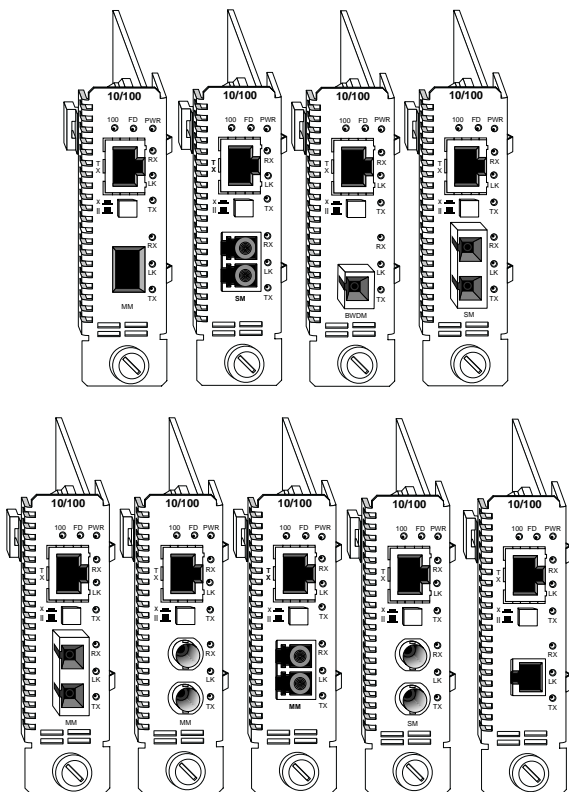# RADIANCE 10/100MBPS INTERFACE LINE CARDS



## *Installation & User Guide*

Models: R643-13 / R643-14 / R643-15 / R643-16 /
R643-17 / R643-1E / R643-1G / R643-1J /
R643-1K / R643-1M / R643-1X / R643-1Y

## Radiance 10/100Mbps Interface Line Cards

R643-13 _____ 10/100Base-TX to 100Base-FX multimode SC
R643-14 _____ 10/100Base-TX to 100Base-FX singlemode SC
R643-15 _____ 10/100Base-TX to 100Base-FX multimode ST
R632-16 _____ 10/100Base-TX to 100Base-FX singlemode ST
R643-17 _____ 10/100Base-TX to 100Base-FX singlemode SC (40km)
R643-1E _____ 10/100Base-TX to 100Base-FX multimode MT-RJ
R643-1G ___ 10/100Base-TX to 100Base-FX multimode VF-45
R643-1J _____ 10/100Base-TX to 100Base-FX singlemode SC (100km)
R643-1K _____ 10/100Base-TX to 100Base-FX multimode LC
R643-1M ___ 10/100Base-TX to 100Base-FX singlemode LC
R643-1X _____ 10/100Base-TX to 100Base-FX singlemode SC 1550/
1310nm bidirectional wavelength division multiplexed
(BDWM) SC
R643-1Y _____ 10/100Base-TX to 100Base-FX singlemode 1310/1550nm
BDWM SC

# Table of Contents

## Radiance 10/100Mbps Interface Line Cards Installation & User Guide

# *Overview*

**The Radiance 10/100Mbps interface line card provides seamless** migration between Ethernet and Fast Ethernet networks, in addition to built-in media conversion allowing high-speed integration of fiber optic and twisted-pair segments. A complete set of LEDs allows for quick status verification, and two banks of DIP switches provide added versatility on each port. To optimize your Ethernet network, each port operates independently in either half or full duplex.

The management functionality allows communication between the chassis and a management station. This ability provides remote software control over the Radiance line card configuration and notification of a failure to the management station.

The Radiance 10/100Mbps interface line card offers the following key features:

- Auto-negotiation switch on the twisted-pair interface.

- Link loss auto-recovery on the fiber optic port.

- Link Loss Return (LLR) functionality to aid in troubleshooting a remote network connection on the fiber optic port.

- Link Loss Carry Forward (LLCF) functionality to aid in trouble-shooting a remote network connection.

- An MDI-II to MDI-X switch that eliminates the need for crossover cables on the twisted-pair port.

- Flow control on each port in either half or full duplex mode.

- Store-and-forward switching to improve overall network performance by buffering packets during times of heavy congestion and to prevent the forwarding of corrupted packets.

- A high-performance switching engine that performs forwarding and filtering at full wire speed (148,800 packets per second).

- The ability to learn up to 1,024 MAC addresses.

- Low last-bit-in to first-bit-out delay.

- 128K bytes of buffer memory.

- VLAN tagging support.

- Discards short packets (less than 64 bytes) and packets with CRC or alignment errors.

- Maximum transmission unit (MTU) size of 1526 bytes.

- Compliant with applicable sections of IEEE 802.3, 802.3u, and 802.3x.

For updating or expanding an existing network, Metrobility offers line cards that support a wide range of configuration needs. The Radiance 10/100Mbps interface line cards support the following conversion combinations:

10/100Base-TX to 100Base-FX multimode SC
10/100Base-TX to 100Base-FX singlemode SC
10/100Base-TX to 100Base-FX multimode ST
10/100Base-TX to 100Base-FX singlemode ST
10/100Base-TX to 100Base-FX multimode LC
10/100Base-TX to 100Base-FX singlemode LC
10/100Base-TX to 100Base-FX multimode MT-RJ
10/100Base-TX to 100Base-FX multimode VF-45
10/100Base-TX to 100Base-FX singlemode SC 1550/1310nm
    bidirectional wavelength division multiplexed (BDWM) SC
10/100Base-TX to 100Base-FX singlemode 1310/1550nm
    BDWM SC

# *Installation Guide*

**Follow the simple steps outlined in this section to install and start using your Radiance 10/100Mbps 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 if return or storage of the unit is necessary.

## 2 Set the Switches
### *MDI-II to MDI-X Switch*

To eliminate the need for crossover cables, the Radiance 10/100Mbps interface line card includes an MDI-II to MDI-X switch for the twisted-pair port. This push-button switch is located in the center of the front panel and allows setup in either straight-through or crossover configurations.

When setting the switch, observe the positioning of the following symbols:

- The parallel symbol (ll) indicates a straight-through or parallel connection. The switch is out. *(default)*
- The cross symbol (X) indicates a crossover connection. The switch is in.

Use the tables below as a guide.

| A device that is wired straight through needs one crossover connection: | |
|---|---|
| If the cable is | the MDI-II to MDI-X Switch Setting should be |
| **straight through** | **X** |
| **crossover** | **ll** |

| A device that is wired crossover needs a parallel connection: | |
|---|---|
| If the cable is | the MDI-II to MDI-X Switch Setting should be |
| **straight through** | **ll** |
| **crossover** | **X** |

## *DIP Switches*

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

**Default Switch Settings**

| | |
|---|---|
| LLCF = DOWN | HDFL = DOWN |
| LLR2 = DOWN | FDFL = UP |
| FD2 = UP | AR = DOWN |
| 100M1 = UP | |
| AN1 = UP | |
| FD1 = UP | |

DIP switches

10/100

Port 1

MDI-II to MDI-X Switch

Port 2

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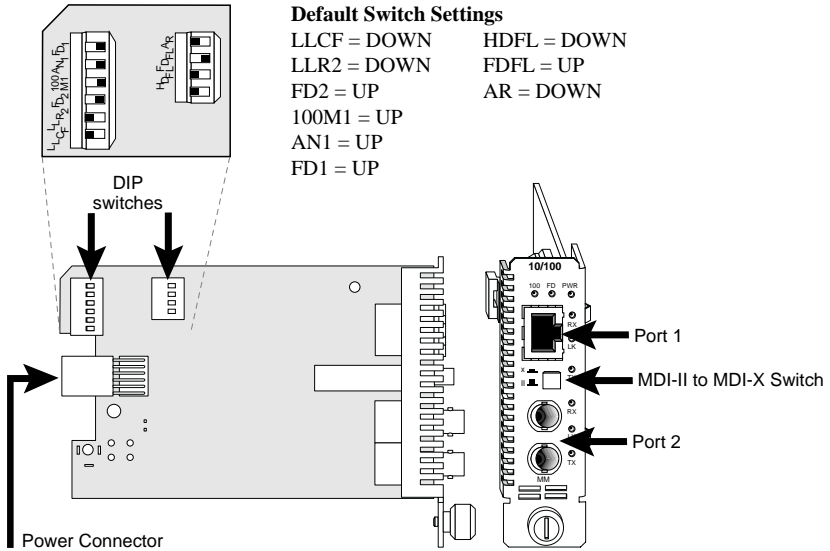
When setting DIP switches,* the UP position is when the lever of the DIP switch is pushed away from the circuit board. The DOWN position is when the lever is pushed toward the circuit board.

## Auto-Negotiation Switch (AN1)

Switch AN1 controls the use of auto-negotiation on the copper port. To enable auto-negotiation, push the lever UP. To disable this function, push the lever DOWN. By default, auto-negotiation is enabled.

When the copper port has auto-negotiation enabled, it advertises 100Mbps full duplex capabilities. When auto-negotiation is disabled, the port's duplex is determined by the FD1 switch, and its speed is set by the 100M1 switch.

Changes to switch AN1 only come into effect after the power-cycle initialization.

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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.

## 10/100Mbps Switch (100M1)*

Switch 100M1 controls the speed setting for the copper port. If auto-negotiation is disabled, the port speed will be the same as this switch setting, where UP is 100Mbps and DOWN is 10Mbps. The default speed setting is 100Mbps. When auto-negotiation is enabled, the 100M1 switch is ignored.

## Half/Full Duplex Switch (FD1, FD2)*

Switch FD1 determines the duplex mode for the copper port if auto-negotiation is disabled. When auto-negotiation is enabled, the FD1 switch setting is ignored. Switch FD2 determines the duplex mode on the fiber optic port. A port operates at full duplex when its FD switch is UP. It operates at half duplex when its FD switch is DOWN. The default is full duplex enabled (UP).

## Link Loss Return Switch (LLR2)

The 10/100Mbps interface line card incorporates Link Loss Return (LLR) functionality as an aid in troubleshooting remote connections on the fiber optic port. When LLR is enabled, the loss of inbound link pulses on the port stops the transmission of outbound link pulses on the *same* port. For example, if LLR is enabled on port 2 and its receiver (RX) stops detecting link pulses, then port 2's transmitter (TX) will stop sending link pulses. LLR is not applicable to the copper port.

Link Loss Return is enabled on Port 2 when switch LLR2 is UP. The unit is shipped with LLR disabled. Refer to Link Loss Return in the User Guide section of this manual for more information.

## Link Loss Carry Forward Switch (LLCF)

In addition to LLR, the 10/100 line cards support Link Loss Carry Forward functionality to help with troubleshooting remote connections.

Unlike LLR, which only applies to the fiber port, LLCF affects both ports on the card. When LLCF is enabled, the loss of inbound link pulses on a port stops the transmission of outbound link pulses on the *opposite* port. For example, if LLCF is enabled, the loss of incoming link pulses at *Port 1* will stop the transmission of link pulses out of *Port 2*. Conversely, if *Port 2* stops receiving link pulses, *Port 1* will not transmit link pulses.

---

*Changes to the 100M and FD switch settings only come into effect after the power-cycle initialization.

Link Loss Carry Forward is enabled on both ports when switch LLCF is UP. The unit is shipped with LLCF disabled. Refer to Link Loss Carry Forward in the User Guide section of this manual for further details.

## Auto-Recovery Switch (AR)

Switch AR controls the use of auto-recovery on the fiber port. To enable auto-recovery, push the lever UP. To disable this function, push the lever DOWN.  Auto-recovery is disabled by default.

When auto-recovery is enabled, the card will attempt to restart the fiber link between two back-to-back 10/100 line cards if they are both waiting for the other one to transmit first. Refer to Auto-Recovery in the User Guide section for more information.

## Full-Duplex Flow Control Switch (FDFL)

Full-duplex flow control is used to avoid dropping packets during network congestion. If FDFL is enabled, the card will issue a PAUSE frame when there is no buffer space available for incoming packets.

For ports operating at full duplex, the FDFL switch determines the use of flow control. Set the switch UP to enable full-duplex flow control on both ports. The setting only applies to ports in full-duplex mode with auto-negotiation enabled. Additionally, during auto-negotiation, the port's link partner must advertise that it supports PAUSE frames. Full-duplex flow control is enabled by default.

## Half-Duplex Flow Control Switch (HDFL)

For ports operating at half duplex, the 10/100 line card provides an option to enable backpressure flow control. When flow control is activated, the card generates a jamming pattern to force a collision on the port if the card cannot allocate a buffer for the port's incoming packets.

Half-duplex flow control is disabled by default. Set the switch UP to enable half-duplex flow control on both ports.

Use the table below to help you set the DIP switches to obtain specific modes of operation. The configuration column lists the speed and duplex options for Port 1 on the left and Port 2 on the right.

**Set the switches UP where indicated.**
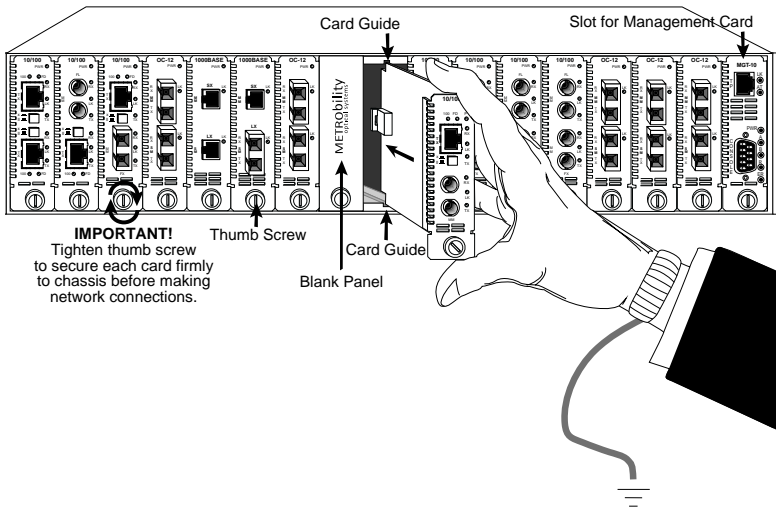**Set the switches DOWN for the blank positions.**
**NA indicates the switch setting is not applicable and can be either UP or DOWN.**

| Configuration | Port 1 | | | Port 2 |
| --- | --- | --- | --- | --- |
| | FD1 | AN1 | 100M1 | FD2 |
| Auto-Negotiation — 100 Full | NA | UP | NA | UP |
| Auto-Negotiation — 100 Half | NA | UP | NA | |
| 10 Half — 100 Half | | | | |
| 10 Half — 100 Full | | | | UP |
| 10 Full — 100 Half | UP | | | |
| 10 Full — 100 Full | UP | | | UP |
| 100 Half — 100 Half | | | UP | |
| 100 Half — 100 Full | | | UP | UP |
| 100 Full — 100 Half | UP | | UP | |
| 100 Full — 100 Full | UP | | UP | UP |

# 3 Install the Line Card

The Radiance 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 the line card.

- Grasp the card by the front panel as shown.

Card Guide

Slot for Management Card

METRObility optical systems

**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 card 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 line 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.

# 4 Connect to the Network

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

## *Fiber Optic Connections*

- The R643-13, -15, -1E, -1G, and -1K provide one set of FX multi-mode SC/ST/MT-RJ/VF-45/LC connectors, respectively, and support a maximum segment length of up to 2km for remote links.

- The R643-14, R643-16 and R643-1M provide one set of FX singlemode SC/ST/LC connectors, respectively, and support a maximum segment length of up to 20km.

- The R643-17 provides one set of FX singlemode SC connectors and supports a maximum segment length of up to 40km.

- The R643-1J provides one set of FX singlemode SC connectors and supports a maximum segment length of up to 100km.

## *BWDM Connection*

The bidirectional wavelength division multiplexed (BWDM) 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, a -1X model must always be connected to a -1Y. The -1X cards are designed to transmit data at a wavelength of 1550nm and receive at 1310nm. Correspondingly, the -1Y cards transmit data at 1310nm and receive at 1550nm.

## *Twisted-Pair Connection*

Each Radiance line card provides one shielded RJ-45 connector that supports a maximum segment length of up to 100 meters. Use Category 3, 4 or 5 cables for 10Mbps segments; use only Category 5 or 5E cables for 100Mbps segments.

*NOTE: Be sure to properly set the MDI-II to MDI-X switch located between the two port connectors. Refer back to <u>Step 2</u> if necessary.*

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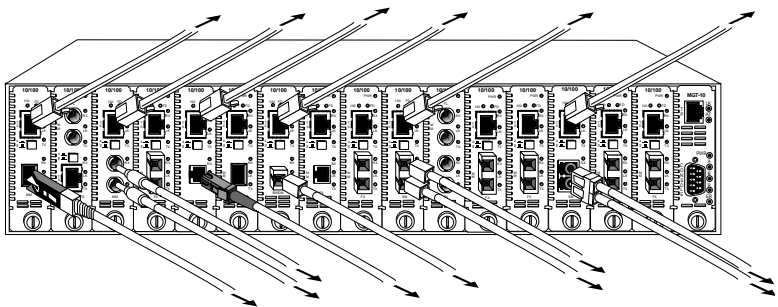
*User Guide*

**This section contains information regarding the operating features of the Radiance 10/100Mbps interface line card.**

## LED Indicators

The Radiance 10/100Mbps interface 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 transmit, receive and link indicators for each port. The twisted-pair port also has a speed LED and a duplex LED.

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

| LED Label | LED Name | Color (Status) | Function |
|-----------|----------|----------------|----------|
| PWR | power | green (steady) | The unit is ON. |
| **Copper Port LEDs** | | | |
| 100 | speed | green (steady) | The speed setting of the port is 100Mbps when lit. It is 10Mbps when not lit. |
| FD | duplex | green (steady) | The port is in full-duplex mode when lit. It is in half-duplex mode when not lit. |
| RX | receive | green (blinking) | The port is receiving data. |
| LK | link | green (steady) | Verifies that the port has a valid link. |
| TX | transmit | green (blinking) | The port is sending data. |
| **Fiber Port LEDs** | | | |
| RX | receive | green (blinking) | The port is receiving data, or the port is attempting auto-recovery. |
| LK | link | green (steady) | Verifies that the port has a valid link. |
| TX | transmit | green (blinking) | The port is sending data, or the port is attempting auto-recovery. |

# Link Loss Return (LLR)

The fiber optic ports of the Radiance line cards have been designed with LLR[*] functionality for troubleshooting remote connections.

When LLR is enabled, the fiber port's transmitter shuts down when its receiver fails to detect a valid receive link. LLR is normally enabled on one end of the link and is typically enabled on either the unmanaged or remote device. Setting LLR on both ends of the link necessitates auto-recovery. See Auto-Recovery on page 16.

The diagram below shows a typical network configuration with good link status using Radiance line cards for remote connectivity.
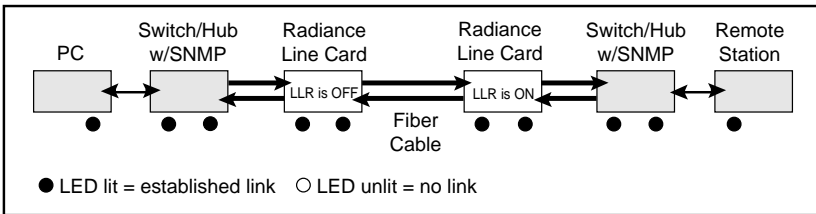


If one of the optical conductors is bad (as shown in the diagram box below), the line card with LLR enabled will return a no-link condition to its link partner. This aids the administrator in determining the source of the loss.
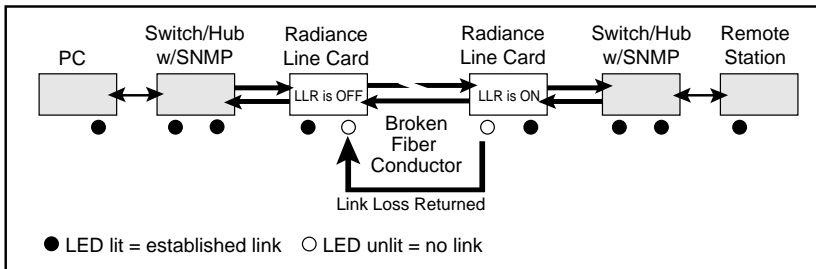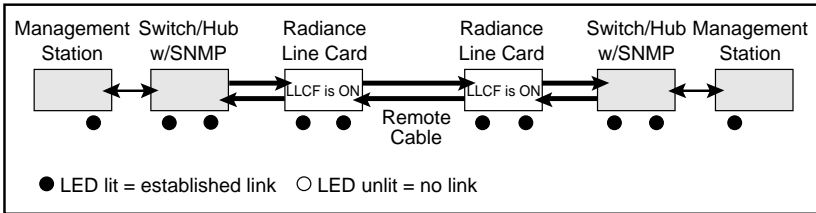


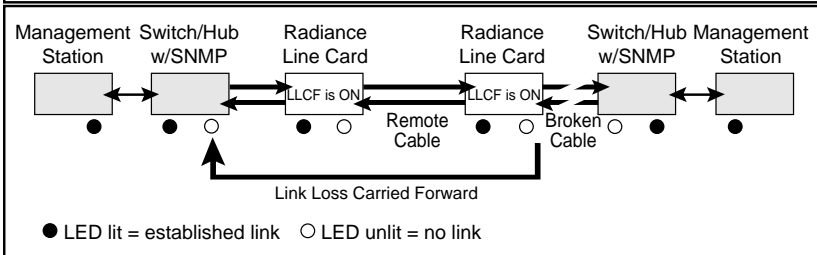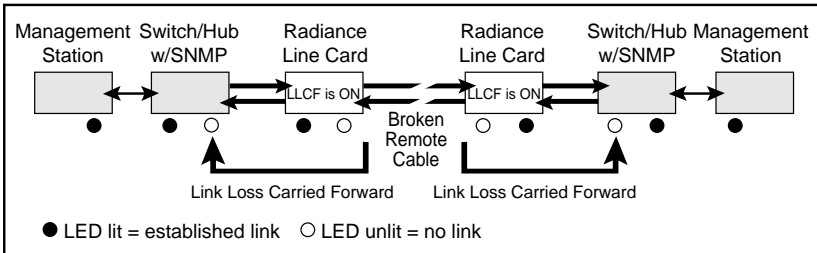*Units are shipped with the LLR function disabled (DOWN).

# Link Loss Carry Forward (LLCF)*

The Radiance 10/100 line card incorporates LLCF for troubleshooting remote connections. When LLCF is enabled, the ports do not transmit a link signal until they receive a link signal from the opposite port.

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

| Management Station | Switch/Hub w/SNMP | Radiance Line Card | Radiance Line Card | Switch/Hub w/SNMP | Management Station |
|---|---|---|---|---|---|

LLCF is ON          LLCF is ON          Remote Cable

● LED lit = established link    ○ LED unlit = no link

If a connection breaks, the line cards carry that link loss forward to the switch/hubs which generate a trap to the management stations. A network administrator can then determine the source of the problem.

| Management Station | Switch/Hub w/SNMP | Radiance Line Card | Radiance Line Card | Switch/Hub w/SNMP | Management Station |
|---|---|---|---|---|---|

LLCF is ON          LLCF is ON          Broken Remote Cable

Link Loss Carried Forward          Link Loss Carried Forward

● LED lit = established link    ○ LED unlit = no link

| Management Station | Switch/Hub w/SNMP | Radiance Line Card | Radiance Line Card | Switch/Hub w/SNMP | Management Station |
|---|---|---|---|---|---|

LLCF is ON          LLCF is ON          Remote Cable          Broken Cable

Link Loss Carried Forward

● LED lit = established link    ○ LED unlit = no link

* Units are shipped with LLCF disabled (DOWN).

# Auto-Recovery

The Radiance 10/100 line card includes an auto-recovery circuit that allows you to transparently connect a pair of cards between two network devices. A typical application is to use the pair to extend a network's reach between two distant devices.
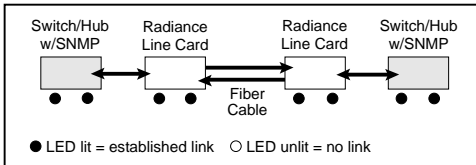


In this back-to-back setup, it may be desirable to see the entire link down if any of the connecting segments fails. This means that both copper ports must relay a no-link condition to the switch/hub when any of the cables is broken. To achieve this, both LLCF and LLR must be enabled on each card. Additionally, auto-recovery must be enabled and auto-negotiation must be disabled.

**Auto-Recovery is enabled only when <u>all</u> of the following switches are set as indicated:**
AN1 = disabled     LLCF = enabled     AR = enabled     LLR2 = enabled

Auto-recovery is required whenever LLR is enabled on two back-to-back 10/100 line cards. LLR is designed for monitoring the transmit fiber. Because a port with LLR enabled requires link to be received *prior* to the transmission of link pulses out the same port, LLR cannot be enabled on both ends of the same fiber line without auto-recovery. Auto-recovery prevents the two fiber ports from ending up in the resulting deadlock situation, with each fiber port waiting for the other to transmit first. Auto-recovery allows the deadlock to be broken by periodically sending out pulses from the fiber port forcing the 10/100 card to establish its fiber link.

The diagrams below show how the two switch/hubs are alerted to a broken fiber cable. Notice that both LLR and LLCF must be enabled under this condition.
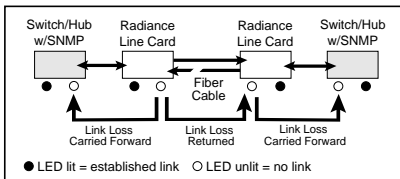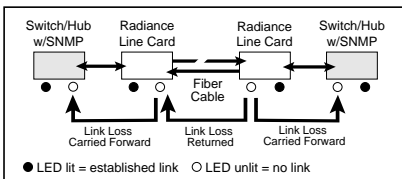
# Auto-Recovery Application Example

A set of four Radiance 10/100 line cards can be used to provide the redundancy necessary to ensure that data from a 100Mbps device reaches its destination in a 10Mbps device, as illustrated in the diagram below. In this example, the main link, which includes cards A1 and A2, must be seen as a single connection. If any of the cables in the main link fails, both switch/hubs must be notified of the failure so they can activate the backup link, which includes line cards B1 and B2.
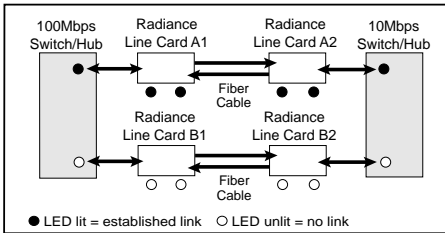


Since the entire main link must appear down if any of its connecting segments fails, the copper ports of line cards A1 and A2 must be able to indicate a no-link condition to their corresponding switch/hubs. To do this, auto-recovery must be enabled on both Radiance line cards A1 and A2.

To enable auto-recovery on the line cards, make sure that on each unit AN1 is disabled, AR is enabled, LLR2 is enabled, and LLCF is enabled.
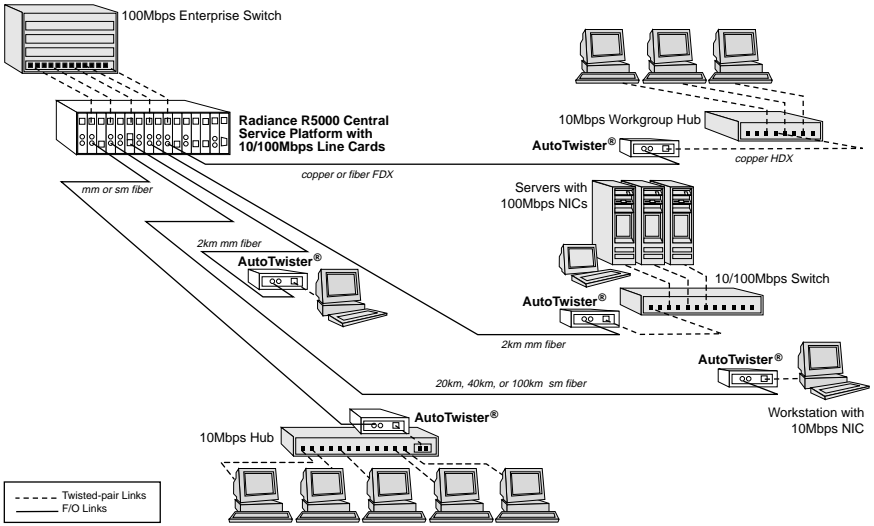
The diagram below illustrates how the two switch/hubs are alerted to a broken fiber cable in the main link, thus activating the backup link with Radiance line cards B1 and B2.
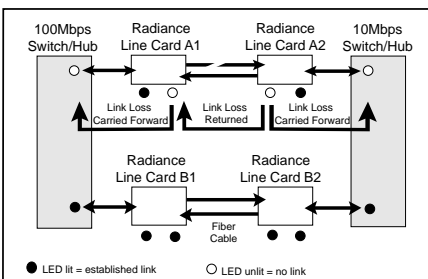


**Sequence of events:**

- Line card A1 stops transmitting data to line card A2.
- A2 senses the loss of link and stops transmitting link pulses to A1 and the 10Mbps switch/hub.
- A1 receives the no-link condition and stops transmitting link pulses to the 100Mbps switch/hub.
- The 100Mbps and 10Mbps switch/ hubs detect that the main link is down and switch traffic to the backup link.
- Traffic resumes via the backup path with line cards B1 and B2.
- Because auto-recovery is enabled, line cards A1 and A2 try to reestablish the fiber link by periodically sending out pulses from their fiber ports.

# Topology Solutions



100Mbps Enterprise Switch

**Radiance R5000 Central
Service Platform with
10/100Mbps Line Cards**

10Mbps Workgroup Hub

**AutoTwister®**

*copper or fiber FDX*

*mm or sm fiber*

*copper HDX*

Servers with
100Mbps NICs

*2km mm fiber*

**AutoTwister®**

**AutoTwister®**

10/100Mbps Switch

*2km mm fiber*

**AutoTwister®**

*20km, 40km, or 100km  sm fiber*

Workstation with
10Mbps NIC

**AutoTwister®**

10Mbps Hub

- - - - - Twisted-pair Links
———— F/O Links

# *Technical Specifications*

## **Network Connections**

*Twisted-Pair Interface*

Connector _____ Shielded RJ-45, 8-pin jack
Impedance _____ 100 Ohms nominal
Signal Level Output (differential) _____ .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

*Multimode Fiber Optic Interface* (R643-13, R643-15, R643-1E, R643-1G, R643-1K)

Connector _____ SC, ST, MT-RJ, VF-45, LC
Wavelength _____ 1310nm
RX Input Sensitivity _____ -31 dBm minimum
Output Power _____ -23.5 dBm to -14 dBm (50/125 μm)
_____ -20 dBm to -14 dBm (62.5/125 μm)
Typical Link Budget _____ 17 dB
Supported Link Length _____ up to 2km full duplex
Cable Type _____ 50/125 or 62.5/125 μm F/O

*Singlemode Fiber Optic Interface* (R643-14, R643-16, R643-1M)

Connector _____ SC, ST, LC
Wavelength _____ 1310nm
RX Input Sensitivity _____ -31 dBm minimum
Output Power _____ -15 dBm to -8 dBm (9/125 μm)
Typical Link Budget _____ 23 dB
Supported Link Length _____ up to 20km full duplex
Cable Type _____ 9/125 μm F/O

*Singlemode Fiber Optic Interface — long haul distance support* (R643-17)

Connector _____ SC
Wavelength _____1310nm
RX Input Sensitivity _____ -31 dBm minimum
Output Power _____-5 dBm to 0 dBm (9/125 μm)
Typical Link Budget _____ 33 dB
Supported Link Length _____ up to 40km full duplex
Cable Type _____ 9/125 μm F/O

*Singlemode Fiber Optic Interface — extended long haul distance support*
(R643-1J)

Connector _____ SC
Wavelength _____ 1550nm
RX Input Sensitivity _____ -34 dBm minimum
Output Power _____-5 dBm to 0 dBm (9/125 µm)
Typical Link Budget _____ 33 dB
Supported Link Length _____ up to 100km full duplex
Cable Type _____ 9/125 µm F/O

*Singlemode BWDM Fiber Optic Interface*

Connector _____ SC
Supported Link Length _____ up to 20km full duplex
Cable Type _____ 9/125 µm F/O
RX Input Sensitivity _____ -32 dBm minimum
Output Power _____ -15 dBm to -8 dBm (9/125 µm)
Typical Link Budget _____ 20 dB
(R643-1X)
    TX Wavelength _____1550nm
    RX Wavelength _____1310nm
(R643-1Y)
    TX Wavelength _____1310nm
    RX Wavelength _____1550nm

## Data Rate

Data Rate _____ 100Mbps half duplex; 200Mbps full duplex (Fast Ethernet)
              _____ 10Mbps half duplex; 20Mbps full duplex (Ethernet)

## Power _____ +5V @ 1A, 5W

## Environmental

Operating Temperature _____ -20° to 70° C
Storage Temperature _____ -30° to 70° 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
- CB
- FCC Part 15, Class A
- NEBS Level 3 Certification

- EN55022 Class A (emissions)
- EN55024: 1998 (immunity)
- DOC Class A (emissions)
- 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 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 10/100Mbps Interface Line Cards**

Metrobility Optical Systems, Inc. warrants that every Radiance 10/100Mbps 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

**Product Registration**

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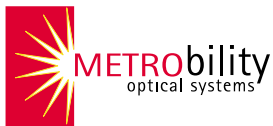
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