METRObility
optical systems
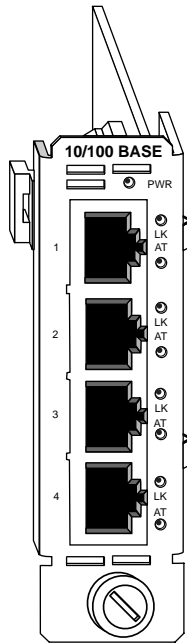
RADIANCE
CHASSIS STACKING
LINE CARD

Installation & User Guide

Model: R104-11

Radiance Chassis Stacking Line Card

R104-11 _____ 10/100Mbps Four-Port TX Switch

Table of Contents

Radiance Chassis Stacking Line Card Installation & User Guide

Overview

The Radiance Chassis Stacking Line Card is a four-port 10/100Mbps TX switch that provides a cost-effective solution for situations in which a simple switching option with few ports is required. When configured for stacking in a Metrobility chassis, the card eliminates the need for any external equipment. This means the network administrator has one less piece of networking hardware to manage and monitor.

The Radiance chassis stacking line card is designed to support a stack of up to four Metrobility chassis, thus enabling communication between the management card in each chassis. The stacking line card enables up to 126 local ports and up to 126 remote ports (using Radiance access line cards) to be managed under a single IP address. This ability provides visibility and remote software control over the entire stack, along with notification of a problem or failure to the network administrator.

Each 10/100Mbps Ethernet port supports auto-negotiation of both duplex and speed, as well as half and full duplex flow control. Additionally, each port includes automatic cross-over functionality, which eliminates the need for cross-over cables, for easier network setup.

The Radiance chassis stacking line card offers the following key features:

- Auto-negotiation to determine the best duplex and speed for data communications.

- 10/100Mbps speed control.

- Backpressure flow control in half-duplex mode.

- Pause frame flow control in full-duplex mode (configurable through software only).

- Built-in crossover functionality that eliminates the need for crossover cables.

- 1M bit buffer of built-in memory.

- Full compliance with applicable sections of IEEE 802.3, IEEE 802.3u and IEEE 802.x standards.

- A non-blocking, high performance switching engine with the ability to learn up to 1,024 MAC addresses.

- Support for long packets (up to 1518 bytes for un-tagged frames or up to 1522 bytes for IEEE 802.3ac tagged frames).

Installation Guide

Follow the simple steps outlined in this section to install and start using the Radiance chassis stacking line card.

NOTE: Electrostatic discharge precautions should be taken when handling any circuit board. 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 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 unit is necessary.

2 Set the Switches

Two sets of DIP switches, located on the back of the circuit board, allow you to select from several modes of operation. These switches are clearly marked on the printed circuit board.

Default Switch Settings

SW1	SW2
HDFL = OPEN	AN4 = OPEN
FD = OPEN	100M4 = OPEN
AN1 = OPEN	AN3 = OPEN
100M1 = OPEN	100M3 = OPEN
	AN2 = OPEN
	100M2 = OPEN

DIP switches

Power Connector

Port 1
Port 2
Port 3
Port 4
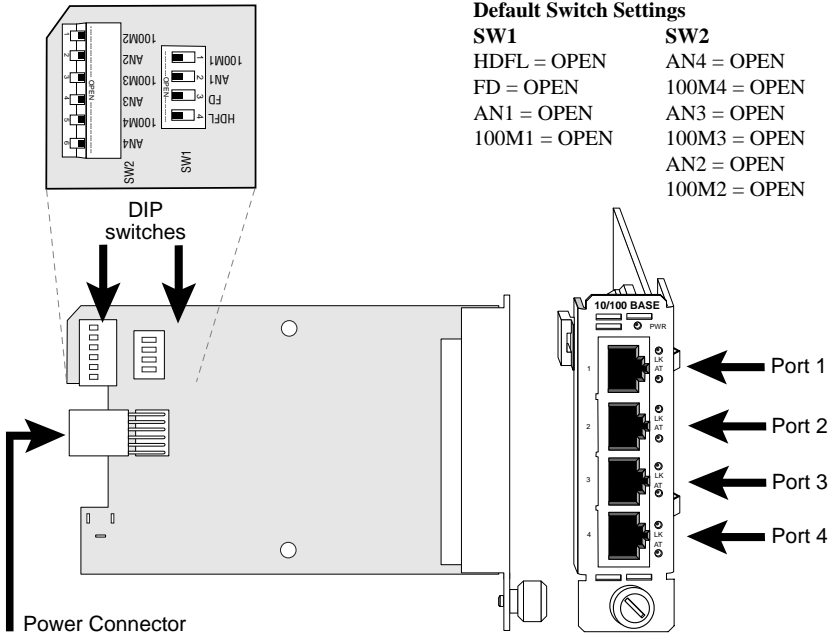
When setting DIP switches[*] on SW2, the OPEN position is when the lever of the switch is pushed up toward the word "OPEN." The CLOSED position is when the lever is pushed down toward the board.

On the rocker DIP switch (SW1), the OPEN position is when the "OPEN" side of the switch is down and the numbered side is up. The CLOSED position is when the numbered side of the switch is down and the "OPEN" side is up. See illustration below.

OPEN   **CLOSED**
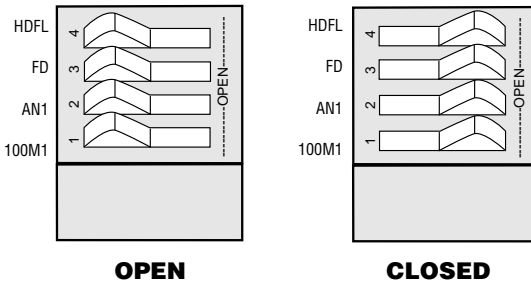
Auto-Negotiation Switch (AN1, AN2, AN3, AN4)

Switch ANx controls the use of auto-negotiation on its associated port (e.g., AN1 sets auto-negotiation on Port 1). To enable auto-negotiation, the switch must be OPEN. To disable this function, the switch must be CLOSED. By default, auto-negotiation is enabled.

When auto-negotiation is enabled on a port, it advertises 10/100Mbps half/full duplex capabilities. When auto-negotiation is disabled, the port's duplex is determined by the FD switch setting, and its speed is set by its corresponding 100Mx switch.

Speed Switch (100M1, 100M2, 100M3, 100M4)

The 100Mx speed switch controls the speed setting on its associated port (e.g., 100M2 determines the speed on Port 2). If auto-negotiation is disabled on a Port x, its speed will be set to one of the following:
- 100Mbps if the 100Mx switch is OPEN. (default)
- 10Mbps if the 100Mx switch is CLOSED.

When auto-negotiation is enabled, the 100Mx switch is ignored.

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*DIP switches also can be managed via console commands or with Metrobility's 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.

Duplex Switch (FD)

Switch FD determines the duplex mode on all ports that have auto-negotiation disabled.
- The ports will operate at full duplex if FD is OPEN. (default)
- They will operate at half duplex if FD is CLOSED.

If auto-negotiation is enabled on a port, that port will ignore the FD switch setting.

For example, if FD is enabled and auto-negotiation is disabled on Ports 1 and 2 and enabled on Ports 3 and 4, then Ports 1 and 2 will operate at full duplex, while Ports 3 and 4 will ignore the FD switch setting. The duplex mode for Ports 3 and 4 will be determined through the auto-negotiation process.

Half-Duplex Flow Control Switch (HDFL)

For ports operating at half duplex, the Radiance chassis stacking line card provides an option to enable half-duplex flow control (backpressure). When half-duplex flow control is activated, the Radiance card generates a jamming pattern to force a collision on a port if a buffer cannot be allocated for the port's incoming packets. Half-duplex flow control is enabled by default (OPEN).

The HDFL switch must be CLOSED to disable half-duplex flow control on all four ports. The switch must be OPEN to enable HDFL on all ports.

The table below displays sample port configurations and the DIP switch settings used to obtain them. The configuration column gives the auto-negotiation, speed and duplex options for each port. By default, all four ports are set to auto-negotiate.

Configuration					Port 1		Port 2		Port 3		Port 4	
Port 1	Port 2	Port 3	Port 4	FD	AN1	100M1	AN2	100M2	AN3	100M3	AN4	100M4
AN	AN	AN	AN		+		+		+		+	
AN	AN	AN	100 Full	+	+		+		+		—	+
AN	AN	AN	100 Half	—	+		+		+		—	+
AN	AN	AN	10 Full	+	+		+		+		—	—
AN	AN	AN	10 Half	—	+		+		+		—	—
AN	AN	100 Full	100 Full	+	+		+		—	+	—	+
AN	AN	100 Full	10 Full	+	+		+		—	+	—	—
AN	AN	100 Half	100 Half	—	+		+		—	+	—	+
AN	AN	10 Full	10 Full	+	+		+		—	—	—	—
AN	AN	10 Half	100 Half	—	+		+		—	—	—	+
AN	100 Full	100 Full	100 Full	+	+		—	+	—	+	—	+
AN	100 Half	100 Half	100 Half	—	+		—	+	—	+	—	+
AN	100 Full	10 Full	100 Full	+	+		—	+	—	—	—	+
AN	10 Half	100 Half	10 Half	—	+		—	—	—	+	—	—
AN	10 Full	10 Full	10 Full	+	+		—	—	—	—	—	—
AN	10 Half	10 Half	10 Half	—	+		—	—	—	—	—	—
100 Full	100 Full	100 Full	100 Full	+	—	+	—	+	—	+	—	+
100 Half	100 Half	100 Half	100 Half	—	—	+	—	+	—	+	—	+
10 Full	10 Full	10 Full	10 Full	+	—	—	—	—	—	—	—	—
10 Half	10 Half	10 Half	10 Half	—	—	—	—	—	—	—	—	—
10 Full	100 Full	10 Full	100 Full	+	—	—	—	+	—	—	—	+
10 Half	100 Half	10 Half	100 Half	—	—	—	—	+	—	—	—	+
10 Full	10 Full	100 Full	100 Full	+	—	—	—	—	—	+	—	+
100 Half	100 Half	10 Half	10 Half	—	—	+	—	+	—	—	—	—

AN indicates that auto-negotiation is enabled.
+ indicates the switch is enabled (OPEN) .
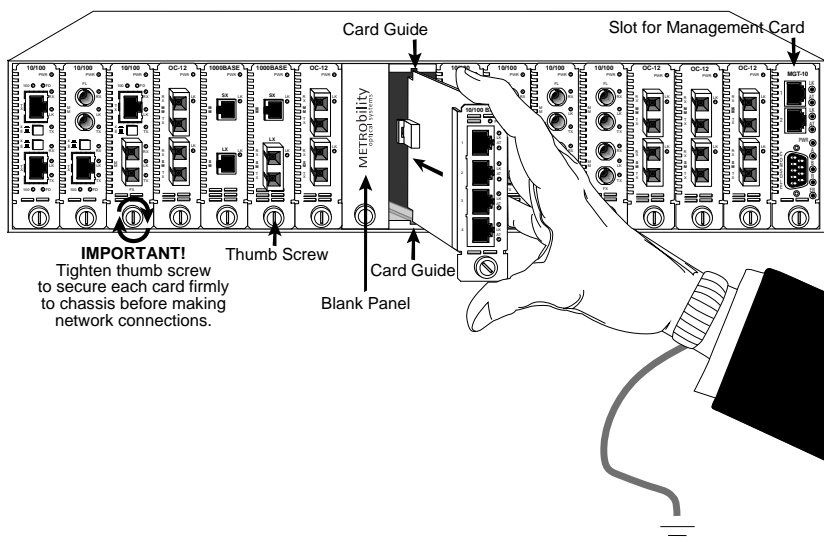**— indicates the switch is disabled (CLOSED).**
A blank space indicates that the switch setting is not applicable and can be either OPEN or CLOSED.

3 Install the Card

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

- Grasp the card by the front panel as shown.

Card Guide

Slot for Management Card

IMPORTANT!
Tighten thumb screw to secure each card firmly to chassis before making network connections.

Thumb Screw

Card Guide

Blank Panel

- Insert the card into a slot on the chassis making sure that the top and bottom edges of the board are aligned with the top and bottom card guides in the chassis. Do not force the card into the chassis unnecessarily. It should slide in easily and evenly.

- Slide the board in until the top and bottom edges of the front panel are flush and even with the top and bottom edges of the chassis.

- To secure the card to the chassis, turn the thumbscrew clockwise until it is snug. The unit is now properly installed and ready for connection to the network.

4 Connect to the Network

To connect the Radiance chassis stacking line card to the network, insert the twisted-pair cables into the appropriate connectors. Be sure the card is secured to the chassis by tightening the thumbscrew before making network connections.

The Radiance chassis stacking line card provides four shielded RJ-45 connectors that support a maximum segment length of 100 meters. Use Category 3, 4 or 5 cables for 10Mbps segments; use only Category 5 or 5E cables for 100Mbps segments.

Insert your connectors as shown below. Once power is applied to the card, correct connectivity can be verified via the link (LK) LED, if an active device is connected to the remote end of the cable.
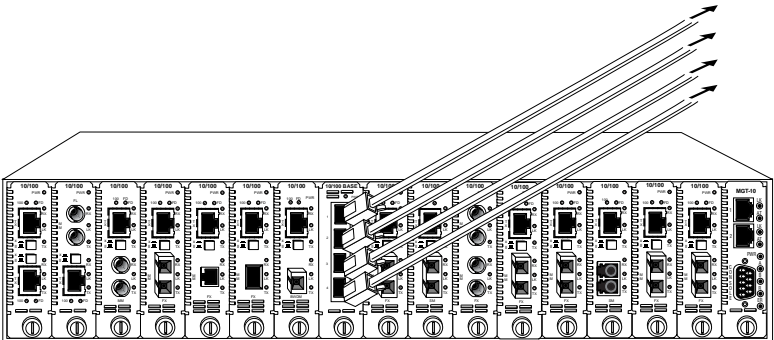
User Guide

This section contains information regarding the operating features of the Radiance chassis stacking line card.

LED Indicators

The Radiance chassis stacking line card provides several LEDs for the visible verification of unit status and proper functionality. These LEDs can assist in troubleshooting and with overall network diagnosis and management. There are separate link/speed and activity/duplex indicators for each port.

After power is applied to the card, verify correct connectivity via the LK LEDs.

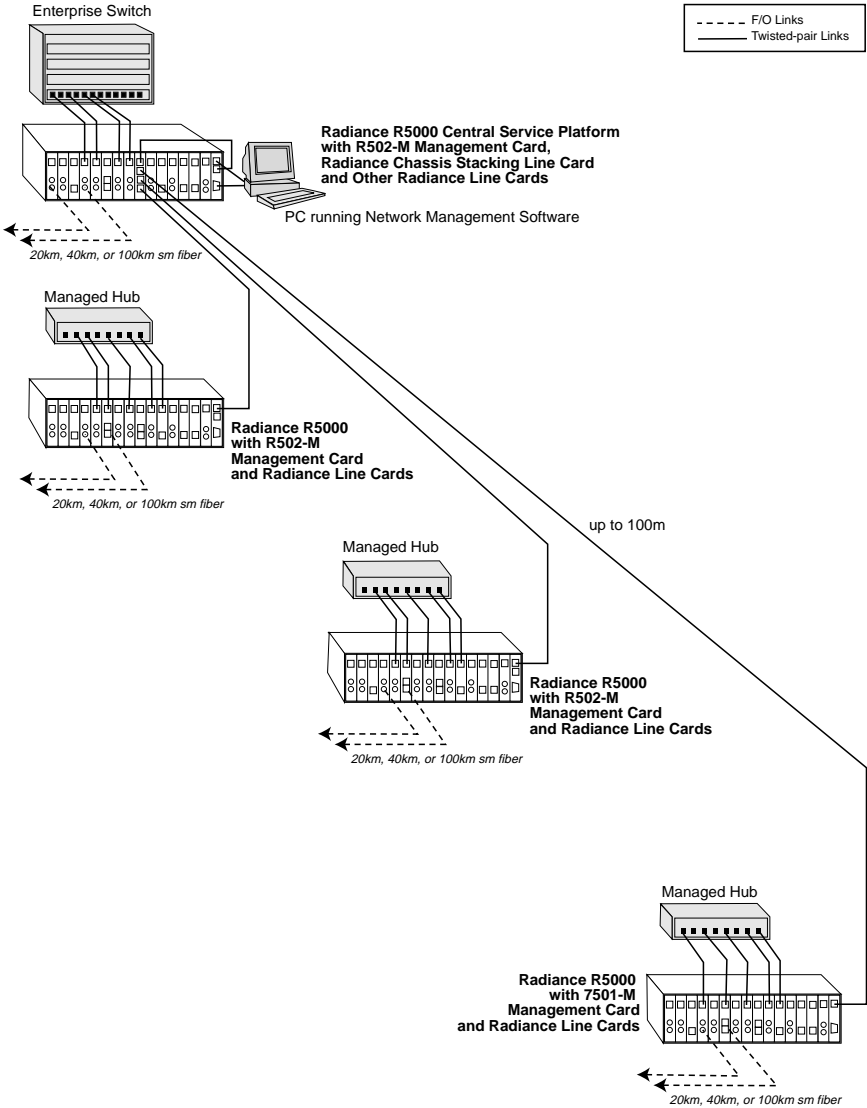| LED Label	LED Name	Color (Status)	Indication
PWR	power	green (steady)	The unit is ON.
LK	link/ speed	green (steady)	The port has a valid link and is running at 100Mbps.
		amber (steady)	The port has a valid link and is running at 10Mbps.
		OFF	No link detected.
AT	activity/ duplex	green (blinking)	The port is sending or receiving data in full duplex mode.
		amber (blinking)	The port is sending or receiving data in half duplex mode.
		OFF	The port has no data activity.

Full-Duplex Flow Control (FDFL)

Full-duplex flow control is provided as a means of avoiding packet loss during times of network congestion. With FDFL enabled (default), the Radiance line card issues a PAUSE frame when there is no buffer space available for incoming packets. FDFL is configurable through management software[*] only.

When FDFL is enabled, it is set on all four ports. However, FDFL is applicable only to a port when the following conditions are met:
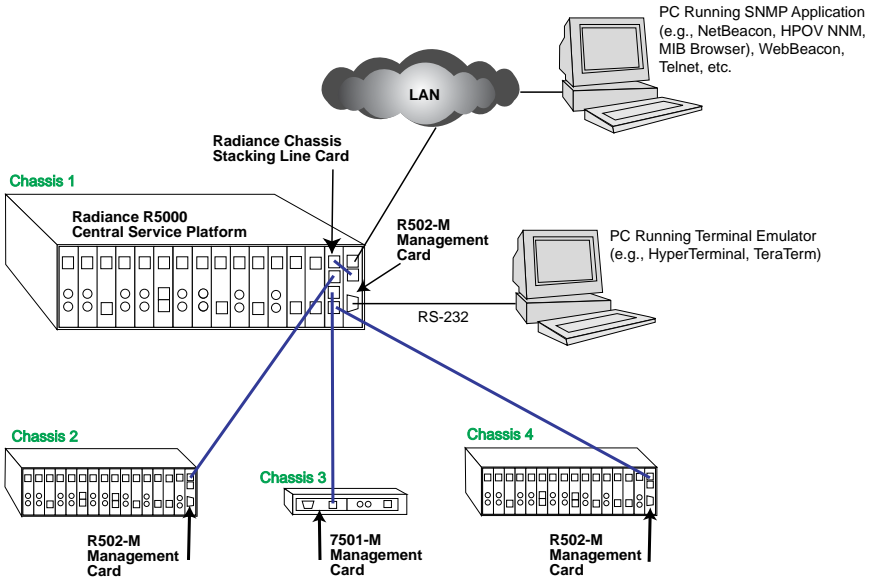- The chassis stacking line card is in full-duplex mode.
- Auto-negotiation is enabled on the port.
- During auto-negotiation, the port's link partner indicated that it supports PAUSE frames.

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*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.

Topology Solutions

Enterprise Switch

F/O Links
Twisted-pair Links

**Radiance R5000 Central Service Platform
with R502-M Management Card,
Radiance Chassis Stacking Line Card
and Other Radiance Line Cards**

PC running Network Management Software

20km, 40km, or 100km sm fiber

Managed Hub

**Radiance R5000
with R502-M
Management Card
and Radiance Line Cards**

20km, 40km, or 100km sm fiber

up to 100m

Managed Hub

**Radiance R5000
with R502-M
Management Card
and Radiance Line Cards**

20km, 40km, or 100km sm fiber

Managed Hub

**Radiance R5000
with 7501-M
Management Card
and Radiance Line Cards**

20km, 40km, or 100km sm fiber

Chassis Stacking Example

Using a Radiance chassis stacking line card, up to four Metrobility chassis can be controlled as a single network device with one IP address. Stacking requires an R502-M management card in the master chassis. One of the ports on the chassis stacking line card must be connected to Port 2 of the R502-M.

For each additional chassis you want to include in the stack, connect the Ethernet port of its x501-M or Port 1 of its R502-M management card to one of the ports on the chassis stacking line card. (See diagram above.) This provides the communication path between the master R502-M and the network stack.

When configured for a stack, the management card's secondary LAN IP address must be a valid Class B address, in accordance with RFC 1597. The network portion of the IP address must be between 172.16.0.0 and 172.31.0.0. The host portion of the IP address must be the chassis' stack position number followed by the slot number where you have installed the management card.

Example: network —— 172 . 16 . | 1 . 17 |—— host (stack . slot)

Each management card in the stack must be configured for stacking. Refer to the *Command Line Interface Reference Guide* for detailed software instructions.

Technical Specifications

Network Connections

Twisted-Pair Interface

Connector _____ Shielded RJ-45, 8-pin jack
Impedance _____ 100 Ohms nominal
Signal Level Output (differential) _____ 0.95 to 1.05V (100Mbps)
_____ 2.2 to 2.8V (10Mbps)
Signal Level Input _____ 200mV minimum (100Mbps)
_____ 585mV (10Mbps)
Supported Link Length _____100m
Cable Type   (10Mbps segments) _____ Category 3, 4 or 5 UTP/STP
(100Mbps segments) _____ Category 5 or 5E UTP/STP

Data Rate

Fast Ethernet _____ 100Mbps half duplex
_____ 200Mbps full duplex
Ethernet _____ 10Mbps half duplex
_____ 20Mbps full duplex

Power _____ +5V @ 1A, 5W

Environmental

Operating Temperature _____ 0˚ to 50˚ C
Operating Humidity _____ 5% to 95% non-condensing
Weight _____ 3.5 oz (0.1 kg)

Product Safety, EMC and Compliance Statements

This equipment complies with the following requirements:
- UL
- CSA
- CE
- FCC Part 15, Class A
- EN55022 Class A (emissions)
- EN55024: 1998 (immunity)
- DOC Class A (emissions)

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 Réglement sur le matériel brouilleur du Canada.

Warranty and Servicing

Three-Year Warranty for Radiance Chassis Stacking Line Card

Metrobility Optical Systems, Inc. warrants that every Radiance stacking 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 circum-stances 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.
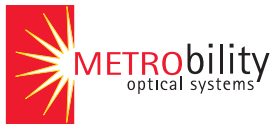
Product Manuals
The most recent version of this manual is available online at
http://www.metrobility.com/support/manuals.htm

To obtain additional copies of this manual, contact your reseller, or call
1.877.526.2278 or 1.603.880.1833

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

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