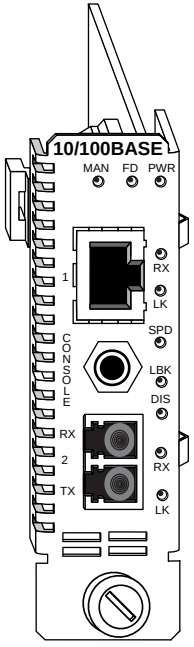
Radiance 10/100 Mbps Services Line Card



Installation and User Guide

Model: R821-1S

Radiance 10/100 Mbps Services Line Card

Line Card:
R821-1S _____ 10/100 Mbps RJ-45 to 100 Mbps SFP

Multimode Small Form-Factor Pluggable (SFP) Fiber Optic Transceiver:
O280-M2_____ SFP Multimode LC (1310 nm, 17 dB) 2 km, without digital diagnostics

Singlemode SFP Fiber Optic Transceivers:
O281-40 _____ SFP Singlemode LC (1310 nm, 33.5 dB) 40 km
O281-80 _____ SFP Singlemode LC (1550 nm, 33.5 dB) 80 km
O283-20 _____ SFP Singlemode LC (1310 nm, 20.5 dB) 20 km

Bidirectional Wavelength Division Multiplexing (BWDM) SFP Fiber Optic Transceivers:
O383-20-31 _____ SFP BWDM SC (1310 nm/1550 nm, 19 dB) 20 km
O383-20-55 _____ SFP BWDM SC (1550 nm/1310 nm, 19 dB) 20 km

Coarse Wavelength Division Multiplexing (CWDM) SFP Fiber Optic Transceivers:
O483-80-47 _____ SFP CWDM LC (1470 nm, 33 dB) 80 km
O483-80-49 _____ SFP CWDM LC (1490 nm, 33 dB) 80 km
O483-80-51 _____ SFP CWDM LC (1510 nm, 33 dB) 80 km
O483-80-53 _____ SFP CWDM LC (1530 nm, 33 dB) 80 km
O483-80-55 _____ SFP CWDM LC (1550 nm, 33 dB) 80 km
O483-80-57 _____ SFP CWDM LC (1570 nm, 33 dB) 80 km
O483-80-59 _____ SFP CWDM LC (1590 nm, 33 dB) 80 km
O483-80-61 _____ SFP CWDM LC (1610 nm, 33 dB) 80 km

Accessory:
R800-CA_____ Console Cable

Contents

Chapter 1: Overview

Designed to support the new IEEE 802.3ah standard, Metrobility's Radiance R821 10/100 Mbps Services Line Card is a manageable two-port copper-to-fiber device capable of remote communications with an off-site unit. A third console port provides a connection for direct management of the R821. Using an in-band management channel, two Radiance services line cards in a back-to-back configuration can communicate without a separate IP address at the remote end. Because an IP address is not needed at every access point, this solution ideally suits large metro access service deployments.

When paired with Metrobility's NetBeacon® Element Manager, the services line card provides the highest level of manageability with a user-friendly graphical interface. NetBeacon delivers non-intrusive RMON Group 1 statistics, errored symbol and frame event notifications, and real-time information on power and temperature, along with Dying Gasp capabilities.

Other advanced management features and diagnostics include Metrobility's patent-pending Logical Services Loopback (LSL), rate limiting, traffic prioritization into four service class levels, Q-in-Q double tagging, PVID support, built-in copper line quality (CLQ) testing on the copper port, integral temperature and transmit/receive optical power monitoring on the fiber port, Link Loss Carry Forward (LLCF), Link Loss Return (LLR), and Far End Fault (FEF). Rate limiting of user data allows control over traffic speed and volume, thus maximizing bandwidth efficiency. LSL, CLQ, LLCF, LLR, and FEF assist in testing and troubleshooting remote connections.

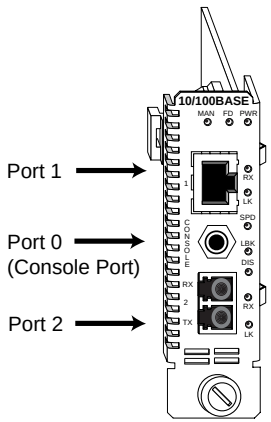
Additional features include management access control which protects the system and network connections from denial of service attacks from the user's network. By default, management access control automatically discards unauthorized traffic received over the access port, making the device impervious to all traffic conditions and traffic patterns. Access control is also provided by reserving the 0x000 VLAN for use with management. This management VLAN can be made unavailable to users by changing the VLAN ID.

Two versions of the operational software, the FPGA firmware, and configuration files can be stored on the services line card. New embedded software can be downloaded easily in the field as upgrades become available.

The 10/100 Mbps services line card can be managed as an independent network interface device (NID) with its own IP address. As a NID at the CPE demarcation point, the services line card responds to SNMP requests addressed to unicast and subnet broadcast addresses by delivering information on its health and status as well as its network connection. SNMP provides Internet-standard management and can be used for surveillance and fault management.

The versatile R821-1S provides a 10/100BASE-T port (Port 1) and a small form-factor pluggable (SFP) port (Port 2) with numerous wavelength and distance options. Typically, Port 1 is designated as the access port and Port 2 as the network port. To simplify device configuration, a third console port is provided for direct access to the services line card's management agent.

Both Ethernet interfaces on the services line card support VLAN double-tagging, baby giant frames (up to 1532 bytes untagged and 1536 bytes tagged), and auto-negotiation. When auto-negotiation is enabled, the copper port auto-detects MDI-II/MDI-X[1]. Both ports also support flow control (forced collisions in half duplex and PAUSE frames in full duplex).



R821-1S

1.When forcing 10 or 100 Mbps, a crossover cable may be needed.

Key Features

The Radiance services line card provides the following key features:

Copper Port

- 10/100 Mbps support.
- Auto-negotiation or manual duplex and speed selection.
- Automatic MDI-II/MDI-X conversion when auto-negotiation is enabled.
- Half- and full-duplex flow control.
- Link Loss Return (LLR) and Link Loss Carry Forward (LLCF) to aid in troubleshooting.

Fiber Port

- Small form-factor pluggable (SFP) transceivers with support for distances up to 80 km.
- Support for bidirectional wavelength division multiplexing (BWDM) with SC connectors and 1550/1310 nm wavelengths.
- Support for coarse wavelength division multiplexing (CWDM) with wavelengths from 1470 to 1610 nm.
- Built-in optical power and temperature meters that enables proactive maintenance by eliminating the need to disable the fiber link for testing.
- Link Loss Return (LLR) with Auto-Recovery, Link Loss Carry Forward (LLCF), and Far End Fault (FEF) to aid in troubleshooting.
- Flow control support.

Hardware

- Hot swappable board and optics.
- Copper to fiber media conversion.
- Compliance with applicable sections of IEEE 802.3-2002.
- Full signal retiming, reshaping, and reamplification (3 Rs).
- Supports a maximum transmission unit size of 1536 bytes for all frames.
- Transparency to user data traffic, including single and double VLAN-tagged Ethernet frames.
- Console port for direct device communication.

Software

- 802.3ah OAM support for remote management including:
  - Loopback
  - Events
  - Dying Gasp
  - Active or passive modes
- 802.3ah with Metrobility vendor extensions for in-band management.
- Remote Quality of Line (QoL) Monitoring (RMON) Group 1 statistics.
- Real-time monitoring of services line card's temperature and power.
- Logical Services Loopback functionality to test non-intrusively for proper connectivity and link integrity.
- Independent rate limiting on each port.
- Port interface statistics.
- Far End Fault detection and notification.
- Manageable with Metrobility's NetBeacon and WebBeacon™ element management software.
- Interoperable with Metrobility's SNMP, CLI, TFTP, and telnet access mechanisms.
- Compatibility with industry-standard SNMP-based management applications.
- Ability to accept and process ARP messages, and respond to ARP requests and replies.
- Storage for two versions of the operating system and FPGA firmware as well as two separate configuration files.
- Static and dynamic ARP entry provisioning, and the ability to use ARP to resolve IP-to-MAC associations when static associations are unavailable.
- Ping support for network path connectivity testing.
- Field-programmable for upgrading management software.
- DHCP client support.
- A unique unicast MAC address for Logical Services Loopback.

- Support for SNMPv1 and SNMPv2c community based profiles and views for read-only, read-write, and administrative access.
- SNMPv3 support for increased network management security. Provides user authentication and authorization along with data encryption.
- Transparent MAC-layer forwarding and filtering. (No Spanning Tree)
- Ability to stack and unstack VLAN tags based on the bridge port over which an Ethernet frame is received or transmitted. (Q-in-Q VLAN tagging.)
- Static ARP and IP address entries.
- Class of Service (CoS) using four priority queues.
- Traffic prioritization based on p-bits in the VLAN header, DSCP bits in IP frames, or the default port priority.
- PVID tagging.
- Traffic filtering and forwarding to provide access control security.
- Copper line quality (CLQ) diagnostic tester that identifies various faults (open circuit, short circuit, impedance mismatch) and indicates the distance to the fault from the device.
- Support for 16 user VLANs and one management VLAN.
- Management support for up to two remote units off each port if the services line card is under proxy management via the R502-M.
- RADIUS client support to protect sensitive network information by restricting access to authorized users only.

Chapter 2: Installation Guide

Safety Warning

Electrostatic Discharge Warning
Electrostatic discharge precautions should be taken when handling any line card. Proper grounding is recommended (i.e., wear a wrist strap).

1. Unpack the Line Card

Your order has been provided with the safest possible packaging, but shipping damage does occasionally occur. Inspect your line card carefully. If you discover any shipping damage, notify your carrier and follow their instructions for damage and claims. Save the original shipping carton if return or storage of the card is necessary.

2. Set the Switches

A bank of six DIP switches is located on the back of the card. These switches allow you to select from several modes of operation that only affect the access port (Port 1). Functional switches are clearly marked on the card's circuit board. Refer to the following table for the proper setting of the DIP switches.

When setting DIP switches, the UP position is when the lever of the DIP switch is pushed away from the circuit board. The DOWN position is when the lever is pushed toward the board.

Default Switch Settings

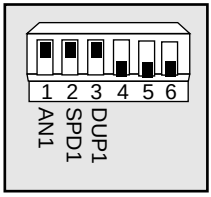


Table 1: DIP Switches

Switch Label	Position	Description
AN1	UP (default)	Auto-negotiation is enabled. Port 1 advertises 10/100 Mbps half/full duplex capability to its link partner.
	DOWN	Auto-negotiation is disabled. The SPD1 and DUP1 switches determine the speed and duplex for Port 1.
SPD1	UP (default)	Port 1 is set to 100 Mbps when AN1 is disabled.
	DOWN	Port 1 is set to 10 Mbps when AN1 is disabled.
DUP1	UP (default)	Port 1 is set to full duplex when AN1 is disabled.
	DOWN	Port 1 is set to half duplex when AN1 is disabled.

DIP Switches

Auto-Negotiation (AN1)

AN1 is the auto-negotiation switch for Port 1. When auto-negotiation is enabled, the port advertises 10/100 Mbps and half/full duplex capability to its link partner. When auto-negotiation is disabled, the speed and duplex for Port 1 are set through the SPD1 and DUP1 switches.

Note: *Speed and duplex are dependent upon auto-negotiation. If AN1 is enabled, the SPD1 and DUP1 switches will be ignored.*

Speed (SPD1)

The speed switch applies to Port 1 and is effective only when auto-negotiation (AN1) is disabled. Port 1 is set to 100 Mbps when SPD1 is up, and 10 Mbps when SPD1 is down.

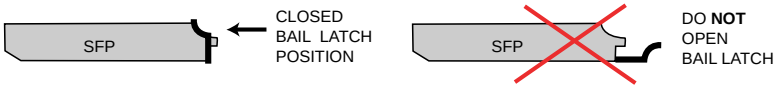
Duplex (DUP1)

The duplex switch applies to Port 1 and is effective only when auto-negotiation (AN1) is disabled. Port 1 is set to full duplex when DUP1 is up, and half duplex when DUP1 is down.

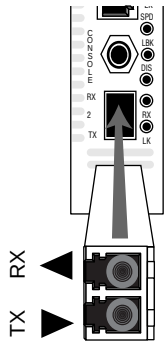
3. Install the SFP Optics

The R821-1S requires one small form-factor pluggable (SFP) optic. Optics are shipped separately.

Before installing the SFP module, make sure the bail latch is closed, as shown below. Do NOT open the bail.



To install the optics, align the SFP module so the receiver (▲) is positioned above the transmitter (▼). For a BWDM module, align it so the visible part of the circuit board located at the back of the module is to the right. The SFP's circuit board should be on the same side as the LEDs. Slide the module into the empty slot. Push the SFP firmly in place.

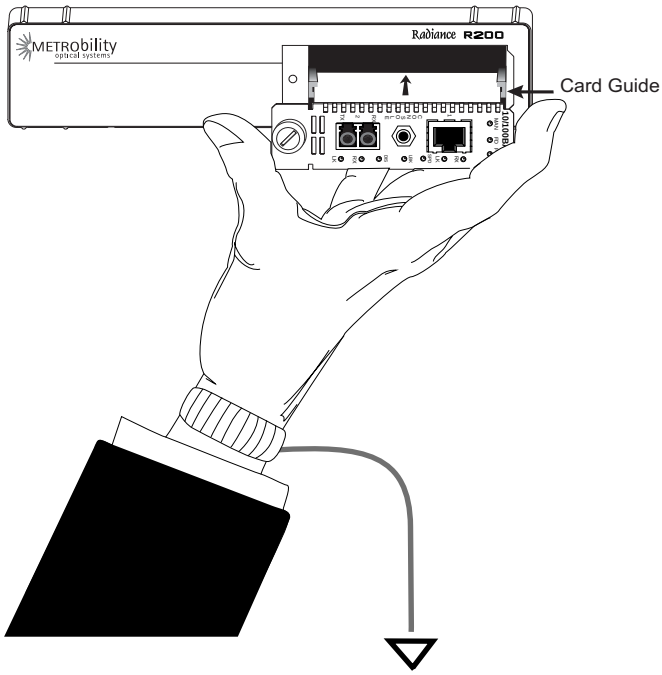


Important: *The Radiance services line card is designed and tested to operate using only Metrobility-supplied SFP transceivers. Safety, performance, and reliability are guaranteed only when Metrobility transceivers are used.* ***Installing unspecified parts may damage the product and will void the unit's warranty.***

4. Install the Line Card

The Radiance services line card offers the ease of plug-and-play installation and is hot-swappable. The card must be firmly secured to the chassis before network connections are made. Follow the simple steps outlined below to install your line card.

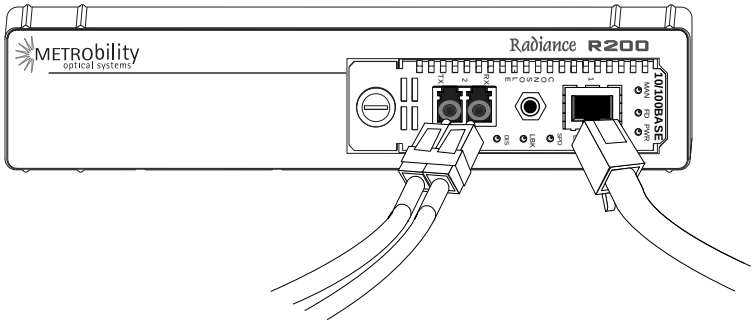
- Grasp the card by the front panel as shown.



- Insert the card into a slot in the chassis. Make sure that the top and bottom edges of the board are aligned with the card guides in the chassis. Do not force the card into the chassis unnecessarily. It should slide in easily and evenly.
- Slide the card in until the top and bottom edges of the front panel are flush and even with the edges of the chassis.
- To secure the card to the chassis, turn the thumbscrew clockwise until it is snug. The card is now properly installed and ready for connection to the network.venly.

5. Connect to the Network

To connect the line card to the network, remove the dust plug from the SFP transceiver and insert the cables into the appropriate connectors as illustrated below. Make sure the card is secured to the chassis before making network connections.



Twisted-Pair Interface

The twisted-pair port provides a shielded RJ-45 connector that supports a maximum segment length of 100 meters.

Fiber Optic Interface

For maximum flexibility in designing or expanding your network, the fiber port supports any of the following Metrobility-supplied small form-factor pluggable (SFP) transceivers. Each transceiver provides as a set of LC or SC connectors. The maximum distance and cable type supported by the SFP transceivers is as follows:

Model #	Distance	Fiber Type
O280-M2	2 km	MM
O281-40	40 km	SM
O281-80	80 km	SM
O283-20	20 km	SM
O383-20-xx	20 km	SM (BWDM)
O483-80-xx	80 km	SM (CWDM)

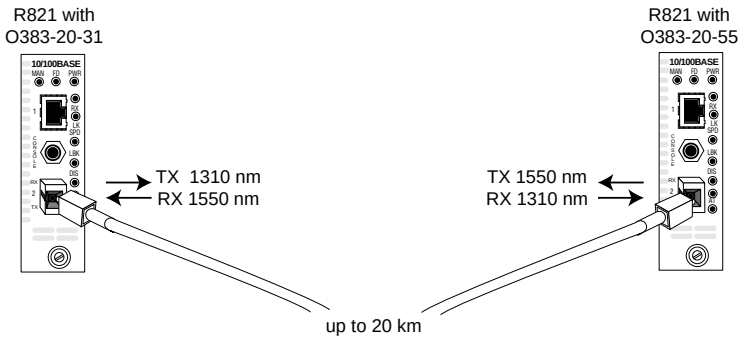
Important: *The distances noted are for reference purposes only. The most important factor to achieve the desired distance is the optical power budget. Metrobility specifications indicate the typical transmit power budget. The actual distance is a function of the fiber type and quality, the number and quality of splices, the type and quality of connectors, the transmission loss, and other physical characteristics.*

When making fiber optic connections, make sure that the transmit (TX) optical fiber of the services line card connects to the receive (RX) optical fiber of the connected device, and that the transmit (TX) optical fiber of the remote device connects to the receive (RX) optical fiber of the services line card.

BWDM Interface

The bidirectional wavelength division multiplexed (BWDM) transceiver provides one singlemode SC connector that supports a maximum segment length of 20 km. BWDM transceivers must always be used in complementary pairs. That is, the O383-20-13 must be connected to the O383-20-55.

The O383-20-31 transmits data at a wavelength of 1310 nm and receives at 1550 nm. Correspondingly, the O383-20-55 transmits data at 1550 nm and receives at 1310 nm.



Use the link (LK) LEDs on the front panel of the card to verify correct segment connectivity. As you insert the cable into each port, the LK LED will be lit if the following conditions are met:

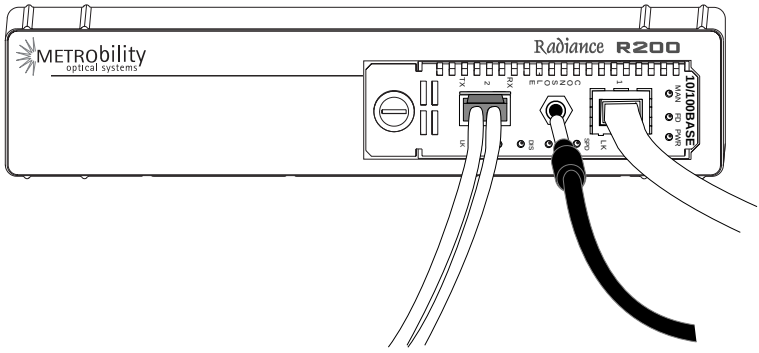
- Power is being applied to the chassis.
- There is an active device connected to the other end of the cable, and it is sending idle link signals.
- All connections are secure and the cables are undamaged.
- Both ends of the cable are set to the same auto-negotiation state. To maximize device compatibility, the R821 is shipped with auto-negotiation enabled on both ports. If necessary, disable auto-negotiation and set full duplex on the fiber port of the remote device to establish link.

For information on replacing the SFP transceiver, refer to “Changing the SFP Transceiver” on page 102 in the User Guide section.

Console Port (optional)

Follow the instructions in this section if you are using a console cable (R800-CA) to communicate directly with the R821.

Remove the dust plug from the console port. Using the R800-CA null-modem console cable, connect the console port on the R821 to the serial port on your PC. The cable provides a 3C plug for insertion into the console port jack on the line card and a female DB9 connector to connect to the PC’s DB9 port.



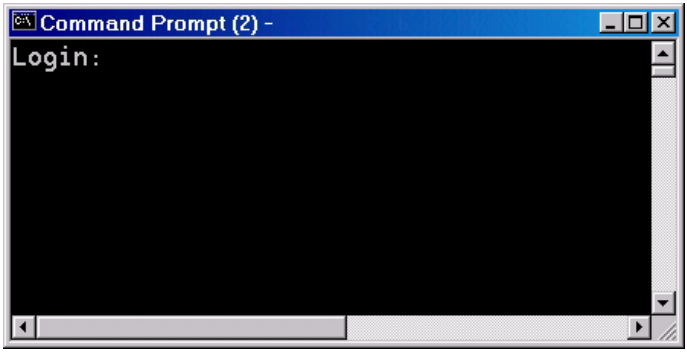
Note: *Do not remove the dust plug from the console port until you are ready to connect the console cable to the port. When you remove the console cable, please replace the port’s dust plug.*

The PC terminal session default parameters are as follows:

57,600 baud / 8 bits / 1 stop bit / no parity / no flow control

Note: *All console port settings, excluding flow control, can be modified using the* set console *command.*

Following power-up, the boot image is automatically executed. It starts by performing a system initialization, followed by diagnostic tests. After diagnostics are completed successfully, a login prompt appears on the console screen. If necessary, press <Enter> to get the login prompt.



If the diagnostics are unsuccessful, a failure message will appear.

When device configuration is complete, disconnect the console cable and reinsert the dust plug.

If the console port session remains idle for 10 minutes, the connection will automatically time out.

Chapter 3: Management

This section contains information regarding the management and software configuration options available on the Radiance 10/100 Mbps services line card.

Default Software Settings

Access Port	Port 1
CLI Access	Enabled
DHCP Client	Enabled
DHCP Server Address	0.0.0.0
DHCP Max Retries Before Timeout	3 (28 seconds)
DSCP Mode	Disabled
DSCP Model	Expedited Forwarding
Far End Fault	Disabled
Flow Control	Disabled
Forwarding Mode	Transparent
ICMP	All Enabled
IP Address (zeroconf)	169.254.x.x
Layer 2 Control Protocols	All Forwarded
Layer 3 Capability	Enabled
Logical Services Loopback	Disabled
Loopback Mode	Disabled
Loopback Timeout	30 seconds
Management Access	Enabled (Ports 0 and 2); Disabled (Port 1)
Management VLAN identifier	0 (Disabled)
Network Mask	255.255.0.0
OAM Admin State	Disabled (Port 1); Enabled (Port 2)
OAM Mode	Passive (Port 1); Active (Port 2)

P-bits Mode . . . . . Disabled
P-bits Model . . . . . .Provider Bridge
Port Management . . . . . Enabled
Port Priority Queue 0
Port State . . . . . Enabled
PVID (native VLAN) 1
Precedence (high-low) . . . . . .p-bits, DSCP, port
RADIUS Authentication. . . . . Disabled
RADIUS Retransmit 2
RADIUS Timeout . . . . . .5 seconds
Rate Limiting. . . . . Disabled
SNMP Access . . . . . Enabled
SNMP Administrative Community String. . . . . admin
SNMP Read-Only Community String . . . . . public
SNMP Read-Write Community String. . . . . .private
Trap Destination Community String . . . . . public
Trap Destination IP Address 0.0.0.0
Trap Destination UDP Port 162
User VLAN . . . . . Disabled

Managed Objects

MIB-II

The Radiance 10/100 Mbps services line card supports the following standard Management Information Base (MIB-II) managed object groups, pertaining only to the end-station traffic. Objects from within these MIB groups are accessible by and available to SNMP-based management stations over UDP/IP.

- System (end-station only)
- Interfaces (end-station and data interface)
- IpNetToMedia (end-station only)

- IP (end-station only)
- ICMP (end-station only)
- TCP (end-station only)
- UDP (end-station only)
- SNMP (end-station only)
- AT (end-station only)

Enterprise-Specific Objects

Metrobility-specific managed objects provide control of the following objects:

- End-station IP addressing information
- SNMP access communities
- Up to 4 SNMP trap destination addresses and communities
- Download server addresses
- Download management software
- Interface control (enable/disable)
- Input/output laser levels
- Management VLAN
- Management port

The Metrobility enterprise ID number is 10527.

Admin Only SNMP Objects

The following SNMP objects can only be read or written by the admin community string:

- mosDownloadServerUsername
- mosDownloadServerPassword
- mosAdminROComm
- mosAdminRWComm
- mosAdminADMINComm
- mosAdminTrapDestComm

Additionally, the following Trap Destination Table objects can be set only when using the admin community string:

- mosAdminTrapDestIP
- mosAdminTrapDestPort
- mosAdminTrapDestComm

Remote Management Statistics

Through software, you can view Remote Monitoring (RMON) statistics for the Radiance 10/100 Mbps services line card.

Each port on the card supports the complete RMON Group 1 statistics outlined in RFC 2819 and RFC 3273.

RFC 2819

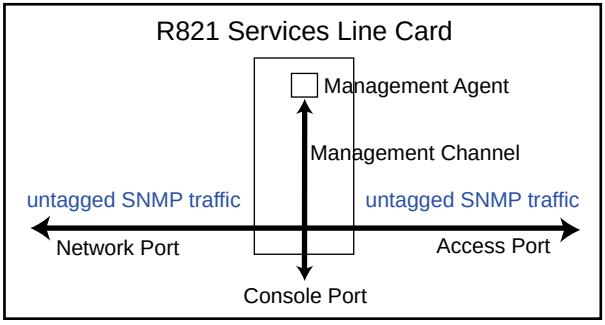
etherStatsOctets
etherStatsPkts
etherStatsBroadcastPkts
etherStatsMulticastPkts
etherStatsCRCAlignErrors
etherStatsUndersizePkts
etherStatsFragments
etherStatsJabbers
etherStatsCollisions
etherStatsPkts64Octets
etherStatsPkts65to127Octets
etherStatsPkts128to255Octets
etherStatsPkts256to511Octets
etherStatsPkts512to1023Octets
etherStatsPkts1024to1518Octets
etherStatsOversizePkts
etherStatsDropEvents

RFC 3273

etherStatsHighCapacityOverflowPkts
etherStatsHighCapacityPkts
etherStatsHighCapacityOverflowOctets
etherStatsHighCapacityOctets
etherStatsHighCapacityOverflowPkts64Octets
etherStatsHighCapacityPkts64Octets
etherStatsHighCapacityOverflowPkts65to127Octets
etherStatsHighCapacityPkts65to127Octets
etherStatsHighCapacityOverflowPkts128to255Octets
etherStatsHighCapacityPkts128to255Octets
etherStatsHighCapacityOverflowPkts256to511Octets
etherStatsHighCapacityPkts256to511Octets
etherStatsHighCapacityOverflowPkts512to1023Octets
etherStatsHighCapacityPkts512to1023Octets
etherStatsHighCapacityOverflowPkts1024to1518Octets
etherStatsHighCapacityPkts1024to1518Octets

Setting a Secure Management Channel

By default, the R821's VLAN identifier (VID) is 0, which indicates no internal management VLAN. In this state, the card forwards all untagged SNMP traffic through both ports, as illustrated below. No security is provided, which means any device connected to any port can make configuration changes to the R821.



Through software, you can create a secure management channel by assigning it a new management VID[2]. The most secure configuration is to have only one port (typically, the network port) enabled for management. This is the recommended configuration, and it allows you to restrict access to the card's management agent, thus preventing unauthorized modifications and other misuses.

The following table describes the available management options along with the security vulnerabilities associated with each configuration.

Table 2: R821 Management Options and Vulnerabilities

Configuration	Configuration Description	Vulnerabilities
Management VLAN (single port)	A management VLAN ID is assigned to one of the ports. Only frames that contain this VID and are from the specified port are allowed access to the R821 management agent.	None
No Management VLAN (single port)	One port is configured for management. Any device connected to this port can manage the R821.	User could respond to ARP request and steal R821's IP address.
Management VLAN (both ports)	A management VLAN ID is specified. Any frame that contains the VID, regardless of its source, is allowed to access the R821 management agent.	Denial of service due to misuse of unicast MAC address.

2.Valid management VLAN IDs are in the range 1 to 4094.

Table 2: R821 Management Options and Vulnerabilities (Continued)

Configuration	Configuration Description	Vulnerabilities
No Management VLAN (both ports) DEFAULT SETTING	No security. Any device connected to either port can manage the R821.	User could respond to ARP and steal IP address.

Once a management VID has been configured, set it back to 0 to disable VLAN management.

The R821 transparently passes reserved multicast protocols such as IEEE 802.3ad, BPDU, GMRP, and GVRP. Transporting these protocols, however, can introduce additional possibilities for denial-of-service attacks including traffic volume from:

- MAC addresses 01-80-C2-00-00-00 through 01-80-C2-00-00-10
  - — BPDU
  - — 802.3 slow protocols (LACP, Marker and OAM)
- GMRP and GVRP

The following table describes the misuses that could cause denial of service when using reserved multicast protocols along with the various management configurations.

Table 3: R821 Management Vulnerabilities When Using Reserved Multicast Protocols

Configuration	Vulnerabilities
Management VLAN (single port) with reserved multicast	Denial of service through misuse of reserved multicast address or 01-80-C2-00-00-02.
No Management VLAN (single port)	User could respond to ARP and steal R821's IP address.
Management VLAN (both ports) with reserved multicast	Denial of service through misuse of reserved multicast or unicast MAC address.
No Management VLAN (both ports) with reserved multicast	Denial of service through misuse of reserved multicast, unicast, or 01-80-C2-00-00-02 MAC address. User could respond to ARP and steal the IP address.

Software Settings

Several functions and settings on the Radiance services line card can be modified only through software commands. This section describes the card's management features including IP addressing management.

IP Addressing Management

You can configure the R821 to obtain its IP addressing information (IP address, network mask, and default gateway) through any of the following means:

- DHCP assignment
- Manual configuration
- Default value

DHCP Assignment

By default, the R821 has DHCP enabled for obtaining its IP addressing information. When DHCP is enabled, the R821 enters a discovery mode to locate a DHCP server. The card makes up to three[3] attempts to resolve its IP addressing information. If any of the attempts is successful, the card will use the information assigned by the DHCP server. The card will also save the DHCP server's IP address along with the address lease time. Once the IP addressing information is acquired, the R821 preserves it in memory and renews it continuously. However, the addressing information is not preserved across power cycles. If the card is reset or loses power, it will enter the discovery mode again and attempt to obtain new IP addressing information.

When DHCP is disabled, the R821 uses its last known IP addressing information (i.e., the address that was used to issue the command to disable DHCP). After the R821 successfully acquires its addressing information, through whatever means, Metrobility recommends disabling DHCP to ensure that the card always uses this information. IP addressing information is retained across power cycles when DHCP is disabled.

3. The max number of retires is configurable. The retry count starts at 4 seconds and doubles for each additional retry (1 = 4 seconds, 2 = 12 seconds, 3 = 28 seconds, 4 = 60 seconds, 5 = 124 seconds)

Manual Configuration

Regardless of the DHCP setting, IP addressing information can be assigned manually. When manually entering the IP addressing information via SNMP, you must also apply the changes by setting mosAdminApplyIPChanges to 1 in the METROBILITY-ADMIN-MIB. The R821 will verify that the information you entered is valid and begin using the new values if there are no problems. If for any reason there is a conflict, the R821 will send a generic SNMP error.

Saving the IP information across power cycles depends on the DHCP setting:

- If DHCP is disabled, the new address will be stored and preserved. If you want to save the addressing information through resets and power cycles, make sure DHCP is disabled after the information is entered successfully.
- If DHCP is enabled, the R821 will enter the discovery mode at each power cycle and attempt to obtain new IP addressing information. The manually configured information will be maintained across a power cycle only until a DHCP server assigns it a new IP address, or until someone manually enters the IP addressing information again.

Default Value

To return the R821's IP address, network mask, and gateway back their factory default values, use the reset command and specify the default option. Resetting the board using this method forces all software settings back to their original values.

Start-up Failure

During the initial discovery mode, if a DHCP server is not found within the timeout period[4], the R821 will generate its own default IP addressing information using Zero Configuration Networking (zeroconf) for local intra-subnet communication. Once the default address is generated, the R821 enters a probing phase to verify that the address is unique. If the address is identical to one previously claimed by another device, the R821 will generate a new address repeatedly until it is successful. The default zeroconf IP address is in the 169.254.0.0 network, the network mask is 255.255.0.0, and the gateway address is 0.0.0.0.

4.The timeout period depends on the number of retries. The timeout period is configurable from 4 seconds (# of retries = 1) up to 124 seconds (number of retries = 5).

Note: *Do not send ARP requests (pings) to the R821 during its initialization. All ARP requests received during the probing phase[5] are interpreted as address collisions and discarded. If a collision occurs, the R821 will immediately discard the address it is verifying and generate another one.*

If DHCP is enabled, every five minutes following a successful self-generated address assignment, the R821 will attempt to acquire its addressing information by locating a DHCP server.

If DHCP is disabled, the R821 will maintain its last known IP addressing information regardless of how the information was acquired, even if it was self-generated using zeroconf.

Copper Line Quality (CLQ) Tester

The R821 features a built-in cable tester that uses time domain reflectometry to identify and locate problems along the copper cable on Port 1. If a fault occurs, you can initiate the CLQ test via software and to see what type of problem occurred (open circuit, short circuit, or impedance mismatch). The test also provides the distance to the fault along the cable from the R821. The distance accuracy is +/- 2 meters.

Far End Fault

Far End Fault (FEF) is only applicable to the fiber port (Port 2). FEF allows a management station to receive notification of a failure in a remote R821's fiber port receiver. When two services line cards are connected through their fiber ports, FEF allows the local card to detect a failure in the remote card's fiber receiver. When FEF is enabled, the local R821 will send an SNMP alarm to its trap destination(s) if a Far End Fault condition is detected. No alarm will be sent if the condition occurs but FEF is disabled.

Flow Control

Full-Duplex Flow Control

Full-duplex flow control is provided to avoid dropping frames during periods of network congestion. If flow control is enabled, the port will issue a PAUSE frame whenever there is no buffer space available for incoming frames. Full-duplex flow control applies only when the port is in full-duplex mode with auto-negotiation enabled. Additionally, during the negotiation process, the port's link partner must indicate support for PAUSE frames.

5.The probing phase lasts approximately 6 seconds.

The following table describes when full-duplex flow control is enabled or disabled. In the table, “Port 1’s Link Partner” is the flow control capability of the device connected to Port 1. The Link Partner’s capability is obtained through auto-negotiation. 0 = disabled, 1 = enabled, and X = not applicable.

Table 4: Full-Duplex Flow Control Modes

Port 1’s Link Partner	Full-Duplex Flow Control Settings	Auto-Negotiation	Full-Duplex Flow Control
X	X	0	Disabled
0	0	1	Disabled
0	1	1	Disabled
1	0	1	Disabled
1	1	1	Enabled

Half-Duplex Flow Control

When a port is operating at half duplex, the R821 provides an option to activate backpressure flow control. If half-duplex flow control is enabled, the card will generate a jamming pattern to force a collision whenever it cannot allocate a buffer for the port’s incoming frames.

ICMP

The R821 supports Internet Control Message Protocol (ICMP) to confirm basic network connectivity. By default, the unit is enabled to respond to all ping requests. Through software, you can reconfigure the R821 as follows:

- Only unicast ICMP messages are processed. The card will not process ICMP messages sent to IP multicast, IP subnet broadcast, and IP limited broadcast addresses.
- All ICMP messages are not processed
- All ICMP messages are processed

Note: *The ICMP setting cannot be reconfigured at runtime.*

Loopback Modes

Loopback is provided as a means of testing connectivity and link integrity. The R821 supports the following loopback modes:

- Local Loopback
- Remote Loopback
- OAM Loopback
- Logical Services Loopback

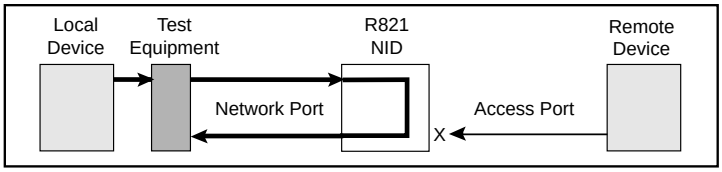
Once loopback is enabled, the R821 can be taken out of loopback using one of the following means:

- Timeout. The timeout period is configurable from 30 seconds to 5 minutes. The default is 30 seconds.
- Software commands.
- A reset or full power cycle of the card.
- Removing the card and then reinserting it into the chassis.

Local Loopback

Local loopback is provided for testing link integrity on an R821 standalone NID. When local loopback is enabled on a port, the port returns its incoming data back to the sender, while continuing to receive and process management frames. Management frames are not looped back to the sender—only data frames are returned. When local loopback is enabled, the LBK LED is lit and the other Ethernet port on the card is disabled.

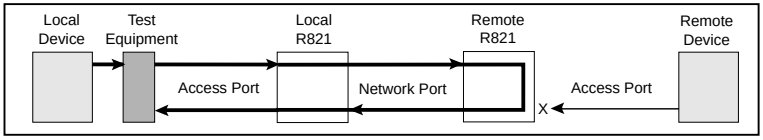
Local loopback can be enabled on either Port 1 or Port 2, however, it is typically enabled on Port 2 to evaluate the network segment by using standard packet-generating test equipment. During local loopback, the incoming data is transmitted through the entire circuitry of the R821 board, not just the port in loopback mode. This allows the entire circuit to be tested. RMON statistics are incremented on both ports, even though the physical interface of the non-loopback port is neither transmitting nor receiving traffic.



Remote Loopback

Remote loopback is only applicable when two R821 cards are in a back-to-back configuration and they are being managed by the R502-M management card. Remote loopback is performed on one of the ports on the remote R821. When remote loopback is enabled on a port, the port returns its incoming data back to the sender, while continuing to receive and process management frames. Management frames are not looped back to the sender—only data frames are returned. During remote loopback, the LBK LED on the remote R821 is lit and its non-loopback port is disabled. The LBK LED on the local R821 remains off.

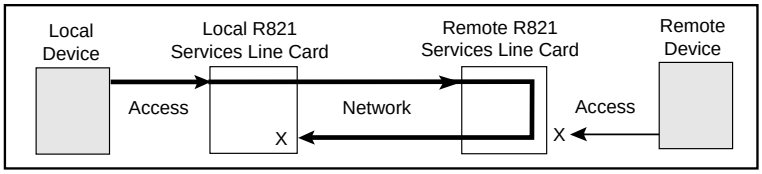
Remote loopback can be enabled on either Port 1 or Port 2, however, it is typically enabled on Port 2 to evaluate the data flow using standard packet-generating test equipment, as shown in the illustration below. During remote loopback, the incoming data is transmitted through the entire circuitry of the remote R821 board, not just the port in loopback. This allows the entire circuit to be tested. RMON statistics are incremented on both ports, even though the physical interface of the non-loopback port is neither transmitting nor receiving traffic.



OAM Loopback

OAM loopback is only applicable to when two R821 services line cards are in a back-to-back configuration with both cards connected through their network ports. By using the 802.3ah management channel, OAM loopback is initiated from the local R821 and performed on the remote R821. During OAM loopback, data on the fiber line is looped at the remote R821, returned to the local R821, and terminated there.

Because the data stream is stopped at the local R821, you do not need any external test equipment to determine the quality of the network segment. Instead, you can simply view the counters for the two services line cards to see if the data is passing properly.



To perform OAM loopback, the following conditions must be met:

- The administrative **OAM state** must be **enabled** on both the port which will initiate loopback and its remote peer.
- The **OAM mode** must be **active** on the port which will initiate loopback.
- The network port on both the local and remote R821 must be in **full-duplex** mode. (OAM is not supported on half-duplex links.)
- The **OAM loopback status** must be set to **start**.

If all the conditions are satisfied, the remote R821 will begin looping back data when the local R821 initiates OAM loopback. During OAM loopback, the remote R821 disables its non-loopback port and returns its incoming data on the network port back to the local R821. (Management frames are processed but not looped — only data frames are returned.) When the data frames arrive back at the local R821, they are terminated.

During OAM loopback, the LBK LED is lit on the remote R821. The LBK LED on the local R821 remains off.

Logical Services Loopback

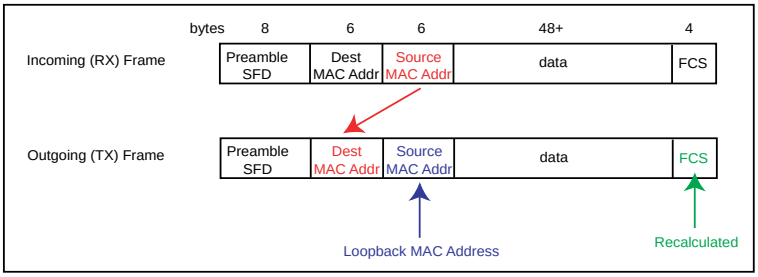
Logical Services Loopback, a patent-pending feature of the R821, enables you to perform loopback testing on the network port (Port 2) without stopping the flow of normal data. Logical Services Loopback is an in-service function that loops only specific frames. These frames are identified by the following:

- A unique factory-assigned unicast MAC address.
- A user-defined multicast MAC address.

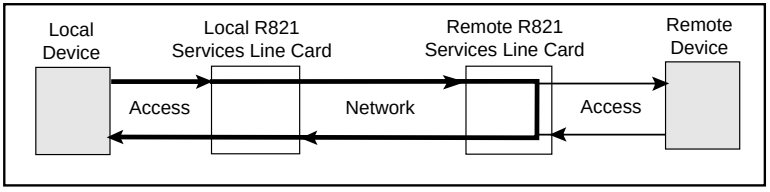
Through software, either one or both addresses may be selected to identify Logical Services Loopback frames. The R821 also provides a frame counter which records the total number of unicast and multicast frames that have been looped.

Upon receiving a Logical Services Loopback frame, the R821 services line card performs the following operations, which are illustrated below:

- Extracts the source MAC address from the incoming frame.
- Inserts the source MAC address into the destination MAC address field (shown in red).
- Sets the new source address to the Loopback MAC address (shown in blue).
- Calculates the new Frame Check Sequence (FCS) and replaces the existing FCS with the new value at the end of the frame, which is then transmitted back to the sender.



The data remains unchanged. Logical Services Loopback operates at full line rate with frames of any size. Normal data frames continue to be received and transmitted without being dropped while Logical Services Loopback is enabled.



Port Management

By default, Port 2 is enabled to respond to management frames such as ARP requests and SNMP commands. This feature is disabled on Port 1 by default. Port management can be disabled on either port, however, it cannot be disabled on both ports simultaneously. When management is disabled on either port, the DIS LED turns green. A port with management disabled discards all management frames, but data frames continue to be received and transmitted normally.

Port State

You can independently enable or disable the port state on either port of the services line card. Disabling the port state stops the flow of data to and from that port. Although data is neither sent nor received, the disabled port continues to accept, process, and transmit management frames. However, if LLCF is enabled and the opposite port has no link, management frames will not be transmitted.

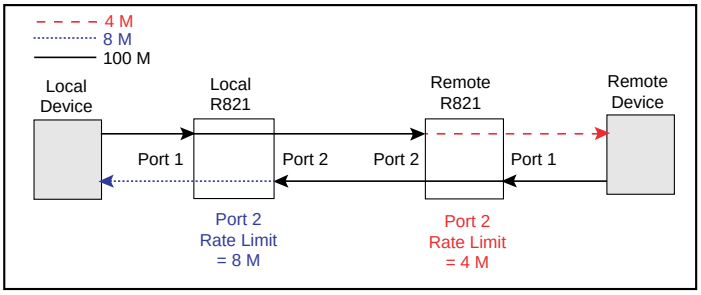
Rate Limiting

By default, each port allows data to flow at full line speed. The R821 supports bandwidth management that allows you to restrict the data rate independently on each port. You can set the maximum speed on a port to any of the following rates:

128 kbps	2 Mbps
256 kbps	4 Mbps
512 kbps	8 Mbps
1 Mbps	100 Mbps

Rate limiting consists of two parts, the rate and the state, both of which are configurable. The rate is any of the values listed above. The state activates or cancels rate limiting. When the rate limiting state is disabled, the data flows without any restrictions as fast as the link allows, even if the rate is configured to a slower setting.

When rate limiting is enabled, the data transmission rate does not exceed the value specified. Because the R821 is a two-port device for data transmission, setting the limit on Port 1 automatically limits the egress (outbound) data rate on Port 2 to the same limit. Similarly, setting the rate limit on Port 2 automatically sets the egress rate on Port 1. For example, if you set the rate limit on Port 2 to 4 Mbps, the maximum rate at which data can exit Port 1 will also be 4 Mbps. Port 1 and Port 2 can be set to different rates.



Traffic Prioritization

The R821 supports Class of Service (CoS) with four priority queues (0 low, 3 high). CoS allows you to assign mission-critical data to a higher priority, so they are processed before less critical traffic during times of network congestion. The four CoS queues determine the priority for transmitting data. Queues can be based on any of the following classifications:

- priority bits (p-bits) in the VLAN header
- DSCP/TOS (differentiated services code point / type of service) bits in the header of IP frames
- default port priority bits

Precedence

By default, both p-bits and DSCP classifications are disabled, and only the port priority is used to determine the queue for each incoming frame. The default port priority setting is not configurable; it is always enabled. However, the other two classifications may be enabled/disabled independently. When there is more than one classification enabled, the R821 allows you to set the precedence to determine which classification will be used first. By default, the precedence from highest to lowest is as follows:

1. p-bits
2. DSCP bits
3. port

This means that if the frame received is priority-tagged, the p-bits will be used to select the queue for sending the message. If the frame received is untagged and is an IP frame, then the DSCP bits will be used to select the queue for sending the message. If the frame is untagged and is not an IP frame, or if both DSCP and p-bits classification are disabled, then the default port priority will be used to select the queue. The port priority always has the lowest precedence.

The table below describes the settings required for the various precedence sequences supported by the R821.

Priority Order (1 high, 3 low)	DSCP setting	p-bits setting	Precedence selection
1. DSCP 2. p-bits 3. port	enabled	enabled	DSCP
1. p-bits 2. DSCP 3. port	enabled	enabled	p-bits (802.1p)

Priority Order (1 high, 3 low)	DSCP setting	p-bits setting	Precedence selection
1. DSCP 2. port	enabled	disabled	not applicable
1. p-bits 2. port	disabled	enabled	not applicable
port (default)	disabled	disabled	not applicable

DSCP

The R821 supports Differentiated Services Code Point (DSCP) classification and provides four pre-defined models which map each DSCP value to a queue.

The general format for the Differentiated Services field is shown below:

DS5	DS4	DS3	DS2	DS1	DS0	ECN=0	ECN=0

The first six bits (DS5 through DS0) are the DSCP bits. The last two bits, the Early Congestion Notification (ECN) bits, are set to 0 and not used by the R821.

The R821 provides the following pre-defined DSCP models:

- TOS (Type of Service)
- SP (Straight Precedence)
- EF (Expedited Forwarding) This is the default option.
- AF (Assured Forwarding)

The R821 also supports a free form configuration, which allows you to define your own DSCP-to-queue mappings. Refer to “Free Form Settings” on page 41.

The DSCP bit value to queue mappings are provided below:

Type of Service

000000: 0	000001: 0	000010: 0	000011: 0
000100: 0	000101: 0	000110: 0	000111: 0
001000: 0	001001: 0	001010: 0	001011: 0
001100: 0	001101: 0	001110: 0	001111: 0
010000: 1	010001: 1	010010: 1	010011: 1
010100: 1	010101: 1	010110: 1	010111: 1
011000: 1	011001: 1	011010: 1	011011: 1
011100: 1	011101: 1	011110: 1	011111: 1

100000: 2	100001: 2	100010: 2	100011: 2
100100: 2	100101: 2	100110: 2	100111: 2
101000: 2	101001: 2	101010: 2	101011: 2
101100: 2	101101: 2	101110: 2	101111: 2
110000: 3	110001: 3	110010: 3	110011: 3
110100: 3	110101: 3	110110: 3	110111: 3
111000: 3	111001: 3	111010: 3	111011: 3
111100: 3	111101: 3	111110: 3	111111: 3

Straight Precedence

000000: 0	000001: 0	000010: 0	000011: 0
000100: 0	000101: 0	000110: 0	000111: 0
001000: 0	001001: 0	001010: 0	001011: 0
001100: 0	001101: 0	001110: 0	001111: 0
010000: 1	010001: 0	010010: 1	010011: 0
010100: 1	010101: 0	010110: 1	010111: 0
011000: 1	011001: 0	011010: 1	011011: 0
011100: 1	011101: 0	011110: 1	011111: 0
100000: 2	100001: 0	100010: 2	100011: 0
100100: 2	100101: 0	100110: 2	100111: 0
101000: 2	101001: 0	101010: 0	101011: 0
101100: 0	101101: 0	101110: 2	101111: 0
110000: 3	110001: 0	110010: 0	110011: 0
110100: 0	110101: 0	110110: 0	110111: 0
111000: 3	111001: 0	111010: 0	111011: 0
111100: 0	111101: 0	111110: 0	111111: 0

Expedited Forwarding

000000: 0	000001: 0	000010: 0	000011: 0
000100: 0	000101: 0	000110: 0	000111: 0
001000: 0	001001: 0	001010: 1	001011: 0
001100: 1	001101: 0	001110: 1	001111: 0
010000: 1	010001: 0	010010: 1	010011: 0
010100: 1	010101: 0	010110: 1	010111: 0
011000: 1	011001: 0	011010: 2	011011: 0
011100: 2	011101: 0	011110: 2	011111: 0
100000: 2	100001: 0	100010: 2	100011: 0
100100: 2	100101: 0	100110: 2	100111: 0
101000: 2	101001: 0	101010: 0	101011: 0
101100: 0	101101: 0	101110: 3	101111: 0
110000: 3	110001: 0	110010: 0	110011: 0
110100: 0	110101: 0	110110: 0	110111: 0
111000: 3	111001: 0	111010: 0	111011: 0
111100: 0	111101: 0	111110: 0	111111: 0

Assured Forwarding

000000: 0	000001: 0	000010: 0	000011: 0
000100: 0	000101: 0	000110: 0	000111: 0
001000: 0	001001: 0	001010: 0	001011: 0
001100: 0	001101: 0	001110: 0	001111: 0
010000: 1	010001: 0	010010: 1	010011: 0
010100: 1	010101: 0	010110: 1	010111: 0
011000: 1	011001: 0	011010: 2	011011: 0
011100: 2	011101: 0	011110: 2	011111: 0
100000: 2	100001: 0	100010: 3	100011: 0
100100: 3	100101: 0	100110: 3	100111: 0
101000: 2	101001: 0	101010: 0	101011: 0
101100: 0	101101: 0	101110: 3	101111: 0
110000: 3	110001: 0	110010: 0	110011: 0
110100: 0	110101: 0	110110: 0	110111: 0
111000: 3	111001: 0	111010: 0	111011: 0
111100: 0	111101: 0	111110: 0	111111: 0

Priority Bits

The classification of p-bits to traffic types is defined in IEEE 802.1D and 802.1ad (Provider Bridge). The R821 supports both models as well as a free form, which allows you to define how each p-bit value will be mapped to a queue. For more information about free form configuration, refer to “Free Form Settings” on page 41.

When the 802.1D model is selected, the priority from highest to lowest is Voice (< 10 ms latency and jitter), Controlled Load, Best Effort, and Background. The 802.1D p-bits-to-queue settings are as follows:

000: 1	001: 0	010: 0	011: 1
100: 2	101: 2	110: 3	111: 3

When Provider Bridge is selected, the priority from highest to lowest is Network Control, Voice (< 10 ms latency and jitter), Critical Applications, and Best Effort. The Provider Bridge p-bits-to-queue settings are as follows:

000: 0	001: 0	010: 1	011: 1
100: 2	101: 2	110: 3	111: 3

Default Port Priority

The priority bits on each port can be set independently to any value between 0 and 7. When a port receives an untagged frame, or when both DSCP and p-bits classifications are disabled, the frame is assigned to the default port priority. Each priority value is mapped to a queue based on the selected p-bits model (IEEE 802.1D or Provider Bridge). By default, both ports are set to the lowest priority queue, 0. This means all frames received without priority information are assigned to queue 0. It also means all received frames are assigned to queue 0 when DSCP and p-bits classifications are disabled.

When the IEEE 802.1D model is selected, the priority-to-queue mappings are as follows:

0:1	1:0	2:0	3:1	4:2	5:2	6:3	7:3

When the Provider Bridge model is selected, the priority-to-queue mappings are as follows:

0:0	1:0	2:1	3:1	4:2	5:2	6:3	7:3

For example, if Port 2's priority is set to 2 and the p-bits model is Provider Bridge, then an untagged frame entering Port 2 will be assigned a priority of 2. According to the Provider Bridge model, priority 2 is mapped to queue 1, and so the frame will be processed at that priority level. Later, if you change the p-bits model to IEEE 802.1D and keep the priority at 2, then an untagged frame entering Port 2 will be mapped to queue 0, because priority 2 is mapped to queue 0 under the 802.1D model.

Free Form Settings

The R821 provides four DSCP models and two p-bit models that match pre-defined bits to a particular queue. The R821 also provides a Free Form option that gives you the ability to individually map any DSCP or p-bit value to one of the four queues.

When Free Form is specified, the R821 starts with the last configured settings. For this reason, it is best to begin with the model that has the closest resemblance your preferred settings. For example, if Expedited Forwarding (EF) was the selected model before Free Form was specified, all the DSCP bits will start with the EF mappings. From there, you can make changes to individual bit values.

DSCP Free Form Configuration

1. Enable DSCP and set the model to Free Form (FF).
2. Specify the six binary DSCP bits you want to configure.
3. Specify the queue that will be mapped to the bits specified in the previous step.

Example: This example shows how to map the DSCP bits 000111 and 001000 to queue 3.

```
Console> set dscp enable model FF
Console> set freeform dscp 000111 queue 3
Console> set freeform dscp 001000 queue 3
```

P-Bits (IEEE 802.1p) Free Form Configuration

1. Enable p-bits and set the model to Free Form (FF).
2. Specify the three binary p-bits you want to configure.
3. Specify the queue that will be mapped to the bits specified in the previous step.

Example: This example shows how to set the p-bits 010 to queue 2, and p-bits 100 to queue 4.

```
Console> set pbits enable model FF
Console> set freeform 802.1p 010 queue 2
Console> set freeform 802.1p 100 queue 4
```

VLAN Tagging

The R821 supports three bridge forwarding modes:

- Transparent (default)
- Q-in-Q
- IEEE 802.1Q

VLAN tagging only applies to egress traffic in Q-in-Q and IEEE 802.1Q modes. Both modes operate under an inclusive model, and one port must be designated as the trunk port and other as the access port. By default, the access port is Port 1 and the trunk is Port 2. VLAN tagging and untagging rules are described in detail under “Q-in-Q Mode” on page 44 and “IEEE 802.1Q Mode” on page 47.

The diagram below shows the VLAN tag format:

Tag Control Info (2 bytes = 8100)	P-Bits (3 bits)	Canonical Indicator (1 bit = 0)	VID (12 bits)

Q-in-Q and IEEE 802.1Q modes require a port VLAN identifier (PVID). The default PVID is 1. The PVID is configurable and assigned as part of a VLAN tag to untagged frames, thus allowing untagged traffic to participate in VLAN assignments. In Q-in-Q mode, the PVID is also assigned to tagged frames as a second, or outer, tag. When the PVID is configured, it is applied to both ports and is persistent through device resets (i.e., the PVID is changed only when modified via software commands).

In addition to the PVID, a VLAN tag includes three priority bits. These bits are derived from the p-bits that were used by the R821 for internal queuing.

Configuring the PVID alone, without enabling Q-in-Q or IEEE 802.1, will not alter traffic. To activate VLAN tagging, you must do the following:

Q-in-Q VLAN Tagging

1. Specify transparent mode using the **set switch** command. If you attempt to enable Q-in-Q while the switch is not in transparent mode, you will receive an error message.

2. Enable Q-in-Q operation using the **set qinq** command.
3. Specify the port VLAN identifier using the **set pvid** command, if you want to use a number other than the default PVID value of 1. This command also allows you to change the access port to Port 2.

802.1Q VLAN Tagging

1. Specify 802.1Q mode using the **set switch** command.
2. Specify the port VLAN identifier using the **set pvid** command, if you want to use a number other than the default PVID value of 1. This command also allows you to change the access port to Port 2.
3. Configure the user VLANs using the **set uservlan** command. This command also allows untagging on the access port on a per-VLAN basis.

Management Frames

The bridge forwarding mode does not affect the processing of IEEE 802.3ah OAM management frames. They are always delivered to, and processed by, the R821's CPU. DSCP and p-bit elements do not apply to OAM frames, however, the receiver port's queuing priority is used to perform internal queuing. OAM frames are never tagged.

If the management channel is untagged, IP-based management frames must also be untagged. If a management frame is received with DSCP elements, those elements will be used for internal prioritization towards the R821's CPU. If management is disabled on a port, IP-based management frames received at that port will be discarded.

If the management channel is VLAN-tagged, IP-based management frames must be tagged with the configured management VLAN. If a VLAN-tagged management frame is received with DSCP elements, the elements will be used for internal prioritization towards the R821's CPU. If management is disabled on a port, VLAN-tagged management frames received at that port will be discarded.

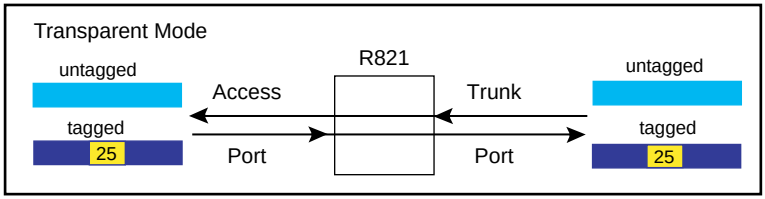
For information about how management frames are processed in Q-in-Q mode, refer to "Management Frames in Q-in-Q Mode" on page 46.

Transparent Mode

Transparent mode is the default setting. In this mode, all tagged and untagged user frames are forwarded without any modifications. All untagged Layer 2 control protocols are also forwarded transparently, however, these frames may be discarded on a per-protocol basis.

If a frame contains DSCP and/or p-bit elements, that information will be used to perform internal queuing, without changing the user frame.

The example below illustrates how frames are forwarded in transparent mode. The untagged frame (light blue) is forwarded as an untagged frame, and the tagged frame (dark blue) with a VLAN ID of 25 is forwarded without any changes. Traffic in both directions is handled in the same manner.



Q-in-Q Mode

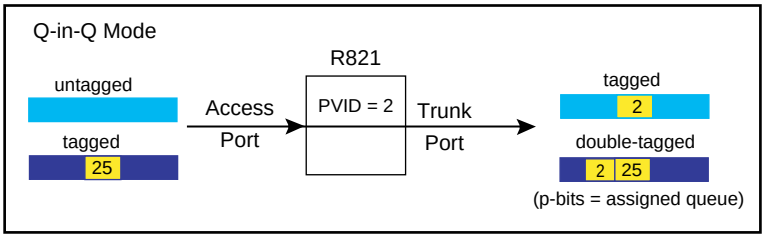
To extend the VLAN space available under 802.1Q mode, the R821 supports the tagging of tagged frames. This results in a double-tagged frame that becomes available for use in the service provider or Q-in-Q domain. Double tagging preserves the original tag and applies a second VLAN tag that is removed when the frame exits the Q-in-Q domain.

Traffic forwarding in this mode depends on whether a frame arrives at the access port or the trunk port. The trunk port serves as the interface to the Q-in-Q domain. VLAN tagging rules for each port are detailed below.

Traffic Forwarding Over the Trunk Port

- All frames received at the access port are forwarded with a VLAN tag over the trunk port. Regardless of whether they are untagged, priority-tagged or VLAN-tagged, all frames received at the access port are forwarded with the PVID assigned to them. Untagged Layer 2 control protocols are forwarded with the PVID, however, these frames may be discarded on a per-protocol basis. (The default PVID is 1.) All tagged frames are forwarded with two tags—the PVID and the original tag. The p-bits in the forwarded frames are derived from the p-bits assigned

to the queue that was used to store the frame. This is illustrated in the following example in which the PVID is set to 2 and the tagged frame has a VLAN ID of 25.

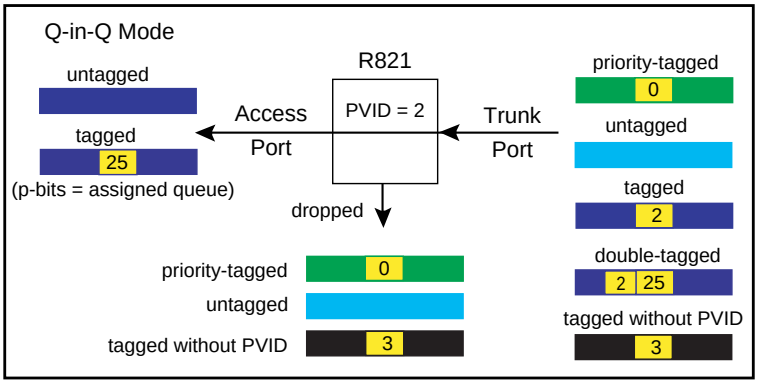


- If a received frame contains DSCP and/or p-bit elements, and the respective classification mode(s) is/are enabled, then that information will be used to perform internal queuing, otherwise the access port's default port priority will be used for queuing.

Traffic Filtering and Forwarding Over the Access Port

- Priority-tagged frames (i.e., frames with a VLAN ID of 0) arriving at the trunk port are discarded.
- Untagged frames, including untagged Layer 2 control protocols, arriving at the trunk port are discarded.
- User frames that are single-tagged with the PVID are forwarded, but with the tag removed.
- User frames that are double-tagged with the PVID are forwarded as a single-tagged frame. The outer tag, which contains the PVID, is deleted. The p-bits in the forwarded frames are derived from the p-bits assigned to the queue that was used to store the frame.
- User frames which do not include the PVID are dropped.
- If the received frame contains DSCP and/or p-bit elements, that information will be used to perform internal queuing, otherwise the access port's default port priority will be used for queuing.

The following example illustrates how different types of frames are processed when they arrive at the trunk port in Q-in-Q mode.



Management Frames in Q-in-Q Mode

The R821 provides two options to forward management frames in Q-in-Q mode when the management channel is tagged. One option encapsulates IP-based management frames and the other bypasses tagging. If encapsulation is selected, a management frame will egress double-tagged with both the service provider's tag and the management VLAN tag. If bypass is selected, a management frame will egress single-tagged with only the management VLAN tag.

If no management VLAN is configured, outbound management frames always egress untagged regardless of whether encapsulate or bypass is selected.

The following table displays how management frames are forwarded in Q-in-Q mode under various conditions.

Encapsulate/Bypass	Mgmt VLAN	Mgmt Frame Tag
Encapsulate	Yes	Double-tagged
Encapsulate	No	Untagged
Bypass	No	Untagged
Bypass	Yes	Single-tagged

IEEE 802.1Q Mode

In this mode, all frames leaving the trunk port are VLAN tagged to identify the VLAN membership of a frame across bridges. The tag identifies the frame's VLAN and prioritization. To properly operate under IEEE 802.1Q mode, the R821 must be configured with a list of acceptable user VLANs. Up to 16 VLANs may be specified.

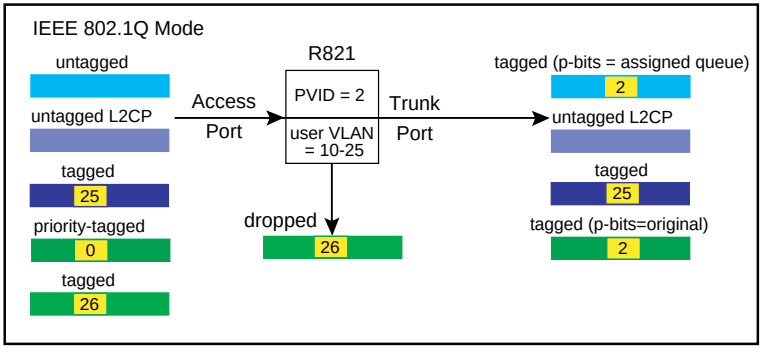
The following sections describe the filtering and forwarding process that is applied to frames entering the access port and the trunk port.

Traffic Filtering and Forwarding Over the Trunk Port

For user data frames entering the access port, only untagged frames and tagged frames which match one of the configured user VLANs are forwarded. All other frames are discarded.

- Untagged frames are forwarded with the PVID assigned to them. The p-bits in the forwarded frames are not changed.
- Tagged frames, which belong to one of the acceptable user VLANs, are forwarded without changes to the frame.
- Priority-tagged frames (i.e., frames with a VLAN ID of 0) received at the access port are forwarded with the the VLAN tag set to the PVID value. The p-bits in the forwarded frames are not changed.
- Untagged Layer 2 control protocols (L2CP) are forwarded transparently, however, they may be discarded on a per-protocol basis.
- If the received frame contains DSCP and/or p-bit elements, that information will be used to perform internal queuing, otherwise the access port's default port priority will be used for queuing.

The following example shows how various types of frames arriving at the access port are processed in 802.1Q mode.

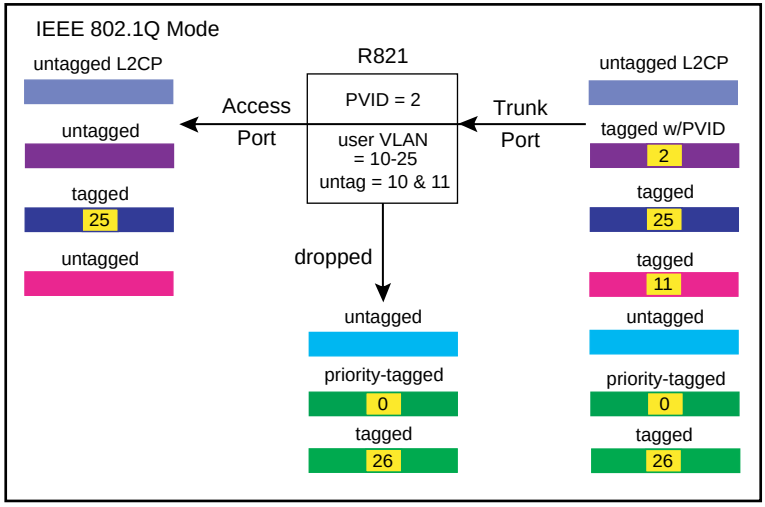


Traffic Filtering and Forwarding Over the Access Port

The only frames that are forwarded from the trunk port to the access port are the following:

- Untagged Layer 2 control protocols frames. Untagged L2CP are forwarded transparently, however, they may be discarded on a per-protocol basis.
- Tagged frames containing the PVID. These frames are forwarded as untagged frames (i.e., the PVID is removed).
- Tagged frames containing one of the configured user VLANs.

Tagged frames containing an acceptable user VLAN are forwarded without modifications, unless untagging has been enabled. The R821 provides an option to forward frames untagged on a per-VLAN basis. For example, if the configured user VLANs are 10-25, the access port may be configured to untag frames for VLANs 10 and 11. Tagged frames, whose VLANs are 10 or 11, will then be forwarded over the access port as untagged frames. Tagged frames, whose VLANs are 12-25, will be forwarded without any modifications, as shown in the illustration below. The illustration also displays how different types of frames arriving at the trunk port are processed in 802.1Q mode.



Sensors

Environmental Sensors

Through software, you can view environmental sensor information for monitoring the health of the services line card. Each sensor reading includes the current value along with the minimum and maximum values for the component. To prevent a potential problem, a trap can be set so a network manager is notified whenever any sensor threshold is crossed. For more information on traps, refer to “Traps” on page 101.

Module Sensors

There are five module sensors. Module sensors measure the main circuit board’s temperature as well as the voltage for the line card’s 1.2, 2.5, 3.3 and 5.0 volt power supplies. The 5.0 volt supply is the input power source for the services line card. The other supplies are used to power various components on the circuit board. The module temperature sensor has an accuracy of ±3° C. The voltage monitoring accuracy is ±1%.

Port Sensors

The R821 includes three SFP port sensors for the fiber port. Information is provided only when an SFP transceiver which supports diagnostics is installed in the port. One sensor provides the internal port temperature reading. The other two sensors provide the optical receive and transmit power levels for the fiber port. The accuracy of the RX and TX monitors is typically ±1 dBm.

Upgrading the Operating System Software

The R821 services line card can store two separate versions of the operating system software. This enables you to revert to a previous version without having to download the older version again. Downloading and installing a new revision of the software onto the R821 is performed via TFTP as configured through SNMP, telnet, CLI, NetBeacon, or WebBeacon. This section describes the steps necessary to download and activate a new version of software via SNMP. Instructions on how to upgrade the OS using the other methods are included in the respective user guides.

1. Copy the new binary OS image file to a TFTP server that can be reached by the R821.

2. Using an SNMP MIB browser, set the following objects in METRO-BILITY-DOWNLOAD-MIB:
   - Set **mosDownloadServer** to the *IP address* of the TFTP server.
   - Set **mosDownloadFilename** to the *path* and *filename* of the OS file to load.
   - Set **mosDownloadLocation** to either *3* for the primary OS file location or *4* for the secondary OS file location. It is recommended that you download the software into the location that is currently not in use.
   - Set **mosDownloadInitiateLoad** to *1* to begin loading the file. The status of the download can be monitored via the **mosDownload-Status** object.
3. When the value of **mosDownloadStatus** is flashBurnComplete(4), set **mosDownloadActiveOSImage** to the location just loaded to. That is, *3* if it was loaded to the primary location, or *4* if it was the secondary location.
4. Reset the board to run the new version of the OS.

Chapter 4: CLI Commands

This section contains a complete listing of all command line interface (CLI) commands available on the R821. Each command includes a detailed description of the syntax and associated parameters.

The R821 supports the following three levels of user accounts. The default login names and passwords for each account are in parentheses.

- User (user/user)
- Administrator (admin/admin)
- Root (root/root)

The list of commands available to each user account is cumulative. That is, the Administrator account includes all User commands, and the Root account includes all commands.

Note: *For any CLI command, you can start typing the first few letters and then press the [Tab] key to complete the rest of the command. There must be enough letters entered to make the command unique.*

Notation Conventions

This chapter uses the conventions described in this section.

Font Conventions

Arial — Arial is the default font used for general text.

Times — This font is used for program examples, prompt responses, and other system output.

[Key] — Key names in are written in square brackets. For example, [Tab] or [Esc].

Symbol Conventions

< > — Angle brackets indicate that the enclosed information is a required field.

[ ] Square brackets indicate that the enclosed information is optional, or it is a key to press.

| A vertical bar separating two or more text items indicates that any **one** of the terms may be entered as a value.

Complete List of Commands

User Commands

arp
change password
exit
help
logout
ping
show cablestatus
show console
show dhcp
show download
show fpga
show icmp
show ip
show l2controlprotocol
show l3capability
show logicalservicesloopback
show mgmtvlan
show oamcontrol
show oameventlog
show oamevents
show oamloopback
show oampeer
show oamstatistics
show os
show port
show portstatistics
show pvid
show radius
show ratelimit
show rmonportstatistics
show sensors

show serviceclasses
show snmpuser
show snmpv1v2
show switch
show systeminfo
show trapcontrol
show trapdestinations
show uservlan

Administrator Commands

clear l2controlprotocol
clear mgmtvlan
clear radius server
clear uservlan
download
reset
run config
set console
set dhcp
set download
set dscp
set fpga
set freeform
set icmp
set ip
set l2controlprotocol
set l3capability
set logicalservicesloopback
set loopback
set mgmtvlan
set oamcontrol
set oamerrframe
set oamerrframeperiod
set oamerrframesecs
set oamerrsymperiod
set oamloopback
set os
set pbits
set port
set precedence
set priority

set pvid
set qinq
set radiusauthentication
set radiusretransmit
set radiusserver
set radiustimeout
set ratelimit
set switch
set systeminformation
set trapcontrol
set uservlan

Root Commands

clear snmpuser
clear trapdestination
clear username
set snmpcommunity
set snmpuser
set snmpv1v2
set trapdestination
set username
show snmpcommunity
show usernames

Clear Commands

clear l2controlprotocol

Description: Clear Layer 2 protocol processing action on a specified port.
Syntax: clear l2controlprotocol <stp | rstp | mstp | lacp | marker | 802.1X | bridge | garp | gvrp | gmrp> port <port number>
Parameters: 802.1X – IEEE 802.1X Port Authentication Protocol.
bridge – LAN Bridge Management Protocol.
garp – IEEE 802 Group Attribute Registration Protocol.
gmrp – IEEE 802 GARP Multicast Registration Protocol.
gvrp – IEEE 802 GARP VLAN Registration Protocol.
lacp – IEEE 802.3ad Link Aggregation Protocol.
marker – IEEE 802.3ad Marker Protocol.
mstp – IEEE 802.1 Multiple Spanning Tree Protocol.
rstp – IEEE 802.1 Rapid Spanning Tree Protocol.
stp – IEEE 802.1 Spanning Tree Protocol.
port number – the actual port number.
Example:
```
Console> clear l2controlprotocol garp port 2
Console>
```

clear mgmtvlan

Description: Clear the management VLAN ID on both ports.
Syntax: clear mgmtvlan
Example:
```
Console> clear mgmtvlan
Console>
```

clear radiusserver

Description: Clear a RADIUS server.
Note: This command is not available to telnet users.
Syntax: clear radiusserver <IP address>
Parameters: IP address – IP address in dotted decimal notation.
Example:
```
Console> clear radiusserver 192.168.2.100
Console>
```

clear snmpuser

Description: Clear name and authentication/privacy parameters for SNMPv3 access.
Syntax: clear snmpuser <user name>
Parameters: user name – name used for SNMPv3 access.
Example:
```
Console> clear snmpuser tempV3user
Console>
```

clear trapdestination

Description: Clear the destination and protocol information for a trap destination host.
Syntax: clear trapdestination <IP address | all>
Parameters: IP address – IP address in dotted decimal notation.
all – all configured destination hosts.

Example: Console> clear trapdestination 192.168.1.100
Console>

clear username

Description: Remove a user account from the device.
Syntax: clear username <username>
Parameters: username – username.
Example: Console> clear username guest
Console>

clear uservlan

Description: Clear the specified user VLAN ID on both ports.
Syntax: clear uservlan <vlan id>
Parameters: vlan id – VLAN ID in the range 1 to 4094.
Example: Console> clear uservlan 126
Console>

System Commands

arp

Description: Display the Address Resolution Protocol (ARP) table; or add or delete an ARP entry. The R821 supports a maximum of five ARP entries. The maximum number of static entries is four.
Syntax: arp [all] [delete <IP address>] [static <IP address> <MAC address>]
Parameters: all – display the ARP table.
delete – delete the ARP entry containing the specified IP address.
static – add a static entry to the ARP table.
Display Parameters: Intf. – Interface number.
IP address – logical IP address.
Physical address – hardware MAC address.
HW – hardware revision.
Proto – protocol type.
State – state of the address resolution process.
RESOLVED – the address has been resolved successfully.
PENDING – address resolution is in progress, but has not yet succeeded.
TTL – Time to live in seconds.
permanent – indicates a static entry.
Example: Console> arp all

Intf.	IP address	Physical address	HW	Proto	State	TTL

```
1   192.168.1.100   00:00:d0:6a:57:b4 1 0800 RESOLVED permanent
1   192.168.1.101   00:01:d0:6d:02:00 1 0800 RESOLVED 548 s
1   192.168.1.102   00:01:5a:98:52:80 1 0800 RESOLVED 576 s
1   192.168.1.103   00:01:5a:9a:fd:58  1 0800 RESOLVED 582 s

Console>
```

change password

Description: Change the current user account password. The password is a case-sensitive ASCII string (32 characters max).

Syntax: change password

Parameters: None.

Example:
```
Console> change password
Enter current password: *****
Enter new password: *******
Re-enter new password: *******
Console>
```

download

Description: Download the operating system, FPGA firmware, configuration script, or boot code. The OS and FPGA files will be downloaded into the inactive location. For a configuration file, the location must be specified. If you download new boot code, it will overwrite the existing code.

Note:The download server must first be identified using the "set download" command before this command can be executed. Refer to "set download" on page 60 for more information.

Syntax: download <os | fpga | config1 | config2 | boot> [set | reset | defaults]

Parameters: os – operating system software.
fpga – FPGA embedded software.
config1 – configuration file/script instance 1.
config2 – configuration file/script instance 2.
boot – bootloader software.
set – set the newly downloaded OS or FPGA software as active.
reset – set the newly downloaded OS or FPGA software as active and reset the card.
defaults – set the newly downloaded OS or FPGA software as active and reset the card to its factory default settings.

Example:
```
Console> download config1
Console> Transferring file config1.txt
Writing image to Z80 internal FLASH

FLASH verification in progress.

Locking Z80 internal FLASH.
```

exit

Description: Log off.
Syntax: exit
Parameters: None.
Example: Console> exit

help

Description: Show all commands that are available to the user, along with a brief description of the command, or all available commands that begin with a specified word. Optionally, press the [Tab] key to display only the commands available to your user account. No descriptions are provided when you use the [Tab] option.
Syntax: help [command]
[Tab]
Parameters: command – a one-word command.
Example:
```
Console> help
arp [all] [delete <IP address>] [static <IP address> <MAC
address>]
   Show, add and delete arp entries.
   :
show uservlan <vlan id | all>
   Show user VLAN IDs (1-4094) on both ports.
Console> help ping
ping <host> [<count> [<size> [<delay>]]]
   Send ICMP echo ('ping') packets.
Console>
```

logout

Description: Log off.
Syntax: logout
Parameters: None.
Example: Console> logout

ping

Description: Send ICMP echo request packets to a network host.
Syntax: ping <host> [count <count>] [size <size> [delay <delay>]
Parameters: host – IP address of the network host.
count – number of packets to send. The default is 4. Range is 1-100.
size – size of the packet in bytes. The default is 56 bytes. Range is 56-1472.
delay – length of time (in seconds) to wait between each request. The default is 0 seconds. The range is 0-10.
Example:
```
Console> ping 192.168.1.100 count 2
56 octets from 192.168.1.100: icmp_seq 0
56 octets from 192.168.1.100: icmp_seq 1
received 2/2 packets (0% loss)
Console>
```

reset

Description: Reset, or reboot, the device and optionally set operational parameters to factory defaults.
Syntax: reset [default]
Parameters: default – factory default settings.
Example: Console> reset default

run config

Description: Run the saved configuration script. (Refer to “download” on page 57 for information on downloading a script.) A script is a text file consisting of CLI commands separated by carriage returns. There is also an “echo” command that can be used to print comments to the screen while the script is running.
Syntax: run config <image number>
Parameters: image number – image number of the configuration script. Valid numbers are 1 and 2.
Example: Configuration script:

```
echo Setting IP information.
set ip 192.168.1.1 mask 255.255.0.0
echo Disabling management on Port 2.
set port 2 management disable
echo Setting up VLAN information.
set mgmtvlan 101
set uservlan 167 port 1 2
set uservlan 190 port 1 2
set uservlan 233 port 1 2
```

```
Console> run config 1
Setting IP information.
Disabling management on Port 2.
Setting up VLAN information.
Console>
```

Set Commands

set console

Description: Set the attributes for the console port.
Note: This command is allowed only through the console port. It is not available to telnet users.

Syntax: set console [baud <1200-57600>] [data <7 | 8>] [stop <1 | 2>] [parity <none | even | odd>] [timeout <time in minutes>]

Parameters: baud – speed of the console port in bits per second. The range is 1200 to 57,600; the default is 57,600.
data – number of data bits per character. The options are 7 or 8; the default is 8 bits.
stop – number of stop bits. The options are 1 or 2; the default is 1 bit.
parity – number of parity bits and the definition of the parity bit if one is used. The options are:
none – no parity bits. (default)
even – one bit with even parity.
odd – one bit with odd parity.
timeout – number of minutes of inactivity on the console port that will force it to log out automatically. The range is 0 to 120; the default is 5 minutes. If the timeout is set to 0, automatic log out will be disabled (i.e., the console port will never timeout).

Example:
```
Console> set console baud 9600 data 8 stop 1 timeout 0
Console>
```

set dhcp

Description: Set the DHCP client's operational mode. Optionally, specify the number of address acquisition retries before reverting back to the last known valid IP address.

Syntax: set dhcp <disable | enable> [# of retries]

Parameters: disable – disables DHCP client operation
enable – enables DHCP client operation.
# of retries – integer in the range 1 to 5. The default is 3.

Example:
```
Console> set dhcp enable 5
   DHCP Enabled
   Retries: 5
   DHCP Server: 192.168.1.100
Console>
```

set download

Description: Set addressing information relative to the download server used by the download command. The file will be downloaded via TFTP.

Syntax: set download [server <IP address>] [filename <name of file>]

Parameters: IP address – IP address of the download host in dotted decimal notation.
name of file – case-sensitive ASCII string (50 characters max.) denoting the name of the download file.

Example:
```
Console> set download server 192.168.1.100 filename control.bin
  server: 192.168.1.100
  filename: control.bin
  protocol: tftp
  status: Previous Flash burn completed successfully
Console>
```

set dscp

Description: Enable or disable DSCP classification to determine traffic prioritization and specify the policy model to use.

Syntax: set dscp <enable | disable> [model <TOS | SP | EF | AF| FF>]

Parameters: enable – enable DSCP classification.
disable – disable DSCP classification. (default)
model – set DSCP classification to one of the following policy models:
TOS – RFC 791/795 Precedence
SP – Straight Precedence
EF – Expedited Forwarding (default)
AF – Assured Forwarding
FF – Free Form
If the model is not specified, the last configured model will be used; the default is EF.

Example:
```
Console> set dscp enable model AF
Console>
```

set fpga

Description: Select the FPGA software to be used by the device.

Syntax: set fpga <image number>

Parameters: image number – 1 or 2.

Example:
```
Console> set fpga 1
  FPGA1 image (1.0.0) will not become active until next reset.
Console>
```

set freeform

Description: Customize the free form service class policy that maps a specific binary bit value to one of the four priority queues.

Syntax: set freeform <802.1P 0bxxx | DSCP 0bxxxxxx> queue <0-3>

Parameters: 802.1P – a three-digit binary number.
DSCP – a six-digit binary number.
queue – The priority queue value. 0 is low, 3 is high.

Example:
```
Console> set freeform DSCP 000111 queue 3
Console>
```

set icmp

Description: Set operational, processing mode for end-station ICMP messages.
Syntax: set icmp <disable | enable | broadcastdisable>
Parameters: disable – disables processing of all ICMP messages.
enable – enables processing of all ICMP messages.
broadcastdisable – enables processing of only unicast ICMP messages, but disables processing of ICMP messages sent to IP multicast, IP subnet broadcast, and IP limited broadcast addresses.
Example:
```
Console> set icmp broadcastdisable
  status: Broadcast Disabled
Console>
```

set ip

Description: Set the device's IP address, network mask, or default gateway IP address.
Note: If you change the network portion of the IP address, the default gateway must also be updated to ensure compatibility. If the gateway cannot be reached with the new IP address, it will not be accepted.
Syntax: set ip <IP address> [mask <mask value>] [gateway <default gateway IP address>]
Parameters: IP address – end-station IP address in dotted decimal notation.
mask value – the end-station prefix, or network mask in dotted decimal notation or in /bits format.
default gateway IP address – default gateway IP address in dotted decimal notation.
Example:
```
Console> set ip 192.168.1.100 mask 255.255.255.0
Console>
```

set l2controlprotocol

Description: Set disposition for a Layer 2 control protocol on a port.
Syntax: set l2controlprotocol <stp | rstp | mstp | lacp | marker | 802.1X| bridge | garp | gvrp | gmrp> disposition <discard | forward | peer> port <port number>
Parameters: 802.1X – IEEE 802.1X Port Authentication Protocol.
bridge – LAN Bridge Management Protocol.
garp – IEEE 802 Group Attribute Registration Protocol.
gmrp – IEEE 802 GARP Multicast Registration Protocol.
gvrp – IEEE 802 GARP VLAN Registration Protocol.
lacp – IEEE 802.3ad Link Aggregation Protocol.
marker – IEEE 802.3ad Marker Protocol.
mstp – IEEE 802.1 Multiple Spanning Tree Protocol.
rstp – IEEE 802.1 Rapid Spanning Tree Protocol.
stp – IEEE 802.1 Spanning Tree Protocol, including Rapid and Multiple Spanning Tree Protocols.

discard – discard (filter) the specified Layer 2 control protocol.
forward – forward the specified Layer 2 control protocol, based on forwarding rules and policies.
peer – accept the specified Layer 2 protocol for end-station processing.
port number – the actual port number.

Example:
```
Console> set l2controlprotocol bridge disposition forward port 1
Console>
```

set l3capability

Description: Set the device's management capability to receive/transmit IP packets.

Syntax: set l3capability <disable | enable>

Parameters: disable – disallows the reception and transmission of all IP packets to/from the management port.
enable – allows all IP packets destined for the management port to be received and allows the management port to transmit IP packets.

Example:
```
Console> set l3capability enable
  IP Capability Enabled
Console>
```

set logicalservices loopback

Description: Configure and activate or cancel Logical Services Loopback (LSL), which returns the specified frames back through the port where they were received. Once LSL is enabled, the only way to cancel it is via software.

Syntax: set logicalservicesloopback [state <disable | all | unicast | multicast>] [address <multicast MAC address>]

Parameters: state – activate Logical Services Loopback or cancel it.
disable – cancels Logical Services Loopback.
all – enables unicast and multicast MAC frames to be looped.
unicast – enables LSL on only unicast MAC frames.
multicast – enables LSL on only multicast MAC frames that you specify.
address – the multicast MAC address that will be used for Logical Services Loopback.

Example:
```
Console> set logicalservicesloopback state unicast
Console>
```

set loopback

Description: Activate or cancel loopback on the specified port.

Syntax: set loopback <port number> <enable | disable> [timeout <30-300>]

Parameters: port number – the actual port number.
enable|disable – activate or cancel loopback. Enable starts a new loopback; disable cancels the current loopback.

timeout – maximum number of seconds to allow the port to remain in loopback mode. The default is 30 seconds. The range is 30 to 300 seconds.

Example: Console> set loopback 2 enable timeout 60
Console>

set mgmtvlan

Description: Set management VLAN ID. It will be applied to both ports. The services line card supports one management VLAN ID. The management VLAN ID number must be different from the user VLAN ID numbers.

Syntax: set mgmtvlan <vlan id>

Parameters: vlan id – VLAN ID in the range 1 to 4094. To disable management VLAN, set the ID to 0.

Example: Console> set mgmtvlan 1070
Console>

set oamcontrol

Description: Set the OAM capabilities for the specified port.

Syntax: set oamcontrol <port number> [admin <enable | disable>] [mode <active | passive>]

Parameters: port number – the actual port number.
admin – enable or disable administrative OAM mode for the specified port.
mode – specify active or passive OAM mode for the selected port. These modes differ in that active mode provides additional capabilities to initiate monitoring activities with the remote OAM port, while passive mode generally waits for the remote OAM port to initiate actions with it and responds to requests. For example, an active OAM port can put the remote port in a loopback state, while a passive OAM port cannot.

Example: Console> set oamcontrol 2 admin enable mode active
Console>

set oamerrframe

Description: Set the OAM attributes for number of errored frames detected for a set time window (100 ms granularity) for the specified port, and enable or disable notification.

Syntax: set oamerrframe <port number> [window <# of 100ms counts>] [threshold <frame threshold>] [notify <enable | disable>]

Parameters: port number – the actual port number.
window – The amount of time (in 100 ms increments) over which the threshold is defined. The range is 10 to 600, which is equal to 1 to 60 seconds.
threshold – The number of frame errors that must occur for the Errored Frame Event to be triggered. Example: if

window = 100 and threshold = 5, then if 5 frame errors occur within a window of 10 seconds, an Event Notification OAMPDU will be generated with an Errored Frame Event TLV indicating that the threshold has been crossed.

notify – Enable or disable notification to the specified port's OAM peer that the Errored Frame Event has been triggered.

Example: Console> set oamerrframe 2 window 100 threshold 5
Console>

set oamerrframeperiod

Description: Set the OAM event attributes for number of errored frames detected for a set frame count window for the specified port, and enable or disable notification.

Syntax: set oamerrframeperiod <port number> [window <# of frames>] [threshold <frame threshold>] [notify <enable | disable>]

Parameters: port number – the actual port number.

window – Number of frames over which the threshold is defined. The range is 148,809 to 89,285,714.

threshold – The number of frame errors that must occur for the Errored Frame Period Event to be triggered. Example: If window = 1,000,000 and threshold = 2, then if 2 frames out of 1,000,000 frames have errors, an Event Notification OAMPDU will be generated with an Errored Frame Period Event TLV indicating that the threshold has been crossed.

notify – Enable or disable notification to the specified port's OAM peer that the Errored Frame Period Event has been triggered.

Example: Console> set oamframeperiod 2 window 1000000 threshold 2
Console>

set oamerrframesecs

Description: Set the OAM event attributes for detection of number of seconds with errored frames for a set time window (100 ms granularity) for the specified port, and enable or disable notification.

Syntax: set oamerrframesecs <port number> [window <# of 100 ms counts>] [threshold <frame secs threshold>] [notify <enable | disable>]

Parameters: port number – the actual port number.

window – The amount of time (in 100 ms intervals) over which the threshold is defined. The range is 100 to 9000.

threshold – The number of errored frame seconds that must occur for the Errored Frame Seconds Summary

Event to be triggered. The threshold range is 1 to 900. Example: if window = 100 and threshold = 5, then if 5 frame errors occur within a window of 10 seconds, an Event Notification OAMPDU will be generated with an Errored Frame Seconds Summary Event TLV indicating the threshold has been crossed.

notify – Enable or disable notification to the specified port's OAM peer that the Errored Frame Seconds Summary Event has been triggered.

Example: Console> set oamerrframesecs 1 window 100 threshold 5
Console>

set oamerrsymperiod

Description: Set the OAM event attributes for number of errored symbols detected for a set symbol count window for the specified port, and enable or disable notification.
Note: This R821 currently does not support this command.

Syntax: set oamerrsymperiod <port number> [window <# of symbols>] [threshold <symbol period threshold>] [notify <enable | disable>]

Parameters: port number – the actual port number.

window – Number of symbols over which the threshold is defined. The range is 125000000 to 3205032704.

threshold – The number of symbol errors that must occur for the Errored Symbol Period Event to be triggered. Example: If window = 125000000 and threshold = 20, then if 20 symbol errors occur within 125000000 symbols, an Event Notification OAMPDU will be generated with an Errored Symbol Period Event TLV indicating that the threshold has been crossed.

notify – Enable or disable notification to the specified port's OAM peer that the Errored Symbol Period Event has been triggered.

Example: Console> set oamerrsymperiod 1 window 125000000 threshold 20
Console>

set oamloopback

Description: Start or stop remote loopback on the specified port with the remote OAM port.

Syntax: set oamloopback <port number> [status <start | end>] [commands <ignore | process>]

Parameters: port number – the actual port number.

status – initiate or terminate remote loopback with the remote port. Starting remote loopback causes the specified port to send a loopback request (with the loopback enable flags set) to the remote port. Ending

remote loopback causes the specified port to send a loopback request (with the loopback enable flags cleared) to the remote port.
commands – process or drop incoming requests for loopback when the specified port receives them.

Example: Console> set oamloopback 2 commands ignore
Console>

set os

Description: Select the operating system image to be used by the device. To activate the selection, you must reset the device after changing the OS image.
Syntax: set os <image number>
Parameters: image number – 1 or 2.
Example: Console> set os 1
OS1 image (1.0.0) will not become active until next reset.
Console>

set pbits

Description: Enable or disable priority bits classification, and set the policy profile as defined in IEEE 802.1D or IEEE 802.1ad (Provider Bridge), or use a free form definition.
Syntax: set pbits <enable | disable> [model <802.1D | Provider Bridge | FF>]
Parameters: enable – enable p-bit classification.
disable – disable p-bit classification. (default)
model – specify the policy to use for p-bit classification. 802.1D prioritizes traffic types in the following order (highest to lowest): Voice, Controlled Load, Best Effort, and Background. Provider Bridge prioritizes traffic types in the following order (highest to lowest): Network Control, Voice, Critical Applications, and Best Effort. FF (Free Form) allows you to define the priority bits. If the model is not specified, the last configured model will be used; by default it is Provider Bridge.
Example: Console> set pbits enable model 802.1D
Console>

set port

Description: Set attributes for a selected port.
Syntax: set port <port number> [autonegotiate <disable | enable>] [duplex <full | half>] [flowcontrol <disable | enable>] [management <disable | enable>] [speed <10 |100>] [state <disable | enable>] [fef <disable | enable>] [llr <disable | enable>] [llcf <disable | enable>]
Parameters: port number – the actual port number.
autonegotiate – disable or enable auto-negotiation for the selected port.

duplex – specify full or half duplex for the selected port.
fef – disable or enable Far End Fault reporting on the selected fiber port.
flowcontrol – disable or enable flow control for the selected port. PAUSE frames are used on full-duplex ports, whereas collisions are forced on half-duplex ports.
llcf – disable or enable the ability to carry forward (to the other port) link loss on the selected port.
llr – disable or enable Link Loss Return status for the selected port.
management – disable or enable management access over selected port.
speed – set the speed on the selected port to 10 or 100 Mbps and disable auto-negotiation on that port. Only Port 1's speed is configurable.
state – disable or enable the selected port.

Example:
```
Console> set port 1 speed 100 state enable
Console>
```

set precedence

Description: Specify which mode (IEEE 802.1p or DSCP) will take precedence if both modes are enabled simultaneously. This command is ignored if only one mode is enabled or if both modes are disabled.

Syntax: set precedence <802.1P | DSCP>

Parameters: 802.1P – 802.1p takes precedence over DSCP. (default)
DSCP – DSCP takes precedence over 802.1p.

Example:
```
Console> set precedence DSCP
Console>
```

set priority

Description: Set the priority bits on a port.

Syntax: set priority <port number> <0-7>

Parameters: port number – the actual port number.
0-7 – specifies the three binary bits used to identify the priority. These bits will be mapped to a queue depending on which p-bit model is enabled, either Provider Bridge or IEEE 802.1D).

0 = 000	4 = 100
1 = 001	5 = 101
2 = 010	6 = 110
3 = 011	7 = 111

Example:
```
Console> set priority 2 4
Console>
```

set pvid

Description: Set the port VLAN identifier that will be used for tagging when 802.1Q and Q-in-Q modes are enabled. When the switch mode is set to Transparent, the PVID is used as the native VLAN for untagged frames.

Syntax: set pvid <VLAN> [access <port number>]

Parameters: VLAN – VLAN ID in the range 1 to 4094.

access – specifies the access port. If not specified, the access port will be the port that was last configured to be the access port. By default, it is Port 1.

Example:
```
Console> set pvid 3
Console>
```

set qinq

Description: Enable or disable Q-in-Q operation, and optionally bypass or encapsulate management frames when a management VLAN is configured.

Syntax: set qinq <enable | disable> [management <bypass| encapsulate>]

Parameters: enable – activates Q-in-Q forwarding mode. For more information, refer to “Q-in-Q Mode” on page 44. Q-in-Q operation can only be enabled when the switch is in transparent mode. If the switch is in 802.1Q mode, an error message will appear.

disable – Q-in-Q mode is disabled. The forwarding mode will be determined by the ‘set switch’ setting.

management – encapsulate or bypass management frames when Q-in-Q is enabled. For more information, refer to “Management Frames in Q-in-Q Mode” on page 46.

bypass – if no management VLAN is configured, allows all management frames to bypass the service provider tag on the trunk port. That is, management frames will egress the trunk port untagged. If the management VLAN is configured, management frames will egress single-tagged with only the management VLAN. This is the default setting.

encapsulate – encapsulates all management frames when there is a management VLAN configured. This results in double-tagged management frames. If no management VLAN is configured, management frames will egress untagged.

Example:
```
Console> set qinq enable
Console>
```

set radiusauthentication

Description: Enable or disable RADIUS authentication.
Note: This command is not available to telnet users.
Syntax: set radiusauthentication <all | telnet | console> <enable | disable>
Parameters: all – authenticates all attempts to access the system.
telnet – authenticates access via telnet only.
console – authenticates access only when it is directly from the connected console port.
enable – enable RADIUS authentication.
disable – disable RADIUS authentication.
Example:
```
Console> set radiusauthentication all enable
Console>
```

set radiusretransmit

Description: Set number of transmission retries to a RADIUS server.
Syntax: set radiusretransmit <count>
Parameters: count – specifies the maximum number of attempts to send a request to a RADIUS server without receiving a response. The range is 1-10; the default is 2.
Example:
```
Console> set radiusretransmit 3
Console>
```

set radiusserver

Description: Set configuration paramaters for a RADIUS server.
Note: This command is not available to telnet users.
Syntax: set radiusserver <IP address> secret <secret> [port <UDP port>] [primary]
Parameters: IP address – RADIUS server's IP address in dotted decimal notation.
secret – the password (max 65 characters) that has been assigned to the RADIUS server.
port – the UDP port number. The default is 1812.
primary – indicates that the specified RADIUS server will be the primary RADIUS server.
Example:
```
Console> set radiusserver 192.168.2.100 secret mypassword
Console>
```

set radiustimeout

Description: Set the time interval (in seconds) between attempts to authenticate with a RADIUS server.
Syntax: set radiustimeout <time in seconds>
Parameters: time in seconds – time interval (in seconds) to wait for a reply from a RADIUS server. The range is 1-10; the default is 5 seconds.
Example:
```
Console> set radiustimeout 6
Console>
```

set ratelimit

Description: Set the rate limit on the specified port or activate/cancel rate limiting.

Syntax: set ratelimit <port number> [rate <128 | 256 | 512 | 1000 | 2000 | 4000 | 8000 | 100000>] [state <disable | enable>]

Parameters: port number – the actual port number.

rate – specify the ingress (inbound) traffic rate limit in Kbps on the selected port to one of the following rates: 128, 256, 1000, 2000, 4000, 8000, or 100000. Because the R821 is a two-port device, changing the ingress rate automatically changes the egress (outbound) rate on the opposite port.

state – activate or cancel rate limiting.

disable – cancel rate limiting and allow traffic to flow at full line rate.

enable – activate rate limiting. The maximum rate is set to the value specified by the rate option.

Example:

```
Console> set ratelimit 1 rate 8000 state enable
Console>
```

set snmpcommunity

Description: Set SNMP community and its corresponding access profile.

Syntax: set snmpcommunity <community name> profile <ro |rw | admin>

Parameters: community name – a case-sensitive ASCII string (up to 50 characters in length) denoting the receive profile on the trap destination host. If unspecified, the default value is NULL.

profile – specifies the access profile for a community user.

ro – read-only access to non-privileged objects.

rw – read-write access to non-privileged objects.

admin – full read-write access to all objects.

Example:

```
Console> set snmpcommunity public profile ro
Console>
```

set snmpuser

Description: Set the name along with the authentication and privacy parameters for SNMPv3 access.

Syntax: set snmpuser <user name> auth <none | md5> [authpwd <auth password>] priv <none | des> [privpwd <priv password>] group <ro | rw | admin>

Parameters: user name – a case-sensitive ASCII string (up to 50 characters in length) denoting the user name that has SNMPv3 access to the device.

auth – identifies the authentication protocol.

none – No authentication is performed.

md5 – MD5 protocol is used to encrypt the authentication process. This option requires an authentication password.

auth password – a case-sensitive ASCII string (up to 50 characters in length) denoting the password associated with the user when MD5 authentication is specified.
priv – identifies the privacy protocol.
none – No privacy. Messages are not encryted.
des – Messages sent by the user are encrypted using the DES protocol. This option requires a privacy password.
priv password – a case-sensitive ASCII string (up to 50 characters in length) denoting the password associated with the user when the DES protocol is specified for encrypting messages.
group – specifies the access profile for the SNMPv3 user.
ro – read-only access to non-privileged objects.
rw – read-write access to non-privileged objects.
admin – full read-write access to all objects.

Example: Console> set snmpuser v3guest auth none priv none group ro
Console>

set snmpv1v2

Description: Enable or disable SNMPv1 and SNMPv2c access.
Syntax: set snmpv1v2 <enable | disable>
Parameters: enable – enable SNMPv1 and SNMPv2c access.
disable – disable SNMPv1 and SNMPv2c access.
Example: Console> set snmpv1v2 enable
Console>

set switch

Description: Specify the forwarding mode.
Syntax: set switch <Transparent | 802.1Q>
Parameters: Transparent – specifies transparent forwarding. The R821 is transparent to user data traffic.Tagged and untagged frames are forwarded unchanged.
802.1Q – specifies that the R821 complies with IEEE 802.1Q VLAN bridge forwarding aspects. For more information, refer to “IEEE 802.1Q Mode” on page 47.
Example: Console> set switch transparent
Console>

set systeminformation

Description: Set system information.
Syntax: set systeminformation <administrative> [name <system name>] [location <location name>] [contact <contact>]
Parameters: administrative – the administrative SNMP community string. The default is admin.
system name – a case-sensitive ASCII string (up to 50 characters in length) denoting the assigned adminis-

trative name. Multi-word strings must be placed in quotation marks. If unspecified, the default value is NULL.

location name – a case-sensitive ASCII string (up to 50 characters in length) denoting the assigned administrative location. Multi-word strings must be placed in quotation marks. If unspecified, the default value is NULL.

contact – a case-sensitive ASCII string (up to 50 characters in length) denoting the contact name. Multi-word strings must be placed in quotation marks. If unspecified, the default value is NULL.

Example: Console> set systeminformation admin name “A B” location 45

Console>

set trapcontrol

Description: Set trap handling for a specified trap on a per destination basis.

Syntax: set trapcontrol <trap index> host <IP address> state <disable | enable>

Parameters: trap index – trap number as defined in MIB-II.

IP address – trap destination host’s IP address in dotted decimal notation.

state – enable or disable the specified trap.

Example: Console> set trapcontrol 4 host 192.168.1.100 state enable
Console>

set trapdestination

Description: Set the destination and protocol information for a trap destination host. Up to four trap destinations may be configured.

Syntax: set trapdestination <IP address> [port <UDP port>] [version <SNMP version>] [community <trap community>] [username <SNMP security name>]

Parameters: IP address – trap destination’s IP address in dotted decimal notation.

UDP port – UDP transport port number in the range 1 to 65535. The default value is 162 for SNMP, and 9162 for management via NetBeacon.

SNMP version – SNMP version number: 1, 2, or 3. The default value is 1.

trap community – a case-sensitive ASCII string (up to 32 characters in length) denoting the receive profile on the trap destination host. The default value is public.

SNMP security name – a case-sensitive ASCII string (up to 32 characters in length) denoting the user name for SNMPv3 traps. The username is a required field for

SNMPv3 traps.

Example: Console> set trapdestination 192.168.1.100 port 9162 version 3 username v3user
Console>

set username

Description: Set the username, password, and access for user login.

Syntax: set username <user name> password <user password> access <user | admin | root>

Parameters: user name – a case-sensitive ASCII string up to 32 characters in length.
user password – a case-sensitive ASCII string up to 32 characters in length.
access – specifies the access level for a user login.
user – read-only access to non-privileged objects.
admin – read-write access to non-privileged objects.
root – full read-write access to all objects.

Example: Console> set username guest password guest access user
Console>

set uservlan

Description: Set the user VLAN ID on one or more ports. (The R821 requires both ports to be set to the same user VLAN(s).) The user VLAN ID must be different from any previously provisioned management VLAN ID(s). Up to 16 user VLAN IDs are supported.

Syntax: set uservlan <vlan id> port <port number[untag] ... [port number n]>

Parameters: vlan id – VLAN ID in the range 1 to 4094.
port number – the port number to which the user VLAN is assigned.
untag – remove the specified uservlan tag from frames that egress the access port. Untagging is not allowed on the trunk port. Untagging is only applicable in IEEE 802.1Q mode.

Example: Console> set uservlan 22 port 1untag 2
Console> set uservlan 23 port 1 2
Console>

Show Commands

show cablestatus

Description: Show results of the copper line quality test for copper port.
Syntax: show cablestatus <port number>
Parameters: port number – the actual port number.
Display Parameters: Good – no problems are detected on the copper cable.
Open – There is an open circuit along the copper cable.
Short – There is a short circuit along the copper cable.
Impedance Mismatch – There is an impedance mismatch along the copper cable.
Example:

```
Console> show cablestatus 1
Copper Pair 1....: Good
Copper Pair 2....: Cable Open @ 30 Meters
Console>
```

show console

Description: Show the attributes for the console port.
Syntax: show console
Display Parameters: Baud – speed of the console port in bits per second.
Data bits – Number of data bits per character.
Stop bits – Number of stop bits.
Parity – Number and type of parity. None is no parity bits; even is one bit with even parity. Odd is one bit with odd parity.
Timeout – Number of minutes of inactivity after which the console port will automatically log out.
Example:

```
Console> show console
  Baud     Data bits     Stop bits     Parity     Timeout
  9600         8             1          none         5

Console>
```

show dhcp

Description: Show the DHCP client's operational mode and operation parameters.
Syntax: show dhcp
Display Parameters: DHCP – identifies the operational mode.
disabled – DHCP client operation is disabled.
enabled – DHCP client operation is enabled.
Retries – specifies the number of address acquisition retries before reverting to using the last known valid IP address.
dhcp server – IP address of the current DHCP server.
Example:

```
Console> show dhcp
```

```
   DHCP Enabled
   Retries: 3
   DHCP Server: 192.168.1.100
Console>
```

show download

Description: Show addressing information relative to the download server used by the download command, along with the status of the current download.

Syntax: show download

Display Parameters: server – identifies IP address of the download host.
filename – identifies the name of the download file.
protocol – identifies the download protocol. The R821 only supports TFTP (Trivial File Transfer Protocol).
status – identifies the status of the current download. The status can be any of the following descriptions:
Transfer in progress
Transfer complete
Flash burn in progress
Flash burn complete
Transfer failed
Flash burn failed
Note: The “status” parameter will only displayed if software has been downloaded since the device was last reset or booted.

Example:

```
Console> show download
   server: 192.168.1.100
   filename: control.bin
   protocol: tftp
   status: Previous Flash burn completed successfully
Console>
```

show fpga

Description: Show the image number and revision of the active FPGA software.

Syntax: show fpga

Example:

```
Console> show fpga
   Active FPGA image number: 1
   Rev: 1.01.02
Console>
```

show icmp

Description: Show operational, processing mode for end-station ICMP messages.

Syntax: show icmp

Display Parameters: status – identifies the processing state of the end-station ICMP messages.

All Disabled – ICMP message processing is disabled.
All Enabled – ICMP message processing is enabled.
Broadcast Disabled – the processing of only unicast ICMP messages is enabled. The processing of ICMP messages sent to IP multicast, IP subnet broadcast, and IP limited broadcast addresses is disabled.

Example:
```
Console> show icmp
  status: All Enabled

Console>
```

show ip

Description: Show the device's IP address, corresponding network mask, and the default gateway IP address.

Syntax: show ip

Display Parameters: IP Address – identifies the end-station IP address.
IP Mask – identifies the end-station prefix (network mask).
Default Gateway – identifies the default route gateway IP address.

Example:
```
Console> show ip
  IP Address: 192.168.1.100
  IP Mask: 255.255.255.0
  Default Gateway: 192.168.1.254
Console>
```

show l2controlprotocol

Description: Show the disposition for Layer 2 protocols on one or more ports.

Syntax: show l2controlprotocol <stp | rstp | mstp | lacp | marker | 802.1X | bridge | garp | gvrp | gmrp | all> port <port number | all>

Parameters: 802.1X – IEEE 802.1X Port Authentication Protocol.
bridge – LAN Bridge Management Protocol.
garp – IEEE 802 Group Attribute Registration Protocol.
gmrp – IEEE 802 GARP Multicast Registration Protocol.
gvrp – IEEE 802 GARP VLAN Registration Protocol.
lacp – IEEE 802.3ad Link Aggregation Protocol.
marker – IEEE 802.3ad Marker Protocol.
mstp – IEEE 802.1 Multiple Spanning Tree Protocol.
rstp – IEEE 802.1 Rapid Spanning Tree Protocol.
stp – IEEE 802.1 Spanning Tree Protocol, including Rapid and Multiple Spanning Tree Protocols.
port number – the actual port number.
all – all three ports.

Display Parameters: Discard – specified protocol is being discarded (filtered).
Forward – specified protocol is being forwarded, based on forwarding rules and policies.

Peer – specified protocol is being accepted for end-station processing.

Example:
```
Console> show l2controlprotocol bridge port 2
Port 0:
   bridge: Forward
Port 1:
   bridge: Forward
Port 2:
   bridge: Forward
Console>
```

show l3capability

Description: Show the device's management capability to receive/transmit IP packets.

Syntax: show l3capability

Example:
```
Console> show l3capability
   L3 Capability Enabled
Console>
```

show logicalservices loopback

Description: Show the configuration and statistics for Logical Services Loopback (LSL).

Syntax: show logicalservicesloopback

Display Parameters: State – specifies the LSL state (enabled or disabled). If enabled, the state will specify the type of frames that have been configured for looping. (i.e., unicast frames, multicast frames, or all frames).

Unicast MAC Address – specifies the unicast MAC address hat is used for LSL.

Multicast MAC Address – specifies the multicast MAC address that is used for LSL.

Total frames looped – specifies the total number of unicast and multicast frames that have been looped.

Example:
```
Console> show logicalservicesloopback
   State . . . . . . . . . . . . . . . . . . : disabled
   Unicast MAC Address . . . . . : 00:40:9f:18:1f:6e
   Multicast MAC Address . . . . : 00:00:00:00:00:00
   Total frames looped . . . . . . . . : 0
Console>
```

show mgmtvlan

Description: Show the management VLAN ID (1-4094) for both ports, if it has been assigned.

Syntax: show mgmtvlan

Example:
```
Console> show mgmtvlan
   Management Disabled
Console>
```

show oamcontrol

Description: Show the primary controls and status for the 802.3ah OAM capabilities for the specified port or all ports.

Syntax: show oamcontrol <port number | all>

Parameters: port number – the actual port number.
all – specifies all ports.

Display Parameters: Admin State – indicates the desired administrative OAM state for the specified port.
DISABLED – OAM is in disabled.
ENABLED – OAM is in enabled.

Note: The Admin State is ignored when the port is not in full-duplex mode. OAM is not supported on half-duplex links.

Operational Status – identifies the OAM capability determined during initialization between the specified port and its peer, which is the remote port on the opposite end of the link.
DISABLED – OAM is disabled administratively on the specified port.
LINK FAULT – The port has detected a fault and is transmitting OAMPDUs with a link fault indication.
PASSIVE WAIT – The port is in passive OAM mode and is waiting to see if the remote port is capable of OAM.
ACTIVE SEND LOCAL – The port is in active OAM mode and is trying to discover whether the remote port has OAM capability but has not yet made that determination.
SEND LOCAL AND REMOTE – The port has discovered its peer, but has not yet accepted or rejected the peer's configuration.
SEND LOCAL AND REMOTE OK – The port has accepted OAM peering with the remote port.
OAM PEERING LOCALLY REJECTED – The port has rejected OAM peering with the remote port.
OAM PEERING REMOTELY REJECTED – The remote port has rejected OAM peering.
OPERATIONAL – Both the port and the remote port have accepted peering.

Mode – identifies the mode of OAM operation for the port.
PASSIVE – Port waits for the remote port to initiate OAM actions with it, but cannot initiate actions itself.
ACTIVE – The port can initiate monitoring activities with the remote port.

Max PDU Size – indicates largest OAMPDU that the port supports. The port exchanges maximum OAMPDU sizes with its peer, and both ports negotiate to use

the smaller of the two maximum sizes between them.

Config Revision – indicates the configuration revision of the port as reflected in the latest OAMPDU sent by the port. The configuration revision is used to indicate configuration changes that have occurred which might require the remote port to re-evaluate whether peering is allowed.

Supported Functions– identifies OAM functions supported by the port. One or more of the following functions may be supported: UNIDIRECTIONAL, LOOPBACK, EVENT, VARIABLE.

Vendor Specific Info– indicates whether or not the services line card is under the control of a management card. Proxy Managed – The services line card is installed in a chassis with a management card and is under its control.
None – The services line card is not being managed by a management card (e.g., it is a standalone NID).

Example:

```
Console> show oamcontrol 2
Port 2 Information:
   Admin State . . . . . : ENABLED (2)
   Operational Status  . . . . : ACTIVE SEND LOCAL (4)
   Mode. . . . . : ACTIVE (1)
   Max PDU Size . . . . . : 1518
   Config Revision . . . . . : 2
   Supported Functions. . . : LOOPBACK
                              EVENT
   Vendor Specific Info . . . : Proxy Managed
Console>
```

show oameventlog

Description: Show a history of events that have occurred at the Ethernet OAM level. These events can be detected locally or remotely. Ethernet OAM events can be signaled by Event Notification OAMPDUs or by the flags field in any OAMPDU. The R821 stores up to 40 event log entries.

Syntax: show oameventlog <port number | all>

Parameters: port number – the actual port number.
all – specifies all ports.

Display Parameters: Timestamp – The R821's system uptime value when the event occurred.

OUI – The Organizational Unique Identifier. Excluding event TLVs that are unique to an organization, all IEEE 802.3 events use the OUI of 0180C2. Organizations that define their own event notification TLVs include their OUI in the TLVs which gets reflected here.

Type – The type of event that generated this entry in the

event log. When the OUI is 0180C2, the following event types are defined:

- Errored Symbol Event
- Errored Frame Period Event
- Errored Frame Event
- Errored Frame Seconds Event
- Link Fault Event
- Dying Gasp Event
- Critical Link Event

The first four types are threshold crossing events which are generated when a metric exceeds a given value within a specified window. The other three types are not threshold crossing events.

Location – Indicates whether the event occurred locally, or was received from the OAM peer via Ethernet OAM.

Window – For a threshold crossing event, the period over which the value was measured for the event (e.g.: 5, when 11 occurrences happened in 5 seconds while the threshold was 10).

Threshold– For a threshold crossing event, the limit that was crossed for the event to be logged (e.g.: 10, when 11 occurrences happened in 5 seconds while the threshold was 10).

Value – For a threshold crossing event, this indicates the number of occurrences within the given window that generated this event (e.g.: 11, when 11 occurrences happened in 5 seconds while the threshold was 10).

Running Total – The total number of times this occurrence has happened since the last reset (e.g.: 987, when 987 symbol errors resulted in 18 symbol error threshold crossing events since the last reset).

Event Total – The total number of times one or more of these occurrences resulted in an event since the last reset (e.g.: 18, when 987 symbol errors resulted in 18 symbol error threshold crossing events since the last reset).

Example:

```
Console> show oameventlog all

Port 1:

Port 2:
   Timestamp: 0 days 0h:0 m:19.93s
   OUI: 01 80 c2 Type: Link Fault Event Location: Local
   Window: none Threshold: none Value: none
   Running Total: 1 Event Total: 1

Console>
```

show oamevents

Description: Show the windows, thresholds, and notification states for generating standard Ethernet OAM events for the specified port(s).

Syntax: show oamevents <port number | all>

Parameters: port number – the actual port number.
all – specifies all ports.

Display Parameters:

Error Symbol Period Window – The number of symbols (***N***) over which the threshold is defined.

Error Symbol Period Threshold – The number of symbol errors (***n***) that must occur for the Errored Symbol Period Event to be triggered. If ***n*** out of ***N*** symbols had errors, an Errored Symbol Period Event notification OAMPDU will be generated.

Error Symbol Period Notify – Indicates whether generating an event notification is enabled or disabled for Errored Symbol Period events.

Error Frame Period Window – The number of frames (***N***) over which the threshold is defined.

Error Frame Period Threshold – The number of frame errors (***n***) that must occur for the Errored Frame Period Event to be triggered. If ***n*** out of ***N*** frames had errors, an Errored Frame Period Event notification OAMPDU will be generated.

Error Frame Period Notify – Indicates whether generating an event notification is enabled or disabled for Errored Frame Period events.

Error Frame Window – The amount of time (***T***), in 100 ms increments, over which the threshold is defined.

Error Frame Threshold – The number of frame errors (***n***) that must occur for the Errored Frame Event to be triggered. If ***n*** frames in ***T*** (in tenths of a second) had errors, an Errored Frame Event notification OAMPDU will be generated.

Error Frame Notify – Indicates whether generating an event notification is enabled or disabled for Errored Frame events.

Error Frame Seconds Summary Window – The amount of time (***T***), in 100 ms increments, over which the threshold is defined.

Error Frame Seconds Summary Threshold – The number of errored frame seconds (***n***) that must occur for the Errored Frame Seconds Summary Event to be triggered. If ***n*** frame errors occur in ***T*** (in tenths of a second), an Errored Frame Seconds Summary Event notification OAMPDU will be generated.

Error Frame Seconds Summary Notify – Indicates whether

generating an event notification is enabled or disabled for Errored Frame Seconds Summary events.

Example:
```
Console> show oamevents 2
Port 2
Error Symbol Period Window. . . . . : 0
Error Symbol Period Threshold . . . . . : 0
Error Symbol Period Notify . . . . . : DISABLED
Error Frame Period Window. . . . . : 1488095
Error Frame Period Threshold . . . . . : 1
Error Frame Period Notify . . . . . : ENABLED
Error Frame Window . . . . . : 100
Error Frame Threshold . . . . . : 1
Error Frame Notify . . . . . : ENABLED
Error Frame Seconds Summary Window . . . : 60
Error Frame Seconds Summary Threshold. . : 2
Error Frame Seconds Summary Notify . . . . : ENABLED
Console>
```

show oamloopback

Description: Show the loopback state for the specified port(s).
Syntax: show oamloopback <port number | all>
Parameters: port number – the actual port number.
all – specifies all ports.

Display Parameters: Loopback Status – indicates the loopback state of the specified port.
NO LOOPBACK – Normal operation with no loopback in progress.
INITIATING LOOPBACK – The local device has sent a loopback request to the remote unit and is waiting for a response.
REMOTE LOOPBACK – The remote unit has responded to the local device and indicated that it is in loopback mode.
TERMINATING LOOPBACK – The local device is in the process of ending the remote loopback.
LOCAL LOOPBACK – The remote unit has put the local device in loopback mode.
UNKNOWN – The local and remote parsers and multiplexers are in an unexpected combination.

Local PARSER – State of the parser on the local R821.
FORWARD – Normal state.
LOOPBACK – Traffic is being looped by the local R821.
DISCARD – Traffic is being looped by the remote R821.

Local MUX – State of the multiplexer on the local R821.

FORWARD – Normal state.
DISCARD – Transitioning into or out of a loopback state.

Remote PARSER – State of the parser on the remote R821.
FORWARD – Normal state.
LOOPBACK – Traffic is being looped by the remote R821.
DISCARD – Traffic is being looped by the local R821.

Remote MUX – Multiplexer's state on the remote R821.
FORWARD – Normal state.
DISCARD – Transitioning into or out of a loopback state.

Received Loopback Status – indicates what the port will do when it receives incoming loopback requests.
PROCESS – Process loopback requests.
IGNORE – Drop loopback requests.

Example:
```
Console> show oamloopback 2
Port 2 Information:
   Loopback Status . . . . . . . . . . . . . : NO LOOPBACK
   Local PARSER . . . . . . . . . . . . . . . : FORWARD
   Local MULTIPLEXER. . . . . . . . . . . . : FORWARD
   Remote PARSER . . . . . . . . . . . . . . : FORWARD
   Remote MULTIPLEXER . . . . . . . . . . : FORWARD
   Received Loopback Commands . . : IGNORE
Console>
```

show oampeer

Description: Show information about the OAM peer for the specified port(s).

Syntax: show oampeer <port number | all>

Parameters: port number – the actual port number.
all – specifies all ports.

Display Parameters: MAC Address – identifies the MAC address of the remote port. The MAC address is derived from the most recently received request.

OUI – identifies the remote port's Organizational Unique Identifier (OUI). The OUI can be used for identifying the vendor of the remote device.

Vendor Info – indicates the vendor information of the remote port as reflected in the latest Information OAMPDU received.

Mode – identifies the mode of OAM operation for the remote port.
PASSIVE – Remote port waits for the local port to initiate OAM actions.

ACTIVE – The remote port can initiate monitoring activities with the local port.

Max PDU Size – indicates largest OAMPDU that the remote port supports. The remote port exchanges maximum OAMPDU sizes with the local port, and both ports negotiate to use the smaller of the two maximum sizes between them.

Config Revision – indicates the configuration revision of the remote port as reflected in the latest OAMPDU sent by the remote port. The configuration revision is used to indicate configuration changes that have occurred which might require the local port to re-evaluate whether peering is allowed.

Supported Functions– identifies OAM functions supported by the remote port. One or more of the following functions may be supported:
UNIDIRECTIONAL
LOOPBACK
EVENT
VARIABLE

Example:

```
Console> show oampeer 2
Port 2 Peer Information:
   MAC Address . . . . . : 00:00:00:00:00:00
   OUI. . . . . : 0 40 9f
   Vendor Info. . . . . : None
   Mode. . . . . : ACTIVE
   Max PDU Size . . . . . : 1518
   Config Revision . . . . . : 1
   Supported Functions. . . : LOOPBACK
                              EVENT
Console>
```

show oamstatistics

Description: Show show OAM statistics for the specified port (s).
Syntax: show oamstatistics <port number | all>
Parameters: port number – the actual port number.
all – specifies all ports.
Example:

```
Console> show oamstatistics 1
Port 1 Information:
PDU Received: 0                    PDU Transmitted: 98
Information Rcv'd: 0               Information Transmitted: 98
Unique Event Notification Rcv'd: 0 Unique Event Notification Transmitted: 0
Duplicate Event Notification Rcv'd: 0 Duplicate Event Notification Transmitted: 0
Loopback Control Rcv'd: 0          Loopback Control Transmitted: 0
Variable Requests Rcv'd: 0         Variable Requests Transmitted: 0
Variable Responses Rcv'd: 0        Variable Responses Transmitted: 0
Org Specific Rcv'd: 0              Org Specific Transmitted: 0
Unsupported Codes Rcv'd: 0         Unsupported Codes Transmitted: 0
```

```
Dropped Events: 0
Console>
```

show os

Description: Show the image number and revision of the active operating system.
Syntax: show os
Example:
```
Console> show os
   Active OS image number: 1
OS version 1.4.0 Aug 04 2005 13:58:50
Console>
```

show port

Description: Show attributes for a selected port or all ports.
Syntax: show port <port number | all>
Parameters: port number – the actual port number.
all – specifies all ports.

Display Parameters: Port Type – identifies the Ethernet media designation for the specified port.
- 100BASE-X – 100 Mbps fiber optic.
- 10/100BASE-T – 4 pairs Category 5 UTP.

Connector Type – identifies the connector type for the specified port.
- RJ45 – RJ-45 connector.
- SFP – Small Form-Factor Pluggable transceiver with an LC or SC connector. For the SFP transceiver, the following parameters are also displayed:
  - SFP Manufacturer – manufacturer's name
  - SFP Part Number – part number assigned by the manufacturer
  - SFP Serial Number – serial number assigned by the manufacturer
  - SFP Wavelength – wavelength in nanometers
  - SFP Link Length – maximum distance (in meters) supported by the transceiver
  - SFP Diagnostics – indicates whether or not the SFP supports diagnostics

MAC Address – identifies the MAC address assigned to the specified port.

The "Port AN" through "Port FEF" parameters display the administrative settings. If the operational value differs from the administrative value, the operational value will be shown in parentheses (). The administrative and operational values could differ because the setting was changed but it has not taken effect yet, or because the setting is not applicable in a particular mode. For the Port State, the link status is always displayed in parentheses.

Port AN– indicates the auto-negotiation status for the specified port.
DISABLED – auto-negotiation is disabled.
ENABLED – auto-negotiation is enabled.

Port Duplex – indicates the duplex mode for the specified port.
FULL – full-duplex mode.
HALF – half-duplex mode.

Port Flow Control – indicates flow control status for the specified port. PAUSE frames are used on full-duplex ports, whereas collisions are forced on half-duplex ports.
DISABLED – flow control is disabled.
ENABLED – flow control is enabled.

Port Management – indicates management access over specified port.
DISABLED – management access is disabled.
ENABLED – management access is enabled.

Port Speed – indicates the speed of the specified port: 10 Mbps, 100 Mbps, or 1000 Mbps.

Port State – indicates the administrative state of the specified port.
DISABLED – port is in disabled.
ENABLED – port is in enabled.
TESTING – port is in test mode.
The operational state of the specified port is displayed in parentheses ().
LINK UP – a valid link is detected at the port.
LINK DOWN – no link is detected at the port.

Port LLCF – identifies LLCF state for the specified port.
DISABLED – LLCF is disabled.
ENABLED – LLCF is enabled.

Port LLR – identifies LLR state for the specified port.
DISABLED – LLR is disabled.
ENABLED – LLR is enabled.

Port FEF – identifies FEF state for the specified port.
DISABLED – FEF is disabled.
ENABLED – FEF is enabled.

Temperature – indicates the temperature of the specified port (fiber only) in degrees Celsius and Fahrenheit.
Current – the current temperature sensor reading.
Min – the lowest temperature at which the SFP can continue to operate properly.
Max – the highest temperature at which the SFP can continue to operate properly.

Transmit Power – indicates the transmit power of the specified port (fiber only) in dBm.

Current – the current transmitter sensor reading.
Min – the lowest power at which the SFP can continue to operate properly.
Max – the highest power at which the SFP can continue to operate properly.

Receive Power – indicates the receive power of the specified port (fiber only) in dBm.
Current – the current receiver sensor reading.
Min – the lowest power at which the SFP can continue to operate properly.
Max – the highest power at which the SFP can continue to operate properly.

Example:

```
Console> show port 2
Port 2 Information:
   Port Type . . . . . : 100BASE-X
   Connector Type . . . . . : SFP – LC
      SFP Manufacturer . . : Infineon AG
      SFP Part Number  . . : V23848-M305-C56
      SFP Serial Number . . : 30010074
      SFP Wavelength  . . . . : 850 nm
      SFP Link Length . . . . : 300 m
      SFP Diagnostics  . . . . : Internally Calibrated
   MAC Address . . . . . : 40:40:9f:18:17:e5
   Port AN . . . . . : ENABLED
   Port Duplex . . . . . : FULL
   Port Flow Control . . . . . : DISABLED
   Port Management  . . . . . : ENABLED
   Port Speed . . . . . : 100 Mbps
   Port State . . . . . : ENABLED (LINK DOWN)
   Port LLCF . . . . . : DISABLED
   Port LLR . . . . . : DISABLED
   Port FEF  . . . . . : DISABLED
Temperature (Celsius)   : Current: 43   Min: -45   Max: 105   (IN RANGE)
Temperature (Fahrenheit): Current: 109  Min: -49   Max: 221   (IN RANGE)
Transmit Power (dBm)  : Current: -6     Min: -9    Max: 0     (IN RANGE)
Receive Power (dBm)   : Current: -35    Min: -20   Max: 0     **OUT OF
RANGE**
Console>
```

show portstatistics

Description: Show MIB-II interface statistics for one port or all three ports.

Syntax: show portstatistics <port number | all>

Parameters: port number – the actual port number.
all – specifies all ports.

Display Parameters: Octets Received – number of octets received.
Unicast Packets Rcv'd – number of unicast packets received.
Broadcast Packets Rcv'd – number of broadcast packets

received.
Multicast Packets Rcv'd – number of multicast packets received.
Rcv'd Packets Dropped – number of received packets that were discarded during reception.
Error Packets Rcv'd – number of packets received with errors.
Octets Transmitted – number of octets transmitted.
Unicast Packets Transmitted – number of unicast packets transmitted.
Broadcast Packets Transmitted – number of broadcast packets transmitted.
Multicast Packets Transmitted – number of multicast packets transmitted.
Transmitted Packets Dropped – number of received packets that were discarded during transmission.
Error Packets Transmitted – number of packets dropped due to transmission errors.

Example:

```
Console> show portstatistics 1
Port: 1
Octets Received: 294583          Octets Transmitted: 59309
Unicast Packets Rcv'd: 855       Unicast Packets Transmitted: 661
Broadcast Packets Rcv'd: 2109    Broadcast Packets Transmitted: 2
Multicast Packets Rcv'd: 166     Multicast Packets Transmitted: 0
Rcv'd Packets Dropped: 0         Transmitted Packets Dropped: 0
Error Packets Rcv'd: 0           Error Packets Transmitted: 0
Console>
```

show pvid

Description: Show each port VLAN identifier and indicate which port is the access port and which one is the trunk port.
Note: If the operational PVID value differs from the administrative value, the operational value will be shown in parentheses (). The administrative and operational values could differ because the setting was changed but it has not taken effect yet.

Syntax: show pvid

Example:

```
Console> show pvid

  Port 1 VID . . . . . . . . . . . . . . . : 1 (Access)
  Port 2 VID . . . . . . . . . . . . . . . : 1 (Trunk)

Console>
```

show radius

Description: Show the RADIUS configuration parameters.
Syntax: show radius
Display Parameters: RADIUS Server – IP address of the RADIUS server.
Port – UDP port number.
Status – indicates if the server is the primary RADIUS server.
Authentication Status – identifies the RADIUS authentication mode (either enabled or disabled) for the connected console port and telnet.
RADIUS Retransmissions – Maximum number of transmission retries to a RADIUS server.
RADIUS Timeout – Number of seconds to wait between attempts to authenticate with a RADIUS server.
Example:

```
Console> show radius
  RADIUS Server       Port                Status
  ------------------- ------------------- -------------------
  192.168.1.200       1812                Primary
  192.168.1.100       1812

  Authentication Status
  ---------------------------------------------------------------------------
  Console Disabled    Telnet Disabled

  RADIUS Retransmissions:   2
  RADIUS Timeout:           5
Console>
```

show ratelimit

Description: Show the rate limit settings for the selected port(s).
Syntax: show ratelimit <port number | all>
Parameters: port number – the actual port number.
all – specifies all ports.
Display Parameters: Octets Received – number of octets received.
Packets Rcv'd – number of packets received.
Example:

```
Console> show ratelimit all
Port 1 : ENABLED 8 Mbps (8 Mbps)
Port 2 : DISABLED 100 Mbps (100 Mbps)
Console>
```

show rmonportstatistics

Description: Show the RMON Group 1 statistics for the selected port(s).
Syntax: show rmonportstatistics <port number | all>
Parameters: port number – the actual port number.
all – specifies all ports.
Display Parameters: Octets Received – number of octets received.

Packets Rcv'd – number of packets received.
Broadcast Packets Rcv'd – number of broadcast packets received.
Multicast Packets Rcv'd – number of multicast packets received.
CRC Alignment Errors – number of CRC alignment errors due to received traffic.
Fragments – number of fragments received.
Undersize Packets Rcv'd – number of under-sized packets received.
Oversize Packets Rcv'd – number of over-sized packets received.
Jabbers Rcv'd – number of jabbers identified from received traffic.
Collisions – number of collisions encountered during transmission.
Size 64 Packets – number of packets (64 octets in length) received.
Size 65 - 127 Packets – number of packets (65 to 127 octets in length) received.
Size 128 - 255 Packets – number of packets (128 to 255 octets in length) received.
Size 256 - 511 Packets – number of packets (256 to 511 octets in length) received.
Size 512 - 1023 Packets – number of packets (512 to 1023 octets in length) received.
Size 1024 - 1518 Packets – number of packets (1024 to 1518 octets in length) received.
Dropped Events – number of events where traffic was dropped either during reception or transmission.

Example:

```
Console> show rmonportstatistics 2
Port: 2
Octets Received: 37706          Packets Rcv'd: 35625
Broadcast Packets Rcv'd: 87     Multicast Packets Rcv'd: 255
CRC Alignment Errors: 0         Fragments Rcv'd: 14
Undersize Packets Rcv'd: 0      Oversize Packets Rcv'd: 0
Jabbers Rcv'd: 0                Collisions: 0
Size 64 Packets: 0              Size 65 - 127 Packets: 0
Size 128 - 255 Packets: 0       Size 256 - 511 Packets: 0
Size 512 - 1023 Packets: 0      Size 1024 - 1518 Packets: 0
Dropped Events: 0
```

show sensors

Description: Show all sensor readings for the main circuit board (module) and the fiber port, and indicate whether the reading is within range for proper operation. Also indicate the highest and lowest values at which the component can operate properly (warning thresholds).

Syntax: show sensors
Display Parameters: Temperature – indicates the current, minimum, and maximum temperature reading (in degrees Celsius and Fahrenheit) of the device or port.
1.5 Volt – indicates the current, minimum, and maximum voltage reading (in millivolts) of the device's 1.5-volt supply.
2.5 Volt – indicates the current, minimum, and maximum voltage reading (in millivolts) of the device's 2.5-volt supply.
3.3 Volt – indicates the current, minimum, and maximum voltage reading (in millivolts) of the device's 3.3-volt supply.
5.0 Volt – indicates the current, minimum, and maximum voltage reading (in millivolts) of the device's 5.0-volt supply.
Transmit Power – indicates the current, minimum, and maximum reading (in dBm) of the SFP transmitter.
Receive Power – indicates the current, minimum, and maximum reading (in dBm) of the SFP receiver.
Example:

```
Console> show sensors
Module Information:
Temperature (Celsius) : Current: 48   Min: 20    Max: 70    (IN RANGE)
Temperature (Fahrenheit): Current: 118  Min: 68    Max: 157   (IN RANGE)
1.5 Volt (Millivolts)   : Current: 1540  Min: 1420  Max: 1580  (IN RANGE)
2.5 Volt (Millivolts)   : Current: 2475  Min: 2375  Max: 2612  (IN RANGE)
3.3 Volt (Millivolts)   : Current: 3250  Min: 3135  Max: 3448  (IN RANGE)
5.0 Volt (Millivolts)   : Current: 4925  Min: 4750  Max: 5250  (IN RANGE)

Port 2 Information:
Temperature (Celsius) : Current: 43   Min: -45   Max: 105   (IN RANGE)
Temperature (Fahrenheit): Current: 109  Min: -49   Max: 221   (IN RANGE)
Transmit Power (dBm): Current: -6   Min: -9    Max: 0     (IN RANGE)
Receive Power (dBm) : Current: -15  Min: -20   Max: 0     (IN RANGE)
Console>
```

show serviceclasses

Description: Show the current service class profiles and settings, including the queue associated with each bit value.
Syntax: show serviceclasses
Parameters: Precedence – specifies the type of forwarding that will have precedence if two modes are enabled simultaneously.
Priority Bits Settings – the model currently configured for p-bits.
Example:

```
Console> show serviceclasses

Precedence . . . . . : DSCP Freeform Forwarding
```

```
000000: 0   000001: 0   000010: 0   000011: 0
000100: 0   000101: 0   000110: 0   000111: 0
001000: 0   001001: 0   001010: 0   001011: 0
001100: 0   001101: 0   001110: 0   001111: 0
010000: 1   010001: 1   010010: 1   010011: 1
010100: 1   010101: 1   010110: 1   010111: 1
011000: 1   011001: 1   011010: 1   011011: 1
011100: 1   011101: 1   011110: 1   011111: 1
100000: 2   100001: 2   100010: 2   100011: 2
100100: 2   100101: 2   100110: 2   100111: 2
101000: 2   101001: 2   101010: 2   101011: 2
101100: 2   101101: 2   101110: 2   101111: 2
110000: 3   110001: 3   110010: 3   110011: 3
110100: 3   110101: 3   110110: 3   110111: 3
111000: 3   111001: 3   111010: 3   111011: 3
111100: 3   111101: 3   111110: 3   111111: 2

Priority Bits Settings: Freeform
000: 3   001: 0   010: 1   011: 1
100: 2   101: 2   110: 3   111: 3

Console>
```

show snmpcommunity

Description: Show SNMP community string for the specified access profile.
Syntax: show snmpcommunity <ro | rw| admin | all>
Parameters: ro – read-only access to non-privileged objects.
rw – read-write access to non-privileged objects.
admin – full read-write access to all objects.
all – identifies all configured communities.
Example:

```
Console> show snmpcommunity ro
   Read-Only: public
Console> show snmpcommunity all
   Read-Only: public
   Read-Write: private
   Admin: admin
Console>
```

show snmpuser

Description: Display the user names for SNMPv3 access.
Syntax: show snmpuser
Display Parameters: User name – identifies the user name that has SNMPv3 access to the device.
Auth protocol – identifies the authentication protcol: MD5 or no authentication.
Priv protocol – identifies the privacy protcol: DES or no privacy.

Group – identifies the access profile for the SNMPv3 user.
ro – read-only access to non-privileged objects.
rw – read-write access to non-privileged objects.
admin – full read-write access to all objects.

Example: Console> show snmpuser

User name	Auth Protocol	Priv Protocol	Group
v3user	MD5	DES	rw

Console>

show snmpv1v2

Description: Display the SNMPv1 and SNMPv2c access state.
Syntax: show snmpv1v2
Display Parameters: enabled – SNMPv1 and SNMPv2c access is enabled.
disabled – SNMPv1 and SNMPv2c access is disabled.
Example: Console> show snmpv1v2

SNMPv1/v2c access: enabled

Console>

show switch

Description: Display the switch forwarding mode and all configured VLANs. Identify the access port and the trunk port, and display the default port priority.
Syntax: show switch
Example: Console> show switch

Switch Forwarding mode . . . . . : Transparent
QinQ Mode. . . . . : Disabled
Management VLAN . . . . . : 0
Port 1 VID / Priority . . . . . : 1 / 0 (Access)
Port 2 VID / Priority . . . . . : 1 / 0 (Trunk)

User VLAN. . . . . : 3
Console>

show systeminfo

Description: Show MIB-II system group information.
Syntax: show systeminfo
Display Parameters: System Name – identifies the MIB-II sysName object.
System Location – identifies the MIB-II sysLocation object.
System Contact – identifies the MIB-II sysContact object.
System Up Time – the length of time the device has been running since the last reset.

Hardware Revision – the hardware version of the line card.
OS1 Revision – the version of the operating system stored in the first flash image.
OS2 Revision – the version of the operating system stored in the second flash image.
FPGA1 Revision – the version of the FPGA firmware stored in the first flash image.
FPGA2 Revision – the version of the FPGA firmware stored in the second flash image.
Serial Number – the line card's serial number.

Example:
```
Console> show systeminfo
  METRObility R821 Fast-E Services Line Card
  System Name: Metro_R821_NID
  System Location: Merrimack, NH
  System Contact: E V Jones
  System Up Time: 6 days 19h:6m:51.46s
  Hardware Revision: A
  OS1 Revision: 1.2.0
  OS2 Revision: 1.4.0 Aug 15 2005 09:34:56 (Currently running)
  FPGA1 Revision: 1.0.0
  FPGA2 Revision: 1.1.0 (Currently running)
  Serial Number: Q102030404
Console>
```

show trapcontrol

Description: Show trap handling for the configured traps on a per destination basis.
Syntax: Show trapcontrol <trap index | all>
Parameters: trap index – trap number.
all – identifies all configured traps.
Display Parameters: Host – identifies the trap destination IP address.
state – identifies the operational state (disabled or enabled) for the specified trap.

Example:
```
Console> show trapcontrol 5
Hosts:  192.168.1.100   192.168.1.101  192.168.1.102   192.168.1.103
--------------------------------------------------------------------------------
Index 5:  Enabled       Enabled        Disabled        Enabled
Console>
```

show trapdestinations

Description: Show information for any configured trap destinations.
Syntax: show trapdestinations
Display Parameters: IP Address – IP address of the trap destination.
UDP Port – identifies the User Datagram Protocol port.
Version – identifies the SNMP version number.
Community – identifies the trap community.

Note: This parameter is displayed only when viewed by a root user.

Username – identifies the SNMPv3 security name.

Note: This parameter is displayed only when viewed by a root user.

Example:

```
Console> show trapdestinations
IP Address      UDP Port  Version    Community     Username
--------------- --------- ---------- ------------- -------------
192.168.1.100   162       1          public
192.168.1.101   162       3          public        v3admin
192.168.1.102   162       3          public        v3guest
192.168.1.103   162       1          public
Console>
```

show usernames

Description: Show all configured login usernames and their corresponding access levels.

Syntax: show usernames

Example:

```
Console> show usernames
Username                  Access level
------------              ---------------
root                      root
admin                     admin
user                      user
Console>
```

show uservlan

Description: Show one or all user VLAN IDs and the port(s) associated with each VLAN.

Syntax: show uservlan <vlan id | all>

Parameters: vlan id – a value in the range 1 to 4094.
all – show all VLAN IDs.

Display Parameters: Member Ports – identifies the port(s) on which the user VLAN is assigned. The letter “u” next to the port number indicates the port is untagged.

Example:

```
Console> show uservlan 2020
VLAN ID: 2020          Member Ports:  1u  2
Console>
```

Chapter 5: User Guide

This chapter contains information about the operating features of the Radiance 10/100 Mbps services line card.

LED Indicators

The Radiance services line card provides several LEDs on the front panel for the visible verification of unit status and proper functionality. These LEDs can help with troubleshooting and overall network diagnosis and management. There are separate receive (RX) and link (LK) indicators for each port. The following table describes the meaning of each LED when lit.

Table 5: LED Indicators

LED Label	LED Name	Color (Status)	Indication
MAN	Managed	Green (steady)	Unit is receiving management activity.
FD	Full Duplex	Green (steady)	Copper port is operating at full duplex.
		OFF	Copper port is operating at half duplex.
PWR	Power	Green (steady)	Unit is powered ON.
RX	Receive	Green (blinking)	Port is receiving data.
LK	Link	Green (steady)	Port has a valid link.
SPD	Speed	Green (steady)	Copper port is running at 100 Mbps/
		OFF	Copper port is running at 10 Mbps/
LBK	Loopback	Green (steady)	Unit is in loopback mode.
		Green (blinking)	The unit has successfully reset itself to its default settings. The DIS LED will also be blinking. Only applicable when resetting the board by using the jumper.
		OFF	Normal operation.
DIS	Disable	Green (steady)	One of the ports is disabled for management.
		Green (blinking)	The unit has successfully reset itself to its default settings. The LBK LED will also be blinking. Only applicable when resetting the board by using the jumper.
		OFF	Normal operation.

Default Hardware Switch Settings

All hardware switches can be overridden through software commands. The card's default settings are listed below.

Auto-Negotiation . . . . . Enabled (UP)

Speed . . . . . 100 Mbps (UP)

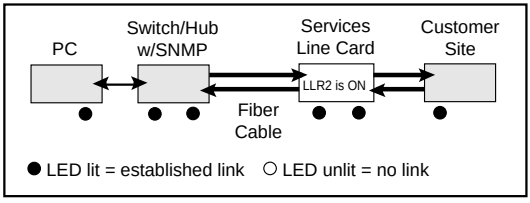
Duplex. . . . . Full (UP)

Link Loss Return (LLR)

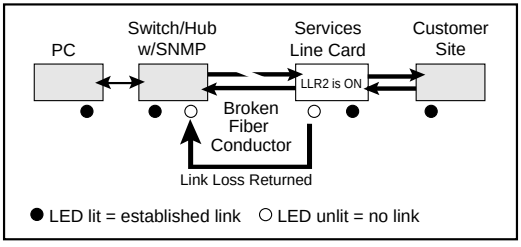
The fiber optic port (Port 2) of the R821 services line card has been designed with LLR[6] to assist in troubleshooting.

When LLR is enabled, the fiber port's transmitter shuts down if its receiver fails to detect a valid receive link. The transmitter will remain off except to periodically transmit heartbeat pulses. Every second, the transmitter will attempt to establish link for 100 ms.

The diagram below shows a typical network configuration with good link status using a services line card for remote connectivity. LLR is enabled on Port 2.



If one of the fiber cables is bad (as shown in the diagram box below), the R821 will return a no link condition to its link partner. This helps the network administrator in determining the source of the loss.

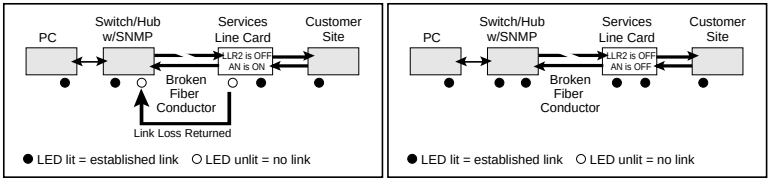


6.Link Loss Return is disabled by default.

If LLR is disabled and the fiber port's receiver loses link, the port's transmitter behavior will depend on the auto-negotiation setting. If auto-negotiation is enabled, the transmitter will shut down. If auto-negotiation is disabled, the transmitter will continue to stay up. The following table describes the transmitter's response when the port stops detecting link, based on the LLR and auto-negotiation settings.

Table 6: Transmitter Behavior When Port Loses Link

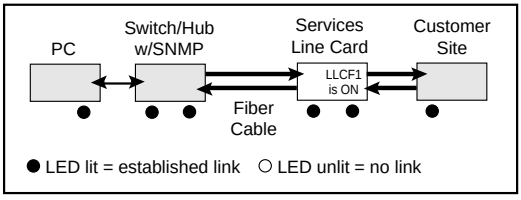
LLR	Auto-Negotiation	Fiber Transmitter
Disabled	Enabled	Off
Disabled	Disabled	On



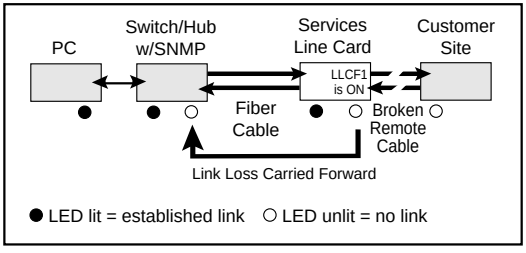
Link Loss Carry Forward (LLCF)

The R821 incorporates LLCF as an aid in troubleshooting a remote connection. Through software, LLCF can be disabled or enabled independently on each port.

The diagram below shows a typical network configuration with good link status using a services line card for remote connectivity. LLCF is enabled on Port 1.



If the remote cable breaks or fails, the R821 carries that link loss forward to the switch/hub which generates a trap to the management station. The administrator can then determine the source of the problem.



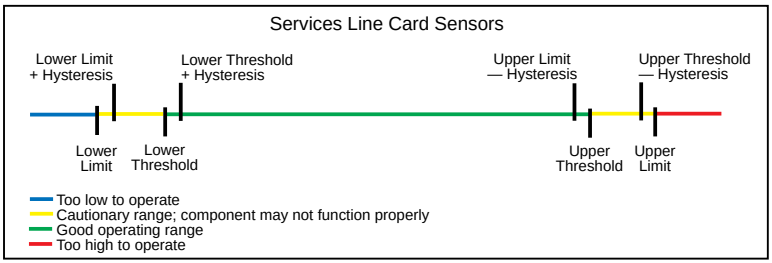
Traps

By default, all traps for the R821 are enabled. Through software, each trap can be disabled/enabled individually for each trap destination. The R821 supports up to four trap destinations. The following table describes the events that trigger SNMP trap messages to be sent to each trap destination that is configured to receive them.

Table 7: Traps Table

Trap Index	Trap Trigger
1	Sensor[a] drops and reaches its lower limit.
2	Sensor returns from lower limit plus hysteresis[b] value.
3	Sensor rises and reaches its upper limit.
4	Sensor returns from upper limit plus hysteresis value.
5	Sensor drops and reaches its lower threshold.
6	Sensor returns from lower threshold plus hysteresis value.
7	Sensor rises and reaches its upper threshold.
8	Sensor returns from upper threshold plus hysteresis value.
9	SFP transceiver is inserted into a port.
10	SFP transceiver is removed from a port.
11	Link Loss Carry Forward occurs.
12	Link Loss Carry Forward is reset.
13	Link Loss Return occurs.
14	Link Loss Return is reset.
15	Port receives Far End Fault notification.
16	Port receives notification that Far End Fault has been reset.
17	Power level in the peer device falls below its minimum operating value.

a.The R821 includes sensors that measure the circuit board temperature, SFP transceiver temperature, SFP transmit and receive laser levels, and circuit board power supply voltages.
b.The hysteresis value is an additional value added to or subtracted from the limits or thresholds when traversing back and forth over the limit or threshold. This is intended to reduce the number of false warnings and to avoid the flooding of warning messages.



Changing the SFP Transceiver

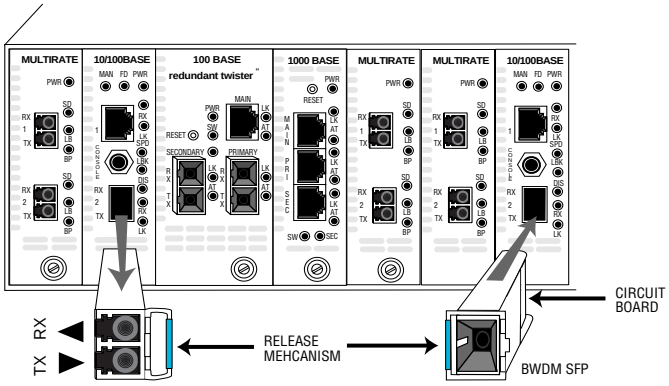
The services line card supports one replaceable small form-factor pluggable (SFP) transceiver. This section explains how to remove and install the transceiver.

Important: *Use only Metrobility-supplied SFP transceivers with this product.* **Installing any other part may damage the unit and will void the product's warranty.**

1. Disconnect the fiber optic network cables, if they are installed, from both the transmitter (TX) and receiver (RX) on the SFP transceiver.

   WARNING: Avoid looking into the laser or cable.

2. To remove the SFP transceiver from services line card, simply pull the release mechanism (i.e., plastic tab, bail latch, etc.) and slide the module out of the slot, as shown below, left.



3. Align the new SFP module so the receiver (▲) is positioned above the transmitter (▼). For a BWDM SFP, align it so the visible part of the circuit board located at the back of the module is to the right.

4. Keeping the release mechanism in the closed position (bail latch should be locked in place), slide the new SFP module into the slot, pushing it firmly in place.

5. Remove the protective covering on the connector.

6. Reconnect the network cables. Verify proper segment connectivity via the green LK LED, which should be lit.

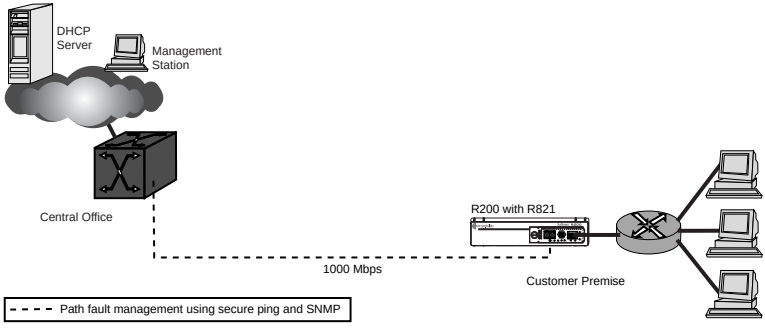
Topology Solutions

Standards-Based Multi-Service Delivery

The R821 services line card supports the delivery of point-to-point E-Line and multi-point E-LAN services as defined by the Metro Ethernet Forum. Traffic belonging to each service is classified by, and tunneled over, predetermined VLANs for segregation and transport across carrier networks. Controlled at the service line card, VLANs identify and segregate the specific ISP-access or corporate-access E-Line service, and determine corresponding prioritization and traffic management parameters for the associated traffic. Management traffic, either tagged or untagged, is given higher priority than user data traffic.

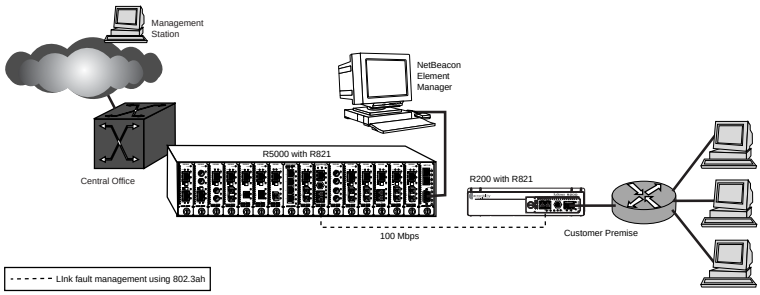
Basic Remote Management as a NID

The Radiance services line card can be used with any of Metrobility's Premise Service Platforms including the Radiance R1000, R400, and R200. Together, the platform and card create a network interface device (NID) that serves as a demarcation point at the customer site. The NID is designed specifically to maintain maximum isolation between the public and private networks. Carrier class management access control protects against denial of service on the management channel. DHCP is enabled on the R821 for obtaining its management (end-station) IP address, network mask, and default gateway. The R821 responds to SNMP requests addressed to unicast and subnet broadcast addresses by delivering information on its health, status, and network connection. Remote management from the Central Office is provided using the NID's unique IP address.



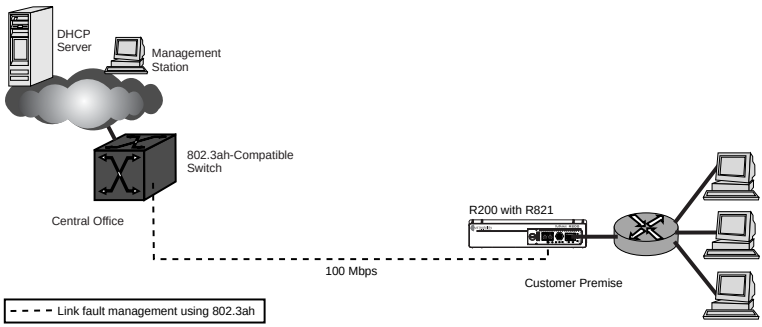
802.3ah-Based Enhanced Remote Management

A Radiance R5000 Central Service Platform in a central office or point of presence connects to a switch or router at the service provider's network. The R5000 includes a management card that collects information from the services line card, which is monitored and managed through Metrobility's NetBeacon Element Manager. In addition to standards-based link OAM, this bookended configuration enables extensions to 802.3ah OAM including the provisioning of IP end-station parameters, quality of line, quality of equipment, optical power, and historical graphs.



Future 802.3ah-Based Remote Management

The embedded software in the services line card is field upgradable. As new software is developed to support evolving standards, new features, and compatibility with IEEE 802.3ah OAM-enabled Layer 2/3 switches, it can easily be downloaded onto the device. Two versions of the operational software and configuration data can be stored on the services line card.



RADIUS Reset

If RADIUS authentication is enabled and the RADIUS server information is entered incorrectly, a user will not be able to log in due to the bad configuration. To work around this condition, toggle DIP switch #5 to clear the RADIUS authentication state. (All other RADIUS settings will be unaffected.) This will allow the user to log in using the currently configured user names and passwords.

Technical Specifications

Data Rate

Data Rate _____ 10/100Mbps (Port 1)
_____ 100 Mbps (Port 2)

Power

Input _____ 5 V DC @1.0 A, 5.0 W

Environmental

Operating Temperature _____ 0° to 50° C
Storage Temperature _____ -25° to 70° C
Operating Humidity _____ 5% to 95% non-condensing
Weight _____ 3.2 oz (0.09 kg)

Network Connections

Twisted-Pair Interface

Connector _____ Shielded RJ-45, 8-pin jack
Impedance _____ 100 ohms nominal
Supported Link Length _____ 100 m
Signal Level Output (peak differential) _____ 2.2 to 2.8 V (10 Mbps)
_____ 0.95 to 1.05 V (100 Mbps)
Signal Level Input (minimum) _____ 585 mV (10 Mbps)
_____ 200 mV (100 Mbps)
Cable Type _____ CAT 3, 4, 5 UTP/STP (10 Mbps)
_____ CAT 5 or 5E UTP/STP (100 Mbps)
(For NEBS Level III and EN55024:1998 compliance, use only CAT 5E STP cables.)

Multimode Fiber Optic Plug-in (O280-M2)

Connector _____ LC
Wavelength _____ 1310 nm
RX Input Sensitivity _____ -32 dBm (minimum); -34 dBm (typical); _____ -14 dBm (saturation)
Output Power _____ -19 dBm to -14 dBm; -17 dBm (typical)
Typical Link Budget _____ 17 dB
Supported Link Length _____ up to 2 km
Cable Type _____ 50/125 or 62.5/125 µm multimode

Singlemode Fiber Optic Plug-in (O281-40)

Connector _____ LC
Wavelength _____ 1310 nm
RX Input Sensitivity _____ -34 dBm (min); -36 dBm (typ); _____ -10 dBm (saturation)
Output Power _____ -5 dBm to 0 dBm; -2.5 dBm (typical)
Typical Link Budget _____ 33.5 dB
Supported Link Length _____ up to 40 km
Cable Type _____ 9/125 µm singlemode

Singlemode Fiber Optic Plug-in (O281-80)

Connector _____ LC
Wavelength _____ 1550 nm
RX Input Sensitivity _____ -34 dBm (min); -36 dBm (typ); _____ -10 dBm (saturation)
Output Power _____ -5 dBm to 0 dBm; -2.5 dBm (typical)
Typical Link Budget _____ 33.5 dB
Supported Link Length _____ up to 80 km
Cable Type _____ 9/125 µm singlemode

Singlemode Fiber Optic Plug-in (O283-20)

Connector _____ LC
Wavelength _____ 1310 nm
RX Input Sensitivity _____ -28 dBm (min); -32 dBm (typ); _____ -8 dBm (saturation)
Output Power _____ -15 dBm to -8 dBm; -11.5 dBm (typical)
Typical Link Budget _____ 20.5 dB
Supported Link Length _____ up to 20 km
Cable Type _____ 9/125 µm singlemode

Singlemode Fiber Optic Plug-in (O383-20-31, -55) for BWDM

Connector _____ SC
Wavelength (O383-20-31) _____ 1310 nm TX / 1550 nm RX
Wavelength (O383-20-55) _____ 1550 nm TX / 1310 nm RX
RX Input Sensitivity_____ -28 dBm (min); -30 dBm (typ); -8 dBm (sat)
Output Power _____-14 dBm to -8 dBm; -11 dBm (typical)
Typical Link Budget_____19 dB
Supported Link Length _____ up to 20 km
Cable Type _____ 9/125 µm singlemode

Singlemode Fiber Optic Plug-in (O483-80-xx) for CWDM

Connector _____ LC
Wavelength _____ (see the following table)
RX Input Sensitivity_____ -34 dBm (min); -36 dBm (typ); -3 dBm (sat)
Output Power _____ -5 dBm to 0 dBm; -3 dBm (typical)
Typical Link Budget_____33 dB
Supported Link Length _____ up to 80 km
Cable Type _____ 9/125 µm singlemode

Model Number	Wavelength
O413-40-47, O483-80-47	1470 nm
O413-40-49, O483-80-49	1490 nm
O413-40-51, O483-80-51	1510 nm
O413-40-53, O483-80-53	1530 nm
O413-40-55, O483-80-55	1550 nm
O413-40-57, O483-80-57	1570 nm
O413-40-59, O483-80-59	1590 nm
O413-40-61, O483-80-61	1610 nm

Abbreviations and Acronyms

AF	Assured Forwarding
AN	Auto-Negotiation
ARP	Address Resolution Protocol
ASCII	American Standard Code for Information Interchange
AT	Address Translation
BPDU	Bridge Protocol Data Unit
BWDM	Bidirectional Wavelength Division Multiplexing
CLI	Command Line Interface
CLQ	Copper Line Quality
CoS	Class of Service
CPE	Customer Premises Equipment
CPU	Central Processing Unit
CWDM	Coarse Wavelength Division Multiplexing
dB	Decibel
dBm	Decibel relative to 1 mW of power (0 dBm equals 1 mW)
DHCP	Dynamic Host Configuration Protocol
DIS	Disable management on a port
DSCP	Differentiated services code point
DUP	Duplex
EF	Expedited Forwarding
ELAN	Ethernet Local Area Network
E-Line	Ethernet Line
FD	Full Duplex
FEF	Far End Fault
FF	Free Form
FPGA	Field Programmable Gate Array
GARP	Generic Attribute Registration Protocol
GMRP	GARP Multicast Registration Protocol

GVRP	GARP VLAN Registration Protocol
ICMP	Internet Control Message Protocol
IEEE	Institute of Electrical and Electronic Engineers
IP	Internet Protocol
ISP	Internet Service Provider
km	Kilometer
L2	Layer 2
L2CP	Layer 2 Control Protocol
LACP	Link Aggregation Control Protocol
LBK	Loopback
LK	Link
LLCF	Link Loss Carry Forward
LLR	Link Loss Return
LSL	Logical Services Loopback
MAC	Media Access Control
MAN	Managed
Mbps	Megabits per second
MIB	Management Information Base
MM	Multimode
ms	Millisecond
MSTP	Multiple Spanning Tree Protocol
mV	Millivolt
NID	Network Interface Device
nm	Nanometer
OAM	Operation, Administration, and Maintenance
OAMPDU	Operation, Administration, and Maintenance Protocol Data Unit
OS	Operating System
OUI	Organizational Unique Identifier

p-bit	Priority bit
PDU	Protocol Data Unit
PVID	Port VLAN identifier
PWR	Power
Q-in-Q	Q-tag inside of Q-tag
RFC	Request for Comments
RMON	Remote Monitoring
RX	Receive
SFP	Small Form-factor Pluggable optical transceiver
SM	Singlemode
SNMP	Simple Network Management Protocol
SP	Straight Precedence
SPD	Speed
STP	Shielded Twisted Pair; Spanning Tree Protocol
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
TLV	Type Length Value
TOS	Type of Service
TX	Transmit
UDP	User Datagram Protocol
VID	VLAN identifier
VLAN	Virtual Local Area Network
zeroconf	Zero configuration

Product Safety and Compliance Statements

This product complies with the following requirements:

- UL
- CSA
- CE
- CB
- NEBS Level III
- EN60950 (safety)
- FCC Part 15, Class B
- ICES-003 Class B (emissions)
- EN55022 Class B (emissions)
- EN55024: 1998 (immunity)
- IEC 825-1 Classification (eye safety)
- Class 1 Laser Product (eye safety)

This product shall be handled, stored and disposed of in accordance with all governing and applicable safety and environmental regulatory agency requirements.

The following FCC and Industry Canada compliance information is applicable to North American customers only.

USA FCC Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: *Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

Canadian Radio Frequency Interference Statement

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Réglement sur le matériel brouilleur du Canada.

Standards Compliance

This equipment complies with the following standards:

- IEEE 802.1D-2004 Forwarding Aspects
- IEEE 802.1Q-2003 Forwarding and Tagging Aspects
- IEEE 802.3-2002
- IEEE 802.3ah OAM
- RFC 768 (UDP)
- RFC 791 (IP)
- RFC 792 (ICMP)
- RFC 793 (TCP)
- RFC 826 (ARP)
- RFC 854 (Telnet)
- RFC 950 (Internet Standard Subnetting Procedure)
- RFC 1157 (SNMPv1)
- RFC 1213 (MIB-II)

- RFC 1349 (IP) — updates RFC 791
- RFC 1350 (TFTP)
- RFC 1782 (TFTP) — updates RFC 1350
- RFC 1783 (TFTP) — updates RFC 1350
- RFC 1784 (TFTP) — updates RFC 1350
- RFC 1785 (TFTP) — updates RFC 1350
- RFC 2011 (MIB-II) — updates RFC 1213
- RFC 2012 (MIB-II) — updates RFC 1213
- RFC 2013 (MIB-II) — updates RFC 1213
- RFC 2131 (DHCP)
- RFC 2347 (TFTP) — updates RFC 1350
- RFC 2348 (TFTP) — updates RFC 1350
- RFC 2349 (TFTP) — updates RFC 1350
- RFC 2674 (Bridge Extensions)
- RFC 2819 (RMON Group 1)
- RFC 2863 (Interfaces Group MIB) — updates RFC 1213
- RFC 2865 (RADIUS)
- RFC 3168 (TCP) — updates RFC 793
- RFC 3273 (RMON Group 1)
- RFC 3396 (DHCP) — updates RFC 2131

Warranty and Servicing

Three-Year Warranty for the Radiance 10/100 Mbps Services Line Card

Metrobility Optical Systems, Inc. warrants that every Radiance 10/100 Mbps services line card will be free from defects in material and workmanship for a period of THREE YEARS from the date of Metrobility shipment. This warranty covers the original user only and is not transferable. Should the unit fail at any time during this warranty period, Metrobility will, at its sole discretion, replace, repair, or refund the purchase price of the product. This warranty is limited to defects in workmanship and materials and does not cover damage from accident, acts of God, neglect, contamination, misuse or abnormal conditions of operation or handling, including overvoltage failures caused by use outside of the product's specified rating, or normal wear and tear of mechanical components.

Metrobility supports only the current released version and the most recent previous minor version of the software embedded on the management card.

To establish original ownership and provide date of purchase, complete and return the registration card or register the product online at www.metrobility.com. If product was not purchased directly from Metrobility, please provide source, invoice number and date of purchase.

To return a defective product for warranty coverage, contact Metrobility Customer Service for a return materials authorization (RMA) number. Send the defective product postage and insurance prepaid to the address provided to you by the Metrobility Technical Support Representative. Failure to properly protect the product during shipping may void this warranty. The Metrobility RMA number must be clearly on the outside of the carton to ensure its acceptance.

Metrobility will pay return transportation for product repaired or replaced in-warranty. Before making any repair not covered by the warranty, Metrobility will estimate cost and obtain authorization, then invoice for repair and return transportation. Metrobility reserves the right to charge for all testing and shipping costs incurred, if test results determine that the unit is without defect.

This warranty constitutes the buyer's sole remedy. No other warranties, such as fitness for a particular purpose, are expressed or implied. Under no circumstances will Metrobility be liable for any damages incurred by the use of this product including, but not limited to, lost profits, lost savings, and incidental or consequential damages arising from the use of, or inability to use, this product. Authorized resellers are not authorized to extend any other warranty on Metrobility's behalf.

ADDITIONAL IMPORTANT WARRANTY INFORMATION:

The Radiance 10/100 Mbps services line card is designed to operate using only the Metrobility-supplied small form-factor pluggable (SFP) transceivers specified in this manual. The use and installation of parts not included in this document will void the product's warranty and may cause damage to the unit.

Technical Support

Before contacting Technical Support, please make sure you have the following information:

- R821 board revision (A, B, C,...)
- R821 OS version number
- R821 FPGA version number
- SFP type(s) (singlemode, multimode, BWDM, CWDM)
- Topology: standalone NID or bookended pair
- VLAN, if applicable
- Version of software on the R502-M management card, if applicable
- NetBeacon software version number, if applicable
- Management station hardware specifications (RAM, operating system, and CPU)
- Network layout including the type of switches/equipment connected to the R821

Notify Metrobility Technical Support via e-mail by contacting **techsupport@metrobility.com** or by calling 1.877.526.2278, from 8 AM to 7 PM (EST). You can also send a fax to Metrobility at 1.603.594.2887.

Chapter 6: Error Messages

This chapter contains descriptions for the error messages that can be generated by the R821 software. The error messages are shown in red.

Console changes are only allowed through the console port.

This message appears if you try to use the 'set console' command through a telnet session.

Copper Line Quality test not supported on Port 2.

The Copper Line Quality test is only applicable to copper ports. Port 2 is a fiber port.

Error: Administrative string does not match.

The SNMP administrative community string is missing or entered incorrectly. The default string is "admin."

Error: Auto Negotiation not supported on Port 2.

Auto-negotiation is disabled on the fiber port (Port 2) and cannot be enabled.

Error: Cannot remove root.

The root user cannot be deleted.

Error: Cannot set speed on Fiber ports.

The fiber port speed is fixed at 100 Mbps. Only the copper port can be configured to 10 or 100 Mbps.

Error: Community name cannot be longer than 32 characters.

The SNMP community string must not contain more than 32 characters.

Error: Community name must be have an end quote.

Multi-word strings require quotation marks at the beginning and end. Your SNMP community entry only has a quotation mark at the start of the string.

Error: Duplex not configurable on Port 2.

The fiber port (Port 2) is set to full duplex and the mode cannot be changed.

Error: Invalid gateway IP format.	The IP address gateway is not in the standard dotted decimal notation (e.g., 192.168.1.254).
Error: Invalid IP address format.	The IP address is not in the standard dotted decimal notation (e.g., 192.168.1.100).
Error: Invalid mask format.	The network mask is not in the standard dotted decimal notation (e.g., 255.255.255.0).
Error: Invalid parameter (xxxx).	The parameter, xxxx, is not an acceptable option for the command. Make sure the parameter is spelled correctly. If the parameter is a number, make sure it is within the range of acceptable values.
Error: Invalid value for mode.	The OAM control mode was set incorrectly. The only acceptable options are active or passive.
Error: IP address entry not found.	The IP address specified was not identified. Make sure you typed the IP address correctly.
Error: Maximum number of user VLANs already configured.	16 user VLANs have been configured on the services line card. No others are allowed unless you first delete one.
Error: Missing filename value.	The name of a file is required with the command, but it is missing.
Error: Missing model value.	The model parameter was specified but the model type was not entered.
Error: Missing group parameter.	The SNMPv3 group (i.e.: read only, read write, or administrative) is required with the command, but it is missing.
Error: Missing image number parameter.	The OS image number is required with the command, but it is missing.
Error: Missing image parameter.	The FPGA image number is required with the command, but it is missing.
Error: Missing IP parameter.	The IP address is a required field with the command, but it is missing.

Error: Missing MAC address value.	The MAC address is a required field with the command, but it is missing.
Error: Missing port parameter.	The port number, either 1 or 2, is a required field and is missing.
Error: Missing queue parameter.	The priority queue for the free form service class policy is a required field and is missing.
Error: Missing trap index parameter.	The trap index number is a required field with the command, but it is missing.
Error: Missing username parameter.	The user name is a required field with the command, but it is missing.
Error: No such username.	The username does not exist. Make sure the spelling is correct.
Error: Passwords do not match.	While attempting to change the password, you incorrectly entered the current password to the device, or the new password was entered incorrectly when you were prompted to re-enter the new password.
Error: RADIUS server not found.	The RADIUS server you want to clear is not in the list of configured RADIUS servers. Make sure the IP address of the RADIUS server is entered correctly.
Error: Switch must be in Transparent Mode to modify QinQ operation.	Q-in-Q operation can only be enabled if the switch is in transparent mode. This message appears because the switch is in 802.1Q mode instead of transparent mode.
Error: The VLAN # already set to Default Port VLAN.	The specified value for the management VLAN is unacceptable because the number has already been assigned as a PVID. If you want to use the number for the management VLAN, you must first change the pvid.
Error: The VLAN # has already been set for the user VLAN. You must clear the user VLAN first.	The specified value for the management VLAN is unacceptable because the number has already been assigned as a user VLAN. The two VLANs must be different.

Error: Trap destination table is full.	Up to four trap destinations can be configured. To add a new trap destination, you must first delete one of the current entries from the table.
Error: Trunk port must be tagged.	When configuring user VLANs, only the access port can be untagged. Untagging is not allowed on the trunk port.
Error: Unknown IP address.	The IP address specified for setting a trap control must be one that is in the trap destination table. Use the 'show trapdestinations' command to see what IP addresses are available.
Error: Username cannot be longer than 32 characters.	The SNMPv3 username must not contain more than 32 characters.
Error: Username must be have an end quote.	Multi-word strings require quotation marks at the beginning and end. Your username entry only has a quotation mark at the start of the string.
Error: Username must be specified for SNMPv3 traps.	When configuring an SNMPv3 trap destination, the username parameter is required for security.
Error: Valid count values are between 1 and 100.	The maximum number of times the device should attempt to ping a network host is not in the acceptable range of 1 to 100.
Error: Valid delay values are between 0 and 10.	The maximum number of seconds the device should wait between attempt to ping a network host is not in the acceptable range of 0 to 10 seconds.
Error: Valid image number values are between 1 and 2.	A value other than '1' or '2' was entered for the OS image number.
Error: Valid image values are between 1 and 2.	A value other than '1' or '2' was entered for the FPGA image number.
Error: Valid index number values are between 1 and 17.	The trap index must be a number between 1 and 17.

Error: Valid queue values are between 0 and 3.	The priority queue for the free form service class policy must be a number between 0 and 3.
Error: Valid retry number values are between 1 and 5.	The maximum number of times the device should attempt to contact a DHCP server is not in the acceptable range of 1 to 5.
Error: Valid size values are between 56 and 1472.	The specified number of bytes the device should send when pinging a network host is not in the acceptable range of 56 to 1472 bytes.
Error: Valid udp port values are between 1 and 65535.	The UDP port parameter must be a number between 1 and 65535.
Error: Valid version values are between 1 and 3.	The SNMP version number must be 1, 2, or 3.
Error: Valid VLAN ID values are between 0 and 4094.	An unacceptable value was entered for the management VLAN. A valid value is any number between 0 and 4094. If the value is 0, the management or user VLAN is disabled.
Error: Valid VLAN ID values are between 1 and 4094.	An unacceptable value was entered for the user VLAN. A valid value is any number between 1 and 4094. The number must also be different from any management VLAN ID values.
Error: Valid window values are between 10 and 600.	An unacceptable value was entered for the window parameter when setting the OAM Errored Frame Event. The acceptable range is 10 to 600.
Error: Valid window values are between 100 and 9000.	An unacceptable value was entered for the window parameter when setting the OAM Errored Frame Seconds Summary Event. The acceptable range is 100 to 9000.
Error: Valid window values are between 148809 and 89285714.	An unacceptable value was entered for the window parameter when setting the OAM Errored Frame Period Event. The acceptable range is 148809 to 89285714.

Error: Valid window values are between 125000000 and 3205032704.	An unacceptable value was entered for the window parameter when setting the OAM Errored Symbol Period Event. The acceptable range is 125000000 to 3205032704.
Error: VLAN # already assigned to PVID or Management VLAN.	The specified value for the user VLAN is invalid because it has already been assigned as either a PVID or a management VLAN. The user VLANs must be unique.
Error: VLAN ID not found.	The specified VLAN ID for the command is invalid. Make sure it is typed correctly. If available, use the 'all' option. For example, enter 'show uservlan all' to see all configured user VLANs.
Error: You must download a valid config file.	To run a configuration file, you must first download a valid file into one of the two image locations.
Error: You must include an IP address.	To execute the 'ping' command, an IP address must be specified.
Invalid retransmit count entered, valid range (1-10).	The value entered for the maximum number of transmission retries to a RADIUS server is out of range. The number must be in the range 1-10.
Invalid timeout value entered, valid range (1-10).	The value entered for the RADIUS timeout is out of range. The time must be in the range 1-10.
Login failed.	The login username or password is incorrect. Make sure the [CAPS LOCK] key is not pressed.
Maximum config file size exceeded.	The configuration file you attempted to download was more than 8K, which is the maximum size supported by the R821.
Maximum number of server entries exceeded.	Up to five (5) RADIUS servers can be configured for the device. To add another RADIUS server, you must first delete an existing server using the 'clear radiusserver' command.
QinQ must be disabled for 802.1Q operation.	To change the forwarding mode from transparent to 802.1Q, you must first disable Q-in-Q operation.

Secret too long.	The secret password assigned to a RADIUS server has more 65 characters, which is the maximum allowed.
Start Loopback Request denied, port must be fiber.	OAM loopback is not supported on the copper port.
Switch must be in Transparent Mode to modify QinQ operation.	The forwarding mode in the switch is currently set to 802.1Q. To change the Q-in-Q setting, the switch must first be changed to transparent mode.
Syntax Error (xxxx).	The command, xxxx, was entered incorrectly; probably due to a spelling error.
Telnet user attempted to add/change a RADIUS server.	Adding a RADIUS server or changing any parameters on an existing RADIUS server is not allowed via telnet. To add or change a RADIUS server, you must connect directly to the console port.
Telnet user attempted to change RADIUS authentication.	RADIUS authentication can only be modified when communicating with the device directly through its console port.
Telnet user attempted to clear a RADIUS server.	Deleting a RADIUS server is not allowed via telnet. To remove a RADIUS server, you must connect directly to the console port.
User VLAN does not exist.	The user VLAN ID you specified has not been configured. Make sure the VLAN ID was typed correctly. Use the 'show uservlan all' command to view all available values.
VLAN # is already assigned to a User VLAN.	The VLAN ID you tried to assign to the port VLAN (pvid) has already been applied to a user VLAN. The VLANs must be different.
Warning: FEF can only be enabled on Fiber Interfaces.	You attempted to enable Far End Fault on Port 1. FEF can only be set on the fiber port, Port 2. FEF is always disabled on Port 1.
Warning: LLR can only be enabled on Fiber Interfaces.	You attempted to enable Link Loss Return on Port 1. LLR can only be set on the fiber port, Port 2. LLR is always disabled on Port 1.

Product Manuals

The most recent version of this manual is available online at
http://www.metrobility.com/support/manuals.htm

Product Registration

To register your product, go to
http://www.metrobility.com/support/registration.asp

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