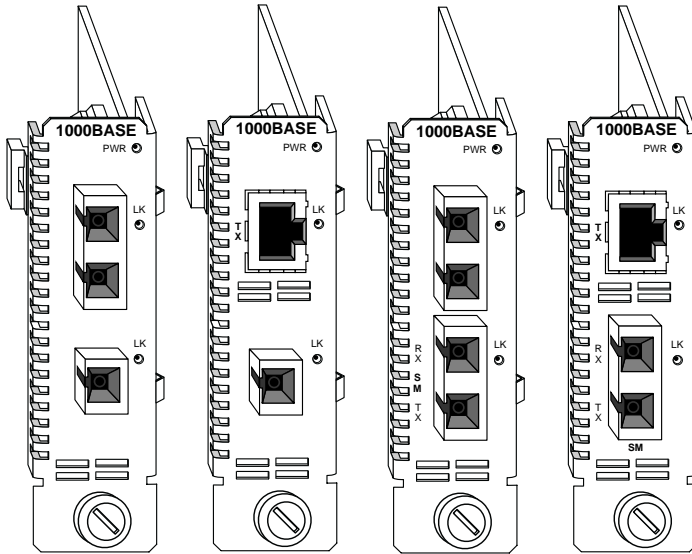


RADIANCE

GIGABIT

SINGLE INTERFACE LINE CARDS



Installation & User Guide

Models: R151-AD / R152-1A / R152-1D / R152-1F / R152-17 / R152-1J /
R152-1X / R152-1Y / R152-AA / R152-AD / R152-AF / R152-A7 /
R152-AJ / R152-AX / R152-AY / R152-DD / R152-DF / R152-D7 /
R152-DJ / R152-77 / R152-JJ

Radiance Gigabit Single Interface Line Cards

Fiber-to-Fiber Converter:

R151-AD _____ 1000Base-SX multimode SC to 1000Base-LX singlemode SC

Fiber-to-Fiber Repeater:

R152-AA _____ 1000Base-SX multimode SC to 1000Base-SX multimode SC
R152-AD _____ 1000Base-SX multimode SC to 1000Base-LX singlemode SC
R152-AF _____ 1000Base-SX multimode SC to 1000Base-MR singlemode SC
R152-A7 _____ 1000Base-SX multimode SC to 1000Base-LH singlemode SC
R152-AJ _____ 1000Base-SX multimode SC to 1000Base-EX singlemode SC
R152-AX _____ 1000Base-SX multimode SC to 1000Base-LX singlemode SC 1550/
1310nm bidirectional wavelength division multiplexed (BWDM)
R152-AY _____ 1000Base-SX multimode SC to 1000Base-LX singlemode SC 1310/
1550nm BWDM
R152-DD _____ 1000Base-LX singlemode SC to 1000Base-LX singlemode SC
R152-DF _____ 1000Base-LX singlemode SC to 1000Base-MR singlemode SC
R152-D7 _____ 1000Base-LX singlemode SC to 1000Base-LH singlemode SC
R152-DJ _____ 1000Base-LX singlemode SC to 1000Base-EX singlemode SC
R152-77 _____ 1000Base-LH singlemode SC to 1000Base-LH singlemode SC
R152-JJ _____ 1000Base-EX singlemode SC to 1000Base-EX singlemode SC

Copper-to-Fiber Repeater:

R152-1A _____ 1000Base-TX to 1000Base-SX multimode SC
R152-1D _____ 1000Base-TX to 1000Base-LX singlemode SC
R152-1F _____ 1000Base-TX to 1000Base-MR singlemode SC
R152-17 _____ 1000Base-TX to 1000Base-LH singlemode SC
R152-1J _____ 1000Base-TX to 1000Base-EX singlemode SC
R152-1X _____ 1000Base-TX to 1000Base-LX singlemode SC 1550/1310nm BWDM
R152-1Y _____ 1000Base-TX to 1000Base-LX singlemode SC 1310/1550nm BWDM

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Table of Contents

Radiance Gigabit Single Interface Line Cards Installation & User Guide

Overview	5
Installation Guide	6
STEP 1: Unpack the Line Card	6
STEP 2: Set the DIP Switches	6
STEP 3: Install the Line Card	8
STEP 4: Connect to the Network	9
User Guide	11
LED Indicators	11
Link Loss Return (LLR)	12
Link Loss Carry Forward (LLCF)	13
Copper Loss Carry Forward (CLCF)	14
Topology Solutions	15
Technical Specifications	16
Product Safety, EMC and Compliance Statements	18
Warranty and Servicing	19

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The information contained in this document is assumed to be correct and current. The manufacturer is not responsible for errors or omissions and reserves the right to change specifications at any time without notice.

Overview

Thank you for choosing the Radiance Gigabit single interface line card.

The Radiance Gigabit line card provides seamless integration between fiber optic multimode and singlemode segments in Gigabit Ethernet environments. It supports copper to fiber translation as well as wavelength conversion (850nm to 1310 and 1550nm; and 1310nm to 1550nm), all at Gigabit speeds. With the Radiance line card, you can extend your network reach up to 70km on a single segment. For networks that require extended distance support, use the R152-series repeaters. These repeaters recover incoming data and retransmit the signal, thus allowing multiple hops over any distance.

The Radiance line card is manageable through console commands, Metrobility's GUI-based NetBeacon® or WebBeacon software, or any SNMP application. This ability provides remote control over the card's configuration and immediate notification of a problem to a management station.

The Radiance Gigabit line card offers the following key features:

- Signal recovery that restores data integrity, enabling repetition over unlimited distances. (Excludes R151-AD.)
- A Link Loss Return (LLR) switch on each fiber optic port to aid in troubleshooting remote network connections.
- Link Loss Carry Forward (LLCF) on the fiber-to-fiber units or Copper Loss Carry Forward (CLCF) on the copper-to-fiber units. LLCF and CLCF work with LLR in diagnosing network connections.
- Full-duplex support.
- Auto-sensing copper port that eliminates the need for crossover cables.
- Gigabit Ethernet (1000Mbps) support.
- A link LED on each port to indicate that the port is receiving idle link signals or a satisfactory level of light.
- IEEE 802.3z compliance.
- Data transmission over singlemode cables up to 70km.*
- Numerous connectivity options, including bidirectional wavelength division multiplexed (BWDM) fiber.

*Actual distance should be calculated based on the actual link loss budget.

Installation Guide

Follow the simple steps outlined in this section to install and start using your Radiance Gigabit single interface line card.

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

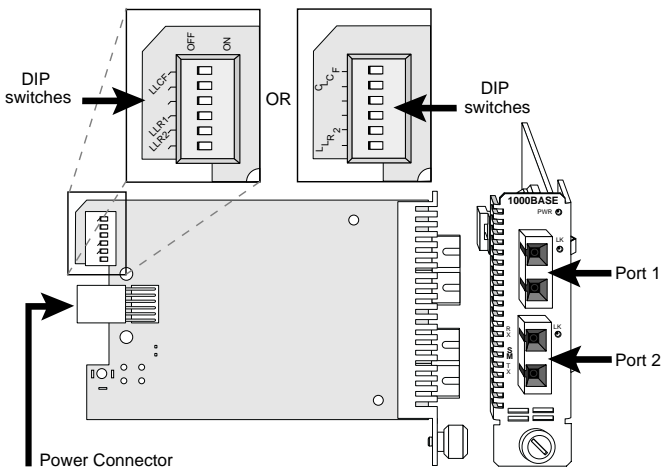
1 **Unpack the Line Card**

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 in case return or storage of the unit is necessary.

2 **Set the DIP Switches***

A set of six DIP switches is located on the back of the line card. (See figure below.) These switches are used to enable/disable functions and are clearly marked on the printed circuit board. Unmarked switches are nonfunctional. **LLR1** sets Link Loss Return on Port 1. **LLR2** sets Link Loss Return on Port 2. **LLCF** sets Link Loss Carry Forward on the fiber-to-fiber repeaters (**LLCF** is nonfunctional on the R151-AD converter). **CLCF** sets Copper Loss Carry Forward on the copper-to-fiber repeaters.

By default, all DIP switches are disabled.



*DIP switches also can be managed by console commands or through NetBeacon or WebBeacon management software. Refer to the *Command Line Interface Reference Guide*, *NetBeacon Element Management Software Installation & User's Guide* or *WebBeacon Management Software Installation & User's Guide* for software management information.

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 circuit board.

Link Loss Return (LLR) Switch

The Radiance Gigabit single interface line card incorporates Link Loss Return functionality as an aid in troubleshooting remote fiber connections. When LLR is enabled on a port, loss of the receive (RX) link at the port disables the transmit (TX) link on the same port. LLR is enabled independently on each fiber port.

LLR1 enables/disables Link Loss Return on Port 1, and **LLR2** enables/disables the function on Port 2. To enable Link Loss Return, set the switch to the ON position (up). Set the switch OFF (down) to disable the LLR. The unit is shipped with LLR disabled.

For more information, refer to [Link Loss Return](#) in the User Guide section of this manual.

Link Loss Carry Forward (LLCF) Switch

On the fiber-to-fiber Gigabit repeater, Link Loss Carry Forward is provided as an additional aid in troubleshooting remote connections. If the card loses link on one of its receive ports, LLCF will inhibit the transmit link out the opposite port.

For example, if LLCF is enabled and the Gigabit line card fails to detect link on Port 2, the card will not transmit link pulses out Port 1. In doing this, LLCF provides a way to extend the link loss indication beyond a single segment.

LLCF is enabled when the **LLCF** switch is in the ON position (up). The fiber-to-fiber repeater is shipped with LLCF disabled. For more information, refer to [Link Loss Carry Forward](#) in the User Guide section of this manual.

On the R151-AD Gigabit converter, LLCF is always enabled and cannot be disabled. Sliding the **LLCF** switch up and down has no effect on this model.

LLCF is not applicable to the copper-to-fiber repeaters.

Copper Loss Carry Forward (CLCF) Switch

The copper-to-fiber repeater provides Copper Loss Carry Forward to assist in identifying a lost copper link. When CLCF is enabled and the module loses link on its copper port, CLCF stops the fiber port from transmitting link pulses. CLCF has no effect on the copper port, which continually transmits pulses, even if the fiber port loses link.

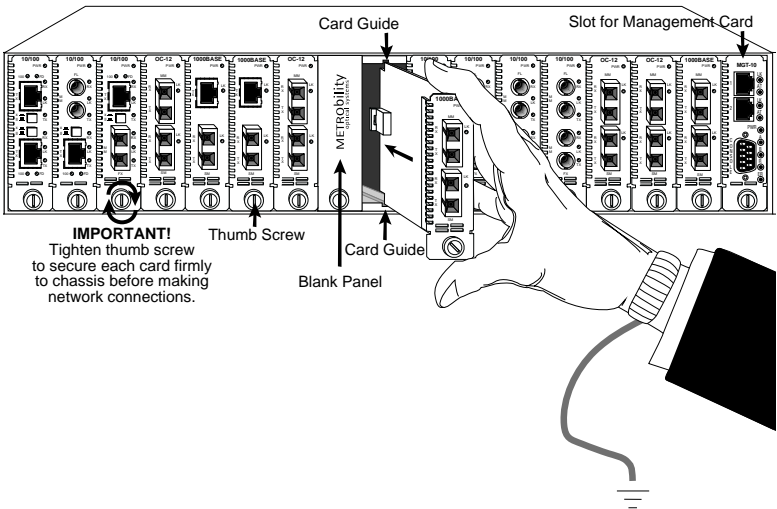
CLCF is enabled when the **CLCF** switch is in the ON position (up). The unit is shipped with CLCF disabled. For more information, refer to [Copper Loss Carry Forward](#) in the User Guide section of this manual.

3 Install the Line Card

The Radiance Gigabit single interface line card offers the ease of plug-and-play installation and is hot-swappable. All cards must be firmly secured to the platform before making network connections. Follow the simple steps outlined below to install your line card.

NOTE: Proper grounding is recommended (i.e., wear a wrist strap).

- Grasp the card by the front panel as shown.



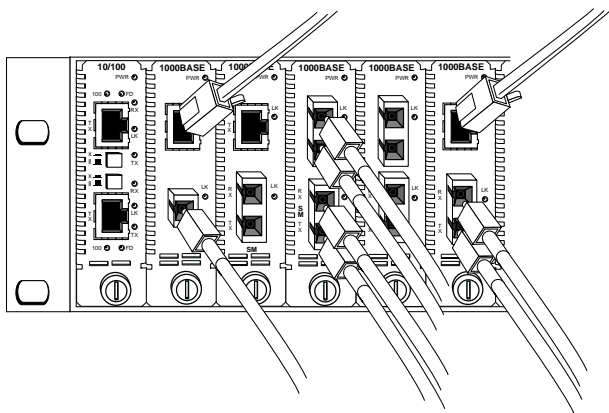
- Insert the card into a slot on the platform. Make sure that the top and bottom edges of the board are aligned with the top and bottom card guides in the platform. Do not force the card into the platform unnecessarily. It should slide in easily and evenly.
- Slide the card in until the top and bottom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

4 **Connect to the Network**

To connect the line card to the network, insert the cables into the appropriate connectors as illustrated below. Make sure the card is secured to the platform before making network connections. Once power is applied to the unit, correct connectivity can be verified via the link (LK) LED.

Twisted-Pair Interface (R152-1x only)

The twisted-pair port provides an auto-sensing RJ-45 connector that supports a maximum segment length of 100 meters. Use Category 5e cables. Because the port is auto-sensing, crossover cables are not needed.



Fiber Optic Interface

Each fiber optic interface provides a singlemode or multimode SC connector. For information regarding the cable lengths supported, refer to the table in the [Technical Specifications](#) section.

The fiber optic interface's receive (RX) port is positioned above its transmit (TX) port. When making network connections, make sure that the receive optical conductor on the card connects to the transmit optical conductor on the connected device, and that the receive optical conductor on the connected device connects to the transmit optical conductor on the line card.

BWDM Interface

The bidirectional wavelength division multiplexed (BWDM) interface port provides one singlemode SC connector that supports a maximum segment length of 20km. BWDM line cards must always be used in complementary pairs. That is, an R152-1X or -AX must be connected to an R152-1Y or -AY, respectively. The R152-1X and -AX line cards are designed to transmit data at a wavelength of 1550nm and receive at 1310nm. Correspondingly, the R152-1Y and -AY cards transmit data at 1310nm and receive at 1550nm.

User Guide

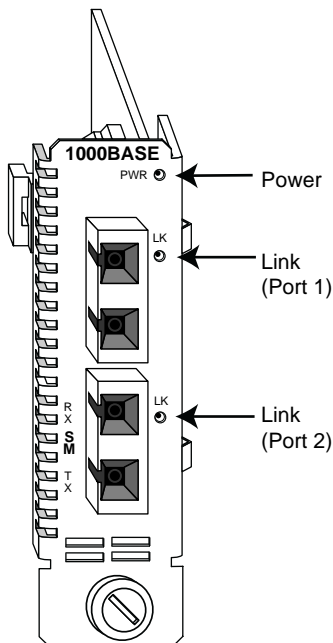
This section contains information regarding the operating features of the Radiance Gigabit single interface line card.

LED Indicators

The Radiance Gigabit single interface line card provides several LEDs on the front panel for the visible verification of unit status and proper functionality. These LEDs can assist with troubleshooting and overall network diagnosis and management.

When lit, the LEDs indicate the following status:

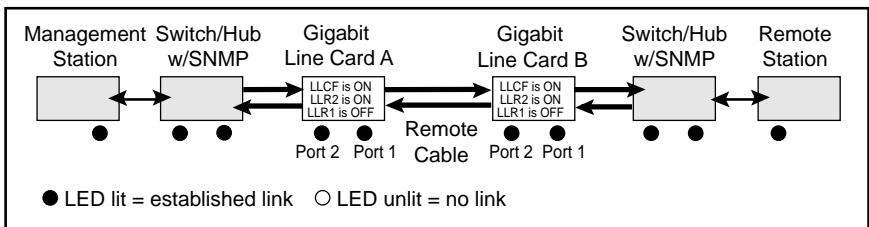
- **PWR** (power): The unit is powered ON.
- **LK** (Port 1): Port 1 is receiving idle link signals (if Port 1 is a copper port), or the input light level is satisfactory (if Port 1 is a fiber port).
- **LK** (Port 2): The input light level is satisfactory on Port 2.



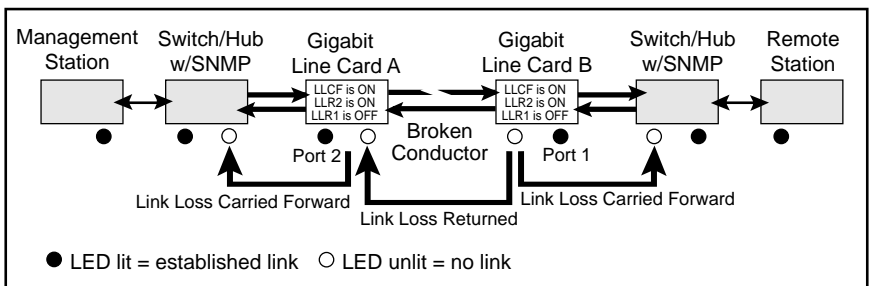
Link Loss Return (LLR)

The fiber ports on the Radiance Gigabit single interface line card have been designed with Link Loss Return functionality for troubleshooting remote connections. When LLR is enabled*, the port's transmitter (TX) shuts down if its receiver (RX) fails to detect a valid link. LLR should only be enabled on one end of a cable and is typically enabled on either the unmanaged or remote device. LLR works in conjunction with LLCF and CLCF.

The diagram below shows a typical network configuration with good link status using two Radiance line cards for remote connectivity. Note that LLR and LLCF are enabled as indicated in the diagram.



Example: If one of the optical conductors breaks (as shown in the diagram box below), Gigabit Line Card B, with LLR2 enabled, will return a no-link condition to its link partner, Line Card A. On the fiber-to-fiber models with LLCF also enabled on both cards, the no-link condition is carried forward to the switch/hub where a trap is generated to the management station. The network administrator can then determine the source of the loss.



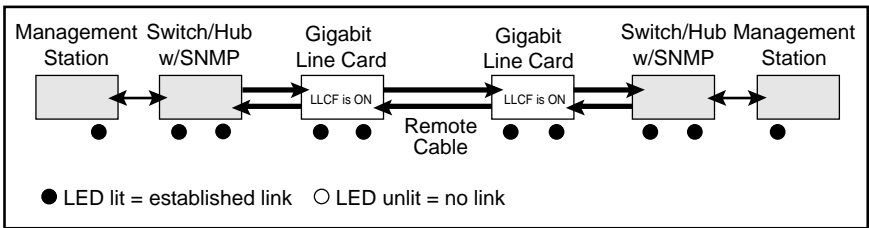
IMPORTANT: LLR must not be active on both ends of the same cable. If it is, the link can never be established.

*Units are shipped with the LLR disabled (DOWN). On the copper-to-fiber boards, LLR is always enabled on the copper port.

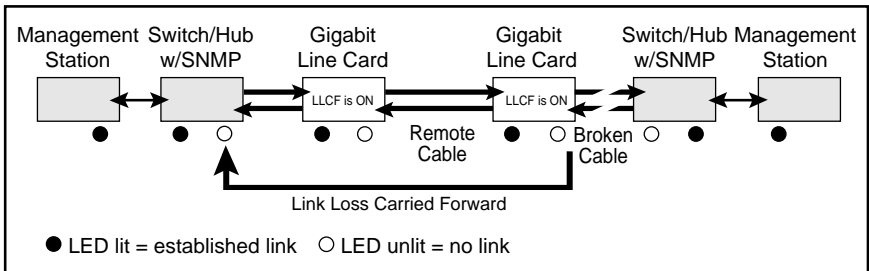
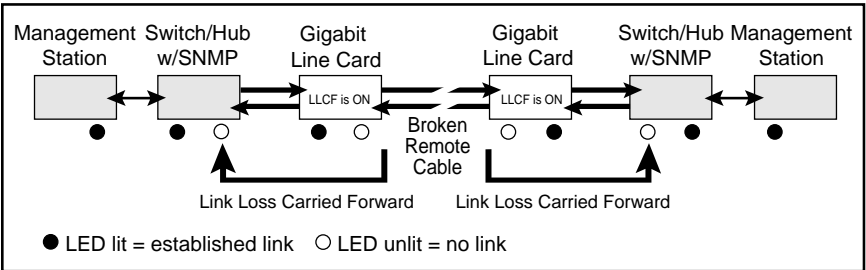
Link Loss Carry Forward (LLCF)

The Radiance fiber-to-fiber Gigabit line card incorporates LLCF for troubleshooting a remote connection. When LLCF is enabled*, the ports do not transmit a signal until they receive a signal from the opposite port. When a lost link signal is returned to an unmanaged line card, that lost link must then be carried forward to a managed device (switch/hub) for trap generation. LLCF works in conjunction with LLR.

The diagram below shows a typical network configuration with good link status using two Radiance fiber-to-fiber line cards for remote connectivity. Note that LLCF is enabled as indicated in the diagram.



If a connection breaks, the line cards will carry that link loss forward to a switch/hub which generates a trap to the management station. The network administrator can then determine the source of the problem.

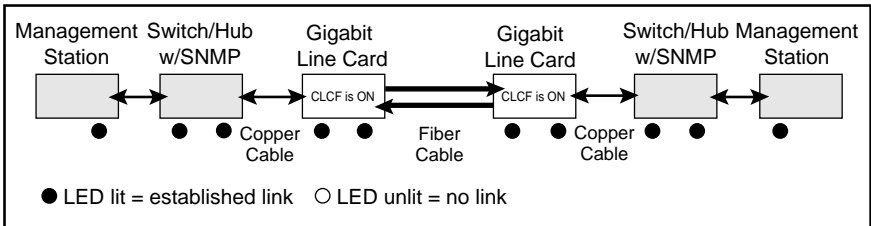


*Units are shipped with the LLCF disabled (DOWN). On the R151-AD, LLCF is always enabled and cannot be disabled.

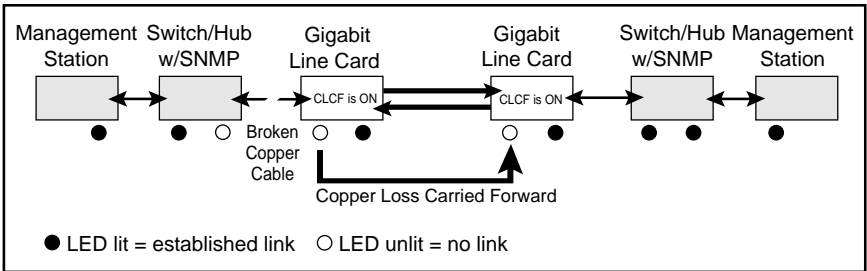
Copper Loss Carry Forward (CLCF)

The Radiance copper-to-fiber Gigabit line card incorporates CLCF for identifying a lost copper connection. When CLCF is enabled*, the fiber port's transmitter shuts down if the copper port stops receiving link pulses. The copper port, however, continually transmits link signals regardless of whether or not the fiber port receives link signals.

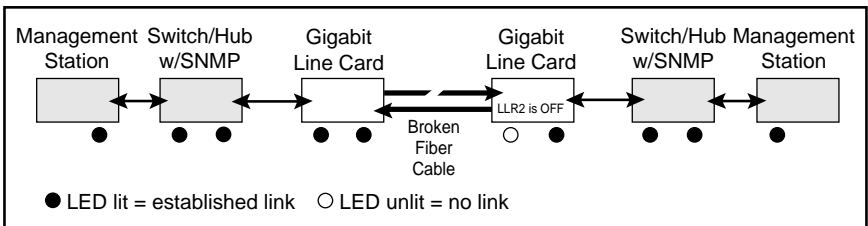
The diagram below shows a typical network configuration with good link status using two Radiance Gigabit cards for remote connectivity. Note that CLCF is enabled as indicated.



If a copper connection breaks, the line card will carry that link loss forward.

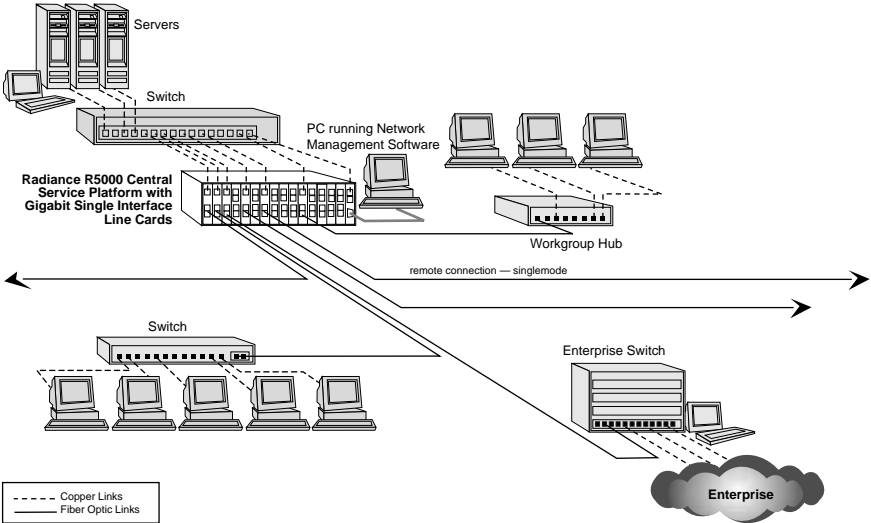


Loss of link at the fiber port is not propagated, as shown in the example below.



*Units are shipped with CLCF disabled (DOWN). CLCF is not applicable to fiber-to-fiber models.

Topology Solutions



Technical Specifications

Fiber Optic Interface

Model	Fiber Type	Wave Length	Cable Length	Cable Size Core/ Clad	RX Input Power (min)	RX Input Power (sat)	TX Output Power (min)	TX Output Power (max)	Power Budget*
R151-AD R152-AA R152-AD R152-AF R152-A7 R152-AJ R152-1A	MM (SX)	850nm	220m	62.5/ 125µm	-17dBm	-3dBm	-9.5dBm	-4dBm	7.5dBm
500m			50/ 125µm	-17dBm	-3dBm	-9.5dBm	-4dBm	7.5dBm	
R151-AD R152-AD R152-DD R152-D7 R152-DJ R152-1D	SM (LX)	1310nm	550m	62.5/ 125µm**	-20dBm	-3dBm	-11.5dBm	-3dBm	8.5dBm
550m			50/ 125µm**	-20dBm	-3dBm	-11.5dBm	-3dBm	8.5dBm	
10km			9/125µm	-20dBm	-3dBm	-9.5dBm	-3dBm	10.5dBm	
R152-1F R152-AF R152-DF	SM (MR)	1310nm	25km	9/125µm	-21dBm	-3dBm	-4dBm	+1dBm	17dBm
R152-A7 R152-D7 R152-77 R152-17	SM (LH)	1550nm	40km	9/125µm	-21dBm	-3dBm	-4dBm	+1dBm	17dBm
R152-AJ R152-DJ R152-JJ R152-1J	SM (ELH)	1550nm	70km	9/125µm	-23dBm	-3dBm	-3dBm	+2dBm	20dBm

* Power Budget = [TX Output Power (min)] — [RX Input Power (min)]

** Using multimode cable with a singlemode transducer.

BWDM Interface

Connector _____ SC

RX Input Sensitivity _____ -20 dBm minimum

Output Power _____ -9 dBm to -3 dBm

Supported Link Length _____ up to 20km

Cable Type _____ 9/125 m µF/O

Wavelength (R152-1X, R152-AX)

TX _____ 1550 nm

RX _____ 1310 nm

Wavelength (R152-1Y, R152-AY)

TX _____ 1310 nm

RX _____ 1550 nm

Twisted-Pair Interface

Connector _____ RJ-45
Impedance _____ 50Ω typical
Signal Level Output (differential) _____ 0.95 to 1.05V
Supported Link Length _____ 100m
Cable Type _____ Category 5e UTP
(For NEBS Level III, use only Category 5e STP cables.)

Power Consumption

R151 series _____ 5V @ 0.8A, 4W
R152 series _____ 5V @ 1.25A, 6.25W

Environmental

Operating Temperature _____ 0° to 50° C
Storage Temperature _____ -30° to 70° C
Operating Humidity _____ 5% to 95% non-condensing
Weight _____ 5 oz (0.14 kg)

Data Rate

Data Rate _____ 1000Mbps (Gigabit Ethernet)

Gigabit Ethernet (1000Base-T) Crossover Pin Layout					
Plug A			Plug B		
Pin #	Signal	Conductor Color Code	Pin #	Signal	Conductor Color Code
1	BI_DA+	white/green	1	BI_DA+	white/orange
2	BI_DA-	green	2	BI_DA-	orange
3	BI_DB+	white/orange	3	BI_DB+	white/green
4	BI_DC+	blue	4	BI_DC+	white/blue
5	BI_DC-	white/blue	5	BI_DC-	brown
6	BI_DB-	orange	6	BI_DB-	green
7	BI_DD+	white/brown	7	BI_DD+	blue
8	BI_DD-	brown	8	BI_DD-	white/blue

Product Safety, EMC and Compliance Statements

This equipment complies with the following requirements:

- UL
- CSA
- EN60950 (safety)
- FCC Part 15, Class A
- DOC Class A (emissions)
- EN55022 Class A (emissions)
- EN55024: 1998 (immunity)
- IEC 825-1 Classification
- Class 1 Laser Product

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

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 A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

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

Warranty and Servicing

Three-Year Warranty for Radiance Gigabit Single Interface Line Card

Metrobility Optical Systems, Inc. warrants that every Radiance Gigabit single interface 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.

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.

Product Manuals

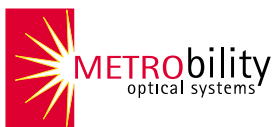
The most recent version of this manual is available online at

<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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