

The Riverstone RS 1000 provides non-blocking, wire-speed Layer-2 (switching), Layer-3 (routing), and Layer-4 (application) switching. This chapter provides a basic overview of the RS 1000 software and hardware feature set.

Note For the latest operating software and user documentation, check the Riverstone Networks web site at www.riverstonenet.com.

2.1 FUNCTIONAL LAYER TERMINOLOGY

This guide, and other RS 1000 documentation, refers to layer-2 (L2), layer-3 (L3), and layer-4 (L4) switching and routing. These layers are based on the International Standards Organization (ISO) 7-layer reference model. Here is an example of that model. The RS 1000 operates within the layers that are not shaded. Notice that layer 2 is divided into a MAC layer, an LLC layer, and an LLC2 layer. The RS 1000 operates at the MAC and LLC layers.

Table 2-1 ISO 7-layer model and RS 1000 capabilities

Layer 7	Application	
Layer 6	Presentation	
Layer 5	Session	
Layer 4	Transport	TCP/UDP - application
Layer 3	Network	IP/IPX - routing
	LLC2	
Layer 2	LLC	
	MAC	Bridging
Layer 1	Physical	Physical Interfaces

2.2 SPECIFICATIONS

The RS 1000's hardware provides high-speed performance regardless of any performance monitoring, filtering, Quality of Service (QoS), or Access Control Lists (ACLs) enabled through the software. Performance is not compromised. The following table lists the RS 1000's technical specifications.

Table 2-2 Technical specifications

Feature	Specification
Throughput	• 6 Gbps non-blocking switching fabric • Up to 4.6 million packets-per-second routing throughput
Capacity	• Up to 250,000 routes • Up to 512,000 Layer-4 application flows • Up to 256,000 Layer-2 MAC addresses • 4,096 Virtual LANs • 20,000 Layer-2 security and access-control filters • 3 MB input/output buffering per Gigabit port • 1 MB input/output buffering per 10/100 port • 16 MB shared input/output buffering across WAN ports on a WAN module
Routing protocols	• IP: RIP v1/v2, OSPF, BGP v2/v3/v4, IS-IS • IPX: RIP, SAP • Multicast: IGMP, DVMRP, GARP/GVRP
Bridging and VLAN protocols	• 802.1d Spanning Tree • 802.1Q (VLAN trunking) • Rapid Spanning Tree Protocol (RSTP) • Per-VLAN Spanning Tree (PVST)
Media Interface protocols	• 802.3 (10Base-T) • 802.3u (100Base-TX, 100Base-FX) • 802.3x (1000Base-SX, 1000Base-LX) • 802.3z (1000Base-SX, 1000Base-LX) • T1/E1 (WAN multi-rate) • T3 Clear Channel • E3 Clear Channel
Quality of Service (QoS)	• Layer-2 prioritization (802.1p) • Layer-3 source-destination flows • Layer-4 source-destination flows • Layer-4 application flows

Table 2-2 Technical specifications (Continued)

Feature	Specification
Load Balancing policies	• Round-robin • Weighted round-robin • Least loaded
Port mirroring	• Traffic from specific ports • Traffic to specific expansion slots (line cards)
RMON	• RMON v1/v2 for each port
Management	• SNMP • Emacs-like Command Line Interface (CLI)

2.3 SOFTWARE OVERVIEW

This section describes the features and capabilities of the RS 1000 in greater detail. For full information regarding the use of these features and capabilities, see the *Riverstone RS Switch Router User Guide*.

2.3.1 Bridging

The RS 1000 provides the following types of wire-speed bridging:

Address-based bridging – The RS 1000 performs this type of bridging by looking up a packet's destination address in an L2 lookup table on the line card that received the packet from the network. The L2 lookup table indicates the exit port(s) for the bridged packet. If the packet is addressed to the RS 1000's own MAC address, the packet is routed rather than bridged.

Flow-based bridging – The RS 1000 performs this type of bridging by looking up a packet's source and destination address in an L2 lookup table on the line card that received the packet from the network.

Your choice of bridging method does not affect RS 1000 performance. However, address-based bridging requires fewer table entries. Alternately, while flow-based bridging uses more table entries, it provides tighter management and control over bridged traffic, and greater resolution to RMON I statistics.

The RS 1000 ports perform address-based bridging by default, but can be configured to perform flow-based bridging on a per-port basis. A port cannot be configured to perform both types of bridging at the same time.

2.3.2 Port and Protocol VLANs

The RS 1000 supports the following types of Virtual LANs (VLANs):

Port-based VLANs – A port-based VLAN is a set of ports that comprises a layer-2 broadcast domain. The RS 1000 confines MAC-layer broadcasts to the ports in the VLAN on which the broadcast originates. RS 1000 ports outside the VLAN do not receive the broadcast.

Protocol-based VLANs – A protocol-based VLAN is a named set of ports that comprises an IP, IPX, AppleTalk, DECNet, SNA, IPv6, or L2 broadcast domain. The RS 1000 confines protocol-specific broadcasts to the ports within the protocol-based VLAN. Protocol-based VLANs sometimes are called subnet VLANs or layer-3 VLANs.

You can include the same port in more than one VLAN, even in both port-based and protocol-based VLANs. Moreover, you can define VLANs that span across multiple RS 1000 switches. To simplify VLAN administration, the RS 1000 supports 802.1Q trunk ports, which allow you to use a single port to "trunk" traffic from multiple VLANs to another RS 1000 or to a switch that supports 802.1Q.

2.3.3 Routing

The RS 1000 provides wire-speed routing for the following protocols:

IP – protocol that switching and routing devices use for moving traffic within the Internet and within many corporate intranets

IPX – protocol by Novell used in NetWare products

Note All other protocols that require routing must be tunneled using IP.

By default, the RS 1000 uses one MAC address for all interfaces. The RS 1000 can be configured to have a separate MAC address for each IP interface and a separate MAC address for each IPX interface. When the RS 1000 receives a packet whose destination MAC address is one of the RS 1000's IP or IPX interface MAC addresses, the line card that received the packet from the network uses information in the line card's L3 lookup tables (or information supplied by the CPU) to route the packet to its IP destination(s).

You can add secondary IP addresses to the same IP interface, however, you can create only one IP and IPX interface on a single port or VLAN. When you add an interface to a set of ports, you are adding a VLAN to those ports. Ports that contain IP and IPX interfaces can still perform layer-2 bridging.

IP Routing

The RS 1000 supports the following IP unicast routing protocols:

- RIP v1 and RIP v2
- OSPF v2
- BGP 2,3,4
- IS-IS

IP interfaces do not use a specific routing protocol by default. When you configure an interface for routing, you also specify the routing protocol that the interface will use.

IP Multicast Routing

The RS 1000 supports the following IP multicast routing protocols:

- IGMP
- DVMRP
- GARP/GVRP

The RS 1000 does not use a specific IP multicast routing protocol by default. When you configure an interface for IP multicast, you also specify the routing protocol you want the interface to use.

IPX Routing

The RS 1000 supports the following IPX routing protocols:

IPX RIP – a version of the Routing Information Protocol (RIP) tailored for IPX

IPX SAP – the Service Advertisement Protocol, which allows hosts attached to an IPX network to reach printers, file servers, and other services

By default, IPX routing is enabled on the RS 1000 when an IPX interface is created.

2.3.4 Layer-4 Switching

In addition to layer-2 bridging and layer-3 routing, the RS 1000 performs layer-4 switching. Layer-4 switching is based on applications and flows.

Layer-4 Applications – The RS 1000 understands the application for which an IP or IPX packet contains data and therefore enables you to manage and control traffic on an application basis. For IP traffic, the RS 1000 looks at the packet's TCP or UDP port number to determine the application. For IPX packets, the RS 1000 looks at the destination socket to determine the application.

Layer-4 Flows – The RS 1000 can store layer-4 flows on each line card. A layer-4 flow consists of the source and destination addresses in the IP or IPX packet combined with the TCP or UDP source and destination port number (for IP) or the source and destination socket (for IPX). You can therefore manage and control individual flows between hosts on an individual application basis.

A single host can have many individual layer-4 entries in the RS 1000. For example, an IP host might have separate layer-4 application entries for email, FTP, HTTP, and so on, or separate layer-4 flow entries for specific email destinations and for specific FTP and Web connections.

2.3.5 Security

The bridging, routing, and application (layer-2, layer-3, and layer-4) support described in previous sections enables you to implement security strategies that meet specific needs. For layer-2, a wide range of bridging filters are available. Additionally, all layers can be protected using Access Control Lists (ACLs) filters. You can implement the following types of filters and ACLs to secure traffic on the RS 1000:

- Layer-2 source filters (block bridge traffic based on source MAC address)
- Layer-2 destination filters (block bridge traffic based on destination MAC address)
- Layer-2 flow filters (block bridge traffic based on specific source-destination pairs)
- Layer-3 source ACLs (block IP or IPX traffic based on source IP or IPX address)
- Layer-3 destination ACLs (block IP or IPX traffic based on destination IP or IPX address)
- Layer-3 flow ACLs (block IP or IPX traffic based on specific source-destination address pairs)
- Layer-4 flow ACLs (block traffic based on application flows)
- Layer-4 application ACLs (block traffic based on UDP or TCP source and destination ports for IP or source and destination sockets for IPX)

In addition to filtering and ACL, the RS also provides login security in the form of TACACS, TACACS+, RADIUS, and Secure Session Shells (SSH) version 1.5.

2.3.6 Quality of Service

Although the RS 1000 supplies non-blocking, wire-speed throughput, you can configure the RS 1000 to apply Quality of Service (QoS) policies during peak periods to guarantee service to specific hosts, applications, and flows (source-destination pairs). This is especially useful in networks where the traffic level can exceed the network capacity.

QoS policies can be configured for the following types of traffic:

- Layer-2 prioritization (802.1p)
- Layer-3 source-destination flows
- Layer-4 source-destination flows

- Layer-4 application flows

QoS mechanisms supported on the RS 1000 include the following:

- Traffic control queuing
- Weighted random early detection
- Weighted fair queuing
- Strict priority queuing
- QoS traffic control queues
- ToS octet rewrites
- Multi-Protocol Label Switching (MPLS) and the creation of LSPs for traffic engineering

Note Traffic control queuing is based on assigning traffic to one of four queues: control, high, medium, and low. Control traffic (routing protocols, and so on) has the highest priority, high the second highest, and so on. The default priority for all traffic is low.

2.3.7 Statistics

The RS 1000 can provide extensive statistical data on demand. You can access the following types of statistics:

Layer-2 RMON and MIB II Statistics – Port statistics for normal packets and for errors (packets in, packets out, CRC errors, and so on)

Layer-3 RMON v2 Statistics – Statistics for ICMP, IP, IP-interface, IP routing, IP multicast, VLAN

Layer-4 RMON v2 Statistics – Statistics for TCP and UDP

LFAP – Light-weight File Accounting Protocol

Open APIs – Slate and FAS Lite.

2.3.8 Web Hosting Features

The RS 1000 provides features that support and improve performance for high-capacity web access:

Load balancing – allows incoming HTTP requests to a company's web site to be distributed across several physical servers. If one server should fail, other servers can pick up the workload.

Web caching – allows HTTP requests from internal users to Internet sites to be redirected to cached web objects on local servers. Not only is response time faster, since requests can be handled locally, but overall WAN bandwidth usage is reduced.

Session persistence – In certain situations where load balancing is being used, it may be critical that all traffic for the client be directed to the same physical server for the duration of the session; this is the concept of *session persistence*.

TCP persistence – a binding is determined by the matching the source IP/port address as well as the virtual destination IP/port address.

SSL persistence – a binding is determined by matching the source IP address and the virtual destination IP/port address. Note that requests from *any* source socket with the client IP address are considered part of the same session.

Sticky persistence – a binding is determined by matching the source and destination IP addresses only. This allows all requests from a client to the same virtual address to be directed to the same load balancing server.

Virtual private network (VPN) persistence – for VPN traffic using Encapsulated Security Payload (ESP) mode of IPSec, a binding is determined by matching the source and destination IP addresses in the secure key transfer request to subsequent client requests.

IP persistence – Used for L3 persistence of load balancing sessions.

2.3.9 Management Platforms

You can manage the RS 1000 using the following management platforms:

Command Line Interface (CLI) – An Emacs editor-like interface that accepts typed commands and responds when applicable with messages or tables. Use the CLI to perform the basic setup procedures described in Chapter 4, *"Initial Configuration."*

SNMP MIBs and traps – The RS 1000 supports SNMP v1/v2 and many standard networking MIBs. The RS 1000's SNMP agent is accessed using integration software such as HP OpenView 5.x on Windows NT or Solaris 2.x, or Aprisma SPECTRUM on Windows NT or Solaris 2.x. Setting up SNMP on the RS 1000 is described in Chapter 4, *"Initial Configuration."*

2.4 HARDWARE FEATURES

This section describes the RS 1000's hardware specifications. For information about installing the chassis and line cards, see Chapter 3, *"Hardware Installation."* This section describes the following hardware:

- Chassis and external controls
- Motherboard features
- Power supplies
- Line Cards

2.4.1 Chassis

The RS 1000 chassis contains two expansion slots, numbered 1 and 2. Currently, Riverstone ships the RS 1000 with the two slots empty. Figure 2-1 shows the front view of a RS 1000 equipped with line cards.

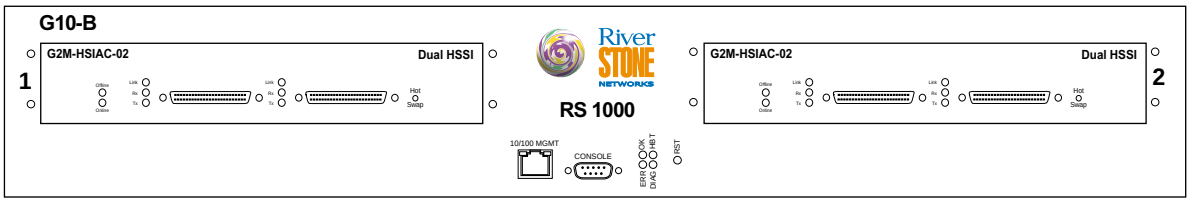

Figure 2-1 Front panel of a RS 1000

Figure 2-1 shows expansion slots filled with two Dual HSSI line cards. For a complete list of line cards available for your RS 1000 see Section 2.4.4, *"Line Cards."*

External Controls and Connections

The RS 1000 has the following external controls and ports used for managing the RS 1000:

- Male DB-9 Data Communications Equipment (DCE) port for serial connection to a terminal or PC running terminal emulation software. Use this port to establish a direct CLI connection to the RS 1000. The default baud rate is 9600.
- 10BASE-T/100BASE-TX Data Terminal Equipment (DTE) port for network connection to a management station. The port is configured as Media Data Interface (MDI). Use this port to establish a management connection to the RS 1000 over a local or bridged Ethernet segment.
- Reset switch (RST). Use this switch to reboot the RS 1000's motherboard. The Reset switch is recessed in the chassis, so that a tool such as a small allen wrench is necessary to activate the switch.
- Status LEDs. Table 2-3 describes the LEDs.

Table 2-3 RS 1000 Status LEDs

LED Label	Description
OK	When this LED is on, the RS 1000 and all line cards are functioning correctly.
ERR	When this LED is on, a fatal system error has occurred. Activate the BootPROM to reboot the RS 1000.
HBT	This LED flashes when the RS 1000's BootPROM is active.
DIAG	When this LED is on, the RS 1000 is in diagnostic mode. (While in the diagnostic mode, you will notice several other LEDs on the RS 1000 are active, as well.)

2.4.2 Motherboard

The motherboard contains system-wide bridging and routing tables. Traffic that does not yet have an entry in the lookup tables on individual line cards is handled by the motherboard. After processing traffic, the motherboard updates the lookup tables in the line card that initially received the traffic. Consequently, the line cards learn how to forward traffic.

Boot and Image Flash

The motherboard has a boot flash containing the RS 1000's boot software and configuration files. The system software image file resides on an internal flash chip and can be upgraded from a TFTP or BootP/TFTP server.

RAM Memory

The motherboard uses 128MB of RAM to hold routing and other tables. This RAM is fixed and is not removable or upgradable.

2.4.3 Power Supplies

The RS 1000 uses one power supply, either an AC power supply or a DC power supply. You can make a choice of supply depending on your needs.

AC Power Supply

A single AC power supply provides enough current to operate a fully configured chassis. On the back end of the supply is the AC power cord socket. See Figure 2-2. On the front end of the supply are the two internal fans and the motherboard connector.

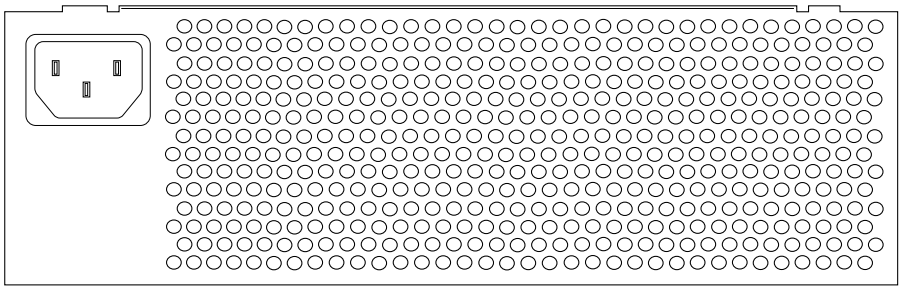

Figure 2-2 AC power supply power backside with power cord socket

Table 2-4 AC power supply specifications

Input	Output
100-240 VAC at 5A, 50-60 Hz	3.45 VDC at 58A maximum, 5.15 VDC at 6.5A maximum, and 12 VDC at 0.6A maximum

Note The RS 1000 does not have an on-off switch. When you plug the AC power supply into a power source, the RS 1000 is on.

Warning When using an AC power supply, be sure to plug the RS 1000 into a single-phase grounded power source located within 6 feet of the installation site.

DC Power Supply

This single DC power supply provides enough current to operate a fully configured chassis. On the back end of the supply is the three-terminal wiring block. See Figure 2-3. On the front end of the supply are the two internal fans and the motherboard connector.

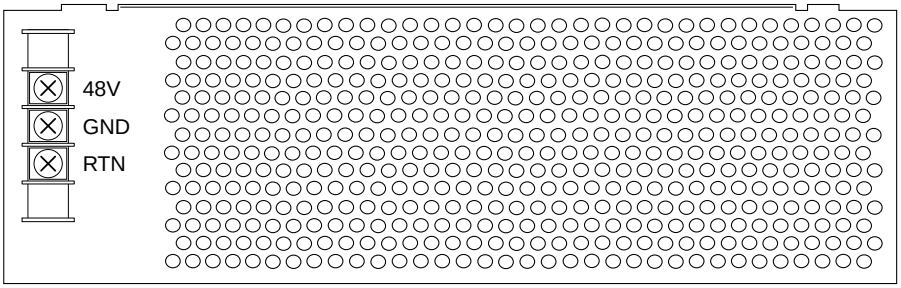

Figure 2-3 DC power supply back side with wiring block

The DC power supply has a three-terminal wiring block consisting of a positive (+) terminal, marked 48V; a negative (–) terminal, marked RTN; and a safety ground, marked GND. The DC supply is designed to be powered by a 48 Volt DC source. Use 12-gauge to 14-gauge wire to connect the 48-Volt source to the RS 1000's DC power supply. Use 12- to 14-gauge wire for the safety ground.

Table 2-5 DC power supply specifications

Input	Output
40 to 70 VDC at 14A, 213W	3.45 VDC at 58A maximum, 5.15 VDC at 6.5A maximum, and 12 VDC at 0.6A maximum

Note The RS 1000 does not have an on-off switch. When you connect the DC power supply to the power source, the RS 1000 is on.

Warning To ensure that the fans provide adequate cooling, Riverstone recommends that you allow a minimum of 3 inches of clearance on each side of the chassis.

2.4.4 Line Cards

The following section describes the various line cards that can be installed in the RS 1000:

100BASE-FX Line Card

The 100BASE-FX line card uses multimode fiber cable (MMF) to connect to the network. Figure 2-4 shows the front panel of the 100BASE-FX line card.

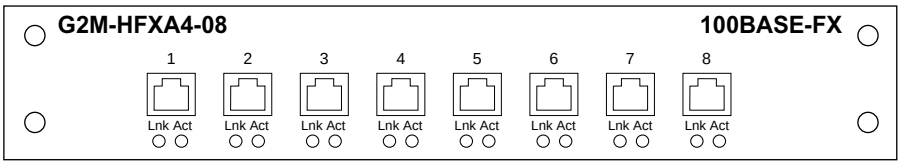

Figure 2-4 100BASE-FX line card

The following tables list the media specifications and LEDs for the 100BASE-FX line card.

Table 2-6 100BASE-FX line card specifications

Port type	Specification
100Base-FX	• 802.3u standard • SC-style Media Interface Connector (MIC). • 62.5 micron multimode fiber-optic cable • Maximum of 412 meters (1352 feet) segment length for half-duplex links • Maximum of 2 kilometers (6562 feet) segment length for full-duplex links

Note Either connection pin in the MIC can be used for transmit or receive.

Table 2-7 100BASE-FX line card LEDs

LED	Description
Lnk	The green LED on the left side of each connector. It indicates the link status. When it is lit, the port has detected that a cable is plugged in and a connection is established.
Act	The amber LED on the right side of each connector flashes each time a traffic is sent or received.

1000BASE-SX Line Card

The 1000BASE-SX line card contains two independent Gigabit (1000-Mbps) Ethernet ports. The ports connect to multi-mode fiber (MMF) cables. Figure 2-5 shows the front panel of the 1000BASE-SX line card.

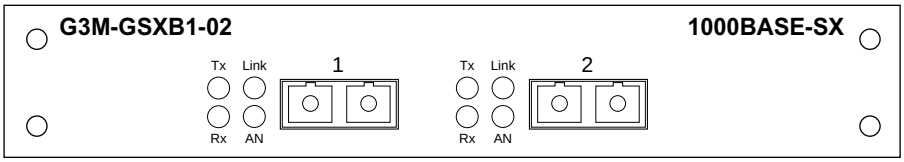

Figure 2-5 1000BASE-SX line card

The following tables list the media specifications and LEDs for the 1000BASE-SX line card.

Table 2-8 1000BASE-SX line card specifications

Port type	Specification
1000Base-SX	• 802.3z standard and 802.3x for flow control • SC-style Media Interface Connector (MIC) • 62.5 micron or 50 micron multimode fiber-optic cable • Maximum of 275 meters (902 feet) segment length for 62.5 micron fiber-optic cable, based on installed fiber bandwidth • Maximum of 550 meters (1804 feet) segment length for 50 micron fiber-optic cable, based on installed fiber bandwidth

Table 2-9 1000BASE-SX line card LEDs

LED	Description
Per-port Link	**Green** – The port has detected that a cable is plugged in and a good connection is established. **Red (intermittent)** – The port has detected an error. **Red (solid)** – The port has detected that a cable is plugged in, but there is no connection. **Off** – There is no cable plugged into the port.
Per-port Rx	**Green** – The port has received packets. **Orange** – The port has received flow-control packets.
Per-port Tx	**Green** – Indicates when the port transmits packets. **Orange** – Indicates when the port transmits flow-control packets.
Per-port AN	**Green** – The line card is auto-negotiating with the link to determine whether to use the full-duplex or half-duplex operating mode. **Orange (intermittent)** – Auto-negotiation is in process. **Orange (solid)** – There are problems with the auto-negotiation configuration. **Red** – Auto-negotiation failure. This fault may occur if the link partner does not support full duplex. **Off** – Auto-negotiation has been disabled or the link is down.

1000BASE-LX Line Card

The 1000BASE-LX line card provides the same features as the 1000BASE-SX line card, and supports both single-mode fiber (SMF) and MMF. Figure 2-6 shows the front panel of the 1000BASE-LX line card.

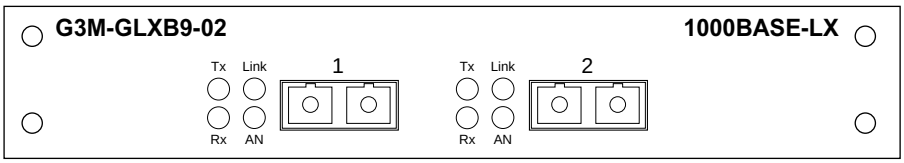

Figure 2-6 1000BASE-LX line card

The following tables list the media specifications and LEDs for the 1000BASE-LX line card.

Table 2-10 1000BASE-LX line card specifications

Port type	Specification
1000Base-LX	• 802.3z standard and 802.3x for flow control • SC-style Media Interface Connector (MIC) • 62.5 micron or 50 micron multi-mode fiber-optic cable • 10 micron single-mode fiber-optic cable • Maximum of 550 meters (1804 feet) segment length for 62.5 micron multi-mode fiber-optic cable, based on installed fiber bandwidth[a] • Maximum of 550 meters (1804 feet) segment length for 50 micron multi-mode fiber-optic cable, based on installed fiber bandwidth[a] • Maximum of 5 kilometers (229,659 feet) segment length for 10 micron single-mode fiber-optic cable

a. A mode-conditioning patch cord is required, one at each end of the connection.

.

Table 2-11 1000BASE-LX line card LEDs

LED	Description
Per-port Link	**Green** – The port has detected that a cable is plugged in and a good connection is established. **Red (intermittent)** – The port has detected an error. **Red (solid)** – The port has detected that a cable is plugged in, but there is no connection. **Off** – There is no cable is plugged into the port.
Per-port Rx	**Green** – Indicates when the port receives packets. **Orange** – Indicates when the port receives flow-control packets.

Table 2-11 1000BASE-LX line card LEDs (Continued)

LED	Description
Per-port Tx	**Green** – This LED indicates when the port transmits packets. **Orange** – This LED indicates when the port transmits flow-control packets.
Per-port AN	**Green** – The line card is auto-negotiating with the link to determine whether to use a full-duplex or half-duplex operating mode. **Orange (intermittent)** – Auto-negotiation is in process. **Orange (solid)** – There is a problem with the auto-negotiation configuration. **Red** – Auto-negotiation failure. This fault may occur if the link partner does not support full duplex. **Off** – Auto-negotiation has been disabled or the link is down.

1000BASE-LH Line Card

The 1000BASE-LH line card supports SMF. Figure 2-7 shows the front panel of the 1000BASE-LH line card.

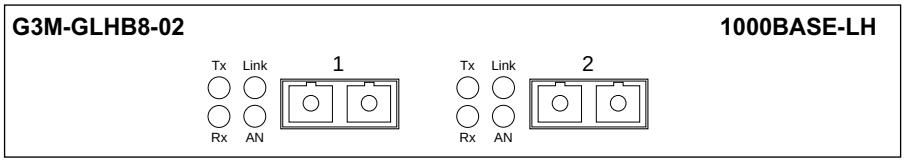

Figure 2-7 1000BASE-LH line card

The following table lists the media specifications for the 1000BASE-LH line card.

Table 2-12 1000BASE-LH line card specifications

Port type	Specification
1000Base-LH	• 802.3z standard (also uses 802.3x for flow control) • SC-style Media Interface Connector (MIC); either connection pin in the MIC can be used for transmit or receive • 10 micron single-mode fiber-optic cable • Maximum 70 kilometers (229,659 feet) segment length for 10 micron SMF fiber-optic cable

The 1000BASE-LH line card uses the following LEDs.

Table 2-13 1000BASE-LH line card LEDs

LED	Description
Per-port Link	**Green** – indicates that the port hardware detects a cable plugged into the port and a good link is established. **Red (intermittent)** – indicates that the port received an error during operation. **Red (solid)** – indicates that the port hardware detects a cable plugged into the port, however, a bad link is established. **Off** – indicates that no link from exists with the port.
Per-port Rx	**Green** – indicates when the port's transceiver receives packets. **Orange** – indicates when the port's transceiver receives flow-control packets.
Per-port Tx	**Green** – indicates when the port's transceiver transmits packets. **Orange** – indicates when the port's transceiver transmits flow-control packets.
Per-port AN	**Green** – indicates that the line card is auto-negotiating the operating mode of the link between full-duplex and half-duplex. **Orange (intermittent)** – indicates that auto-negotiation is in process. **Orange (solid)** – indicates a problem with auto-negotiation configuration. **Red** – indicates an auto-negotiation failure. This fault may occur if the link partner does not support full duplex. **Off** – indicates that auto-negotiation has been disabled or the link is down.

Dual Serial and Quad Serial – C/CE Line Cards

The Dual Serial line card contains a single dual serial WAN port (two serial ports located on one high density connector). The Quad Serial – C and Quad Serial – CE line cards each contain two dual serial WAN ports. In addition, the Quad Serial – C line card includes compression, and the Quad Serial – CE line card includes compression and encryption, for each WAN port. Figure 2-8 shows the front panel of the Dual Serial WAN line card.

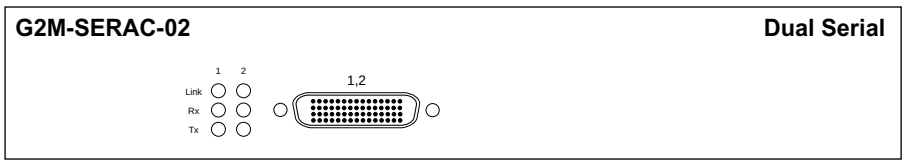

Figure 2-8 Front panel of Dual Serial WAN line card

Figure 2-9 shows the front panel of the Quad Serial WAN line card.

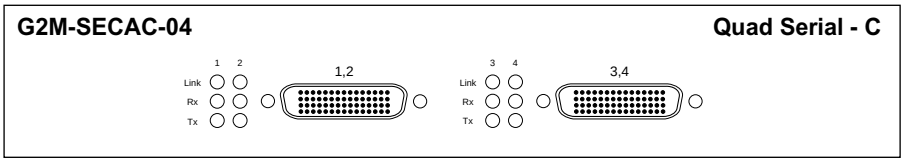

Figure 2-9 Front panel of Quad Serial – C/CE WAN line card

The following table lists the media specifications for the Dual Serial and Quad Serial – C/CE line cards.

Table 2-14 Dual Serial and Quad Serial – C/CE WAN line card specifications

Port Type	Specification
Dual serial	• V.35, X.21, EIA530, EIA530A, or RS449 • LFH-60 high density connector • Recommended 3 meters (10 feet) segment length for standard WAN line card to CSU/DSU data port.[a]

a. Connector cables for WAN line cards may be ordered from Riverstone Networks, Inc.

Riverstone offers the following four cables, used to connect the RS 1000 to standard CSU/DSU modules:

Table 2-15 Dual Serial port to CSU/DSU cables

Riverstone Part Number	CSU/DSU Connector Type	Standard
SYS-SV35-DTE	Two (2) V.35 34-pin connectors[a]	V.35
SYS-S530-DTE	Two (2) DB-25 25-pin connectors	EIA-530
SYS-S449-DTE	Two (2) DB-37 37-pin connectors	RS-449
SYS-SX21-DTE	Two (2) DB-15 15-pin connectors	X.21

a. The two remote ends of each type of connector cable is labeled “Port A” and “Port B”. “Port A” corresponds to Port 1 on a Dual Serial WAN line card and Port 1 or 3 on a Quad Serial – C/CE, depending upon which WAN line card port you are using. Similarly, Port B corresponds to Port 2 on a Dual Serial WAN line card and Port 2 or 4 on a Quad Serial – C/CE.

Note Because the LFH-60 high density connectors on Dual Serial and Quad Serial – C/CE line cards contain two serial WAN ports per interface, all four cable types defined above feed two CSU/DSU ports.

Table 2-16 maps the pin assignments for Riverstone's LFH-60 high density connectors for the Dual Serial and Quad Serial – C/CE line cards.

Table 2-16 LFH-60 connector pin assignments

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	P1_GND	16	P2_TXC_A	31	P1_GND	46	P2_TXD_A
2	P1_MODE[2]	17	P2_TXC_B	32	P1_MODE[0]	47	P2_TXD_B
3	P1_CTS_B	18	P2_DCD_A	33	P1_DCD_B	48	P2_RTS_A
4	P1_CTS_A	19	P2_DCD_B	34	P1_DCD_A	49	P2_RTS_B
5	P1_RTS_B	20	P2_MODE[1]	35	P0_RXD_B	50	P2_DSR_A
6	P1_RTS_A	21	P2_GND	36	P0_RXD_A	51	P2_DSR_B
7	P1_SCTE_B	22	P2_GND	37	Reserved	52	P2_LL_A
8	P1_SCTE_A	23	P1_TXD_A	38	P2_GND	53	P2_SHIELD
9	P1_GND	24	P1_TXD_B	39	P2_MODE[0]	54	Reserved
10	P2_GND	25	P1_TXC_A	40	P2_CTS_B	55	P1_RXC_A
11	P2_MODE[2]	26	P1_TXC_B	41	P2_CTS_A	56	P1_RXC_B
12	P2_RXD_B	27	P1_DSR_A	42	P2_DTR_B	57	P1_DTR_A
13	P2_RXD_A	28	P1_DSR_B	43	P2_DTR_A	58	P1_DTR_B
14	P2_RXC_B	29	P1_MODE[1]	44	P2_SCTE_B	59	P1_LL_A
15	P2_RXC_A	30	P1_GND	45	P2_SCTE_A	60	P1_SHIELD

Figure 2-10 shows the pin positions in the LFH-60 high density connector.

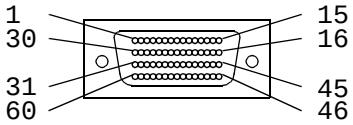

Figure 2-10 LFH-60 high density connector

The Dual Serial and Quad Serial – C/CE line cards use the following LEDs.

Table 2-17 Dual Serial and Quad Serial – C/CE WAN line card LEDs

LED	Description
Per-port Link	Indicates that the line card detects a cable plugged into the port and a good link is established.
Per-port Rx	Indicates when the port's transceiver receives data.
Per-port Tx	Indicates when the port's transceiver transmits data.

Dual HSSI Line Card

The Dual HSSI line card contains two 50-pin High Speed Serial Interface (HSSI) ports. Figure 2-11 shows the front panel of the Dual HSSI WAN line card.

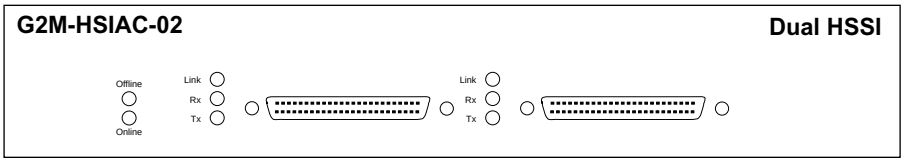

Figure 2-11 Front panel of Dual HSSI WAN line card

Table 2-18 lists the media specifications for the Dual HSSI line card.

Table 2-18 Dual HSSI line card specifications

Port Type	Specification
HSSI	• HSSI rev 2.11 • 50-pin High Speed Serial Interface (HSSI) connector • Recommended 3 meters (10 feet) segment length for standard WAN line card-to-CSU/DSU data port.[a]

a. Connector cables for WAN line cards may be ordered from Riverstone.

The following table maps the pin assignments for Riverstone's 50-pin HSSI connector for the Dual HSSI line card.

Table 2-19 Pin assignments for the HSSI connector

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	GND	14	(reserved)	26	GND	39	(reserved)
2	RT+	15	(reserved)	27	RT-	40	(reserved)
3	CA+	16	(reserved)	28	CA-	41	(reserved)
4	RD+	17	(reserved)	29	RD-	42	(reserved)
5	LC+	18	(reserved)	30	LC-	43	(reserved)
6	ST+	19	GND	31	ST-	44	GND
7	GND	20	(reserved)	32	GND	45	(reserved)
8	TA+	24	(reserved)	33	TA-	46	(reserved)
9	TT+	22	(reserved)	34	TT-	47	(reserved)
10	LA+	23	(reserved)	35	LA-	48	(reserved)
11	SD+	24	(reserved)	36	SD-	49	(reserved)
12	LB+	25	GND	37	LB-	50	GND
13	GND			38	GND		

Note Because neither connector at the ends of the SYS-HSSI-CAB cable is keyed, you can simply plug either end of the cable into either your Dual HSSI line card or the remote HSSI CSU/DSU data port.

Figure 2-12 shows the pin positions in the 50-pin HSSI connector.

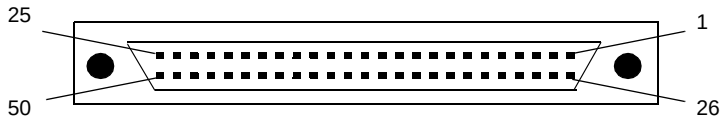

Figure 2-12 50-pin HSSI connector

The Dual HSSI line card uses the following LEDs.

Table 2-20 Dual HSSI line card LEDs

LED	Description
Offline	When lit, this amber LED on the left side of the line card indicates that the line card is offline (powered off). The Offline LED also is lit briefly during a reboot or reset of the RS 1000 but goes out as soon as the CPU discovers the line card.
Online	When lit, this green LED indicates that the line card is online and is ready to receive, process, and send packets if configured to do so.
Link	Indicates that the line card detects a cable plugged into the port and a good link is established.
Rx	Indicates when the port's transceiver receives data.
Tx	Indicates when the port's transceiver transmits data.

Multi-rate WAN Line Card

The Multi-rate WAN line card can contain two WAN Interface Cards (WICs). Figure 2-13 shows the front panel of the Multi-rate WAN line card with one WIC installed. The Multi-rate WAN line card supports channelized T1 and E1 and Clear Channel T3 and E3 WICs. The WAN line card can support any combination of the various WICs.

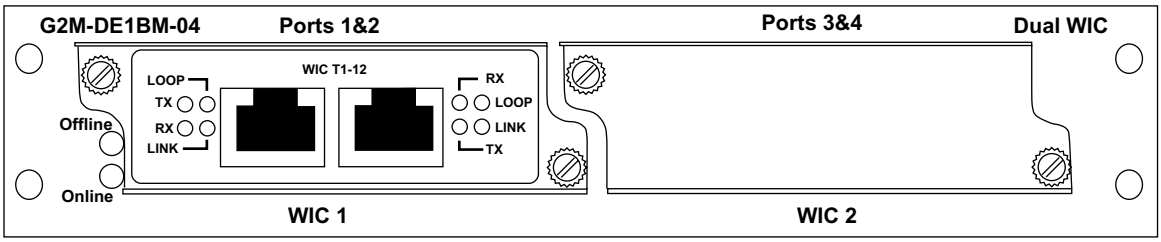

Figure 2-13 Multi-Rate WAN line card with one T1 WIC

Each T1/E1 WIC has two ports, each port provides a WAN interface.

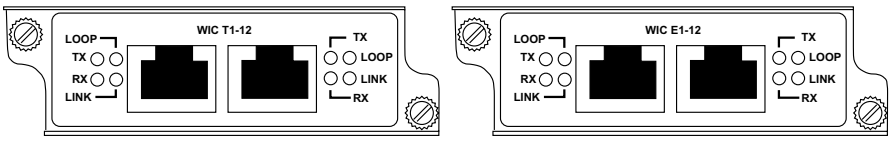

Figure 2-14 T1 and E1 WICs

Each ClearChannel T3/E3 WIC contains a transmit and a receive port that provide a single WAN interface.

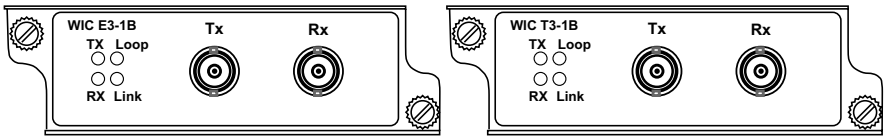

Figure 2-15 Clear Channel T3 and E3 WICs

Table 2-21 through Table 2-24 list the specifications for the various WICs supported by the Multi-rate WAN module.

Table 2-21 Specifications for T1 WIC card

Port type	Specification
Channelized T1	• Two RJ-48c connectors • ANSI T1.102, T1.107, T1.403 compliant • Supports SF/ESF • Supports AMI/B8ZS

Table 2-22 Specifications for E1 WIC card

Port type	Specification
Channelized E1	• Two RJ-45 connectors • G.703, G.704, and 732 compliant • G.704 framing • HDB3, AMI

Table 2-23 Specifications for Clear Channel T3 WIC card

Port-type	Specification
Clear Channel T3	• 75-ohm coaxial BNC connectors • ANSI T1.102, T1.107, and T1.404a compliant • Supports M23 and C-bit framing • B8ZS

Table 2-24 Specifications for Clear Channel E3 WIC card

Port-type	Specification
Clear Channel E3	• 75-ohm coaxial BNC connectors • G.703, G.704, and 732 compliant • G.704 framing • HDB3, AMI

Table 2-25 lists the pin assignments for both the RJ-48c connector on the T1 WIC and the RJ-45 connector on the E1 WIC.

Table 2-25 Pin assignments for T1 and E1 WICs

WIC Line Card Connector	Pin Number	RJ-48c/RJ-45 Connector at Other End of Segment
RXD	1	TXD
RXD	2	TXD
reserved	3	reserved
TXD	4	RXD
TXD	5	RXD
reserved	6	reserved
reserved	7	reserved
reserved	8	reserved

Table 2-26 explains the LEDs used by the The Multi-rate WAN line card and all WICs:

Table 2-26 LEDs for Multi-rate WAN line card and WICs

LED	Description
Offline	When lit, this amber LED on the left side of the module indicates that the module is offline (powered off) but is ready for hot swap. The Offline LED also is lit briefly during a reboot or reset of the RS but goes out as soon as the Control Module discovers the module.
Online	When lit, this green LED indicates that the module is online and is ready to receive, process, and send packets if configured to do so.
Per-port Loop	**Off** – indicates normal operations. **Blinking Green** – remote loopback; Tx is looped back into Rx outside this device. **Green** – local loopback; Tx is looped back into Rx before leaving this device. **Yellow** – the network has placed this port in loopback; Rx is looped back out to Tx within this device **Blinking Yellow** – the Alarm Indication Signal (AIS)/ Blue Alarm. It indicates that the line card has a connection to the upstream device; but the upstream device has lost its receive connection to the network and is sending an AIS to indicate this.
Per-port Link	**Green** – indicates that the line card detects a cable plugged into the port and a good link is established. **Blinking Green** – Port is in transition to active state **Yellow** – indicates that the port was disabled by management. **Off** – indicates that the port is not configured (i.e., there are no time slot assignments).
Per-port Tx	**Flashing Green** – indicates that the port's transceiver is transmitting data. **Blinking Yellow** – the Remote Alarm Indication (RAI)/Yellow Alarm signal. The remote device is in a Red alarm condition (it is not receiving a signal from the line card). This is a framed indication.
Per-port Rx	**Flashing Green** – indicates that the port's transceiver is receiving data. **Blinking Yellow** – the Red alarm. Indicates a loss of signal (LOS) or loss of framing (LOF) on the Rx side.

10/100Base-TX Line Card

The 10/100Base-TX line card contains 16 independent Ethernet ports. Each port senses whether it is connected to a 10-Mbps or 100-Mbps segment and configures itself automatically as a 10Base-T or 100Base-TX port. Figure 2-16 shows the front panel of the 10/100Base-TX line card.

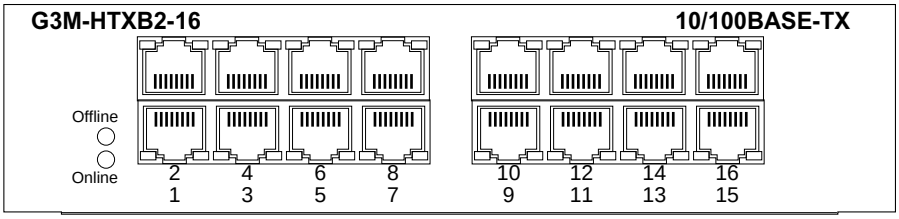

Figure 2-16 Front panel of 10/100Base-TX line card

The following tables list the media specifications and LEDs for the 10/100Base-TX line card.

Table 2-27 10/100Base-TX line card specifications

Port type	Specification
10Base-T	• 802.3 standard • RJ-45 connector wired as Media Data Interface Crossed (MDIX) • EIA Category 3, 4, or 5 unshielded twisted pair cabling • Maximum of 100 meters (328 feet) for segment length
100Base-TX	• 802.3u standard • RJ-45 connector wired as Media Data Interface Crossed (MDIX) • EIA Category 5 unshielded twisted pair cabling • Maximum of 100 meters (328 feet) for segment length

Table 2-28 10/100Base-TX line card LEDs

LED	Description
Offline	This amber LED on the left side of the line card indicates that the line card is offline. It is also lit briefly during a reboot or reset of the RS 1000 and goes out as soon as the control module discovers and properly initializes the module.
Online	This green LED indicates that the line card is online and is ready to receive, process, and send packets.

Table 2-28 10/100Base-TX line card LEDs (Continued)

LED	Description
Link	The green LED on the left side of the connector indicates the link status. When this LED is lit, the port has detected that a cable is plugged into it, and the port has established communication with the device at the other end.
Activity	The amber LED on the right side of each port connector flashes each time the port sends or receives packets.

3 HARDWARE INSTALLATION

This chapter provides hardware installation instructions and information on safety considerations, environmental considerations, and regulatory standards.

3.1 SAFETY CONSIDERATIONS

Read the following safety warnings and product cautions to avoid personal injury or product damage.

3.1.1 Preventing Injury

Warning Observe the following safety warnings to prevent accidental injury when working with the RS 1000 hardware

- Be careful when lifting the RS 1000 out of the shipping box.
- Never attempt to rack mount the RS 1000 unaided. Ask an assistant to help you with the RS 1000.
- Before performing any mechanical upgrade or installation procedures, make sure that the RS 1000 is powered off.
- Never operate the RS 1000 with exposed expansion slots.
- Never operate the RS 1000 if it becomes wet or the area where it has been installed is wet.

3.1.2 Preventing Equipment Damage

To prevent damage to the RS 1000 components, observe the following warnings.

Warning Always use proper electrostatic discharge (ESD) gear when handling line cards or other internal parts of the RS 1000.

Warning Make sure you allow at least three inches of room for air flow around the RS 1000 chassis.

3.2 HARDWARE SPECIFICATIONS

The following table lists the physical and environmental specifications for the RS 1000.

Table 3-1 RS 1000 specifications

Specification	Measurement
Height	8.4 cm (3.3 in)
Width	43 cm (16.9 in)
Depth	46.6 cm (18.3 in)
Weight	7.9 Kgs (17.5 lbs)
Power	AC: 100 - 240 VAC, 5A, 50-60 Hz DC: 48 - 60 VDC, 14A, 113W
Operating temperature	0^{o}C to 40^{o}C (32^{o}F to 104^{o}F)
Non-Operating Temperature	-40^{o}C to 70^{o}C (-38^{o}F to 158^{o}F)
Operating Humidity	10% to 95% (non-condensing)
Non-operating Humidity	10% to 95% (non-condensing)

3.3 INSTALLING THE HARDWARE

Hardware installation of the RS 1000 is accomplished by the following basic steps:

- Unpacking your shipment and verifying its contents
- Installing expansion line cards (if any)
- Mounting the unit into an equipment rack
- Connecting the serial and 10/100 Base-T management cables

This section provides detailed information regarding these procedures.

3.3.1 Verifying Your Shipment

Before you begin installing your RS 1000, check your shipment to ensure that everything you ordered arrived securely. Open the shipping box(es) and verify that you received the following equipment:

- RS 1000 power cord(s)
- Console (serial) cable
- *Riverstone Networks RS 1000 Switch Router Getting Started Guide*
- *Riverstone Networks Documentation CD*
- Release Notes
- Rack mount kit
- Depending on your order, your shipment may also contain line cards

3.3.2 Installing Line Cards

Before installing the RS 1000 into an equipment rack, it is recommended that you first install any expansion line cards that you may have ordered with the unit. Installing expansion line cards before rack mounting will prevent the need to remove the RS 1000 from its rack and remove the mounting hardware from the RS 1000 chassis.

Line Card Differences

While the process for installation is essentially the same for all line cards, there are a few differences between a few line cards that affect installation process. The following lists these differences:

- All line cards use one of two types of face plates: a “standard” face plate or an “extended,” EMI-protective face plate (see Figure 3-4). Each of these face plates must be installed in a slightly different manner.
- The Multi-rate WAN line card is designed differently from other line cards, and requires the removal of certain hardware components from inside the RS 1000 chassis (see Figure 3-8).

Installing Standard and Extended Face Plate Line Cards

There are two types of face plates for line cards: a standard face plate (shipped with most line cards) and an extended, EMI-protective face plate (shipped with certain line cards). The standard face plate is shaped somewhat like the expansion slot cover. The extended, EMI-protective face plate has an extended bottom surface (see Figure 3-4). The following procedure explains how to install line cards that use either the standard or extended face plate.

Warning Always use proper electrostatic discharge (ESD) gear when handling line cards or other internal parts of the RS 1000.

1. Make sure that the RS 1000 is powered off.
2. If rack mounted, remove the RS 1000 from the equipment rack.
3. If the RS 1000 is equipped for rack mounting, use the #2 Phillips-head screwdriver to remove the mounting brackets from each side of the chassis.
4. Use the #2 Phillips-head screwdriver to remove the four screws that hold the top cover on the RS 1000 (see Figure 3-1).

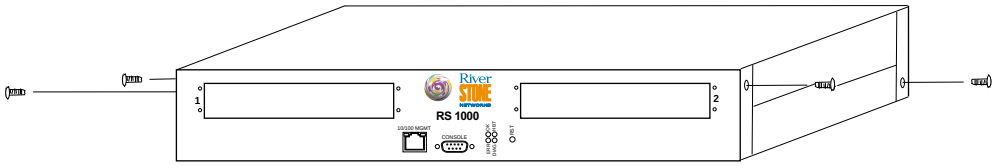

Figure 3-1 Removing the RS 1000's cover

5. Slide the cover away from the front of the RS 1000 about one-half inch (1/2"), then lift the cover away. Be careful not to damage or remove any EMI gaskets around the edges of the cover.
6. Use the #2 Phillips-head screwdriver to remove the four mounting screws that secure the cover plate to the expansion slot (see Figure 3-2). Be careful not to damage or remove any EMI gaskets around the edges of the expansion slot opening.

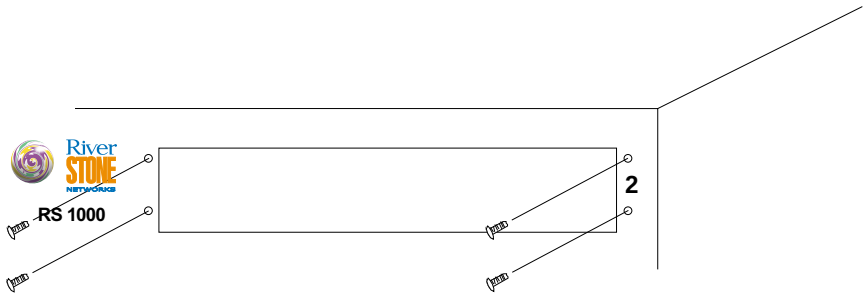

Figure 3-2 Removing the cover plate (view from outside chassis)

7. Install the line card's face plate:

   Standard Face Plate – From the inside of the chassis, line up the four holes in the line card's face plate with the corresponding holes around the expansion slot. Use the screws provided and the #2 Phillips-head screwdriver to affix the line card's face plate to the chassis.

   Extended Face Plate – From the inside of the chassis, place the face plate on top of the motherboard. Align the extended face plate so that the four holes around the front of the face plate align with the four holes around the expansion slot, and the four notches of the extended part are directly over the four stand-offs on the motherboard (see Figure 3-5). You may need to gently push the extended face plate down while lining up the first of the face plate screws. Use the screws provided and the #2 Phillips-head screwdriver to affix the line card's face plate to the chassis.

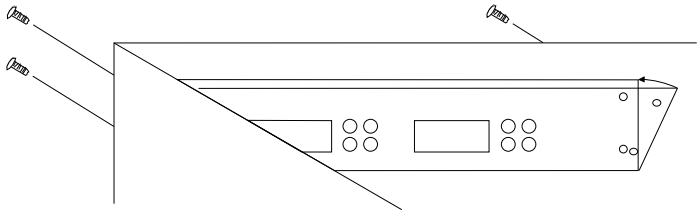

Figure 3-3 Installing "standard" line card face plate (view from inside chassis)

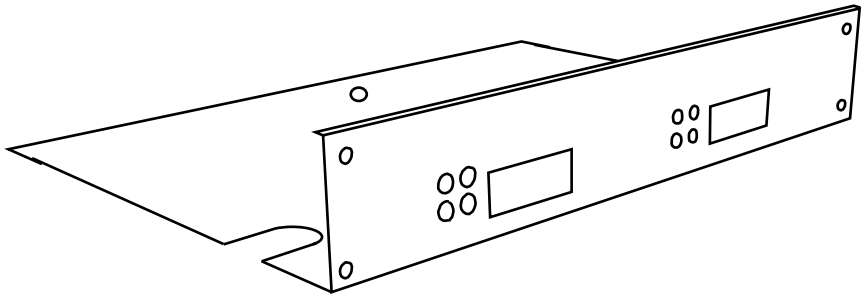

Figure 3-4 “Extended” EMI face plate

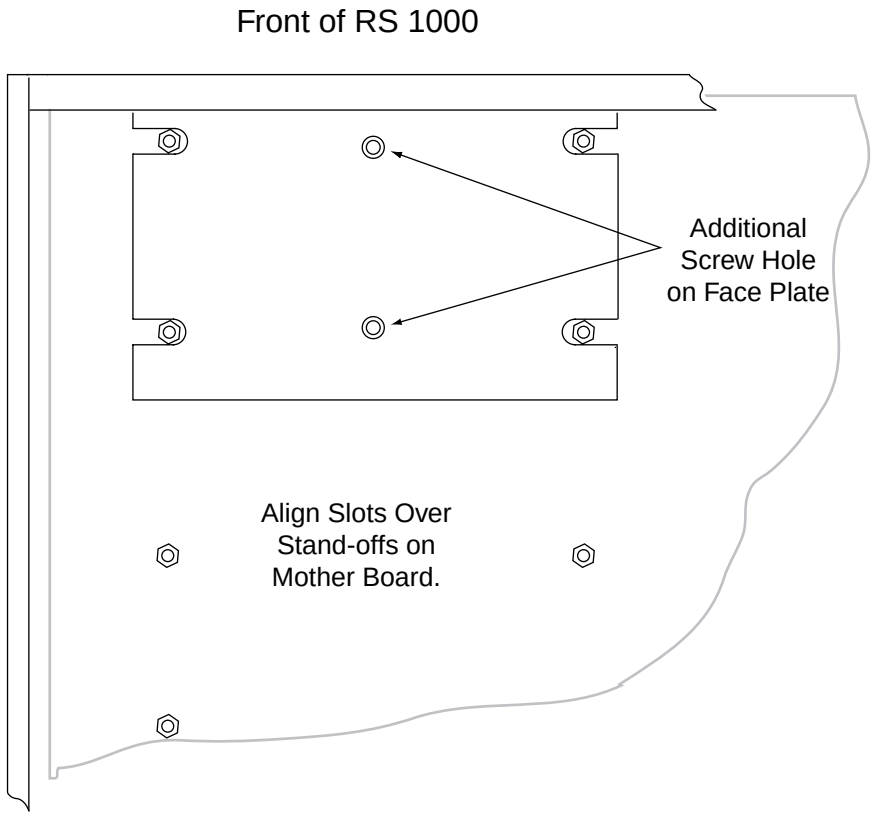

Figure 3-5 Installing the extended EMI face plate

8. Insert the line card from the top and ensure that it makes maximum surface contact with its face plate.

9. Line up the two screw holes at the back of the line card and insert the vertical female connector at the back of the line card into the male connector on the RS 1000’s motherboard.

Warning The female and male connectors are not keyed, so it is possible to misalign the connection. Ensure that all pins fit properly before applying power to the RS 1000.

10. Insert the six screws that hold the line card in place over the motherboard. Use the #2 Phillips-head screwdriver to tighten the screws. If installing a line card that uses the extended face plate, insert and tighten the two additional screws that go through the center of the line card (see Figure 3-6).

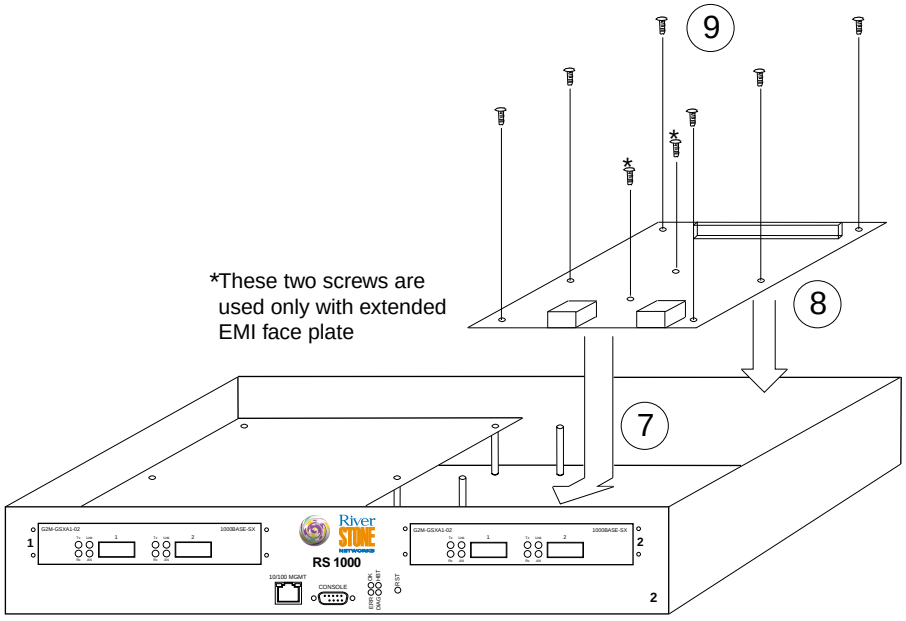

Figure 3-6 Installing a line card

11. Replace the cover of the RS 1000, and secure it using the #2 Phillips-head screwdriver and the four screws previously removed.

3.3.3 Multi-rate WAN Line Card and WICs

This section describes the procedure for installing the Multi-rate WAN line-card. Additionally, if your configuration uses either a Clear Channel T3 or E3 WIC, you must consider the setting of the WIC module's grounding-jumpers.

Setting Jumpers on the Clear Channel T3/E3 WICs

Both the Clear Channel T3 and E3 WICs contain a set of jumpers (JP2, JP3,and JP4). These jumpers allow you to set whether the shielding of the transmit (Tx) and Receive (Rx) cables are grounded. In their default positions, the jumpers are set such that the shielding on the Tx cable is grounded at the RS and the shielding on the Rx cable is not grounded at the RS (see Table 3-2 and Figure 3-7).

Table 3-2 Jumper default settings

Jumper	Default Position	Setting
JP2	Jumper block in place	Shielding on Tx cable is grounded at the RS
JP3	No jumper block in place (open)	Shielding on Rx cable is not grounded at the RS
JP4	Jumper block in place	Storage jumper for jumper block to be used on JP3

To Ground the Shielding on the Rx Cable – Remove the jumper block on JP4 and place it on the pins of JP3.

Note The industry standard for E3 is both Tx and Rx cable shielding grounded. To be E3 industry-compliant, the jumper block must be moved from JP4 to Jp3.

To Remove Grounding of the Shielding on the Tx Cable – Remove the jumper block on JP2.

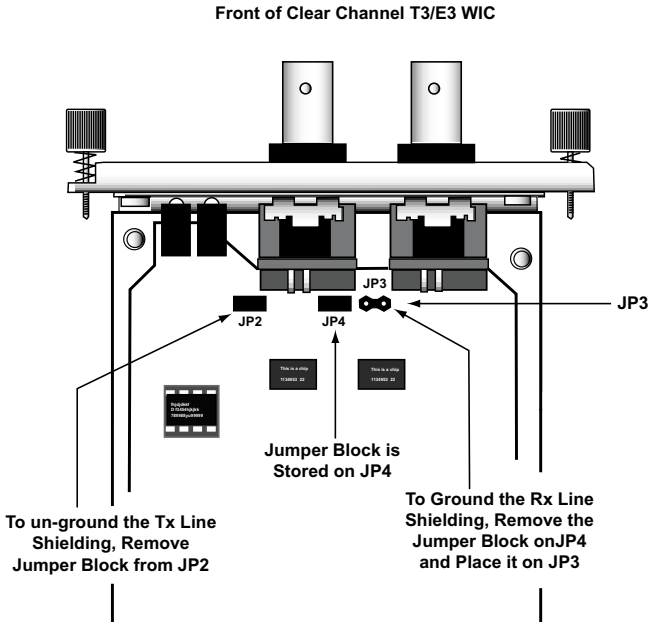

Figure 3-7 Jumper position on Clear Channel T3 and E3 WICs

Installing the Multi-rate Line card

Because of its design, the Multi-rate WAN line card requires a somewhat different installation procedure. The following describes how to install a Multi-rate WAN line card and its WAN Interface Cards (WIC).

Note The Multi-rate WAN line card does not come with a separate face plate. The face plate is integral to the Multi-rate WAN line card.

1. Make sure that the RS 1000 is powered off.
2. If rack mounted, remove the RS 1000 from the equipment rack.
3. If the RS 1000 is equipped for rack mounting, use the #2 Phillips-head screwdriver to remove the mounting brackets from each side of the chassis.
4. Use the #2 Phillips-head screwdriver to remove the four mounting screws that hold the top cover on the RS 1000 (see Figure 3-1).
5. Slide the cover away from the front of the RS 1000 about one-half inch (1/2”), then lift the cover away. Be careful not to damage or remove any EMI gaskets around the edges of the cover.
6. Use the #2 Phillips-head screwdriver to remove the four mounting screws that secure the cover plate to the expansion slot (see Figure 3-2). Be careful not to damage or remove any EMI gaskets around the edges of the expansion slot opening.
7. Use the #2 Phillips-head screwdriver to remove the expansion slot cover.
8. Remove the two stand-offs from the motherboard as shown in Figure 3-8.

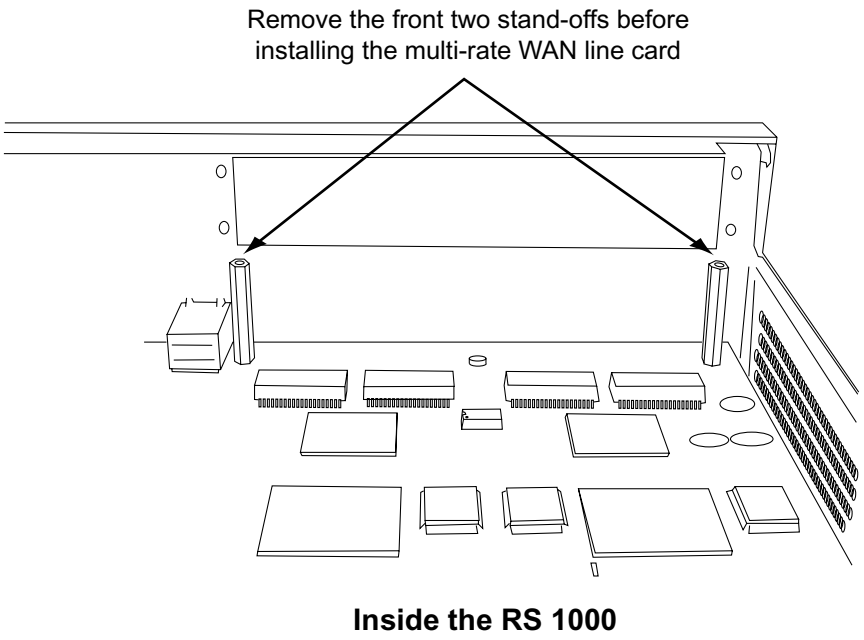

Figure 3-8 Removing the stand-offs on the motherboard

9. Use the #2 Phillips-head screwdriver to replace the standoffs with the screws provided.
10. Insert the line card from the top and ensure that it makes maximum surface contact with its face plate.
11. Line up the two screw holes at the back of the line card and insert the vertical female connector at the back of the line card into the male connector on the RS 1000’s motherboard.

Warning The female and male connectors are not keyed, so it is possible to misalign the connection. Ensure that all pins fit properly before applying power to the RS 1000.

12. Insert the screws that hold the line card in place over the motherboard. Use the #2 Phillips-head screwdriver to tighten the screws.
13. Insert the WIC card into one of the WIC receptacles in the front of Multi-rate WAN line card. As you insert the WIC, make sure that the sides of the WIC card are aligned with the card guides in the WIC receptacle. See Figure 3-9.

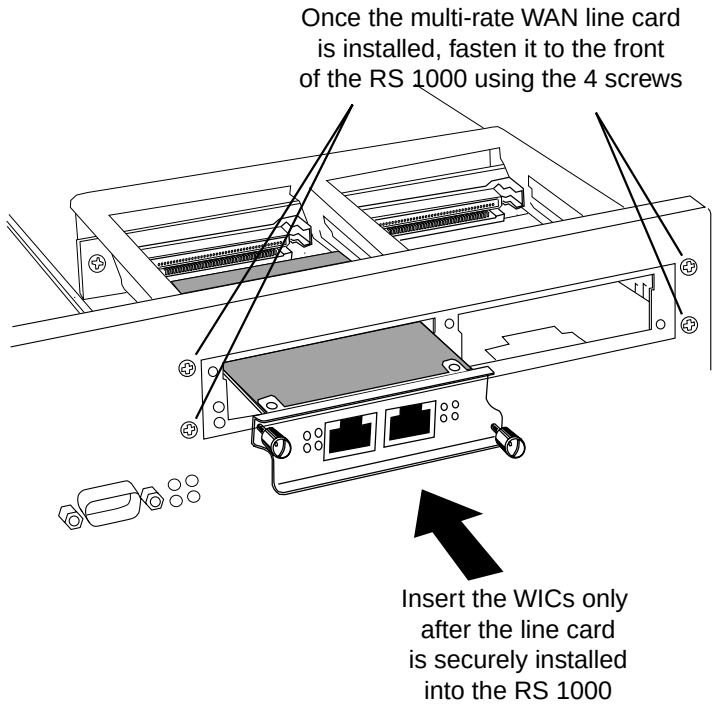

Figure 3-9 Installing a WIC

14. Push the WIC card into the WIC receptacle until the 96-pin connector is firmly seated into the connector at the back of the receptacle.
15. Use the two captive screws on the WIC card to secure it to the Multi-rate line card.
16. Replace the cover of the RS 1000, and secure it using the #2 Phillips-head screwdriver and the four screws previously removed.

3.3.4 Installing the RS 1000 into an Equipment Rack

The RS 1000 is designed to be installed in a standard 19” equipment rack. To install the RS 1000 in an equipment rack, use the following procedure. You will need a #2 Phillips-head screwdriver to perform this procedure.

Note Riverstone recommends that only qualified personnel conduct installation of any chassis.

Warning Before performing any mechanical upgrade or installation procedures, make sure that the RS 1000 is powered off.

1. Align one of the mounting brackets over the corresponding holes in the side of the RS 1000. The mounting bracket is correctly positioned when the side with two open mounting holes is flush with the front of the RS 1000.
2. Use the #2 Phillips-head screwdriver and the eight supplied screws to attach the rack mounting flanges to each side of the chassis.

Warning Be sure to use the Phillips-head screws supplied by Riverstone Networks. If you use screws that are longer than the ones included with your shipment, there is a danger of damaging the RS 1000's internal components.

3. Along with an assistant, lift the RS 1000 into place in the mounting rack.
4. While your assistant holds the chassis in place, attach the mounting flanges of the RS 1000 to the equipment rack using appropriate mounting hardware.

Figure 3-10 shows an example of how to install the RS 1000 in an equipment rack.

Warning Make sure the screws are tight before your assistant releases the chassis. If you accidentally leave the screws loose, the chassis can slip and fall, possibly becoming damaged.

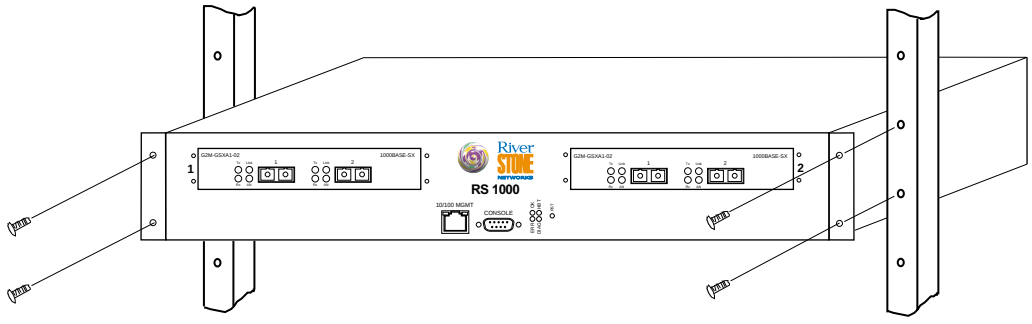

Figure 3-10 Installing the RS 1000 chassis in an equipment rack

3.3.5 Management Ports

The RS 1000 has two ports for attaching management devices:

Male DB-9 DCE port – This serial port is used for direct connection to a terminal or PC running terminal emulation software. Use this port to perform basic setup using the Command Line Interface (CLI).

RJ-45 10/100Base-T DTE port – This Media Data Interface (MDI) port is used for in-band management of the RS 1000 through a Telnet session to the CLI or through SNMP.

Connecting the Serial Management Cable

Use the serial cable to connect the RS 1000 to a terminal (or to a PC running terminal emulation software) to perform initial setup and configuration. The RS 1000's serial cable is a female to female DB-9 crossover cable. Figure 3-11 shows the serial port on the front of the RS 1000, and Figure 3-12 shows the serial port's pin-out. Table 3-3 maps the wiring of the serial cable.

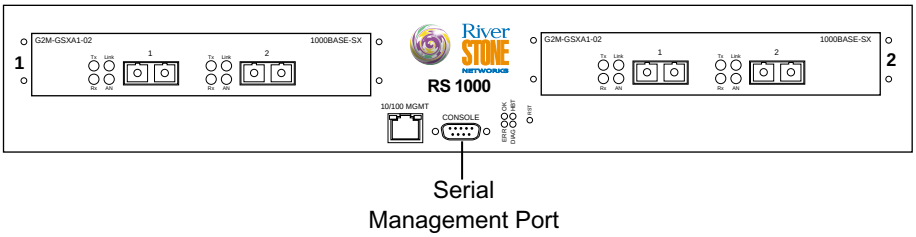

Figure 3-11 RS 1000's serial (DB-9 DCE) management port

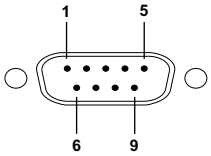

Figure 3-12 Serial port (DB-9 DCE) pin-out

Table 3-3 Wiring map for serial cable

Signal (RS 1000 serial port)	Pin	Signal (management console port)
Unused	1	Unused
TXD (transmit data)	2	RXD (receive data)[a]
RXD (receive data)	3	TXD (transmit data)
Unused	4	Unused
GND (ground)	5	GND (ground)

Table 3-3 Wiring map for serial cable (Continued)

Signal (RS 1000 serial port)	Pin	Signal (management console port)
Unused	6	Unused
CTS (clear to send)	7	CTS (clear to send)
RTS (request to send)	8	RTS (request to send)
Unused	9	Unused

a. The left hand column pin assignments are for the male DB-9 connector on the RS 1000. Pin 2 (TXD or “transmit data”) must emerge on the management console’s end of the connection as RXD (“receive data”).

Connecting a 10/100BASE-TX Management Cable

Use the RJ-45 10/100BASE-TX DTE port for connecting the RS 1000 to your network for in-band management through either Telnet or SNMP. Figure 3-13 shows the location of the MDI cable management port on the front of the RS 1000. Figure 3-14 shows the pin positions of the 10/100BASE-TX port, and Table 3-4 shows the wiring map for the MDI management cable:

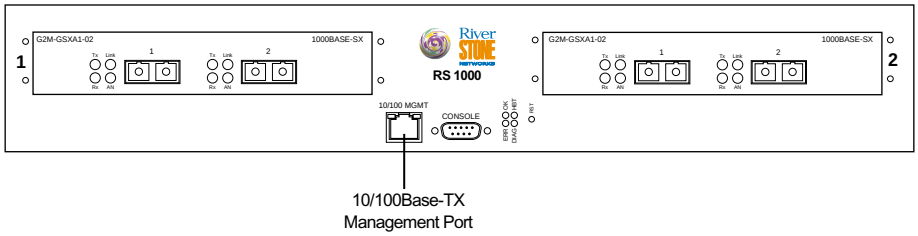

Figure 3-13 RS 1000’s 10/100BASE-TX management port

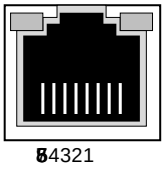

Figure 3-14 10/100BASE-TX RJ-45 port

Table 3-4 Wiring map for MDI management cable

Signal (RS 1000 port)	Pin	Signal (management console port)
TXD (transmit data)	1	RXD (receive data)[a]
TXD (transmit data)	2	RXD (receive data)

Table 3-4 Wiring map for MDI management cable (Continued)

Signal (RS 1000 port)	Pin	Signal (management console port)
RXD (receive data)	3	TXD (transmit data)
Unused	4	Unused
Unused	5	Unused
RXD (receive data)	6	TXD (transmit data)
Unused	7	Unused
Unused	8	Unused

a. The right hand column pin assignments are for the RJ-45 connector on the RS 1000. Pin 1 (TXD or "transmit data") must emerge on the management console's end of the connection as RXD ("receive data").

4 INITIAL CONFIGURATION

This chapter provides the following information on powering up the RS 1000 for the first time, and performing basic setup procedures. Basic setup includes:

- Powering on the RS 1000 and booting the software
- Starting the Command Line Interface (CLI)
- Activating and saving configuration changes
- Assigning passwords
- Using the CLI to add an IP interface, subnet mask, and default gateway
- Setting up SNMP
- Assigning a DNS server(s) to the RS 1000
- Configuring the SYSLOG server and server message levels

4.1 POWERING ON THE RS 1000

To power on the RS 1000 perform the following steps:

1. Make sure all exposed line card slots are free of foreign objects such as tools and are covered with blanks.
2. Make sure that the RS 1000's DB-9 console port is connected to an active terminal or a PC running terminal emulation software.

Note The RS 1000 does not have a power ON/OFF switch. The RS 1000 is turned on by plugging in its AC power cords and connecting them to the AC source

3. Plug the AC power cords into the RS 1000 chassis, then connect the RS 1000 to the AC power source.

   If this is the first time you have powered on the RS 1000, it boots automatically using the software image on the internal flash memory. While the software is booting, the amber Offline LED on the front of the RS 1000 is lit. When the software finishes booting, the Offline LED goes dark and the green Online LED lights up, indicating that the Rapid Operating System (ROS) software is online.

   In addition, as the software boots, the management terminal or PC attached to the RS 1000's DB-9 DCE port displays messages related to the phases of the boot sequence.

Here is a partial example:

```
Boot Software Version prom-2.0.1.1, Built Jan 5 2001 20:18:57
Processor: R7000 rev 2.1 [0x2321], 160 MHz, (bus: 80 MHz), 128 MB DRAM
I-Cache 32 KB, linesize 32. D-Cache 32 KB, linesize 32.
Mounting 16MB flash card . . . Done
Autoboot in 2 seconds - press ESC to abort and enter prom
using link: bootsource
link pointed at file:/pc-flash/boot/rs80/
source: file:/pc-flash/boot/rs80/
  Loaded version file
 Loading kernel (base 0x80001000, size 50592)
(base 0x8000d5a0, size 2658597)
  100% -  Image checksum validated
------------------------------------------------------------------------
RS 1000 System Software, Version 8.0.0.0
Copyright (c) 2000-2001, Riverstone Networks, Inc.
Built by mhaydt@diego on Mon Jan 5 17:10:42 2001
Processor: R7000, Rev 2.1, 159.99 MHz
System started on 2001-10-01 15:27:01
------------------------------------------------------------------------
2001-10-01 15:27:02 %SYS-I-FLASHCRD, Mounting 16MB Flash card
2001-10-01 15:27:06 %SYS-I-FLASHMNTD, 16MB Flash card mounted
2001-10-01 15:27:06 %SYS-I-INITSYS, initializing system RS 1000
2001-10-01 15:27:06 %SYS-I-DSCVMOD, discovered 'Control Module' module in slot CM
2001-10-01 15:27:11 %SYS-I-INITSLOTS, Initializing system slots - please wait
2001-10-01 15:27:18 %SYS-I-MODPROBE, Detecting installed media modules - please wait
2001-10-01 15:27:20 %SYS-I-DSCVMOD, discovered '10/100-TX' module in slot 1
2001-10-01 15:27:20 %SYS-I-DSCVMOD, discovered 'Quad Serial-CE' module in slot 2
```

4. When the software is fully booted, the following messages appears on the management console:

```
Press RETURN to activate console...
```

5. As prompted, press Return (or Enter) to activate the Command Line Interface (CLI) on the console.

Note If prompted for a password, simply press the Return key. The default passwords are blank.

Note If the message "**SYS-E-NOFLASHCARD**" appears while booting the RS 1000, the system has not detected its internal flash memory. If this occurs, reboot the system. If the system still does not recognize its memory, contact Riverstone Networks Technical Support.

4.2 STARTING THE COMMAND LINE INTERFACE

To start the Command Line Interface (CLI), power on the system as described in Section 4.1, *"Powering on the RS 1000."* After the software is fully booted, press Return (or Enter) to activate the CLI. If prompted for a password, simply press Return; the factory default passwords for all access levels is blank.

4.2.1 CLI Access Modes

The CLI has four levels of access, each of which provides the ability to perform specific operations on the RS 1000 (see Table 4-1).

Table 4-1 CLI access modes

Access Mode	Description
User	Allows you to display basic information and use basic utilities such as ping but does not allow you to display SNMP, filter, and access control list information or make other configuration changes. You are in User mode when the command prompt ends with the "**>**"character.
Enable	Allows you to display SNMP, filter, and access control information, as well as all the information you can display in User mode. To enter Enable mode, enter the **enable** command, then supply the password when prompted. When you are in Enable mode, the command prompt ends with the "**#**" character.
Configure	Allows you to make configuration changes. To enter Configure mode, first enter Enable mode (**enable** command), then enter the **configure** command. When you are in Configure mode, the command prompt ends with "**(config)**."
Boot	This mode appears when the system image is not found during bootup. Enter the **reboot** command to reset the RS 1000. If the RS still fails to boot, contact Riverstone Networks Technical Support. Certain tasks can be performed only from Boot mode. To enter the Boot mode intentionally, boot the RS 1000, and then interrupted the normal bootup sequence by pressing the "Esc" key. When you are in Boot mode, the command prompt is "**rs-boot>**."

Note The command prompt will show the name of the RS 1000 in front of the mode character(s). The default name is "**rs**." The procedure in Section 4.4, *"Setting the Basic System Information"* describes how to change the system name.

When you are in Configure or Enable mode, use the **exit** command or press Ctrl+z to exit to the previous access mode.

4.2.2 Basic Line Editing Commands

The CLI supports Emacs-like line editing commands. The following table lists some commonly used commands. For a complete set of commands, see the *Riverstone RS Switch Router Command Line Interface Reference Manual*.

Table 4-2 Common CLI line editing commands

Key sequence	Command
Ctrl+a	Move cursor to beginning of line
Ctrl+b	Move cursor back one character
Ctrl+d	Delete character
Ctrl+e	Move cursor to end of line
Ctrl+f	Move cursor forward one character
Ctrl+n	Scroll to next command in command history (use the **`cli show history`** command to display the history)
Ctrl+p	Scroll to previous command in command history
Ctrl+u	Erase entire line
Ctrl+x	Erase from cursor to end of line
Ctrl+z	Exit current access mode to previous access mode

4.3 CONFIGURATION CHANGES AND SAVING THE CONFIGURATION FILE

The RS 1000 uses three special configuration files:

Table 4-3 Configuration file contents

File	Descriptions
Scratchpad	The configuration commands you have entered during a management session. These commands do not become active until you explicitly activate them. Because some commands depend on other commands for successful execution, the RS 1000 scratchpad simplifies system configuration by allowing you to enter configuration commands in any order, even when dependencies exist. When you activate the commands in the scratchpad, the RS 1000 sorts out the dependencies and executes the commands in their proper sequence.
Active	The commands from the Startup configuration file and any configuration commands that you have made active from the scratchpad.
Startup	The configuration file that the RS 1000 uses to configure itself when the system is powered on.

Caution The active configuration remains in effect only during the current power cycle. If you power off or reboot the RS 1000 without saving the active configuration changes to the Startup configuration file, the changes are lost.

4.3.1 Activating the Configuration Commands in the Scratchpad

Use the following procedure to activate the configuration commands in the scratchpad.

1. Ensure that you are in Enable mode by entering the **`enable`** command in the CLI.
2. Ensure that you are in Configure mode by entering the **`configure`** command in the CLI.
3. Enter the following command:

```
save active
```

The CLI displays the following message:

```
Do you want to make the changes Active? [y]
```

4. Enter **`y`** to activate the changes.

Note If you exit the Configure mode (by entering the **exit** command or pressing Ctrl+z), the CLI will ask you whether you want to make active the changes in the scratchpad. If you do not make the changes in the scratchpad active, the changes will be lost when you log out.

4.3.2 Saving the Active Configuration to the Startup Configuration File

Use the following procedure to save Active configuration changes into the Startup configuration file so that the RS 1000 remembers and uses the changes when you reboot the software.

1. Enter the following command from Configure mode:

```
rs(config)# save startup
```

2. When the CLI displays the following message, enter **y** to save the changes:

```
Are you sure you want to overwrite the Startup configuration [no]? y
%CONFIG-I-SAVED, configuration saved to Startup configuration.
rs(config)#
```

Alternately, to save the Active configuration to the Startup configuration from Enable mode, perform the following steps.

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.
2. Enter the following command to copy the Active configuration to the Startup configuration:

```
copy active to startup
```

3. When the CLI displays the following message, enter **yes** to save the changes.

```
Are you sure you want to overwrite the Startup configuration? [n]
```

The new configuration changes are added to the Startup configuration file located in the RS 1000's boot flash.

4.3.3 Viewing the Current Configuration

To view the current configuration:

1. Ensure that you are in Enable mode by entering the **enable** command.
2. Enter the following command to display the status of each command line:

```
system show active-config
```

Note Remember that the Active configuration contains both the Startup configuration and any configuration changes that you've made active in the current configuration session.

The CLI displays the Active configuration file with the following possible annotations:

- Commands without errors are displayed without any annotation.
- Commands with errors are annotated with an "**E:**."
- If a particular command has been applied such that it can be expanded on additional interfaces/line cards, it is annotated with a "**P:**." For example, if you enable STP on all ports on the RS 1000, but the RS 1000 contains only one line card, the configuration lines that enable STP will be applied to all ports on all other line cards as they are added to the system.

A command like **stp enable et.*.*** would be displayed as follows:

```
P: stp enable et.*.*
```

If you update the configuration file to state specifically which Ethernet ports STP is enabled on, the "**P:**" annotation in the above command line would disappear.

4.4 SETTING THE BASIC SYSTEM INFORMATION

Follow the procedures in this section to set the following system information:

- System time and date
- System name
- System location
- Contact name (the person to contact regarding this RS 1000)
- IP address for the management port on the RS 1000

Note Some of the commands in this procedure accept a string value. String values can be up to a maximum of 255 characters in length including blank spaces. Surround strings that contain blanks with quotation marks (for example: **"string with internal blanks"**).

1. Enter the **enable** command to get to Enable mode in the CLI.
2. Enter the following commands to set the system time and date and to verify your settings.

```
system set date year <number> month <month-name> day <day> hour <hour> minute <minute> second
<second>

system show date
```

Here is an example:

```
rs# system set date year 2003 month march day 27 hour 11 minute 54
second 0
Time changed to: Mon Mar 27 11:54:00 2003
rs# system show date
Current time: Mon Mar 27 11:54:04 2003
```

3. Enter the **configure** command to get to Configure mode in the CLI. The following commands can be entered only from Configure mode.
4. Enter the following commands to set the system name, location, and contact information:

```
system set name <string>
system set location <string>
system set contact <string>
```

Here is an example:

```
rs(config)# system set name rs
rs(config)# system set location "Houston, TX"
rs(config)# system set contact "John Smith"
```

5. Use the **interface add ip** command to set the IP address and netmask for the en0 Ethernet interface. The en0 Ethernet interface is used by the RS 1000's management port.

   Here is an example:

```
rs(config)# interface add ip en0 address-netmask 16.50.11.22/16
```

Note The en0 interface is automatically created by the system and is reserved for the RS 1000's management port.

6. To activate the system commands entered in the previous steps, use the following command:

```
save active
```

   The CLI displays the following message:

```
Do you want to make the changes Active? [y]
```

7. Enter "**y**" to activate the changes.

8. To display the Active configuration, exit the Configuration mode, then enter the following command:

```
system show active-config
```

   Here is an example:

```
rs# system show active-config
Running system configuration:
     !
     ! Last modified from Console on Mon Jan 25 11:55:35 2001
     !
 1 : system set name "rs"
 2 : system set location "Houston, TX"
 3 : system set contact "John Smith"
```

9. Save the Active configuration to the Startup configuration file using the following command:

```
copy active to startup
```

10. When the CLI displays the following message, enter **y** to save the changes to the Startup configuration file:

```
Are you sure you want to overwrite the Startup configuration [no]? y
%CONFIG-I-WRITTEN, file copied successfully
rs#
```

4.5 SETTING UP PASSWORDS

You can password-protect CLI access to the RS 1000 by setting up passwords for User mode access, Enable mode access, and Diag mode access. Users who have a User password but not an Enable password can use only the commands available in User mode. Users with an Enable password can use commands available in the Enable and Configure modes, as well as the commands in User mode.

In addition, you can set up the RS 1000 for TACACS, TACACS+, and/or RADIUS authentication by a TACACS or RADIUS server. Procedures for configuring the RS 1000 for TACACS and RADIUS can be found in the *Riverstone RS Switch Router User Guide*.

To add password protection to the CLI, use the following procedure.

1. Ensure that you are in Enable mode by entering the **`enable`** command in the CLI.
2. Ensure that you are in Configure mode by entering the **`configure`** command in the CLI.
3. Type the following command for each password you want to set:

```
system set password login|enable|diag <string>|none
```

4. Use the **`show`** command to examine the commands you just entered.
5. Use the **`save active`** command to activate the commands.
6. Exit the Configuration mode, then use the **`system show active-config`** command to verify the active changes.

Here is an example of the commands in the previous steps:

```
rs(config)# system set password login demo
rs(config)# system set password enable killer
rs(config)# system set password diag trouble
rs(config)# save active
rs# exit
rs# system show active-config

Running system configuration:
!
! Last modified from Console on Mon Mar 27 12:12:19 2003
!
 1 : system set name "rs"
 2 : system set location "Houston, TX"
 3 : system set contact "John Smith"
 4 : system set hashed-password login jNIssH c976b667e681d03ccd5fc527f219351a
 5 : system set hashed-password enable zcGzbO 5d1f73d2d478ceaa062a0b5e0168f46a
 6 : system set hashed-password diag jdfbyp 67e681d3d2d478cf21935a0b5e016f2193
```

Notice that the passwords are shown in the Active configuration in an encrypted format. Passwords also appear this way in the Startup configuration. To keep your passwords secure, the RS 1000 does not have a command for displaying passwords in an unencrypted format.

Caution Test all new passwords before saving the active configuration to the Startup configuration file.

4.5.1 If You Forget Your Passwords

If you forget your passwords follow this procedure to regain access to your RS 1000.

Note To perform this procedure, you must use a terminal or PC running terminal emulation software that is connected directly to the RS 1000 through its DB-9 console port.

1. Power cycle the RS 1000.
2. Interrupt the normal boot-cycle and enter Boot mode by pressing the “Esc” key.
3. From the boot prompt enter the **`set`** command and note the image name displayed for **`bootsource`**. For example:

```
...
mfg_loop_by = time        [time count]
mfg_loop_max = 62000
 bootdelay = 2
  autoboot = boot
promsetaddrs = 1
   netaddr = 134.152.179.132
  bootaddr = 0.0.0.0
   netmask = 255.255.255.224
   gateway = 134.152.179.129
bootsource = link:/pc-flash/boot/rs80 <This is the image name for this example>
   ethaddr = 00:00:1d:12:34:56
     sysid = -1
rs-boot>
```

4. Enter the following line to reboot the RS 1000:

```
boot <image name> skipconfig=yes
```

Here is an example:

```
rs-boot> boot /pc-flash/boot/rs80 skipconfig=yes
```

5. When the RS 1000 finishes booting, enter the following commands (when prompted, answer **yes**):

```
rs> enable
rs# copy startup to scratchpad
rs# config
rs(config)# system set password login none
rs(config)# system set password enable none
rs(config)# system set password diag none
rs(config)# save startup
Are you sure you want to overwrite the Startup configuration [no]? yes

There are non-committed configuration changes. Do you want to make
these changes active and then save everything to Startup [yes]? yes

%CONFIG-I-SAVED, 2001-10-02 21:53:54 %GATED-I-RECONFIGDONE, Routing
configuration changes completed (pid 0x809eab20).
configuration saved to Startup configuration.
rs(config)#
```

6. The User, Enable, and Diag access mode passwords are now reset to the default “blank” values.

7. Enter new passwords for the User, Enable, and Diag access modes.

4.6 SETTING UP SNMP

To use SNMP to manage the RS 1000, you need to set up an SNMP community and specifying the IP address of the target host for SNMP traps. Otherwise, the RS 1000's SNMP agent runs in local trap process mode, unless disabled using the **snmp stop** command.

For additional information about configuring and using SNMP, see the *Riverstone RS Switch Router User Guide*.

4.6.1 Setting the Community string

Use the following procedure to add the SNMP community string, specify the target host for traps, and the trap interface.

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.
2. Ensure that you are in Configure mode by entering the **configure** command in the CLI.
3. Use the following commands to add an SNMP community string and set a target host IP address for the traps:

```
rs(config)#snmp set community <community-name> privilege read|read-write
rs(config)#snmp set target <IP-addr> community <community-name> status enable|disable
```

Note If the IP address of the trap target is more than one hop away from the RS 1000, configure the RS with a static route to the target. If the RS 1000 is rebooted, the static route allows a cold start trap to be sent to the trap target. Without a static route, the cold-start trap is lost while the routing protocols are converging.

4. Use the **save startup** command to activate the commands entered in the previous steps.

   Here is an example of the commands and output for configuring SNMP and saving the changes.

```
rs# config

rs(config)# snmp set community public privilege read-write

rs(config)# snmp set target 16.50.11.12 community public status enable

rs(config)# save startup
Are you sure you want to overwrite the Startup configuration [no]? yes

There are non-committed configuration changes. Do you want to make
these changes active and then save everything to Startup [yes]? yes

%CONFIG-I-SAVED, 2001-09-02 21:53:54 %GATED-I-RECONFIGDONE, Routing
configuration changes completed (pid 0x809eab20).
configuration saved to Startup configuration.
rs(config)#
```

By default, SNMP information is sent and received on the RS 1000's en0 Ethernet port. If you want SNMP to use a different port on the RS 1000, use the following command.

```
snmp set trap-source <interface>|<IPaddr>
```

Here is an example:

```
rs(config)# snmp set trap-source 134.152.78.192
```

SNMP will now use the port with IP address 134.152.78.192. Remember, to make this change permanent, enter the **save startup** command.

4.6.2 Improving SNMP Security

SNMPv1 is not a secure protocol. Messages containing community strings are sent in plain text from manager application to agent. Anyone with a protocol decoder and access to the wire can capture, modify, and replay messages.

Applying ACLs to SNMP

When using SNMP v1 or v2, it is important to protect your RS 1000 by applying an Access Control List (ACL) to the SNMP agent to prevent unauthorized access and route your SNMP traffic through trusted networks only.

Here are the basic configuration commands to apply an ACL to the RS 1000's SNMP agent, allowing access to the RS 1000 by only one management station.

```
rs(config)# acl mgmt_only permit udp <IPaddr> any any any
rs(config)# acl mgmt_only apply service snmp
```

The above ACL applied to the SNMP service allows messages from source IP address *<IPaddr>* to be processed by the SNMP agent, packets form any other source IP address are dropped.

Disabling Authentication Traps

To provide additional security to the RS 1000, disable the sending of authentication traps. Authentication traps are sent when SNMP v1 packets are received with invalid community strings. A common security attack on an SNMP v1 agent is to send a message containing an invalid message, and then capture the authentication trap to learn the community string.

Here is an example of how to turn off the sending of authentication traps:

```
rs(config)#snmp disable trap authentication
```

For additional information about RS 1000 security and ACLs, see the *Riverstone RS Switch Router User Guide.*

4.6.3 Supported MIBs

The following lists the MIBs that are supported by the RS 1000 SNMP agent.

Table 4-4 Supported MIBs

MIB II	Layer 1	Layer 2	Layer 3	System Related	Enterprise
IP-MIB RFC 2011	EtherLike-MIB RFC 2665	FRAME-RELAY-DTE-MIB RFC 2115	BGP4-MIB RFC 1657	RADIUS-AUTH-CLIENT-MIB RFC 2618	NOVELL-IPX-RIPSAP 2/94
TCP-MIB RFC 2012	SONET-MIB RFC 1595	BRIDGE-MIB RFC 1493	RIPv2-MIB RFC 1724		NOVELL-IPX 4/21/94
UDP-MIB RFC 2013	DS1-MIB RFC 2495	Q-BRIDGE-MIB RFC 2674	OSPF-MIB RFC 1850		CTRON-LFAP 8/28/99
IP-FORWARD-MIB RFC 2096	DS3-MIB RFC 2496	P-BRIDGE-MIB RFC 2674	OSPF-TRAP-MIB RFC 1850		CTRON-SSR-POLICY 8/11/99
IF-MIB RFC 2233	DS0bundle-MIB RFC 2494	PPP-LCP-MIB RFC 1471	RMON2-MIB RFC 2021		CTRON-SSR-CONFIG 8/17/99
SNMPv2-MIB RFC 1907	MAU MIB RFC 2668	PPP-SEC-MIB RFC 1472	VRRP-MIB Draft #9		CTRON-SSR-HARDWARE 8/14/99
	DOCS-IF-MIB RFC 2670	PPP-IP-NCP-MIB RFC 1473	DVMRP-MIB Draft #4		CTRON-SSR-SERVICE-STATUS 8/4/98
	DOCS-BPI-MIB Draft #1	PPP-BRIDGE-NCP-MIB RFC 1474	IGMP-MIB Draft #5		CTRON-SSR-CAPACITY 5/13/99
		RMON-MIB RFC 1757			RIVERSTONE-STP-MIB 7/11/00
		ATM-MIB RFC 1695			RIVERSTONE-RS-AGENT-CAP-MIB
		IEEE LAG MIB 8/17/00			RIVERSTONE-ATM-MIB

4.7 SETTING THE DNS DOMAIN NAME AND ADDRESS

Associating a DNS name server with your RS 1000 allows you to use device names (rather than IP addresses) when entering certain commands. For example, you can use a device's name (which the DNS server knows) when using the **ping** command.

If you want the RS 1000 to access a DNS server, use the following procedure to specify the domain name and IP address for the DNS server.

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.
2. Use the **ping** command to verify that the RS 1000 can reach the DNS server.

   Here is an example:

```
rs# ping 16.50.11.12              <IP address of the DNS server>
PING 16.50.11.12 (16.50.11.12): 56 data bytes
64 bytes from 16.50.11.12: icmp_seq=0 ttl=255 time=0 ms

--- 16.50.11.12 ping statistics ---


1 packets transmitted, 1 packets received, 0% packet loss
round-trip min/avg/max = 0/0/0 ms
```

3. Enter Configure mode by entering the **configure** command in the CLI.
4. Enter the following command to specify the domain name for which the DNS server(s) have authority:

```
system set dns domain <domain-name>
```

   For example: <*domain-name*> = **riverstone.com**

5. Enter the following command to add the DNS server to the RS 1000:

```
system set dns server <IP-addr>[,<IP-addr>[,<IP-addr>]]
```

   where <*IP-addr*> is the IP address of the DNS server(s). You can specify up to three DNS servers. Separate the server IP addresses with commas.

6. Enter the **save active** command to activate the commands and enter **yes** to activate the changes.

   Here is an example:

```
rs# config
rs(config)# system set dns domain "mktg.mrb.com"
rs(config)# system set dns server 16.50.11.12
rs(config)# save active
```

7. Exit Configure mode, then enter the **system show dns** command to verify the new DNS settings.

Here is an example:

```
rs# system show dns
DNS domain: mrb.com, DNS server(s): 16.50.11.12
```

8. Use the **ping** command to verify that the RS can resolve the DNS server name into its IP address.

Here is an example:

```
rs# ping rs
PING rs.mktg.mrb.com (16.50.11.22): 56 data bytes
64 bytes from 16.50.11.22: icmp_seq=0 ttl=255 time=0 ms

--- rs.mktg.mrb.com ping statistics ---
1 packets transmitted, 1 packets received, 0% packet loss
round-trip min/avg/max = 0/0/0 ms
```

4.8 SETTING THE SYSLOG PARAMETERS

The RS 1000 can use SYSLOG messages to communicate the following types of messages to a SYSLOG server:

Table 4-5 Types of SYSLOG messages

Message Type	Description
Fatal	Information about events that caused the RS 1000 to crash and reset.
Error	Information about errors.
Warning	Warnings against invalid configuration information and other conditions that are not necessarily errors.
Informational	Informational messages such as status messages. The SYSLOG messages that the CPU displays while booting the software and reading the startup configuration file are examples of Informational messages.

Table 4-6 shows examples of the types of SYSLOG messages. Notice that after the facility type (in this case, "`CONFIG`") the message contains a letter that refers to the message type: "`F`" for fatal, "`E`" for error, and so on.

Table 4-6 Examples of message types

Message Type	Example
Fatal	`%CONFIG-F-CREATE_SEMA4 Unable to create %s semaphore: %d`
Error	`%CONFIG-E-NEED_COMMAND Need at least one command word to match`
Warning	`%CONFIG-W-BACKUP_CFG Cannot find Startup config - using backup on PCMCIA flash`
Informational	`%CONFIG-I-SAVED configuration saved to Startup configuration`

The RS 1000 writes the SYSLOG messages to a SYSLOG daemon on UDP port 514. You can set the CLI to send all or only some of the message types. By default, the CLI sends warning, error, and fatal messages but not informational messages to the specified SYSLOG server.

Use the following procedure to specify the SYSLOG server and the types of messages you want the CLI to send to the server.

1. Ensure that you are in Enable mode by entering the **`enable`** command in the CLI.
2. Use the **`ping`** command to verify that the RS 1000 can reach the SYSLOG server.
3. Ensure that you are in Configure mode by entering the **`configure`** command in the CLI.
4. Enter the following commands to add the SYSLOG server to the RS 1000, set the message level, and set the SYSLOG facility:

```
system set syslog server <hostname-or-IP-addr>
system set syslog level fatal|error|warning|info
system set syslog facility <facility-type>
```

Note The <*facility-type*> is a string of the form: *user*, *kern*, or *local0* through *local7*. These strings are reserved by the SYSLOG server daemon. for information on how <*facility-type*> is used by the SYSLOG server, see the documentation for your server's *syslog.conf* file.

Here is an example:

```
rs# config
rs(config)# system set syslog server 16.50.11.12
rs(config)# system set syslog level info
rs(config)# system set syslog facility local0
```

5. To activate the SYSLOG commands, use the **save active** command. Enter **yes** to activate the changes.

Note Up to four SYSLOG servers can be configured for each RS.

5 MANAGING SOFTWARE

This chapter describes how to perform operations regarding RS 1000 operating software and bootPROM images software. The following topics are covered:

- Upgrading the system image software
- Upgrading the Boot PROM image software
- Loading RS 1000 software from a TFTP server
- Loading RS 1000 software from a BootP/TFTP server

5.1 UPGRADING SYSTEM IMAGE SOFTWARE

To upgrade the system software and boot using the upgraded image, perform the following procedure.

1. Display the current boot settings by using the **`system show version`** command. Note the current **`Image Boot Location`**.

   Here is an example:

```
rs# system show version
Software Information
  Software Version   : 8.0
  Copyright          : Copyright (c) 2000-2001 Riverstone Networks, Inc.
  Image Information  : ros8000, built on Mon Jan 25 14:10:21 2000
  Image Boot Location: file:/pc-flash/boot/img/ros8000
  Boot Prom Version  : prom-2.0.0.5
```

   In the example above, the location "**`pc-flash`**" indicates that the RS 1000 is set to use the factory-installed software on its internal flash memory.

2. Copy the upgrade system software onto a TFTP server that the RS 1000 can access. (Use the **`ping`** command to verify that the RS 1000 can reach the TFTP server.)

Note If the TFTP server is one or more hops away from the RS 1000, add a route to the TFTP server's network using the **`ip add route`** command.

3. Enter the following command to copy the software upgrade onto the RS 1000's internal flash memory:

```
system image add <IPaddr-of-TFTP-host> <image-file-name>
```

Note The <*image-file-name*> is the full directory path and filename to the image software file on the TFTP server.

Here is an example:

```
rs# system image add 134.152.178.5 tftpboot/ros8100
Downloading image 'tftpboot/ros8100' from host '134.152.178.5'
 to local image ros8100 (takes a while) . . .
 download: done
 save:
kernel: 100%
done
Image checksum validated.
%SYS-I-BOOTADDED, Image 'ros8100' added.
```

4. Enter the **system image list** command to list the images on the internal flash memory and verify that the new image is present.

   Here is an example:

```
rs# system image list
Images currently available on Master CM
slot0:
ros8100 (version 8.1.0.0)
ros8000 (version 8.0.0.0)  [selected for next boot]
```

5. Use the **system image choose** command to select the image file that the RS 1000 will use when rebooted.

   Here is an example:

```
rs# system image choose ros8100
Found image in slot0
Making image ros8100 (version 8.1.0.0) the active image
for next reboot on Master CM . . .
%SYS-I-CHS_PRIMARY_OK, image successfully chosen on Primary CM
rs#
```

6. Use the **system image list** command to verify the change.

Note You do not need to activate this change.

7. Reboot the RS 1000 to load and run the new system software image.

5.2 UPGRADING BOOT PROM SOFTWARE

The RS 1000 boots using the boot PROM image software installed on the motherboard's internal memory. To upgrade the boot PROM image, use the following procedure.

1. Display the current boot settings by entering the **`system show version`** command. Note the current **`Boot Prom Image`** version.

Here is an example:

```
rs# system show version
Software Information
  Software Version   : 8.0
  Copyright          : Copyright (c) 1996-2000 Riverstone Networks, Inc.
  Image Information  : ros8000, built on Mon Jan 25 14:10:21 2000
  Image Boot Location: file:/pc-flash/boot/img/ros8000
  Boot Prom Version  : prom-2.0.0.5
```

2. Copy the upgrade boot PROM image software onto a TFTP server that the RS 1000 can access. (Use the **`ping`** command to verify that the RS 1000 can reach the TFTP server.)

Note If the TFTP server is one or more hops away from the RS 1000, add a route to the TFTP server's network using the **`ip add route`** command.

3. Enter the following command to copy the bootPROM upgrade onto the RS 1000's internal memory:

```
system promimage upgrade <IPaddr-of-TFTP-host> <image-file-name>
```

Note The <*image-file-name*> is the full directory path and filename to the bootPROM image file on the TFTP server.

Here is an example:

```
rs# system promimage upgrade 134.152.178.5 tftpboot/prom-211
Downloading image 'tftpboot/prom-211' from host '134.152.178.5'
image is a prom upgrade to version 'prom-2.0.1.1'
tftp complete
checksum valid. Ready to program.
Active-CM: flash found
Active-CM: erasing...
Active-CM: programming...
Active-CM: verifying...
Active-CM: programming successful.
Active-CM: Programming complete.
rs#
```

4. Reboot the RS 1000.
5. Enter the **`system show version`** command to verify that the new boot PROM software is in the internal memory of the RS 1000's motherboard.

5.3 LOADING SOFTWARE FROM THE NETWORK

Typically, the RS 1000 loads its operating software from the flash memory contained on the motherboard. Alternately, the RS 1000 can be configured to ignore its internal flash image and obtain its software from a network server. The RS 1000 can obtain its image software from either a TFTP or BootP/TFTP server.

5.3.1 Loading Image Software from a TFTP Server

Perform the following procedure to configure the RS 1000 to load its image software from a TFTP server:

1. Copy the image software onto a TFTP server that the RS 1000 can access.
2. Reboot the RS 1000 and enter Boot mode by pressing the "Esc" key to interrupt the normal boot process.
3. At the Boot prompt, enter the **`set`** command to view the current bootPROM variable values.

   Here is an example:

```
 re-boot> set

...tty1 = 9600
bootdiagmode = off         [off on quick mfg-test]
  diag_log =
mfg_loop_by = time        [time count]
mfg_loop_max = 86400
 bootdelay = 2
promsetaddrs = 1
flow_control = on          [off on]
bootptimeout = 5
   netaddr = 0.0.0.0
  autoboot = boot
   netmask = 0,0,0,0
   gateway = 0.0.0.0
bootsource = /pc-flash/boot/ros80
  bootaddr = 0.0.0.0
   ethaddr = 00:00:1d:12:34:56
sysid = -1
rs-boot>
```

4. Notice in the example above that `netaddr`, `netmask`, and `gateway` have the value **`0.0.0.0`**, and that **`bootsource = /pc-flash/boot/ros80`**.
5. From the Boot prompt, use the **`set`** command to set the following:

- IP address of the RS 1000 – (**`netaddr`**)
- Subnet mask for the RS 1000 – (**`netmask`**)
- The IP address of the RS 1000's default gateway – (**`gateway`**)
- Full path and filename to the software image on the TFTP server – (**`bootsource`**)
- IP address of the TFTP server – (**`bootaddr`**)

```
rs-boot> set netaddr <IPaddr>
rs-boot> set netmask <subnet-mask>
rs-boot> set gateway <IPaddr>
rs-boot> set bootsource <dir-filename>
rs-root> set bootaddr <IPaddr>
```

Here is an example:

```
rs-boot> set netaddr 134.152.179.132
rs-boot> set netmask 255.255.255.224
rs-boot> set gateway 134.152.179.129
rs-boot> set bootsource /tftpboot/ros80
rs-boot> set bootaddr 134.152.176.5
```

6. Enter the **set** command to view the changes.

Here is an example:

```
 rs-boot> set
...
   netaddr = 134.152.179.132
  autoboot = boot
   netmask = 255.255.255.224
   gateway = 134.152.179.129
bootsource = /tftpboot/ros80
  bootaddr = 134.152.176.5
   ethaddr = 00:00:1d:12:34:56
sysid = -1
rs-boot>
```

7. From the Boot prompt, use the **ping** command to verify that the RS 1000 can reach the TFTP server.

8. Reboot the RS 1000. As the RS 1000 initializes, it ignores the software image on the internal flash and retrieves its operating software from the TFTP server at **134.152.176.5**.

Here is an example:

```
rs-boot> boot

Rebooting. . .

. . .source: tftp://134.152.176.5/tftpboot/ros80

  Build location: host 'matrix' by 'adm'...

  Version: 8.0.0.0 . . .
```

5.3.2 Loading Image Software from a BootP/TFTP Server

The RS 1000 contains a BootP client and can be configured to obtain its image software from a BootP/TFTP server. Using the BootP client allows the RS 1000 to obtain its software network address from the server using only its MAC address. This eliminates the need to initially configure the RS's IP address, subnet mask, and boot source.

To configure the RS 1000 to use its BootP client to obtain its image software, perform the following procedure:

1. Load the RS 1000's image software on a BootP/TFTP server that can be reached by the RS 1000.
2. Boot the RS 1000 and enter Boot mode by interrupting the normal startup sequence by pressing the "Esc" key.
3. Use the **`set`** command to obtain the RS 1000's MAC address.

   Here is an example:

   .

```
 re-boot> set

...tty1 = 9600
bootdiagmode = off         [off on quick mfg-test]
  diag_log =
mfg_loop_by = time        [time count]
mfg_loop_max = 86400
 bootdelay = 2
promsetaddrs = 1
flow_control = on          [off on]
bootptimeout = 5
   netaddr = 0.0.0.0
  autoboot = boot
   netmask = 0,0,0,0
   gateway = 0.0.0.0
bootsource = /pc-flash/boot/ros80
  bootaddr = 0.0.0.0
   ethaddr = 00:00:1d:12:34:56   < MAC address >
sysid = -1
rs-boot>
```

4. Use the **`set`** command to change the value of **`autoboot`** to **`bootp`**.

   Here is an example:

```
rs-boot> set autoboot bootp
```

5. Configure the BootP/TFTP server with the RS 1000's MAC address, an appropriate IP address, and the location of the RS 1000 software image file. Additionally, make sure that the ARP cache of the BootP/TFTP server is set correctly for the RS 1000.

6. Reboot the RS 1000 by entering the **reboot** command at the Boot prompt.

Here is an example:

```
rs-boot> reboot

Ethernet Base address = 00:00:1d:12:34:56
Ethernet CPU address  = 00:00:1d:12:34:57

Performing Bootp with timeout in 5 seconds.
** plen = 300  plen - sizeof(struct bootp) = 0
BOOTPD='134.141.179.134'
netaddr='134.141.179.132'
* bootp source is C:\TFTPBOOT\ROS80
Booting boot file C:\TFTPBOOT\ROS80.
source: tftp://134.141.179.134/C:\TFTPBOOT\ROS80
 File: version (703 bytes)
  Build location: host 'matrix' by 'adm'
  Version: 8.0.0.0
  Build date: Mon Dec 25 23:56:47 2000
 File: kernel (3568593 bytes)
  Loading kernel (base 0x80001000, size 50528)
(base 0x8000d560, size 3507312)
  100% - kernel loaded...
...
...
Press RETURN to activate console . . .
```

APPENDIX A TROUBLESHOOTING

If you experience difficulty with the basic hardware or software setup procedures in this guide, check the following table to see whether the difficulty you are experiencing is described. If you find a description of the difficulty you are experiencing, try the remedy recommended for the difficulty. If the remedy does not remove the difficulty or the difficulty is not listed in this appendix, contact:

Riverstone Technical Assistance Center - RTAC

- Telephone: (408) 844-0010
- FAX: 408.878.6920
- Internet address: www.riverstonenet.com/support
- Email: support@riverstonenet.com

Table A-1 Troubleshooting

If you experience this difficulty...	Try this remedy...
The router exhibits no activity. No LEDs are on and the fan module is not operating.	Ensure that the power supply is installed and plugged into a power source and the power source is active. Ensure that the switch on the power supply is in the on position.
The power supply is installed but is not operating.	Check the power cable and the circuit to which the power supply is connected.
The fan is not operating.	Check the power cable and the circuit to which the power supply is connected.
No expansion modules are active.	Check the power cable and the circuit to which the power supply is connected.
A specific expansion module is inactive.	Ensure that the expansion module has been properly installed in its expansion slot. For more detailed information, see Section 3.3.2, *"Installing Line Cards."*
An older software version continues to boot instead of the newer version on a TFTP server.	Reconfigure the router to boot using newer software using the procedure in Section 5.1, *"Upgrading System Image Software."*
You are unable to access the configuration commands in the CLI.	From the CLI, type **`enable`** to access the Enable mode, then type **`configure`** to access the Configure mode.

Table A-1 Troubleshooting (Continued)

If you experience this difficulty...	Try this remedy...
Configuration changes do not seem to be taking effect.	Reactivate the changes using the procedure in Section 4.3.1, *"Activating the Configuration Commands in the Scratchpad."*
Configuration changes are not reinstated after a reboot.	Save the configuration changes to the startup configuration file using the procedure in Section 4.3.2, *"Saving the Active Configuration to the Startup Configuration File."*
The router is not resolving DNS names.	Set up DNS using the procedure in Section 4.7, *"Setting the DNS Domain Name and Address."* Ensure that you can use NS lookup on the DNS server to get the default domain.
An SNMP manager cannot access the router.	Set up an SNMP community string and specify a target for SNMP traps using the procedure in Section 4.6, *"Setting Up SNMP."* Type the **`snmp show all`** in the CLI to check the SNMP settings. Use the **`traceroute`** and **`ping`** commands to verify that the router can reach the SNMP management station.
You are unable to ping a certain host.	Create and add an IP or IPX interface for the host. See the *Riverstone RS Switch Router User Guide* for information.

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