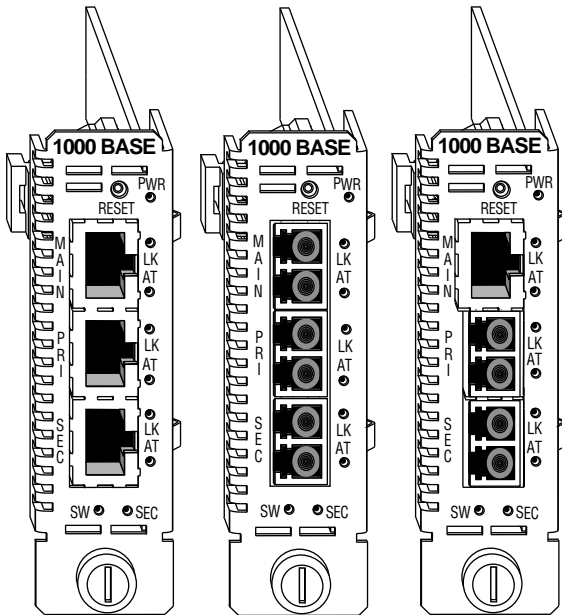


RADIANCE

1000MBPS REDUNDANT INTERFACE LINE CARDS



Installation & User Guide

Models: R752-11 / R752-1S / R752-SS

Radiance 1000Mbps Redundant Interface Line Cards

Line Card Models

R752-11 _____ 1G TX RJ-45 to Dual TX RJ-45
R752-1S _____ 1G TX RJ-45 to Dual FX LC
R752-SS _____ 1G FX LC to Dual FX LC

Small Form-Factor Pluggable (SFP) Fiber Optic Options

O211-M5 _____ SFP LC (multimode, 550 m 50 μ m; 275 m 62.5 μ m)
O211-10 _____ SFP LC (singlemode, 10 km)
O211-25 _____ SFP LC (singlemode, 25 km)
O211-40 _____ SFP LC (singlemode, 40 km)
O211-70 _____ SFP LC (singlemode, 70 km)
O211-1A _____ SFP LC (singlemode, 100 km)
O411-80-31 _____ SFP LC (Coarse Wavelength Division Multiplexing, 80 km,
1310 nm)
O411-80-33 _____ SFP LC (CWDM, 80 km, 1330 nm)
O411-80-35 _____ SFP LC (CWDM, 80 km, 1350 nm)
O411-80-37 _____ SFP LC (CWDM, 80 km, 1370 nm)
O411-80-39 _____ SFP LC (CWDM, 80 km, 1390 nm)
O411-80-41 _____ SFP LC (CWDM, 80 km, 1410 nm)
O411-80-43 _____ SFP LC (CWDM, 80 km, 1430 nm)
O411-80-45 _____ SFP LC (CWDM, 80 km, 1450 nm)
O411-80-47 _____ SFP LC (CWDM, 80 km, 1470 nm)
O411-80-49 _____ SFP LC (CWDM, 80 km, 1490 nm)
O411-80-51 _____ SFP LC (CWDM, 80 km, 1510 nm)
O411-80-53 _____ SFP LC (CWDM, 80 km, 1530 nm)
O411-80-55 _____ SFP LC (CWDM, 80 km, 1550 nm)
O411-80-57 _____ SFP LC (CWDM, 80 km, 1570 nm)
O411-80-59 _____ SFP LC (CWDM, 80 km, 1590 nm)
O411-80-61 _____ SFP LC (CWDM, 80 km, 1610 nm)

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“redundant twister” technology is a patent of Metrobility Optical Systems, Inc.

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Overview

The Radiance 1000Mbps redundant interface line card offers the resiliency of data link redundancy to ensure network integrity with no down time. This link duplication provides the nonstop networking capability essential for high priority traffic and mission-critical applications. The Radiance redundant interface line card provides full redundant data paths for Gigabit Ethernet devices. The card also provides 1000Base copper-to-fiber migration.

The redundant line card actively monitors the primary link and if it fails, automatically activates the secondary link without interruption to network operation. Every redundant line card also features SONAR (Switch On No Activity Received). With SONAR enabled, the card provides protection against loss of data activity in addition to link integrity.

Management control over the Radiance redundant interface line card allows the network administrator to monitor and configure the card via a PC through console commands, Metrobility's NetBeacon™ or WebBeacon™ management software, or any SNMP application.

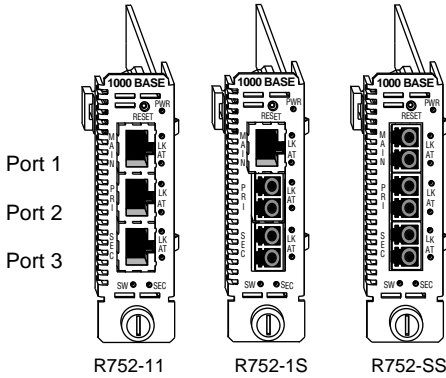
The Radiance 1000Mbps redundant interface line card includes the following features:

- Can be configured to operate in Dynamic Recovery Mode (DRM) to ensure session integrity and increased uptime.
 - Can be configured to operate in Network Select Mode (NSM) to redirect and isolate traffic adding extra security.
 - Immediately switches from the primary port to the secondary port if the primary link fails.
 - In addition to switching on loss of link, the card can be configured to switch on loss of data (SONAR).
 - Full signal retiming, reshaping and re-amplification, thus allowing the maximum segment length.
 - Fast failover time (750 ms for the R752-11, and 672 ns for the R752-1S and R752-SS) for low packet/frame loss.
 - A maximum loss of 1-2 packets (measured with minimum packet size and minimum inter-packet gap) due to failover transition.
-

- In addition to providing link and data on the active ports, the card can be configured to provide link or link and redundant data transmission on the inactive port.
- Automatic or manually controlled switchover.
- Supports full-duplex and half-duplex operation.
- Link Loss Carry Forward on the R752-SS and Copper Loss Carry Forward on the R752-1S for troubleshooting remote network connections.
- Compatibility with devices configured for auto-negotiation.
- Small form-factor pluggable (SFP) fiber optic transceivers fully compliant with applicable aspects of IEEE 802.3-2002.

The Radiance 1000Mbps redundant interface line card is available in several models. Each model contains a MAIN port, a PRIMARY port and a SECONDARY port. Redundancy is provided between the PRIMARY and SECONDARY ports.

Model Number	Connectors	Maximum Supported Link Length
R752-11	RJ-45 to dual RJ-45	100m/100m
R752-1S	RJ-45 to dual LC	100m/100km
R752-SS	LC to dual LC	100km/100km



Installation Guide

Follow the steps outlined in this section to install and start using your Radiance 1000Mbps redundant 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).

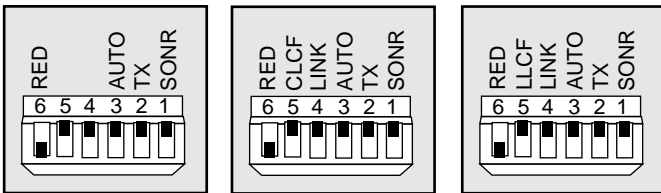
1 Unpack the Line Card

Your order has been provided with the safest possible packaging, but shipping damage does occasionally occur. Inspect your order carefully for damage that may have occurred during shipment. If you discover any shipping damage, notify the 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 DIP Switches

A set of DIP switches, located on the circuit board, provides configuration options for several modes of operation. These switches are clearly marked on the line card's printed circuit board. Refer to the tables on the following pages for the proper setting of the DIP switches.*

The DIP switches are the same on all models except for switches 4 and 5. On the R752-11, both switches are non-functional. On the R752-1S, switch 5 controls Copper Loss Carry Forward (CLCF); and on the R752-SS, switch 5 controls Link Loss Carry Forward (LLCF).



R752-11

R752-1S

R752-SS

Default DIP Switch Settings

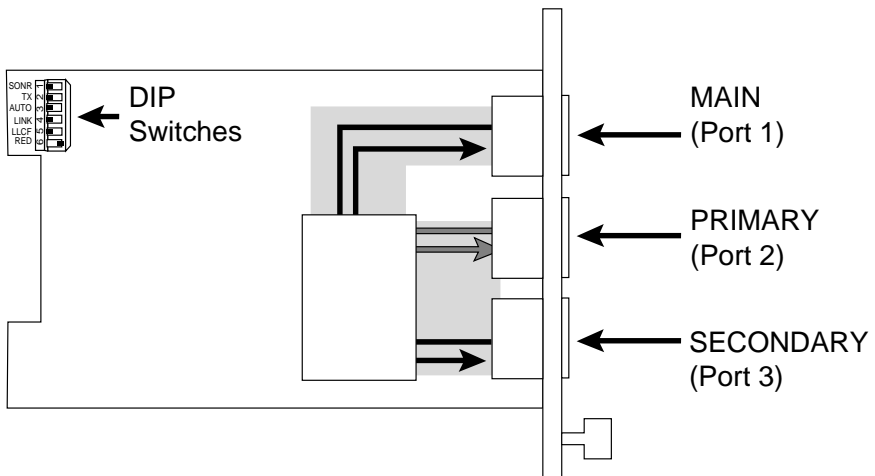
* DIP switches can also be managed via console commands or through Metrobility NetBeacon or WebBeacon management software. Refer to the **Command Line Interface Reference Guide**, **NetBeacon Element Management Software Installation & User Guide** or **WebBeacon Management Software Installation & User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

Set the DIP switches for the Radiance 1000Mbps redundant interface line card as follows:

Switch Name	Position*	Operation
SONR	UP	SONAR (switch on no activity received) is enabled. To properly activate SONAR, the RED and LINK switches also must be enabled.
	DOWN <i>(default)</i>	SONAR is disabled.
TX	UP	Transmits data on both the PRIMARY and SECONDARY ports simultaneously. The LINK switch must be enabled on both ports.
	DOWN <i>(default)</i>	Transmits data on the active port only.
AUTO	UP	In Network Select Mode (NSM), sets the default port to SECONDARY. In Dynamic Recovery Mode (DRM), the active port automatically reverts back to the PRIMARY port when its link is reestablished. If SONAR is enabled, activity detection will also be required before the active port reverts back to PRIMARY.
	DOWN <i>(default)</i>	In NSM, sets the default active port to PRIMARY. In DRM, the active port does not revert back to the PRIMARY port when its link is reestablished or if activity is detected (SONAR enabled). Use the RESET push button located on the front of the card to force the active port back to PRIMARY and to clear the SW (switchover) LED. Note: The active port will revert back to PRIMARY if the SECONDARY port has no link or a loss of activity (SONAR enabled) and the PRIMARY port has a valid link and data is detected (SONAR enabled).

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

Switch Name	Position	Operation
LINK*	UP	Link signals are sent out on both the PRIMARY and SECONDARY ports.
	DOWN <i>(default)</i>	Link signals are sent out on the active port only. Note: The TX switch is ignored in this setting.
LLCF or CLCF**	UP	Link Loss Carry Forward (LLCF) or Copper Loss Carry Forward (CLCF) is enabled.
	DOWN <i>(default)</i>	Link Loss Carry Forward or Copper Loss Carry Forward is disabled.
RED	UP <i>(default)</i>	Operates in Dynamic Recovery Mode. If the primary link fails and the secondary link is present, the SECONDARY port will become active. When SONAR is enabled, if the PRIMARY port loses activity and activity is detected on the SECONDARY port, then the SECONDARY port will be the active port.
	DOWN	Operates in Network Select Mode. Use the RESET push button to toggle between PRIMARY and SECONDARY. Use the AUTO switch to set the initial active port on power up. Up is SECONDARY and down is PRIMARY.



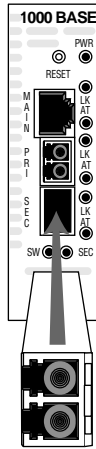
* LINK is not applicable to the R752-11.

** The R752-SS supports LLCF; the R752-1S supports CLCF; and the switch is not applicable to the R752-11.

3 **Install the SFP Optics**

The R752-1S and R752-SS require two or three sets of small form-factor pluggable (SFP) optics. Each set of optics is shipped separately.

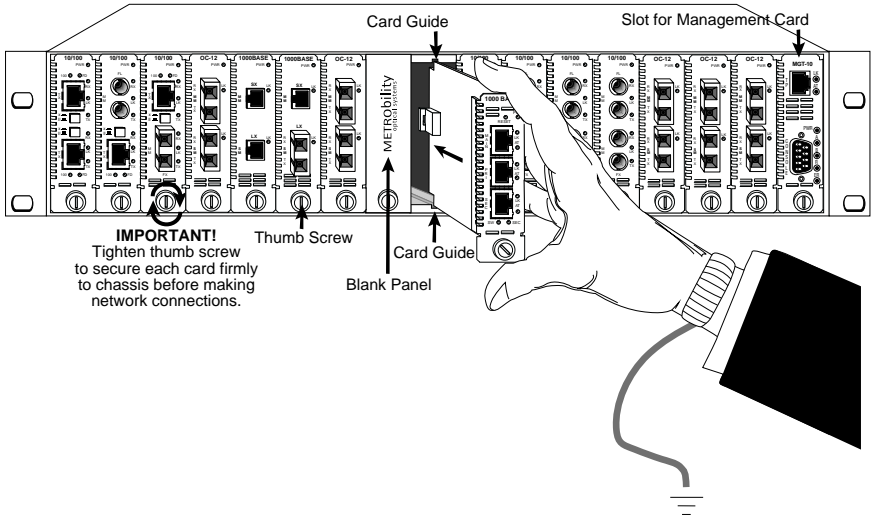
To install the optics, slide the SFP module into an empty slot, pushing it firmly in place. Remove the protective covering on the LC connectors.



4 **Install the Line Card**

Radiance line cards offer the ease of plug-and-play installation and are hot-swappable. All cards must be firmly secured to the chassis before network connections are made. Follow the simple steps outlined below to install the redundant interface line card.

- Grasp the card by the front panel as shown.
- Insert the card into a slot on the chassis making sure that the top and bottom edges of the circuit 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.



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

5 **Connect to the Network**

A total of three connections must be made on the front panel when connecting the Radiance redundant line card to the network. Make sure that the card is firmly secured to the chassis before making network connections.

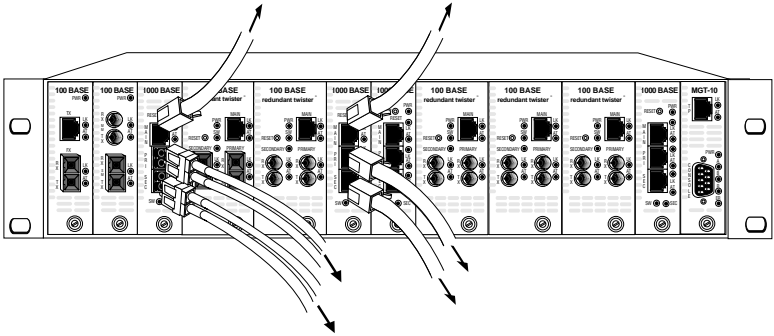
The MAIN port provides connectivity to the local networking system. The PRIMARY and SECONDARY ports provide protected connectivity to the remote system(s).

- Connect to the MAIN port.
- Connect to the PRIMARY port.
- Connect to the SECONDARY port.

Twisted-Pair Interface

The R752-11 and R752-1S redundant line cards provide one shielded RJ-45 jack for connection to the 1000Base-T MAIN port. It supports a maximum segment length of 100 meters over Category 5e twisted-pair cables.

The R752-11 redundant interface line card provides two additional RJ-45 jacks for the PRIMARY and SECONDARY port connections. Both ports support a maximum segment length of 100 meters over Category 5e twisted-pair cables.



Fiber Optic Interface

The R752-1S and R752-SS redundant interface line cards provide two or three fiber optic ports, respectively. Each fiber port provides a set of LC connectors. For maximum flexibility in designing or expanding your network, these fiber ports support any combination of the following Metrobility small form-factor pluggable (SFP) transceivers. The maximum distance and fiber type supported by each port is as follows:

<u>Model #</u>	<u>Distance</u>	<u>Fiber Type</u>
O211-M5	550 m	multimode
O211-10	10 km	singlemode
O211-25	25 km	singlemode
O211-40	40 km	singlemode
O211-70	70 km	singlemode
O211-1A	100 km	singlemode
O411-80-xx	80 km	singlemode (CWDM)

IMPORTANT: The Radiance 1000Mbps redundant interface line card is designed to operate using only the Metrobility SFP transceivers listed above. **Installing unspecified parts may damage the product and will void the unit's warranty.**

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

transmit (TX) optical conductor of the device connects to the receive (RX) optical conductor of the Radiance card.

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 R752 is designed with auto-negotiation enabled on its copper ports and disabled on its fiber 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](#).

User Guide

This section contains information regarding the operating features of your Radiance 1000Mbps redundant interface line card.

LED Operation

Several LEDs are visible from the front panel. These include the power (PWR), switchover (SW), secondary (SEC), link (LK) and activity (AT) LEDs. There are separate link and activity LEDs for each of the three ports. Refer to the table below for a description of each LED.

The function of each LED is as follows:

LED Label	Color (Status)	Indication
SW	Green (steady)	SECONDARY port was the active port at some point.
PWR	Green (steady)	Power ON.
SEC	Green (steady)	SECONDARY is the active port.
	(off)	PRIMARY is the active port.
(MAIN) LK	Green (steady)	Receive link present on MAIN port.
(MAIN) AT	Green (blinking)	MAIN port receiving data.
(PRI) LK	Green (steady)	Receive link present on PRIMARY port.
(PRI) AT	Green (blinking)	PRIMARY port receiving data.
(SEC) LK	Green (steady)	Receive link present on SECONDARY port.
(SEC) AT	Green (blinking)	SECONDARY port receiving data.

Reset Push Button

A small RESET push button is located on the front panel of the Radiance redundant line card. When used in conjunction with the card's switchover and secondary LEDs and the AUTO DIP switch setting, this push button allows you to effectively maintain or troubleshoot the PRIMARY link connection.

Because of its small size and recessed placement within the front panel, press the RESET push button with the tip of a pointed object. Pushing and holding the RESET push button has no effect. It is the act of pressing the push button that causes a reset.

In the event of a primary link failure, pressing the RESET push button has the following effects:

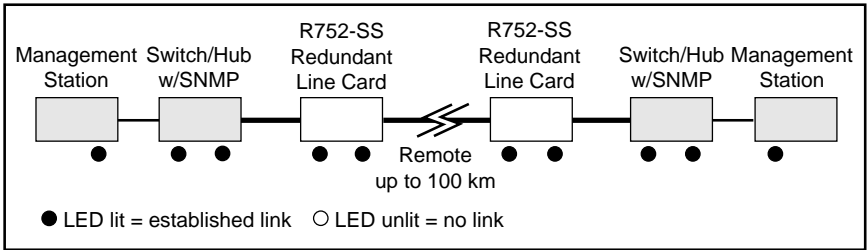
If the AUTO switch is UP and the RED switch is UP.	The active port automatically reverts to PRIMARY when the primary link is reestablished. Pressing the RESET switch clears the SW LED.
If the AUTO switch is DOWN and the RED switch is UP.	The active port does <u>not</u> automatically revert to PRIMARY when the primary link is reestablished. Pressing the RESET switch clears the SW and SEC LEDs and forces the PRIMARY port to be the active port. If the secondary link is disabled, it will revert to PRIMARY if the PRIMARY port has a good link.
	If there is a link only on the SECONDARY port, then the SW and SEC LEDs will remain lit. Pressing the RESET switch will have no effect.
If the RED switch is DOWN.	The card operates in Network Select Mode (NSM). The RESET push button toggles the active link between the PRIMARY and SECONDARY ports.

Link Loss Carry Forward (LLCF)

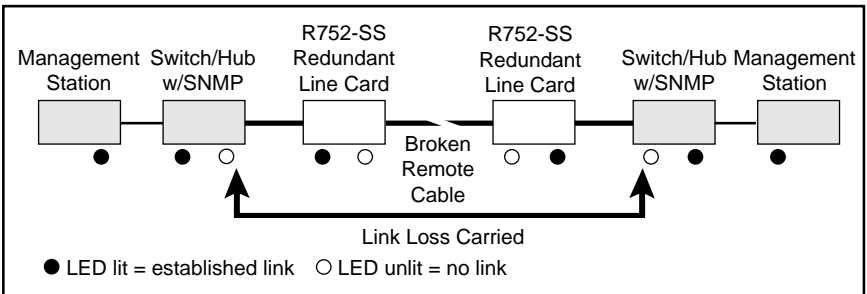
The R752-SS redundant interface line card has been designed with LLCF functionality to aid in troubleshooting remote connections.

When LLCF is enabled* and the R752-SS stops receiving link signals on a port, it stops the transmission of link signals on the other port of the line card. For example, if LLCF is enabled and two R752-SS redundant line cards are connected at the PRIMARY port with nothing else connected to them, their Link LEDs will *not* be lit. When a valid link is established by connecting to the MAIN port, a complete connection is accomplished.

The diagram below shows a typical network configuration using R752-SS redundant line cards for remote connectivity:



If the remote cable breaks, or the remote device fails, the cards carry that link loss all the way to the switch/hub which generates a trap to the management station. The network administrator can then look at the card to determine the source of the loss.



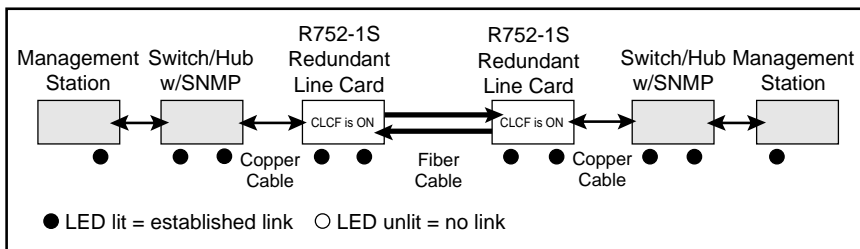
IMPORTANT: When connecting a line card to a port that supports auto-negotiation, it is strongly recommended to fix the port setting to 1000Mbps at either full or half duplex. This allows the card to sense receive links and select the active port.

* The card is shipped with LLCF disabled.

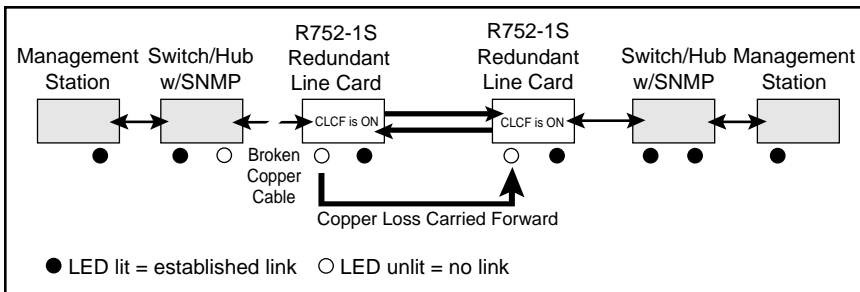
Copper Loss Carry Forward (CLCF)

The R752-1S copper-to-fiber 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.

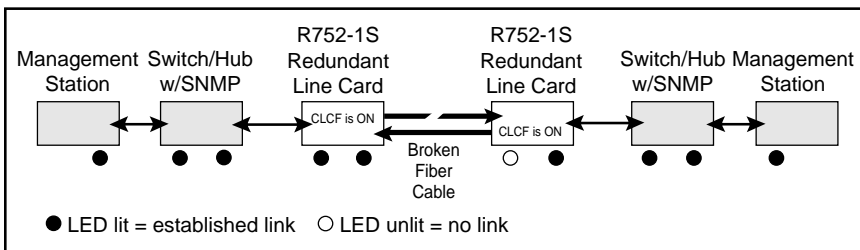
The diagram below shows a typical network configuration with good link status using two R752-1S redundant line cards for remote connectivity. Note that CLCF is enabled as indicated.



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).

Switch On No Activity Received (SONAR)

The Radiance 1000Mbps redundant interface line card is designed to protect a network from failure that would prevent data from reaching its destination. With SONAR enabled, the line card monitors the active port for loss of data activity, in addition to loss of a valid link. SONAR enables the card to automatically change the active port to its backup when the following two conditions occur:

- No data activity is detected on the active port for a configurable period of time. (The default period is 2 seconds.)
- Data activity is detected on the backup port.

To switch active ports, the backup port must have data activity within the specified time-out period from when the active port loses activity. Through software commands, the time period can be set from 1 to 31 seconds in increments of 1 second. The default is 2 seconds.

If both ports have no activity, the port that receives data activity first becomes the active port. The active port is switched immediately if it loses its link and the backup port has a link.

To activate SONAR, make sure the following switches are enabled:

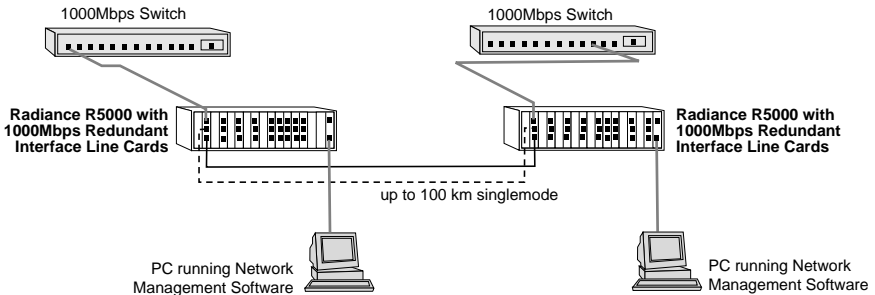
1. RED switch. This sets the redundant line card to operate in Dynamic Recovery Mode.
2. LINK switch. This allows link signals to be sent out both ports. (Not applicable to the R752-11.)
3. SONAR switch.

The settings of the other DIP switches do not affect SONAR operation. However, SONAR will override the Auto Revert Primary Circuit (AUTO) switch. If both SONAR and AUTO are enabled, the active port will not automatically revert to PRIMARY (after switching to SECONDARY) if the PRIMARY port has link but no activity. Data activity on the PRIMARY port must also be detected within the time-out period before the active port reverts back to it.

*NOTE: The card is shipped with SONAR disabled. SONAR can be enabled through the DIP switch, via console commands or by using Metrobility management software (version 3.4 or later). Refer to the **Command Line Interface Reference Guide, NetBeacon Element Management Software Installation & User Guide** or **WebBeacon Software Installation & User Guide** for software instructions.*

Back-to-Back Application

A typical application of the 1000Mbps redundant interface line cards is to use them in pairs to extend a network's reach between two remote devices. In this back-to-back setup, both PRIMARY ports are linked to each other and both SECONDARY ports are linked to each other as shown in the figure below.



In a back-to-back application, make sure that the following switches are enabled on both redundant interface line cards:

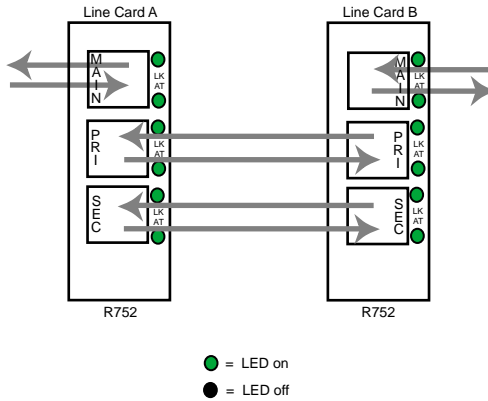
1. **RED switch.** Sets the card to operate in Dynamic Recovery Mode. In this mode, the SECONDARY port automatically becomes the active port if the PRIMARY link is lost and the SECONDARY link is present.
2. **TX switch.** Allows the redundant interface line card to transmit data on both the PRIMARY and SECONDARY ports simultaneously. The cards must have this switch enabled because they cannot determine which port is active on the other card.
3. **LINK switch.** This allows link pulses to be sent out both the PRIMARY and SECONDARY ports. If neither SECONDARY port is transmitting link pulses and one of the PRIMARY ports loses link, a switchover will NOT occur. A switchover will occur only if the SECONDARY port has link. (LINK is not applicable to the R752-11.)

Single Strand Fiber Failover Protection

To ensure network resiliency in the event a single strand of fiber cable breaks or fails, the R752-1S and R752-SS (Rev B or higher) provide failover protection by automatically forcing both ports to switch from Primary to Secondary. This maintains the continuous flow of data in both directions.

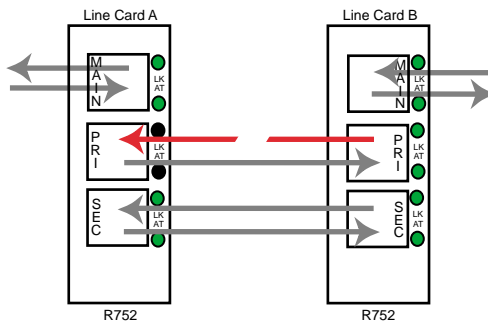
Scenario

The diagram below shows two R752 redundant interface line cards connected together at the Primary and Secondary ports. All ports have good link status, and both cards are operating in full-duplex mode with the Primary ports active.



Problem

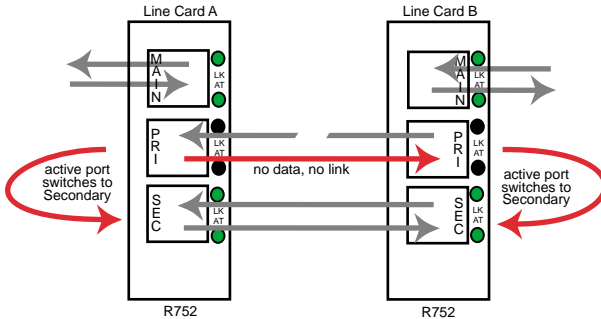
The fiber strand carrying data from Line Card B to A breaks, thus stopping the flow of data from B to A.



Solution

To implement single-strand failover protection, enable the following DIP switches*: **RED, LINK, AUTO, and TX** on each card. The R752 line cards automatically perform the following operations to restore data activity.

- Line Card A switches its active port from Primary to Secondary.
 - Line Card A stops transmitting data and link pulses through the Primary port.
 - Line Card B switches its active port from Primary to Secondary.
- Bi-directional traffic is now restored.



- Line Card A restarts transmitting link pulses on the Primary port.

Result

All data communications continue in both directions with the Secondary port active on both cards.

Revert to Primary

The R752 cards will revert to having the Primary port active if the following conditions are met:

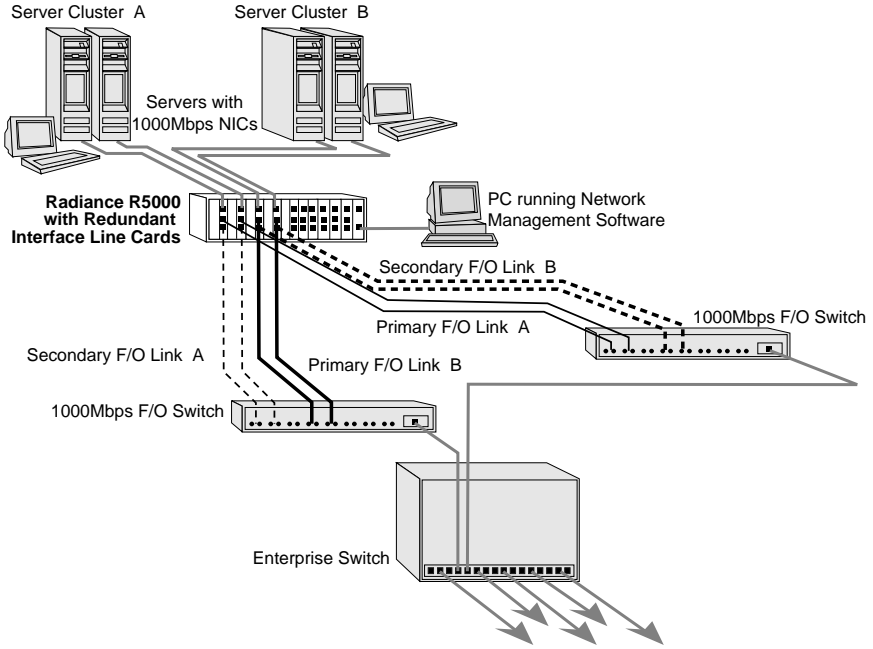
- Both cards receive valid link pulses on the Primary port.
- Both cards detect data on the Primary port.

Alternate Solution

If you do not want bidirectional traffic resumed through the Secondary port when a single strand of fiber breaks, do NOT enable the four switches (RED, LINK, AUTO, and TX) at the same time on both cards. This results in the transfer of data from B to A, but not from A to B.

*The SONAR switch may also be enabled.

Topology Solution



Changing the SFP Transceiver

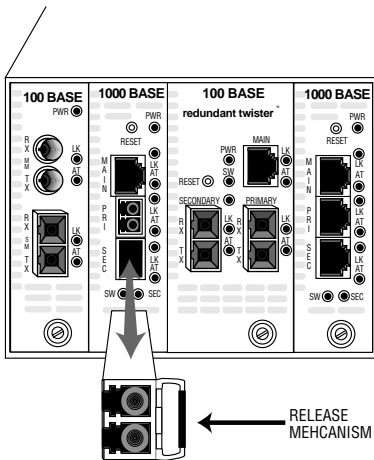
Depending on the model, the fiber ports on 1000Mbps redundant interface line card supports two or three replaceable small form-factor pluggable (SFP) transceivers. This section explains how to remove and install the parts into the card. Metrobility SFP transceivers are hot-swappable and can be changed without disrupting traffic on the other ports.

IMPORTANT: Use only Metrobility 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) ports of the SFP transceiver.

WARNING: Avoid staring into the laser beam coming from the cable.

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



3. Slide the new SFP module into the slot, pushing it firmly in place.
4. Remove the protective cover on the LC connector.
5. Reconnect the network cables. Verify proper segment connectivity via the green LK LED, which should be lit.

Technical Specifications

Data Rate

Full duplex _____ 1000Mbps

Power Requirements

R752-11 _____ 5V DC @ 1.4A, 7.0W

R752-1S _____ 5V DC @ 1.1A, 5.5W

R752-SS _____ 5V DC @ 0.84A, 4.2W

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)

Twisted-Pair Interface

Connector _____ Shielded RJ-45, 8-pin jack

Impedance _____ 50 ohms typical

Signal Level Output (differential) _____ 0.95 to 1.05V

Signal Level Input _____ 200 mV minimum

Supported Link Length _____ 100m

Cable Type _____ Category 5e UTP

RJ-45 Pin Layout	
Pin #	Signal
1	BI_DA+
2	BI_DA-
3	BI_DB+
4	BI_DC+
5	BI_DC-
6	BI_DB-
7	BI_DD+
8	BI_DD-

Multimode Fiber Optic Plug-in (O211-M5)

Connector _____ LC

Wavelength _____ 850nm

RX Input Sensitivity _____ -19 dBm to 0 dBm

Output Power _____ -9 dBm to -3.5 dBm

Typical Link Budget _____ 16 dBm

Supported Link Length _____ up to 550m (50/125 μ m); or 275 m (62.5 μ m)

Cable Type _____ 50/125 or 62.5/125 μ m multimode or 9/125 μ m

Singlemode Fiber Optic Plug-in (O211-10)

Connector _____ LC
Wavelength _____ 1310nm
RX Input Sensitivity _____ -20 dBm to -3 dBm
Output Power _____ -9.5 dBm to -3 dBm
Typical Link Budget _____ 19 dBm
Supported Link Length _____ up to 10km
Cable Type _____ 9/125 μ m singlemode

Singlemode Fiber Optic Plug-in (O211-25)

Connector _____ LC
Wavelength _____ 1310nm
RX Input Sensitivity _____ -24 dBm to -3 dBm
Output Power _____ -7 dBm to -3 dBm
Typical Link Budget _____ 21 dBm
Supported Link Length _____ up to 25km
Cable Type _____ 9/125 μ m singlemode

Singlemode Fiber Optic Plug-in (O211-40)

Connector _____ LC
Wavelength _____ 1550nm
RX Input Sensitivity _____ -24 dBm to -3 dBm
Output Power _____ -5 dBm to 0 dBm
Typical Link Budget _____ 23.5 dBm
Supported Link Length _____ up to 40km
Cable Type _____ 9/125 μ m singlemode

Singlemode Fiber Optic Plug-in (O211-70)

Connector _____ LC
Wavelength _____ 1550nm
RX Input Sensitivity _____ -24 dBm to -3 dBm
Output Power _____ 0 dBm to 5 dBm
Typical Link Budget _____ 28 dBm
Supported Link Length _____ up to 70km
Cable Type _____ 9/125 μ m singlemode

Singlemode Fiber Optic Plug-in (O211-1A)

Connector _____ LC
Wavelength _____ 1550nm
RX Input Sensitivity _____ -32 dBm to -3 dBm minimum
Output Power _____ 0 dBm to 5 dBm
Typical Link Budget _____ 36 dBm
Supported Link Length _____ up to 100km
Cable Type _____ 9/125 μ m singlemode

*Singlemode Fiber Optic Plug-in (O411-80-xx) for CWDM**

Connector _____ LC
Wavelength _____ (see tables below)
RX Input Sensitivity _____ -26 dBm to -24 dBm
Output Power _____ 0 dBm to 5 dBm; 2 dBm (typical)
Typical Link Budget _____ 28 dBm
Supported Link Length _____ up to 80 km
Cable Type _____ 9/125 μ m singlemode

Model Number	Wavelength
O411-80-31	1310 nm
O411-80-33	1330 nm
O411-80-35	1350 nm
O411-80-37	1370 nm
O411-80-39	1390 nm
O411-80-41	1410 nm
O411-80-43	1430 nm
O411-80-45	1450 nm

Model Number	Wavelength
O411-80-47	1470 nm
O411-80-49	1490 nm
O411-80-51	1510 nm
O411-80-53	1530 nm
O411-80-55	1550 nm
O411-80-57	1570 nm
O411-80-59	1590 nm
O411-80-61	1610 nm

*Coarse Wavelength Division Multiplexing

Product Safety, EMC and Compliance Statements

This equipment complies with the following requirements:

- UL
- CSA
- EN60950 (safety)
- FCC Part 15, Class A
- EN55022 Class A (emissions)
- DOC 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 the Radiance 1000Mbps Redundant Interface Line Card

Metrobility Optical Systems, Inc. warrants that every Radiance 1000Mbps redundant 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.

ADDITIONAL IMPORTANT WARRANTY INFORMATION:

The Radiance 1000Mbps redundant interface line card is designed to operate using only the Metrobility 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.

Product Manuals

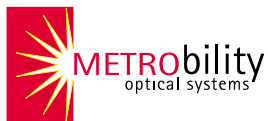
The most recent version of this manual is available online at

<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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