



METRObility

optical systems

"Simply Brilliant Optical Ethernet"

Manageable
LAN and MAN
Optical Connectivity,
Access and
Wavelength Multiplexing
Solutions.

MAY 2005

me • tro • bil • i • ty \ mĕ'trō-bĭ-lə-tē \ *n* : the ability to provide access WAN capabilities – optical remote management, connectivity, access and wavelength multiplexing – to the MAN.

Metrobility Optical Systems® is leading the way in the design and delivery of intelligent optical connectivity, access and wavelength multiplexing solutions for your network. The Company's manageable media, distance, and speed conversion solutions deliver highly reliable connections for the mission-critical enterprises, broadband metro access and emerging Ethernet industrial process control networks.

The Company offers innovative, comprehensive, standards-based Ethernet solutions for copper-to-fiber and fiber-to-fiber connectivity, metro Ethernet access, and wavelength multiplexing, as well as optical solutions for SONET and TDM networks. These fiber connectivity interface products provide a flexible, scalable, and manageable alternative to a “fork lift” upgrade when increased speed and distance extension (e.g., a campus environment or a metropolitan network) require fiber optics.

Metrobility's Radiance access products provide carrier-class (NEBS Level 3 certified) optical Ethernet as a metro access solution with important operations, administration, maintenance, and provisioning (OAM&P) features, as well as remote troubleshooting and management features that reduce both CapEx and OpEx.

To meet the needs of business-critical applications, Metrobility® offers patented line protection and restoration, load-sharing hot-swap power options, and best-of-class network element management. Our products enable users to integrate and manage legacy and evolving Ethernet networking technologies with fault tolerance and failure recovery options to support mission-critical applications.

More information on our Company and products can be found at www.metrobility.com.

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Line Protection and Restoration (LPR) technology and Remote Inter-packet Gap (IPG) Management are patents of Metrobility Optical Systems, Inc.

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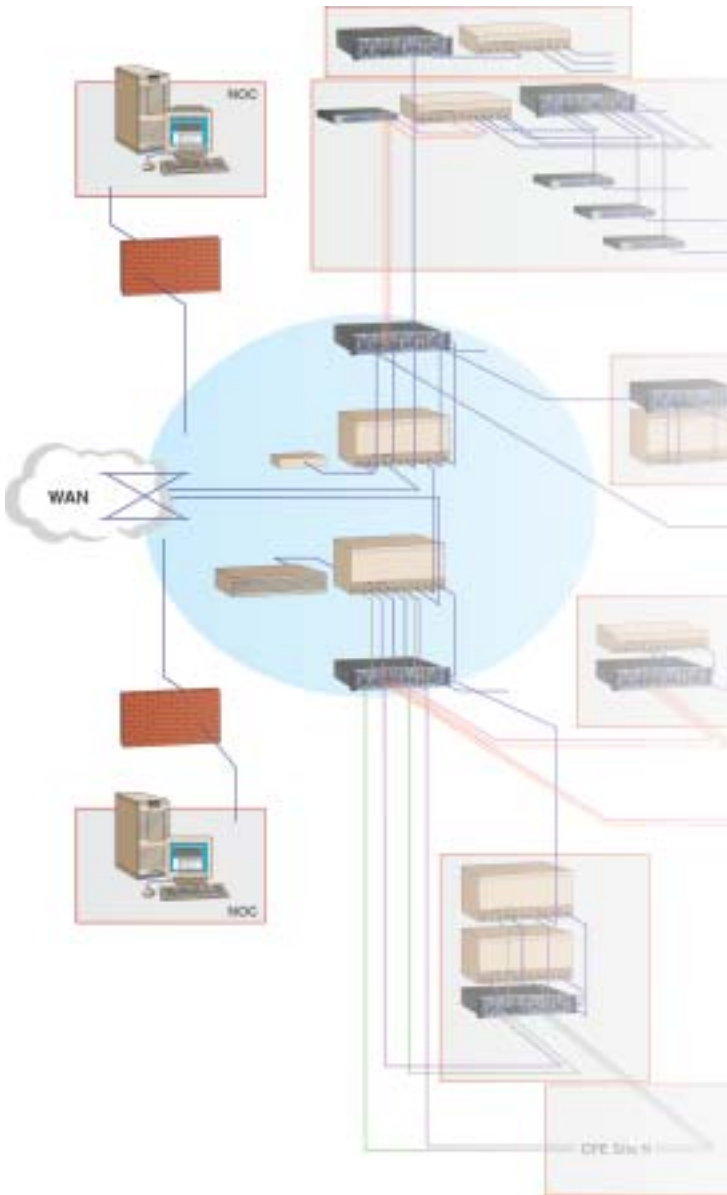
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The Metrobility Difference

MANAGEMENT





Metrobility Optical Systems...Pioneer in Conversion and EFM OAM Access Management

Management and ease of deployment are essential functions in networks today. Networks increase in complexity as demands for higher speeds, greater distances, increased security, high levels of uptime, and voice and data convergence become the norm.

Network administrators running applications requiring session integrity and demanding 24x7 reliability cannot afford to have a network failure. To maximize network uptime, they need end-to-end visibility of all network components and the ability to initiate remote active control and testing through sophisticated management tools.

When administrators implement proactive management strategies, they can minimize downtime, control costs, dramatically reduce troubleshooting time and manage larger networks with existing staff, thus assuring the lowest cost of total ownership.

MANAGEMENT



NetBeacon® Element Management Software Comprehensive Workstation-based Solution

NetBeacon provides intuitive management that graphically shows all link connections, environmental conditions, port activity and status at a glance. NetBeacon's innovative, Java-based Graphical User Interface (GUI) simulates the appearance and functions of each chassis. Most configuration changes made to interface line cards in the chassis are stored in the management line card.

NetBeacon implements the widely used IETF standard RADIUS (Remote Authentication Dial-In User Service) which enables authentication, authorization and accounting of multiple users.

NetBeacon may be run on any standard Windows or UNIX workstation, and can be launched from HP Network Node Manager. NetBeacon requires an R502-M management card installed in the chassis. One IP address can be used to manage over 400 ports.

- *Full-featured management of 40 functional, operational and environmental parameters for remote monitoring and troubleshooting*
- *Open architecture allows integration with industry-standard SNMP-based management systems*
- *Thresholds and alarm conditions allow automatic notification by e-mail or pager*
- *Supports MIB-II and Metrobility-specific MIB extensions*

All line cards/modules are graphically represented exactly as they appear in the chassis. The far right slot is reserved for the management card.



Access and Services line cards are indicated as all blue. Their respective remote links are indicated in the small graphic just below each access or services line card.

ToolTips provide a brief description of the currently selected component.

Link status is easily identifiable by the red or green color on each port.



Individual line card information is available by double-clicking the card image (i.e. serial number, model number, date of manufacture, hardware revision, and diagnostic test status).



Device information is also available under the Modules tab on the main screen. Line cards and modules can be sorted by type using the pull down menu.



Extensive real-time information on MIB-II and Metrobility-specific MIB statistics – plus alarm thresholds and notification procedures – enable early problem identification, fast fault isolation and proactive management.

MANAGEMENT

Unique EFM OAM Capabilities

The same capabilities found in wide area networks – remote management, remote testing and reliable connectivity – are essential to placing Ethernet in the First Mile (EFM). Metrobility offers multiple mechanisms for both remote management and troubleshooting which can reduce operating expenses (OPEX) utilizing existing management frameworks and minimizing truck rolls. Proactive management of both the equipment and the link maximizes uptime to help ensure that the customer's requirements are being met. See *network diagram on page 43*.

Multi-level Management

Multi-level management incorporates management schemes which enables, and limits, access to the device by different levels of the operations staff. These management schemes can be initiated concurrently and are password-protected to prevent unauthorized access.

Standards-based management utilizes a familiar management framework, eliminating costly retraining of personnel. The device can be managed as an independent network element with its own IP address by using SNMP, Telnet/CLI, and IP PING.

Extended standards-based management enables any IEEE 802.3ah OAM compliant management system to manage the device as an independent network element through a proxy system using IEEE 802.3ah OAM protocol.

Proxy-based management provides many scaling benefits, including reducing the total number of directly-addressable network elements.

Metrobility's NetBeacon Element Manager provides value-added and scalable management by offering additional security mechanisms and negating the need for an individual management address at each device.

Quality of Line Monitoring

RMON Group 1 statistics provide real-time quality of line statistics which can identify potential line degradations immediately.

Quality of Equipment Monitoring

Easy-to-read graphics display power, voltage and temperature levels at a glance. Also supports the IEEE 802.3ah Dying Gasp.

A screenshot of a network management interface showing a table of device statistics. The table has columns for 'Name' and 'Status'.

Name	Status
10.10.10.10	OK
10.10.10.11	OK
10.10.10.12	OK
10.10.10.13	OK
10.10.10.14	OK
10.10.10.15	OK
10.10.10.16	OK
10.10.10.17	OK
10.10.10.18	OK
10.10.10.19	OK
10.10.10.20	OK
10.10.10.21	OK
10.10.10.22	OK
10.10.10.23	OK
10.10.10.24	OK
10.10.10.25	OK
10.10.10.26	OK
10.10.10.27	OK
10.10.10.28	OK
10.10.10.29	OK
10.10.10.30	OK





Quality of Optical Amplitude Monitoring

The Radiance Access and Services Line Cards work like an integral optical power meter by monitoring the transmit and receive power level of the optical transceivers in real time. Now, instead of the cost of a “truck roll” to physically open the link to insert an optical power meter, technicians can see – in real time – all the information about the laser’s transmit and receive power. Alarm limits can be centrally set to initiate notification of alarm conditions through SNMP and the 802.3ah proxy on the Services Line Card. A database provides up to 28 days of historical data.



Bandwidth Management

Because Ethernet scales in bandwidth so easily, remote and instantaneous bandwidth management can be accomplished with a point-and-click. Both transmit and receive bandwidth can be adjusted independently to accommodate customers’ changing requirements.



Services Line Cards Layer 2 Networking

The ability to process VLANs and priority information is critical in order to guarantee prioritization of the traffic – especially where there is a speed mismatch between the provider’s network and the customer’s network – to ensure the proper handling of low latency, high-priority traffic. The device supports multiple modes – VLAN-unaware, customer VLAN-aware (802.1Q), and provider VLAN-aware (Q-in-Q) – to provide both traffic control and security at the customer edge.



Link-level and Network-level Loopbacks

NetBeacon can initiate a link-level loopback by sending traffic to the remote optical fiber connection then reading it back at the central office to see if there are any errors or problems.

Patent-pending Logical Services Loopback, available only on the R821 line card, is a non-service affecting Layer 2 loopback to provide end-to-end service level verification.



Copper Line Quality

The embedded Copper Line Quality (CLQ) test measures signal integrity between the NID and customer equipment to locate link problems on copper interfaces connected to subscriber networks. CLQ recognizes impedance mismatches, open and short circuits, and measures the distance to those mismatches and open and short circuits to identify not only a link problem from the NID to the customer equipment, but the exact location of the problem.

(Available only on the R821 line card.)

Management Card

The R502-M Management Card is the SNMP agent for all Metrobility chassis-based systems. The Management Card enables the collection and transmission of all chassis and individual board status for use by NetBeacon and WebBeacon. The Management Card requires one slot in the chassis and serves as a CPU. The R502-M supports stacking and database capabilities to track historical data.



Chassis Stacking Line Card (4-port Ethernet switch)

The Radiance R104-11 Chassis Stacking Line Card is a four-port 10/100Mbps copper Ethernet Layer 2 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.

The Radiance chassis stacking line card is designed to support the stacking of up to four (4) Metrobility chassis. A configuration of multiple chassis

stacking line cards can support the stacking of up to seven (7) Metrobility chassis and up to 109 remote sites. Stacking requires an R502-M management card in the 'master' chassis and in each of the stacked (or 'slave') chassis. All management cards are connected to the chassis stacking line card. While each chassis uses a private IP address to create an isolated subnet for management, the stacked configuration only requires a single public IP address for SNMP management.

TO ORDER, specify (NOTE: blue denotes NEBS-certified):

Software

NetBeacon

CD with Management Software for Windows, Linux and UNIX versions, and Database Option

Management Cards

R502-M

Management Card (required for database management option)

R104-11

Chassis Stacking Line Card



Central Service Platform

The Radiance R5000 Central Service Platform is a NEBS Level 3 *certified* chassis which provides managed fiber optic connectivity and access for mission-critical IP network applications. The R5000 supports Interface Line Cards, Access Line Cards and Services Line Cards to deliver the highest level of managed, high-availability solutions at the network edge.

Installed at the central office (CO) or the point of presence (POP), the Radiance R5000 Central Service Platform interfaces to the switch or router at the service provider's metropolitan area network and to another Radiance access device (i.e.: R1000, R400, R200, and RA21) at the customer premise to provide extensive remote WAN management, fiber connectivity and access.

The R5000 Central Service Platform is available as a 19" or 23" rack-mountable 2U platform with rear-loading, redundant, load-sharing, hot-swap AC or DC power supplies, 16 slots for connectivity, and one slot for optional management access. The chassis is thermally protected for non-stop operation and high MTBF.

Premise Service Platforms

The R1000 Premise Service Platform is a NEBS Level 3 *certified* 1U, mountable unit with single or dual, load-sharing AC or DC internal power supplies, and two slots for connectivity.

The R400 Premise Service Platform is a two-slot standalone unit which accommodates up to two line or management cards and is equipped with a single external AC power supply with support for an optional second external AC power supply.

The R200 Premise Service Platform is a standalone unit which accommodates one line card and is equipped with an internal AC or DC power supply.

See network diagram on page 42.



TO ORDER, specify (NOTE: *blue* denotes *NEBS-certified*):

- R5000-17HS 17-slot platform with two bays for optional AC or DC power supplies (NEBS requires DC power supplies only)
- R1000-AAF 2-slot platform with two front-facing AC power supplies
- R1000-AAR 2-slot platform with two rear-facing AC power supplies
- R1000-DDF 2-slot platform with two front-facing DC power supplies
- R1000-DDR 2-slot platform with two rear-facing DC power supplies
- NEW** R1000-AF 2-slot platform with single front-facing AC power supply
- NEW** R1000-AR 2-slot platform with single rear-facing AC power supply
- NEW** R1000-DF 2-slot platform with single front-facing DC power supply
- NEW** R1000-DR 2-slot platform with single rear-facing DC power supply
- R400-2HS-1A 2-slot platform with single external AC power supply
- R200-AC 1-slot platform with single internal AC power supply
- R200-DC 1-slot platform with single internal DC power supply

Accessories

- ACPS-17HS AC power supply for R5000
- DCPS-17HS DC power supply for R5000
- R400-AC AC power supply and line cord for R400

- NEW** R200-WM-1 Wall mount bracket (for the R200 and R400 chassis)
- R200-RM-1A 19" Rack Mount Kit (ears) for single R200 or R400
- R200-RM-2A 19" Rack Mount Kit (tray) for two R200 or R400
- R200-RM-EXT23 23" Rack Mount Extension Kit (ears) for the R200-RM-xx kits

Radiance

ETHERNET SERVICES LINE CARDS



Services Line Cards

Metrobility's Radiance Services Line Cards provide an intelligent optical Ethernet demarcation point for service providers who are deploying Ethernet in the First Mile. The Services Line Cards extend baseline VLAN technologies to enable delivery of multiple, converged end-user services across the first mile, optical access network. These services include transport (link specific) OAM, interconnectivity (network-specific) OAM, and services (application-specific) OAM.

The Radiance Ethernet Services Line Cards support both a standalone Network Interface Device (NID) and proxy-based book ended configurations. As a carrier-class device, the Services Line Cards are specifically designed to maintain the maximum isolation between the public and private network while supporting the OAM requirements defined by both the IEEE and the Metro Ethernet Forum (MEF).

Gigabit Services Line Cards

- *Transparent Ethernet access*
- *Advanced VLAN Aware Bridging*
- *Minimal Touch Provisioning*
- *Scalable Aggregation Point*
- *Optional ITU-Grid CWDM SFP Optics*
- *Signal re-amplification, reshaping and retiming*

TO ORDER, specify (NOTE: *blue* denotes *NEBS-certified*):

Gigabit Services Line Cards

- | | |
|----------------|--|
| R851-IS | 10/100/1000TX to 1000BASE-X SFP
(requires 1 pluggable optic) |
| R851-SS | 1000BASE-X LC to 1000BASE-X SFP
(requires 2 pluggable optics) |

10/100Mbps Ethernet Services Line Card

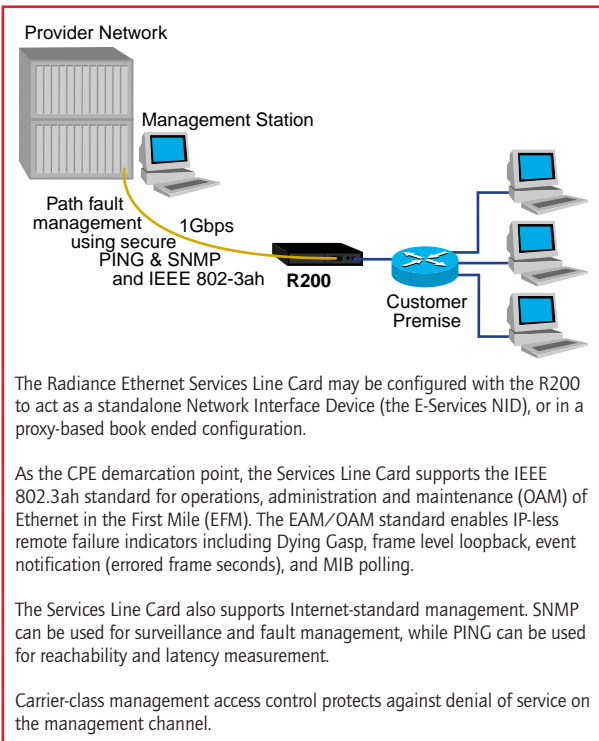
- *Transparent Ethernet access*
- *Advanced VLAN Aware Bridging*
- *Minimal Touch Provisioning*
- *Q-in-Q VLAN Tagging*
- *Traffic Engineering*
- *Signal re-amplification, reshaping and retiming*
- *Optional ITU-Grid CWDM SFP Optics*

TO ORDER, specify (NOTE: *blue* denotes *NEBS-certified*):

10/100Mbps Ethernet Services Line Card

821-1S

10/100BASE-T RJ-45 to 100BASE-X SFP
(requires 1 pluggable optic)



The Radiance Ethernet Services Line Card may be configured with the R200 to act as a standalone Network Interface Device (the E-Services NID), or in a proxy-based book ended configuration.

As the CPE demarcation point, the Services Line Card supports the IEEE 802.3ah standard for operations, administration and maintenance (OAM) of Ethernet in the First Mile (EFM). The EAM/OAM standard enables IP-less remote failure indicators including Dying Gasp, frame level loopback, event notification (errored frame seconds), and MIB polling.

The Services Line Card also supports Internet-standard management. SNMP can be used for surveillance and fault management, while PING can be used for reachability and latency measurement.

Carrier-class management access control protects against denial of service on the management channel.

Accessories

8R00-CA

Services Line Card Console Cable

For Radiance Optical Ethernet System platforms, see page 12.

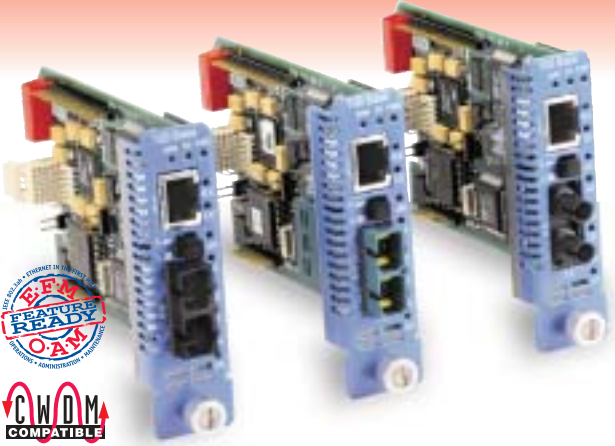
For the R200 chassis, see page 12.

For a complete listing of SFP Pluggable Optics, see pages 18-19.

For CWDM chassis, see page 22.

Radiance

ACCESS LINE CARDS



Metrobility's Radiance Access Line Cards provide the ability to reach across a metropolitan area network to communicate, test and reconfigure a remote device, without reducing the available bandwidth to the customer site. Radiance remote management technology provides the highest level of manageability without an IP address or SNMP agent – including remote loopback testing, optical power monitoring, real-time analog information, RMON statistics and dynamic bandwidth provisioning. This patented (U.S. Patent No. 6,741,566 B1) technology utilizes a management channel embedded in the inter-packet gap (IPG) between Ethernet frames to send management information in real time across a network.

- *Quality of Equipment (QoE) Monitoring (see p. 8)*
- *Quality of Line (QoL) Monitoring (see p. 8)*
- *Quality of Optical Amplitude (QoOA) (see p. 9)*
- *Dynamic bandwidth provisioning in 1Mbps increments – transmit and receive provisioned independently*
- *Full signal restoration – with low bit delay – allows for maximum segment length*
- *BWDM doubles the fiber capacity on existing fiber cables*
- *CWDM option*

Radiance Access Line Cards

The NEBS Level 3 *certified* Access Line Card gathers real-time data to provide critical, up-to-the-minute QoL information on an Ethernet fiber link including optical receive power level measurement, optical transmit power level measurement, and Radiance voltage and temperature measurements.

Access Line Cards are available as 100Mbps and as single strand fiber bi-directional wavelength division multiplexing (BWDM). Access Line Cards are supported in Metrobility's Radiance R5000, R1000, R400 and R200 Platforms and require NetBeacon 3.01 or above and the R502-M Management Card for reporting.

TO ORDER, specify (NOTE: *blue* denotes *NEBS-certified*):

Radiance Access Line Cards

100Mbps TX to FX

R231-13	TX to FX MM-SC (2km)
R231-14	TX to FX SM-SC (20km)
R231-15	TX to FX MM-ST (2km)
R231-16	TX to FX SM-ST (20km)
R231-17	TX to FX SM-SC (40km)
R231-1J	TX to FX SM-SC (100km)
R231-1X*	TX RJ-45 to FX SM-SC 1550nm/1310nm (20km)
R231-1Y*	TX RJ-45 to FX SM-SC 1310nm/1550nm (20km)

* Single-strand Bi-directional Wavelength Division Multiplexing (BWDM)
Each end of the link must be configured with a different receive and transmit wavelength.
Order a -1X for one end and a -1Y for the opposite end.

100Mbps TX to CWDM Wavelength-specific Fixed Optics

R231-47	100M TX RJ-45 to SM SC 1470nm (80km)
R231-49	100M TX RJ-45 to SM SC 1490nm (80km)
R231-51	100M TX RJ-45 to SM SC 1510nm (80km)
R231-53	100M TX RJ-45 to SM SC 1530nm (80km)
R231-55	100M TX RJ-45 to SM SC 1550nm (80km)
R231-57	100M TX RJ-45 to SM SC 1570nm (80km)
R231-59	100M TX RJ-45 to SM SC 1590nm (80km)
R231-61	100M TX RJ-45 to SM SC 1610nm (80km)

For Radiance Optical Ethernet System platforms, see page 12.
For the full range of Metrobility's interface options, please see the **Metrobility Interface Options** section beginning on page 25.

Radiance

SFP PLUGGABLE OPTICS



SFP Optics

SFP optics are small form-factor pluggable transceivers which have been designed into many of Metrobility's newer products such as the Gig-E LPR, Gig-E Interface Line Card, Gig-E Services Line Card, Fast Ethernet Services Line Card and the Multi-rate Line Card. The optics have an LC or SC receptacle and may be ordered to support singlemode or multimode fiber, or as single wavelengths (or channels) for the CWDM options. SFP optics allow the customer to minimize inventory requirements and protect investments when the network needs change.

Metrobility products which utilize SFP optics include:

- | | | | |
|-----------|-----------|-----------|-----------|
| ■ R851-1S | ■ R153-1S | ■ R752-1S | ■ 2752-1S |
| ■ R851-SS | ■ R153-SS | ■ R752-SS | ■ 2752-SS |
| ■ R380-SS | ■ R821-1S | | |

NOTE: products with a -1S extension require one optic, while products that have an -SS extension require two or more optics.

Disclaimer: Metrobility products using SFP optics were only designed and tested with the SFP optics offered for sale by Metrobility. Metrobility can only warrant the safety, performance, and quality of our products when used with SFP optics from Metrobility. The buyer assumes the complete risk when using SFP optics not sold by Metrobility.

Please refer to the chart on pages 20-21.

SFP Optics – 1000Mbps

0211-M5	1G SFP LC multimode (500m)
0211-10	1G SFP LC singlemode (10km)
0211-25	1G SFP LC singlemode (25km)
0211-40	1G SFP LC singlemode (40km)
0211-70	1G SFP LC singlemode (70km)
0211-1A	1G SFP LC singlemode (100km)
0311-10-31	1G SFP SC singlemode (BWDM, 1310nm, 10km)
0311-10-49	1G SFP SC singlemode (BWDM, 1490nm, 10km)

SFP Optics – Wavelength-Specific for Fast Ethernet/OC-3

0281-40	100M/155M SFP SM/LC (1310nm, 40km)
0281-80	100M/155M SFP SM/LC (1550nm, 80km)
0383-20-31	OC-3 SFP SC singlemode (BWDM, 1310nm, 20km)
0383-20-55	OC-3 SFP SC singlemode (BWDM, 1550nm, 20km)

SFP Optics – Wavelength-Specific for CWDM (Gigabit)

0411-80-31	1G CWDM SFP LC (1310nm, 80km)
0411-80-33	1G CWDM SFP LC (1330nm, 80km)
0411-80-35	1G CWDM SFP LC (1350nm, 80km)
0411-80-37	1G CWDM SFP LC (1370nm, 80km)
0411-80-39	1G CWDM SFP LC (1390nm, 80km)
0411-80-41	1G CWDM SFP LC (1410nm, 80km)
0411-80-43	1G CWDM SFP LC (1430nm, 80km)
0411-80-45	1G CWDM SFP LC (1450nm, 80km)
0411-80-47	1G CWDM SFP LC (1470nm, 80km)
0411-80-49	1G CWDM SFP LC (1490nm, 80km)
0411-80-51	1G CWDM SFP LC (1510nm, 80km)
0411-80-53	1G CWDM SFP LC (1530nm, 80km)
0411-80-55	1G CWDM SFP LC (1550nm, 80km)
0411-80-57	1G CWDM SFP LC (1570nm, 80km)
0411-80-59	1G CWDM SFP LC (1590nm, 80km)
0411-80-61	1G CWDM SFP LC (1610nm, 80km)

SFP Optics – Multi-rate for CWDM (40km)

0413-40-47	CWDM SFP 45M to 2.7G SM/LC (1470nm, 40km)
0413-40-49	CWDM SFP 45M to 2.7G SM/LC (1490nm, 40km)
0413-40-51	CWDM SFP 45M to 2.7G SM/LC (1510nm, 40km)
0413-40-53	CWDM SFP 45M to 2.7G SM/LC (1530nm, 40km)
0413-40-55	CWDM SFP 45M to 2.7G SM/LC (1550nm, 40km)
0413-40-57	CWDM SFP 45M to 2.7G SM/LC (1570nm, 40km)
0413-40-59	CWDM SFP 45M to 2.7G SM/LC (1590nm, 40km)
0413-40-61	CWDM SFP 45M to 2.7G SM/LC (1610nm, 40km)

SFP Optics – Multi-rate for CWDM (80km)

0413-80-47	CWDM SFP 45M to 2.7G LC (1470nm, 80km)
0413-80-49	CWDM SFP 45M to 2.7G LC (1490nm, 80km)
0413-80-51	CWDM SFP 45M to 2.7G LC (1510nm, 80km)
0413-80-53	CWDM SFP 45M to 2.7G LC (1530nm, 80km)
0413-80-55	CWDM SFP 45M to 2.7G LC (1550nm, 80km)
0413-80-57	CWDM SFP 45M to 2.7G LC (1570nm, 80km)
0413-80-59	CWDM SFP 45M to 2.7G LC (1590nm, 80km)
0413-80-61	CWDM SFP 45M to 2.7G LC (1610nm, 80km)

SFP Optics – Multi-rate for CWDM (80km)

0483-80-47	CWDM SFP 45M to 155M SM/LC (1470nm, 80km)
0483-80-49	CWDM SFP 45M to 155M SM/LC (1490nm, 80km)
0483-80-51	CWDM SFP 45M to 155M SM/LC (1510nm, 80km)
0483-80-53	CWDM SFP 45M to 155M SM/LC (1530nm, 80km)
0483-80-55	CWDM SFP 45M to 155M SM/LC (1550nm, 80km)
0483-80-57	CWDM SFP 45M to 155M SM/LC (1570nm, 80km)
0483-80-59	CWDM SFP 45M to 155M SM/LC (1590nm, 80km)
0483-80-61	CWDM SFP 45M to 155M SM/LC (1600nm, 80km)

SFP Optics – Multi-rate Singlemode or Multimode

0280-M2	SFP MM/LC 45M to 155M OC-3/STM-1 (2km)
0283-20	SFP SM/LC 10M to 155M (20km)
0293-20	SFP SM/LC 125M to 622M (20km)
0293-M5	SFP MM/LC 50M to 700M (500m)
02A3-10	SFP SM/LC 155M to 2.67G (10km)

SFP 1 OPTICS		MULTIMODE		
PROTOCOL	DATA RATE (Mbps)	PART #	POWER BUDGET ²	SUPPORTED DISTANCE
DS3	44.73	0280-M2	17dB	2km
OC-1	51.84	0280-M2	17dB	2km
		0293-M5	10db	500m
Fast Ethernet	125.00	0280-M2	17dB	2km
		0293-M5	10db	500m
OC-3 STM-1	155.52	0280-M2	17dB	2km
		0293-M5	10db	500m
ESCON	200.00	0293-M5	10db	500m
OC-12 STM-4	622.08	0293-M5	10dB	500m
Fibre Channel 1x	1062.50	0211-M5	16dB	500m
Gigabit Ethernet	1250.00	0211-M5	16dB	500m
Fibre Channel 2x	2125.00	0211-M5	16dB	500m
OC-48	2488.32			

IMPORTANT: The distances noted in the product descriptions are for reference purposes only. The most important factor to achieve the desired distance is the "optical power budget" or fiber optic light measured in dB. The Metrobility descriptions generally indicate the typical transmit power budget for a specific fiber type (core diameter and numerical aperture).

The "distance" is a function of the type (core diameter and numerical aperture) and quality of fiber cabling (cable attenuation), the number of splices and the quality of those splices (splice loss), the type and quality of connectors (connector loss), the distance (transmission loss) and a number of other physical characteristics. For multi-rate optics, the speed is another factor along with all others previously mentioned.

The optical power budget should be calculated and the power should be measured in the fiber cabling to determine what model should be ordered to achieve the desired results.

SINGLEMODE			CWDM		
PART #	POWER BUDGET ²	SUPPORTED DISTANCE	PART #	POWER BUDGET ²	SUPPORTED DISTANCE
0283-20	20.5dB	20km	0413-40-xx	24dB	40km
			0413-80-xx	33.5dB	80km
0283-20	20.5dB	20km	0413-40-xx	24dB	40km
			0413-80-xx	33.5dB	80km
0283-20	20.5dB	20km	0413-40-xx	24dB	40km
0281-40	33.5dB	40km	0483-80-xx	33dB	80km
0281-80	33.5dB	80km	0413-80-xx	33.5dB	80km
0293-20	19dB	20km			
0383-20-31	19dB	20km			
0383-20-55	19dB	20km			
02A3-10	16dB	10km	0413-40-xx	24dB	40km
0283-20	20.5dB	20km	0483-80-xx	33dB	80km
0293-20	19dB	20km	0413-80-xx	33.5dB	80km
0383-20-31	19dB	20km			
0383-20-55	19dB	20km			
02A3-10	16dB	10km	0413-40-xx	24dB	40km
0293-20	19dB	20km	0413-80-xx	33.5dB	80km
02A3-10	16dB	10km	0413-40-xx	24dB	40km
0293-20	19dB	20km	0413-80-xx	33.5dB	80km
			0411-80-xx	28dB	80km
02A3-10	16dB	10km	0413-40-xx	24dB	40km
0211-10	17dB	10km	0413-80-xx	33.5dB	80km
0211-25	22-25dB	25km			
0211-40	23.5dB	40km			
0211-70	25-28dB	70km			
0211-1A	36dB	100km			
02A3-10	16dB	10km	0413-40-xx	24dB	40km
0211-10	17dB	10km	0413-80-xx	33.5dB	80km
0211-25	22-25dB	25km	0411-80-xx	28dB	80km
0211-40	23.5dB	40km			
0211-70	25-28dB	70km			
0211-1A	36dB	100km			
0311-10-31	18dB	10km			
0311-10-49	18dB	10km			
02A3-10	16dB	10km	0413-40-xx	24dB	40km
			0413-80-xx	33.5dB	80km
02A3-10	16dB	10km	0413-40-xx	24dB	40km
			0413-80-xx	33.5dB	80km

Part Number Coding

O	x	x	x	- xx	-	xx
Optic	2-SFP	1-1G	0-no diagnostics	distance (km)		wavelength
	3-BWDM*	8-OC-3	1-with diagnostics		31-1390nm**	39-1390nm** 47-1470nm 55-1550nm
	4-CWDM	9-OC-12	2-multirate		33-1330nm**	41-1410nm** 49-1490nm 57-1570nm
			no diagnostics		35-1350nm**	43-1430nm** 51-1510nm 59-1590nm
		A-OC-4B	3-multirate		37-1370nm**	45-1450nm** 53-1530nm 61-1610nm
			with diagnostics			

* single-strand fiber (use different optics for TX and RX; order in pairs) ** Available for 0411-80-xx only

¹ **SFP Optics:** Metrobility products using SFP optics were only designed and tested with the SFP optics offered by Metrobility. Metrobility can only warrant the safety, performance, and quality of our products when used with SFP optics from Metrobility. The buyer assumes the complete risk when using SFP optics not sold by Metrobility.

² **Power Budget:** The Metrobility descriptions generally indicate the typical transmit power budget for the following fiber types: 9/125µm SM; 50/125µm or 62.6/125µm MM. ITU G-652.C-compliant fiber recommended for CWDM applications.

Radiance

WAVELENGTH DIVISION MULTIPLEXING



Managed Coarse Wave Division Multiplexing

Metrobility's CWDM solutions allow users to increase the capacity of existing fiber by utilizing widely spaced, separate wavelengths – between 1310nm and 1610nm – within the same fiber pair. These passive CWDM solutions require no external power and can support up to 16 different channels. Two CWDM multiplexer modules and Optical Add/Drop Multiplexer (OADM) modules can be housed in a Radiance R4000 chassis.

The mux/de-mux module provides either four (4) or eight (8) discrete wavelengths for subscriber connections. These wavelengths are combined, or multiplexed, onto a single fiber pair to the external network. Multiple modules may be linked through the expansion port to increase wavelength capacity to a total of 16 on a single fiber pair. An OADM module or 4-channel multiplexer at the subscriber site provides the “drop and pass” or “drop and add” capabilities.

By combining Metrobility's CWDM solution with Metrobility's CWDM-compatible line cards, users can create a managed wavelength-specific connection from the provider's network to the customer's network. *See network diagrams on pages 44 and 45.*

- Supports up to 16 discrete wavelengths
- ‘Drop and Pass’ or ‘Drop and Add’ capabilities
- Managed optical links to customer site
- Passive Multiplexer and OADM modules

TO ORDER, specify (NOTE: blue denotes NEBS-certified):

Chassis unit

R4000-02 19", 1U Rack Mount Chassis for CWDM multiplexer and OADM modules

Multiplexer Modules – SC connectors

R416-B4 8-Channel CWDM mux/de-mux module
(1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610nm)

Multiplexer Modules – SC connectors with expansion port

R416-A4-A 4-Channel CWDM mux/de-mux module
(1550, 1570, 1590, 1610nm)

R416-A4-B 4-Channel CWDM mux/de-mux module
(1470, 1490, 1510, 1530nm)

R416-A4-C 4-Channel CWDM mux/de-mux module
(1390, 1410, 1430, 1450nm)

R416-A4-D 4-Channel CWDM mux/de-mux module
(1310, 1330, 1350, 1370nm)

Multiplexer Modules with expansion port – SC connectors – with extended temperature range (-40 to 80 degrees Centigrade)

R416-A4-AE	4-Channel CWDM mux/de-mux module (1550, 1570, 1590, 1610nm)
R416-A4-BE	4-Channel CWDM mux/de-mux module (1470, 1490, 1510, 1530nm)

For a complete listing of SFP Pluggable Optics, see pages 18-19.

Single Channel OADM Modules (drop & pass modules)

Standard Temperature (0 to 50 C)	Extended Temperature (-40 to 80 C)	
R426-D4-31		1310nm drop & pass module
R426-D4-33		1330nm drop & pass module
R426-D4-35		1350nm drop & pass module
R426-D4-37		1370nm drop & pass module
R426-D4-39		1390nm drop & pass module
R426-D4-41		1410nm drop & pass module
R426-D4-43		1430nm drop & pass module
R426-D4-45		1450nm drop & pass module
R426-D4-47	R426-D4-47E	1470nm drop & pass module
R426-D4-49	R426-D4-49E	1490nm drop & pass module
R426-D4-51	R426-D4-51E	1510nm drop & pass module
R426-D4-53	R426-D4-53E	1530nm drop & pass module
R426-D4-55	R426-D4-55E	1550nm drop & pass module
R426-D4-57	R426-D4-57E	1570nm drop & pass module
R426-D4-59	R426-D4-59E	1590nm drop & pass module
R426-D4-61	R426-D4-61E	1610nm drop & pass module

Single Channel OADM Modules (drop & add modules)

R436-J4-31		1310nm drop & add module
R436-J4-33		1330nm drop & add module
R436-J4-35		1350nm drop & add module
R436-J4-37		1370nm drop & add module
R436-J4-39		1390nm drop & add module
R436-J4-41		1410nm drop & add module
R436-J4-43		1430nm drop & add module
R436-J4-45		1450nm drop & add module
R436-J4-47	R436-J4-47E	1470nm drop & add module
R436-J4-49	R436-J4-49E	1490nm drop & add module
R436-J4-51	R436-J4-51E	1510nm drop & add module
R436-J4-53	R436-J4-53E	1530nm drop & add module
R436-J4-55	R436-J4-55E	1550nm drop & add module
R436-J4-57	R436-J4-57E	1570nm drop & add module
R436-J4-59	R436-J4-59E	1590nm drop & add module
R436-J4-61	R436-J4-61E	1610nm drop & add module

For 1000Mbps Interface Line Cards for CWDM for use in the R5000 chassis, see pages 16 and 30.



Radiance Optical Network Unit

The Radiance Optical Network Unit (ONU) provides a secure, intelligent demarcation point at the customer premise. The ONU communicates to a Radiance Access Line Card in a managed Radiance chassis at the central office. Radiance remote management technology provides the highest level of manageability without an IP address or SNMP agent. This patented (U.S. Patent No. 6,741,566 B1) technology utilizes a management channel embedded in the inter-packet gap (IPG) between Ethernet frames to send management information in real time across a network.

TO ORDER, specify:

10/100Mbps Copper to Fiber

- RA21-13 10/100 TX to FX MM/SC (2km)
- RA21-14 10/100 TX to FX SM/SC (20km)
- RA21-15 10/100 TX to FX MM/ST (2km)
- RA21-16 10/100 TX to FX SM/ST (20km)
- RA21-17 10/100 TX to FX SM/SC LH (40km)
- RA21-1J 10/100 TX to FX MM/SC ELH (100km)
- RA21-1X* 10/100 TX to FX SM/SC BWDM 1550nm/1310nm (20km)
- RA21-1Y* 10/100 TX to FX SM/SC BWDM 1310nm/1550nm (20km)

10/100Mbps Copper-to-CWDM Wavelength-specific Fixed Optics

- RA21-47 10/100 TX to 100M FX SM/SC 1470nm 80km
- RA21-49 10/100 TX to 100M FX SM/SC 1490nm 80km
- RA21-51 10/100 TX to 100M FX SM/SC 1510nm 80km
- RA21-53 10/100 TX to 100M FX SM/SC 1530nm 80km
- RA21-55 10/100 TX to 100M FX SM/SC 1550nm 80km
- RA21-57 10/100 TX to 100M FX SM/SC 1570nm 80km
- RA21-59 10/100 TX to 100M FX SM/SC 1590nm 80km
- RA21-61 10/100 TX to 100M FX SM/SC 1610nm 80km

Accessories

- 2731-WM Wall mount bracket for Radiance ONU

* Each end of the link must be configured with a different receive and transmit wavelength. Order a -1X for one end and a -1Y for the opposite end.

For the full range of Metrobility's interface options, please see the **Metrobility Interface Options** section beginning on page 25.



10/100 Solutions

Future-proof Your Network with the AutoTwister

Metrobility's 10/100 interface supports a variety of configuration options which extend copper-based network distances, connect 10Mbps devices to 100Mbps devices, isolate network segments, and convert from copper to fiber and fiber to fiber as well as half-duplex to full-duplex. Link Loss Return and Link Loss Carry Forward are incorporated for troubleshooting loss of remote network connections. Auto-recovery, used in conjunction with LLR, enables the card to restart the fiber link after a link loss event without a costly troubleshooting trip. On select models, bi-directional wavelength division multiplexing (BWDM) provides two channels in different directions on a single strand of fiber to increase bandwidth.

- *Link Loss Return, Link Loss Carry Forward and Auto-Recovery*
- *BWDM models double the fiber capacity on existing fiber cables*
- *Auto-negotiation and MDI-II/MDI-X switch on copper ports*

TO ORDER, specify (NOTE: *blue* denotes *NEBS-certified*):

Line Cards	Standalones	
10/100Mbps		
R621-11	2621-11-01	10/100 TX to 10/100 TX (100m)
R643-13 [†]	2643-13-01 [†]	10/100 TX to FX MM-SC (2km)
R643-14 [†]	2643-14-01 [†]	10/100 TX to FX SM-SC (20km)
R643-15 [†]	2643-15-01 [†]	10/100 TX to FX MM-ST (2km)
R643-16 [†]	2643-16-01 [†]	10/100 TX to FX SM-ST (20km)
R643-17 [†]	2643-17-01 [†]	10/100 TX to FX SM-SC (40km)
R643-1E [†]	2643-1E-01 [†]	10/100 TX to FX MM/MT-RJ (2km)
R643-1G [†]	2643-1G-01 [†]	10/100 TX to FX MM/VF-45 (2km)
R643-1J [†]	2643-1J-01 [†]	10/100 TX to FX SM-SC (100km)
R643-1K [†]	2643-1K-01 [†]	10/100 TX to FX MM-LC (2km)
R643-1M [†]	2643-1M-01 [†]	10/100 TX to FX SM-LC (20km)
R643-1X ^{†*}	2643-1X-01 ^{†*}	10/100 TX RJ-45 to FX SM-SC 1550nm/1310nm (20km) BWDM
R643-1Y ^{†*}	2643-1Y-01 ^{†*}	10/100 TX RJ-45 to FX SM-SC 1310nm/1550nm (20km) BWDM

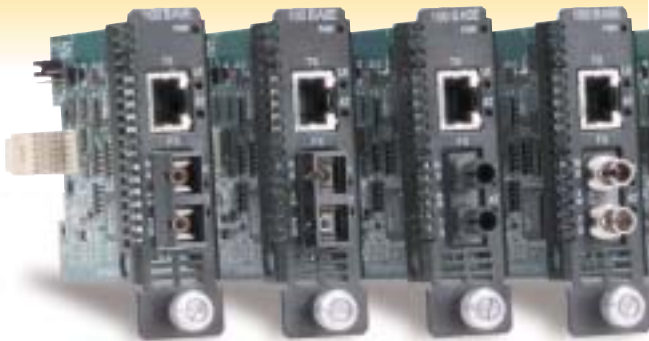
Accessories

2100-WM Wall mount bracket for 2621 and 2643 standalone units

[†] LLCF, LLR and Auto-Recovery

* Each end of the link must be configured with a different receive and transmit wavelength. Order a -1X for one end and a -1Y for the opposite end.

For Delta Class M643 standalones, see page 40.



Ethernet and Fast Ethernet

10Mbps and 100Mbps Single Interface Connectivity Solutions

Metrobility offers transparent integration of fiber optic connectivity for 10Mbps Ethernet and 100Mbps Fast Ethernet networks. The Radiance R111 and 2111 preconfigured media converter offers transparent integration of fiber optic connectivity or copper-to-coaxial integration for 10Mbps Ethernet networks. The Radiance R141 is a transparent two-port copper-to-fiber media converter that can be set to either 10Mbps on both ports or 100Mbps on both ports. The preconfigured 100Mbps units offer the widest range of options for Fast Ethernet connectivity and feature copper-to-fiber and fiber-to-fiber options and distance solutions. These highly reliable conversion solutions provide full signal restoration – with low bit delay – ensuring accurate data transmission and guaranteeing maximum cable length. All line cards and standalone converters are interoperable with any Ethernet device.

In 100Mbps networks, bi-directional wavelength division multiplexing (BWDM) provides an interface that carries two distinct channels in different directions on a single strand of fiber: one wavelength is used to transmit and another wavelength is used to receive.

- Supports half-duplex or full-duplex
- Link Loss Carry Forward (LLCF) on all copper-to-fiber versions
- MDI-II/MDI-X switch on all twisted pair ports
- BWDM doubles the fiber capacity on existing fiber cables

TO ORDER, specify (NOTE: *blue* denotes *NEBS-certified*):

Interface Line Cards Standalones

10Mbps – Copper to BNC and Copper to Fiber

NEW	R111-12	2111-12-01	TP to BNC (185m)
	R111-13-B	2111-13-B	TP to FL MM-SC (2km)
	R111-15-B	2111-15-B	TP to FL MM-ST (2km)

10 and 100Mbps – Copper to Fiber

NEW	R141-13	10M and 100M TX to 10M and 100M FX MM-SC (2km)
	R141-14	10M and 100M TX to 10M and 100M FX SM-SC (20km)
	R141-15	10M and 100M TX to 10M and 100M FX MM-ST (2km)



Interface Line Cards

R141-16

Standalones

10M and 100M TX to 10M and 100M
FX SM-ST (20km)

10 and 100Mbps BWDM – Copper to Fiber

R141-1X*

10M and 100M TX to 10M and 100M
FX SM/SC 1550nm/1310nm (20km)

R141-1Y*

10M and 100M TX to 10M and 100M
FX SM/SC 1310nm/1550nm (20km)



100Mbps – Multimode to Singlemode

R131-34

2131-34-01

FX MM-SC (2km) to FX/SM-SC (20km)

R131-36

2131-36-01

FX MM-SC (2km) to FX/SM-ST (20km)

R131-54

2131-54-01

FX MM-ST (2km) to FX/SM-SC (20km)

R131-56

2131-56-01

FX MM-ST (2km) to FX/SM-ST (20km)

100Mbps – Copper to Fiber with Remote Loopback

R133-13

2133-13-01

TX to FX MM-SC (2km)

R133-14

2133-14-01

TX to FX SM-SC (20km)

R133-15

2133-15-01

TX to FX MM-ST (2km)

R133-16

2133-16-01

TX to FX SM-ST (20km)

R133-17

2133-17-01

TX to FX SM-SC (40km)

R133-1E

2133-1E-01

TX to FX MM/MT-RJ (2km)

R133-1J

2133-1J-01

TX to FX SM-SC (100km)

R133-1K

2133-1K-01

TX to 100M FX MM/LC (2km)

R133-1M

2133-1M-01

TX to 100M FX SM/LC (20km)

100Mbps BWDM – Copper to Fiber with Remote Loopback

R133-1X*

2133-1X-01 *

TX RJ-45 to 100M FX SM-SC
1550nm/1310nm (20km)

R133-1Y*

2133-1Y-01 *

TX RJ-45 to 100M FX-SM-SC
1310nm/1550nm (20km)

Accessories

2100-WM

Wall mount bracket for 2111 standalone units

* Each end of the link must be configured with a different receive and transmit wavelength.
Order a -1X for one end and a -1Y for the opposite end.

For 100Mbps LPR Interface Line Cards with SONAR, see page 32.
For 100Mbps Copper to Fiber Standalones with Remote Loopback,
see Delta Class M133 Series on page 40.



Double Existing Fiber Capacity with BWDM Extend Voice and Data Networks up to 20km

Metrobility offers a bi-directional wavelength division multiplexing (BWDM) interface that carries two distinct channels in different directions on a single strand of fiber. The BWDM interface converts electrical signals to wavelengths on a single strand of fiber, and provides a manageable, cost effective solution to achieve distances up to 20km. Each end of the link must be configured with a different receive and transmit wavelength. At one end of the single strand fiber connection one wavelength is used to transmit (e.g., 1310nm or 1550nm), and another wavelength is used to receive (e.g., 1310nm or 1550nm).

Bi-directional fiber connectivity improves network scalability and serviceability and is ideal for both MAN and LAN applications where additional users or voice and data applications must be supported on existing fiber connections. BWDM eliminates the need to install a second fiber and effectively doubles the fiber capacity on existing fiber cables. This provides a 100% improvement in fiber utilization since only a single fiber strand is required for bi-directional transmission. Thus, fiber costs, installations costs, and maintenance costs all reduce the overall cost of ownership.

See network diagram on page 47.

- *Copper-to-single strand singlemode fiber*
- *Two channels in two different directions increase bandwidth capacity*
- *Advanced monitoring and management features built into the module support SNMP management software including Metrobility's NetBeacon and WebBeacon Element Management System*
- *Link Loss Return, Link Loss Carry Forward and Auto-Recovery to aid troubleshooting on applicable models*

TO ORDER, specify (NOTE: blue denotes NEBS-certified):

Radiance Access Line Cards*

- R231-1X TX RJ-45 to FX SM-SC 1550nm/1310nm (20km)
- R231-1Y TX RJ-45 to FX SM-SC 1310nm/1550nm (20km)

Radiance Interface Line Cards*

- R133-1X TX RJ-45 to FX SM-SC 1550nm/1310nm (20km)
- R133-1Y TX RJ-45 to FX SM-SC 1310nm/1550nm (20km)
- R643-1X 10/100 TX RJ-45 to FX SM-SC 1550nm/1310nm (20km)
- R643-1Y 10/100 TX RJ-45 to FX SM-SC 1310nm/1550nm (20km)

- R152-1X 1000 TX RJ-45 to FX SM-SC 1550nm/1310nm (20km)
- R152-1Y 1000 TX RJ-45 to FX SM-SC 1310nm/1550nm (20km)
- R152-AX 1000 SX MM-SC to FX SM-SC 1550nm/1310nm (20km)
- R152-AY 1000 SX MM-SC to FX SM-SC 1310nm/1550nm (20km)

- R105-1X T1 TP to T1 Fiber SM-SC 1550 nm/1310 nm (20km)
- R105-1Y T1 TP to T1 Fiber SM-SC 1310 nm/ 1550 nm (20km)
- R165-1X E1 TP to E1 Fiber SM-SC 1550 nm/1310 nm (20km)
- R165-1Y E1 TP to E1 Fiber SM-SC 1310 nm/ 1550 nm (20km)

- R115-2X T3 Dual BNC to Fiber SM-SC 1550nm/1310nm (20km)
- R115-2Y T3 Dual BNC to Fiber SM-SC 1310nm/1550nm (20km)
- R175-2X E3 Dual BNC to Fiber SM-SC 1550nm/1310nm (20km)
- R175-2Y E3 Dual BNC to Fiber SM-SC 1310nm/1550nm (20km)

"twister" Standalones*

- 2133-1X-01 TX RJ-45 to FX SM-SC 1550nm/1310nm (20km)
- 2133-1Y-01 TX RJ-45 to FX SM-SC 1310nm/1550nm (20km)
- 2643-1X-01 10/100 TX RJ-45 to FX SM-SC 1550nm/1310nm (20km)
- 2643-1Y-01 10/100 TX RJ-45 to FX SM-SC 1310nm/1550nm (20km)

- 2152-1X-01 1000 TX RJ-45 to FX SM-SC 1550nm/1310nm (20km)
- 2152-1Y-01 1000 TX RJ-45 to FX SM-SC 1310nm/1550nm (20km)
- 2152-AX-01 1000 SX MM-SC to FX SM-SC 1550nm/1310nm (20km)
- 2152-AY-01 1000 SX MM-SC to FX SM-SC 1310nm/1550nm (20km)

- 2105-1X-01 T1 TP to T1 Fiber SM-SC 1550 nm/1310 nm (20km)
- 2105-1Y-01 T1 TP to T1 Fiber SM-SC 1310 nm/ 1550 nm (20km)
- 2165-1X-01 E1 TP to E1 Fiber SM-SC 1550 nm/1310 nm (20km)
- 2165-1Y-01 E1 TP to E1 Fiber SM-SC 1310 nm/ 1550 nm (20km)

- 2115-2X-01 T3 Dual BNC to Fiber SM-SC 1550/1310nm (20km)
- 2115-2Y-01 T3 Dual BNC to Fiber SM-SC 1310/1550nm (20km)
- 2175-2X-01 E3 Dual BNC to Fiber SM-SC 1550/1310nm (20km)
- 2175-2Y-01 E3 Dual BNC to Fiber SM-SC 1310/1550nm (20km)

* Each end of the link must be configured with a different receive and transmit wavelength.
Order a -1X for one end and a -1Y for the opposite end.

For Delta Class options, see page 40.

For ONU options, see page 24.

For BWDM SFP optics, see pages 20-21.

For 10 and 100Mbps, see pages 26-27.



Gigabit Ethernet

Implement Singlemode Fiber on Existing Copper or Multimode Fiber in Gigabit Ethernet

Metrobility offers the industry's most complete line of Gigabit products with signal retiming and regeneration to achieve data integrity. Metrobility's Gigabit solutions meet the demands of today's networks as they migrate from copper to 1000Mbps fiber infrastructures and from low-cost SX to the longer distances supported by LX and EX. These solutions support copper to fiber, multimode to singlemode, and singlemode to singlemode to extend Gigabit Ethernet networks up to 100km.

See network diagram on page 46.

- *Signal retiming and regeneration*
- *Link Loss Return (LLR), Link Loss Carry Forward (LLCF) and Copper Loss Carry Forward (CLCF) to aid in troubleshooting remote network connections*

TO ORDER, specify:

Gigabit Ethernet Interface Line Cards with SFP Optics

(See below for pluggable optics)

R153-1S 1000BASE-T RJ-45 to 1000BASE-X SFP
(requires 1 pluggable optic; see below)

R153-SS 1000BASE-X SFP to 1000BASE-X SFP
(requires 2 pluggable optics; see below)

1000Mbps Pluggable Optics

0211-M5 OPTIC, 1000M SFP MM/LC (850nm, 550m)
0211-10 OPTIC, 1000M SFP SM/LC (1310nm, 10km)
0211-25 OPTIC, 1000M SFP SM/LC (1310nm, 25km)
0211-40 OPTIC, 1000M SFP SM/LC (1550nm, 40km)
0211-70 OPTIC, 1000M SFP SM/LC (1550nm, 70km)
0211-1A OPTIC, 1000M SFP SM/LC (1550nm, 100km)

For a complete listing of SFP Pluggable Optics, see pages 18-19.



Gigabit Ethernet Interface Line Cards with Fixed Optics

Multimode to Multimode (for Singlemode to Singlemode see page 34)

R152-AA SX MM-SC (500m) to SX MM-SC (500m)

Multimode to Singlemode

R152-AD SX MM-SC (500m) to LX SM-SC (10km)

R152-AF SX MM-SC (500m) to LX SM-SC (25km)

R152-A7 SX MM-SC (500m) to LH SM-SC (40km)

R152-AJ SX MM-SC (500m) to EX SM-SC (70km)

Copper to Fiber

R152-1A 1000Base-T to SX MM-SC (500m)

R152-1D 1000Base-T to LX SM-SC (10km)

R152-1F 1000Base-T to LX SM-SC (25km)

R152-17 1000Base-T to LH SM-SC (40km)

R152-1J 1000Base-T to EX SM-SC ELH (70km)

"twister" Gigabit Ethernet Standalones

Multimode to Multimode

2152-AA-01 SX MM-SC (500m) to SX MM-SC (500m)

Multimode to Singlemode

2152-AD-01 SX MM-SC (500m) to LX SM-SC (10km)

2152-AF-01 SX MM-SC (500m) to LX SM-SC (25km)

2152-A7-01 SX MM-SC (500m) to LH SM-SC (40km)

2152-AJ-01 SX MM-SC (500m) to EX SM-SC (70km)

Copper to Fiber

2152-1A-01 1000Base-T to SX MM-SC (500m)

2152-1K-01 1000Base-T to SX MM-LC (500m)

2152-1D-01 1000Base-T to LX SM-SC (10km)

2152-1M-01 1000Base-T to LX SM-LC (10km)

2152-1F-01 1000Base-T to LX SM-SC (25km)

2152-17-01 1000Base-T to LH SM-SC (40km)

2152-1J-01 1000Base-T to EX SM-SC (70km)

For 1000Mbps LPR Interface Line Cards with SONAR, see page 32.

For 1000Mbps BWDM Interface Line Cards and Standalones, see page 28. For 1000Mbps Optical Extenders, see page 34.



Line Protection and Restoration (LPR)

Network-on-Demand, Network Reliability and Enhanced Security for Mission-critical Applications

Metrobility's patented* redundant interface provides redundant data paths for line protection and restoration. An essential connectivity tool for high priority and mission-critical applications, it provides fully redundant data paths, as well as power supply redundancy, for Ethernet devices. If the primary connection fails due to a cable or hardware failure, the redundant interface switches the device's traffic to the secondary connections within 200 microseconds at 100Mbps. The network-on-demand accessibility of the redundant interface can deliver two levels of security:

Dynamic Recovery Mode (DRM) is used in areas of your network that need high fault tolerance – where you can't afford a single point of failure. At those points in the network, simply introduce one or more intelligent redundant interfaces and cross-connect network links to avoid downtime in the event that one or more links fail or even if an entire card fails. An alarm notification is sent to the management console so that corrective steps can be initiated while users are still up and running. End-users will not notice any disruption in service as a link fails and the fail-over is completed.

For areas in the network that don't require redundancy, a secondary port on the redundant interface can be configured in **Network Select Mode (NSM)** to provide flexibility and security through link isolation. NSM redirects traffic from one link to another to implement dedicated networks for maintenance applications.

And with the SONAR option, or Switch on No Activity Received, the interface not only monitors for loss of link on the active port, but also monitors for traffic. With SONAR, if the active port remains idle for a given amount of time (configurable for 1-31 seconds for Gigabit Ethernet) the resilient technology of the redundant interface will verify activity on the secondary port, and switch traffic to that port once traffic is detected. This prevents a switch or switch port failure from bringing down the network or any part of it. *See network diagram on page 49.*

* U.S. Patent No. 6,058,479



TO ORDER, specify (NOTE: Line cards are designed to meet NEBS Level 3 compliance):

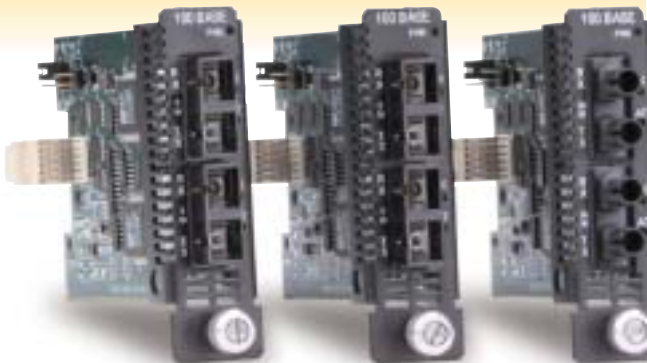
Line Cards	Standalones	
100Mbps		
	2731-11	TX to redundant TX (100m)
	2731-13	TX to redundant FX MM-SC (2km)
	2731-14	TX to redundant FX SM-SC (20km)
	2731-15	TX to redundant FX MM-ST (2km)
	2731-16	TX to redundant FX SM-ST (20km)
	2731-17	TX to redundant FX SM-SC (40km)
	2731-1J	TX to redundant FX SM-SC (100km)
100Mbps with SONAR		
	R732-11	TX to redundant TX with SONAR (100m)
	R732-13*	TX to redundant FX MM-SC with SONAR (2km)
	R732-14*	TX to redundant FX SM-SC with SONAR (20km)
	R732-15*	TX to redundant FX MM-ST with SONAR (2km)
	R732-16*	TX to redundant FX SM-ST with SONAR (20km)
	R732-17*	TX to redundant FX SM-SC with SONAR (40km)
	R732-1J*	TX to redundant FX SM-SC with SONAR (100km)
1000Mbps with SONAR (See below for pluggable optics)		
	R752-11	2752-11-01 1000Base-T to Dual 1000Base-T with SONAR
	R752-1S	2752-1S-01 1000Base-T to Dual 1000Base-X with SONAR (requires 2 pluggable optics; see below)
	R752-SS	2752-SS-01 1000Base-X to Dual 1000Base-X with SONAR (requires 3 pluggable optics; see below)
1000Mbps Pluggable Optics		
	0211-M5	OPTIC, 1000M SFP MM/LC (850nm, 550m)
	0211-10	OPTIC, 1000M SFP SM/LC (1310nm, 10km)
	0211-25	OPTIC, 1000M SFP SM/LC (1310nm, 25km)
	0211-40	OPTIC, 1000M SFP SM/LC (1550nm, 40km)
	0211-70	OPTIC, 1000M SFP SM/LC (1550nm, 70km)
	0211-1A	OPTIC, 1000M SFP SM/LC (1550nm, 100km)

Accessories

2731-WM Wall mount bracket for 2731 standalone units

* Line card requires 2 slots in R5000 chassis

For a complete listing of SFP Pluggable Optics, see pages 18-19.



Optical Extenders

Extend Your Network Reach

Designed specifically for Metropolitan Area Network (MAN) providers, Competitive Local Exchange Carriers (CLEC) and installers of medium to long fiber runs, Metrobility's Optical Extenders provide a straightforward and reliable solution for connecting remote offices. Optical Extenders connect to each end of a Fast Ethernet or Gigabit Ethernet fiber optic segment to extend the supported distance. Optical extenders may be cascaded to achieve distances over 200km.

Strict standards compliance provides flexibility by ensuring reliable data transmission in multi-vendor environments. The seamless transfer of all signal activity ensures accurate data flow without sacrificing quality.

When configured with a management card, Optical Extenders can be remotely managed and configured through Metrobility's NetBeacon management software, any SNMP management platform, or Metrobility's WebBeacon browser-based management software.

- *Signal retiming and regeneration (1000Mbps Line Cards only)*
- *Link Loss Carry Forward (LLCF) provides an easy means for troubleshooting a remote network connection*

TO ORDER, specify (NOTE: *blue* denotes *NEBS-certified*):

100Mbps Interface Line Cards

R131-33	FX MM-SC (2km) to FX MM-SC (2km)
R131-44	FX SM-SC (20km) to FX SM-SC (20km)
R131-47	FX SM-SC (20km) to FX SM-SC (40km)
R131-4J	FX SM-SC (20km) to FX SM-SC (100km)
R131-55	FX MM-ST (2km) to FX MM-ST (2km)



- R131-66 FX SM-ST (20km) to FX SM-ST (20km)
- R131-77 FX SM-SC (40km) to FX SM-SC (40km)
- R131-JJ FX SM-SC (100km) to FX SM-SC (100km)

1000Mbps Interface Line Cards

- R152-DD LX SM-SC (10km) to LX SM-SC (10km)
- R152-DF LX SM-SC (10km) to LX SM-SC (25km)
- R152-D7 LX SM-SC (10km) to LX SM-SC (40km)
- R152-DJ LX SM-SC (10km) to LX SM-SC (70km)
- R152-77 LH SM-SC (40km) to LH SM-SC (40km)
- R152-JJ EX SM-SC (70km) to EX SM-SC (70km)

100Mbps "twister" Standalones

- 2131-33-01 FX MM-SC (2km) to FX MM-SC (2km)
- 2131-44-01 FX SM-SC (20km) to FX SM-SC (20km)
- 2131-47-01 FX SM-SC (20km) to FX SM-SC (40km)
- 2131-4J-01 FX SM-SC (20km) to FX SM-SC (100km)
- 2131-55-01 FX MM-ST (2km) to FX MM-ST (2km)
- 2131-66-01 FX SM-ST (20km) to FX SM-ST (20km)
- 2131-77-01 FX SM-SC (40km) to FX SM-SC (40km)
- 2131-JJ-01 FX SM-SC (100km) to FX SM-SC (100km)

1000Mbps "twister" Standalones

- 2152-DD-01 LX SM-SC (10km) to LX SM-SC (10km)
- 2152-DF-01 LX SM-SC (10km) to LX SM-SC (25km)
- 2152-D7-01 LX SM-SC (10km) to LX SM-SC (40km)
- 2152-DJ-01 LX SM-SC (10km) to LX SM-SC (70km)
- 2152-77-01 LH SM-SC (40km) to LH SM-SC (40km)
- 2152-JJ-01 EX SM-SC (70km) to EX SM-SC (70km)



T1/E1

Extend T1/E1 Network Services up to 100km

The Radiance T1/E1 interface provides seamless signal extension of a T1 (1.544Mbps) or E1 (2.048Mbps) copper interface to a variety of multimode or singlemode fiber optic interface links. Connect PBX, multiplexers, ATM/Frame Relay devices, routers, servers and video CODECS to achieve extended distances, high density and high quality transmission. Transmission of voice/video/data application is totally frame and data independent and supports framed or unframed formats. See network diagram on page 48.

- Variable line length select for proper T1 pulse shape
- BERT (Bit Error Rate Testing) and remote loopback testing
- SNMP manageable (interface line cards only)

TO ORDER, specify (NOTE: blue denotes NEBS-certified):

Interface Line Cards

T1	E1	
R105-13	R165-13	RJ-45 to Fiber MM-SC (2km)
R105-14	R165-14	RJ-45 to Fiber SM-SC (15km)
R105-15	R165-15	RJ-45 to Fiber MM-ST (2km)
R105-16	R165-16	RJ-45 to Fiber SM-ST (15km)
R105-17	R165-17	RJ-45 to Fiber LH/SM-SC (40km)
R105-1J	R165-1J	RJ-45 to Fiber ELH/SM-SC (100km)
R105-1X*	R165-1X*	T1 TP to T1 Fiber SM-SC 1550nm/1310nm (20km)
R105-1Y*	R165-1Y*	T1 TP to T1 Fiber SM-SC 1310nm/1550nm (20km)

"twister" Standalones

2105-13-01	2165-13-01	RJ-45 to Fiber MM-SC (2km)
2105-14-01	2165-14-01	RJ-45 to Fiber SM-SC (15km)
2105-15-01	2165-15-01	RJ-45 to Fiber MM-ST (2km)
2105-16-01	2165-16-01	RJ-45 to Fiber SM-ST (15km)
2105-17-01	2165-17-01	RJ-45 to Fiber LH SM-SC (40km)
2105-1J-01	2165-1J-01	RJ-45 to Fiber ELH SM-SC (100km)
2105-1X-01*	2165-1X-01*	T1 TP to T1 Fiber SM-SC 1550nm/1310nm (20km)
2105-1Y-01*	2165-1Y-01*	T1 TP to T1 Fiber SM-SC 1310nm/1550nm (20km)

* Supports links up to 20km. Each end of the link must be configured with a different receive and transmit wavelength. Order a -1X for one end and a -1Y for the opposite end.



T3/E3

Seamless Signal Extension up to 100km Without Repeaters

The T3/E3 interface provides cost effective high-speed integration and conversion of T3 (44.736Mbps) or E3 (34.368Mbps) serial copper telco communication lines to fiber optic links. Connect PBX, multiplexers, ATM/Frame Relay devices, routers, servers and video CODECS to achieve extended distances, high density and high quality transmission. Select models support bi-directional wavelength division multiplexing (BWDM) on a single strand of fiber for increased bandwidth. See network diagram on page 48.

- Local and remote loopback testing
- NRZ (non-return to zero) data and clock encoding ensures reliable clock recovery at the remote fiber port
- BWDM models double the fiber capacity on existing fiber cables
- SNMP manageable (interface line cards only)

TO ORDER, specify (NOTE: blue denotes NEBS-certified):

Interface Line Cards

T3	E3	
R115-23	R175-23	Dual BNC to Fiber MM-SC (2km)
R115-24	R175-24	Dual BNC to Fiber SM-SC (15km)
R115-25	R175-25	Dual BNC to Fiber MM-ST (2km)
R115-26	R175-26	Dual BNC to Fiber SM-ST (15km)
R115-27	R175-27	Dual BNC to Fiber LH/SM-SC (40km)
R115-2J	R175-2J	Dual BNC to Fiber ELH/SM-SC (100km)
R115-2X*	R175-2X*	Dual BNC to Fiber SM-SC 1550nm/1310nm (20km)
R115-2Y*	R175-2Y*	Dual BNC to Fiber SM-SC 1310nm/1550nm (20km)

Standalones

2115-23-01	2175-23-01	Dual BNC to Fiber MM-SC (2km)
2115-24-01	2175-24-01	Dual BNC to Fiber SM-SC (15km)
2115-25-01	2175-25-01	Dual BNC to Fiber MM-ST (2km)
2115-26-01	2175-26-01	Dual BNC to Fiber SM-ST (15km)
2115-27-01	2175-27-01	Dual BNC to Fiber LH/SM-SC (40km)
2115-2J-01	2175-2J-01	Dual BNC to Fiber ELH/SM-SC (100km)
2115-2X-01 *	2175-2X-01 *	Dual BNC to Fiber SM-SC 1550nm/1310nm (20km)
2115-2Y-01 *	2175-2Y-01 *	Dual BNC to Fiber SM-SC 1310nm/1550nm (20km)

* Supports links up to 20km. Each end of the link must be configured with a different receive and transmit wavelength. Order a -1X for one end and a -1Y for the opposite end.



SONET

Metrobility's SONET solutions provide multimode to singlemode conversion for OC-3/STM-1 (155Mbps) and OC-12/STM-4 (622Mbps) to achieve distances up to 40km.

- *Signal regeneration*
- *Link Loss Return (LLR) and Link Loss Carry Forward (LLCF) to aid in troubleshooting remote network connections*
- *Full- and half-duplex support*

TO ORDER, specify (NOTE: Line cards are designed to meet NEBS Level 3 compliance):

Interface Line Cards

R125-34	OC-3 MM-SC (2km) to SM-SC (15km)
R125-37	OC-3 MM-SC (2km) to SM-SC (40km)
R135-34	OC-12 MM-SC (500m) to SM-SC (15km)

"twister" Standalones

2125-34-01	OC-3 MM-SC (2km) to SM-SC (15km)
2125-37-01	OC-3 MM-SC (2km) to SM-SC (40km)
2135-34-01	OC-12 MM-SC (500m) to SM-SC (15km)

For Multi-rate Line Card options, see page 39.



Multi-Rate Line Card

Metrobility's Multi-rate Line Card (MRLC) provides a transparent interface for multimode, singlemode, BWDM (single-strand bi-directional wavelength division multiplexing), and CWDM across a wide range of protocols with data rates ranging from 44.7Mbps to 2.7Gbps. The Multi-rate Line Card supports Ethernet,

SONET/SDH, fibre channel, and ESCON protocols. Data rate is determined by DIP switch setting on the card, or by software auto-detection or manual settings in Metrobility's NetBeacon or WebBeacon element management software. The MRLC provides the ability to connect optical network segments operating at different wavelengths, including multimode, singlemode or CWDM lambdas.

The line card performs 3R (re-amplification, reshaping and re-timing) signal regeneration on all known data rates or 2R (re-amplification and reshaping) signal regeneration for protocol transparent data rates. When configured with wavelength-specific CWDM optics, the MRLC enables service providers to leverage existing fiber infrastructure to provision and manage multiple services over a single fiber pair.

- Supports data rates from 44.7Mbps to 2.7Gbps
- SFP optics for single channel, BWDM and CWDM
- SNMP manageable
- Auto-detection or manual frequency settings

TO ORDER, specify (NOTE: *blue* denotes *NEBS-certified*):

Multi-Rate Line Card

R380-SS

Multi-rate Optical Transponder

For a complete listing of SFP Pluggable Optics, see pages 18-19.

For Radiance Optical Ethernet System platforms, see page 12.

For CWDM chassis, see page 22.

Delta Class “twister”® and AutoTwister®

Sleek, compact, and rich in features, the 100Mbps Delta Class “twister” looks as impressive as it operates. Designed for desktop use in any office, the durable “twister” supports mixed media networks by enabling copper-to-fiber conversion to extend network distances. The Delta Class AutoTwister auto-negotiates from 10Mbps to 100Mbps, allowing existing 10Mbps devices to communicate over a 100Mbps backbone.

Network troubleshooting features

- *Link Loss Carry Forward*
- *Far End Fault (100Mbps only)*
- *Remote Loopback (100Mbps only)*
- *Link Loss Return (10/100Mbps only)*
- *Auto-Recovery (10/100Mbps only)*

Installation features

- *Auto-negotiation of full and half duplex*
- *Auto-crossover (100Mbps only)*
- *Integral cable management and protection*
- *Superior noise immunity*
- *Integral wall mounting*

Operational features

- *Integral retiming (reduces jitter)*
- *Low power consumption*
- *Highly visible LED indicators*



TO ORDER, specify: 100Mbps “twister”

M133-13	TX to FX MM-SC (2km)
M133-14	TX to FX SM-SC (20km)
M133-15	TX to FX MM-ST (2km)
M133-16	TX to FX SM-ST (20km)
M133-17	TX to FX SM-SC (40km)
M133-1E	TX to FX MM/MT-RJ (2km)
M133-1J	TX to FX SM-SC (100km)
M133-1K	TX to FX MM-LC (2km)
M133-1M	TX to FX SM-LC (20km)
M133-1X	TX to FX SM-SC (20km) BWDM 1550nm/1310nm
M133-1Y	TX to FX SM-SC (20km) BWDM 1310nm/1550nm

10/100 AutoTwister

M643-13	10/100 TX to FX MM-SC (2km)
M643-14	10/100 TX to FX SM-SC (20km)
M643-15	10/100 TX to FX MM-ST (2km)
M643-16	10/100 TX to FX SM-ST (20km)
M643-17	10/100 TX to FX SM-SC (40km)
M643-1E	10/100 TX to FX MM/MT-RJ (2km)
M643-1G	10/100 TX to FX MM/VF-45 (2km)
M643-1J	10/100 TX to FX SM-SC (100km)
M643-1K	10/100 TX to FX MM-LC (2km)
M643-1M	10/100 TX to FX SM-LC (20km)
M643-1X	10/100 TX to FX SM-SC (20km) BWDM 1550nm/1310nm
M643-1Y	10/100 TX to FX SM-SC (20km) BWDM 1310nm/1550nm

DELTA CLASS



Industrial Ethernet for the Factory Floor

The RD20-24 chassis is the first modular chassis designed for the Industrial Ethernet market. A two-slot modular chassis that mounts on a DIN-rail, the RD20-24 offers a chassis for Metrobility's line cards that support copper-to-fiber connectivity between the copper-based devices on the factory floor and the control room. Fiber to the control room presents many advantages since it is immune to noise and supports extended distances which may be found in large plants or even between buildings in campus environments.

The modular design enables the mix-and-match of connection types and speeds. The RD20-24 will accommodate any of Metrobility's wide range of line cards for Ethernet, Fast Ethernet, 10/100 rate adaption, "redundant" line protection and restoration (LPR), and BWDM (single strand bi-directional wavelength division multiplexer). Further, when configured with Metrobility's Access Line Cards, the device can be managed from a central SNMP management station with NetBeacon Element Manager.

- *Modular design supports mix and matching of connection types and speeds*
- *Management option for easy troubleshooting and configuration*
- *High availability option with dual links*
- *Redundant power inputs*
- *Extended temperature range*
- *Rugged DIN-rail mounted enclosure*

TO ORDER, specify:

RD20-24 2-slot, DIN-rail mount chassis, 24vdc (nominal) @0.75amps

Note: Use either one or two single slot Radiance Access or Interface Line cards or one 2-slot LPR card.

For Metrobility Radiance Access Line Cards, see page 16.

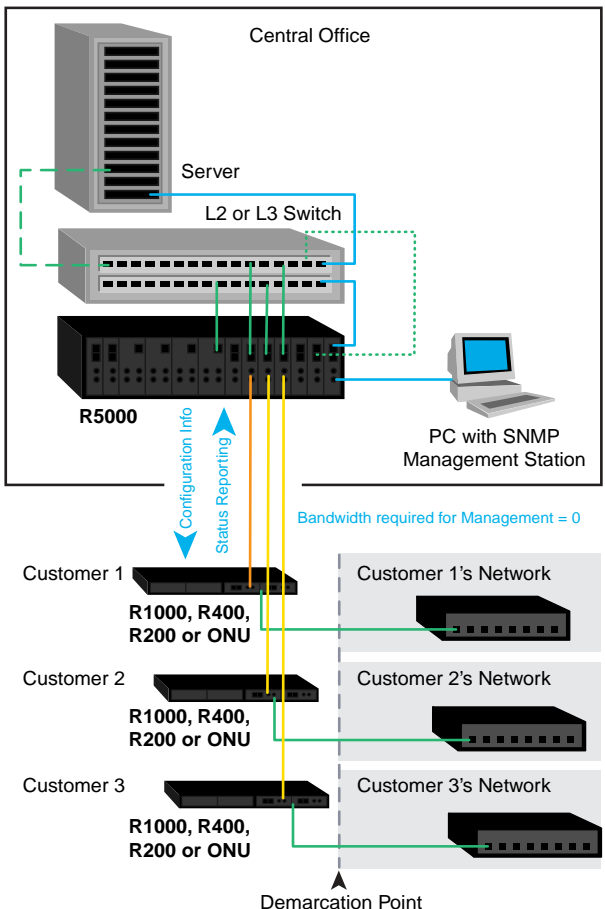
For the full range of Metrobility's interface options, please see the Metrobility Interface Options section beginning on page 25.

NETWORK APPLICATIONS

Metro Access

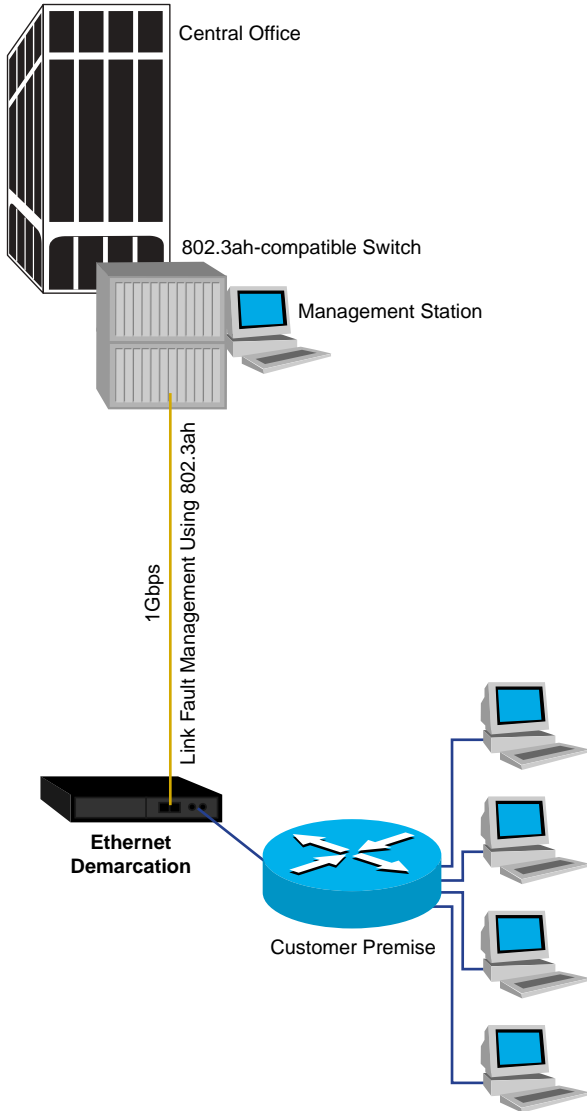
Installed at the central office (CO) or the point of presence (POP), the Radiance R5000 Central Service Platform interfaces to the switch or router at the service provider's metropolitan area network and to a Metrobility Premise Service Platform at the customer site to provide extensive remote WAN management, fiber connectivity and access. The Premise Service Platform is configured with the same options as the Central Service Platform counterpart.

Metrobility's patented technology provides a managed, secure link while maintaining maximum bandwidth capabilities. Remote loopback testing tests the connection from the fiber port at the Central Office through the copper port at the demarcation point. An integral optical power meter measures the strength of the laser eliminating the need to open the link for testing. Bandwidth provisioning can be accomplished in 1Mbps increments with burst rates up to 256KB.



Managed NID with 802.3ah EFM OAM Capabilities

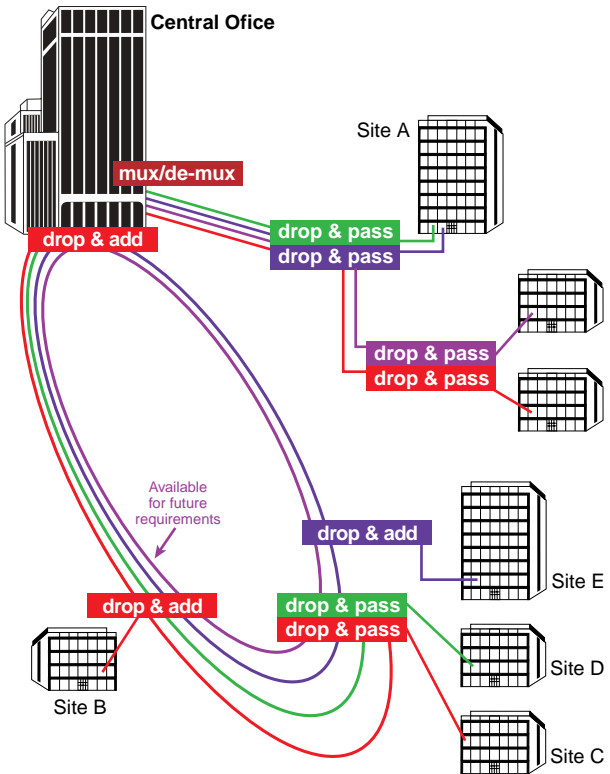
This diagram illustrates an 802.3ah-based remote site management application. As an NID at the customer premise, the Services Line Card is used in one of Metrobility's Premise Service Platforms. Carrier-class management access control protects against denial of service on the management channel. The Radiance access device will talk with a compatible switch to deliver EFM OAM capabilities.



NETWORK APPLICATIONS

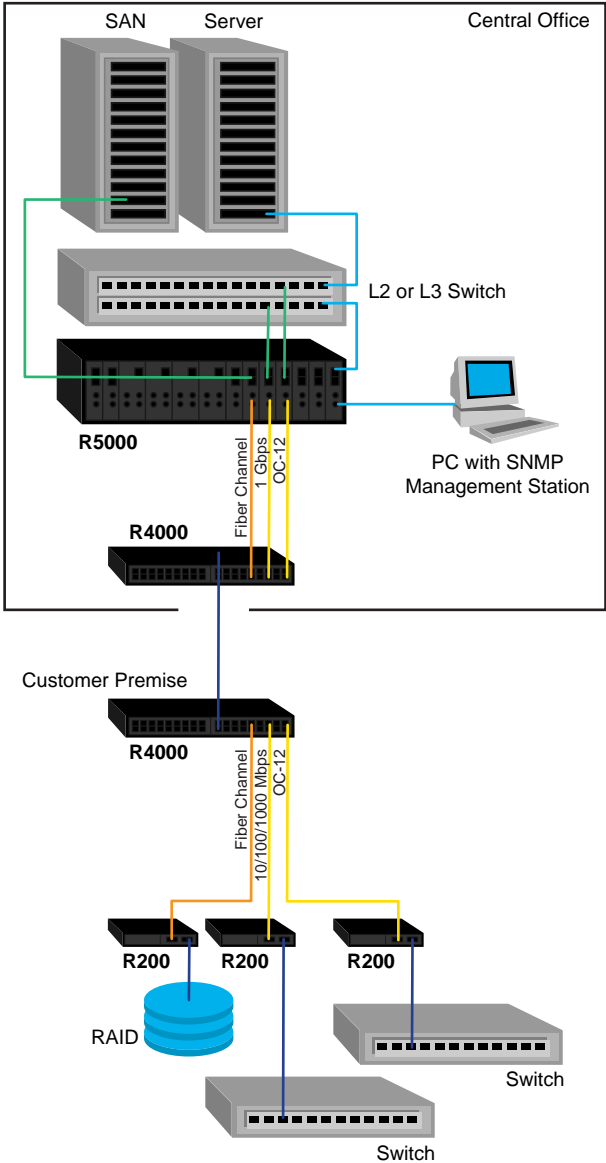
Ethernet over CWDM

Service providers who are looking for an end-to-end solution can team CWDM mux/de-mux and OADM devices with wavelength-specific Gigabit Ethernet line cards in a Radiance R5000 chassis to create a robust and flexible managed connection to remote terminals. An R4000 chassis with an OADM module or a 4-channel multiplexer at the subscriber site provides “drop & add” or “drop & pass” capabilities. This diagram also illustrates a robust and flexible *managed* point-to-point, or ring, network solution. Metrobility’s CWDM solution is ideal for applications where dedicated bandwidth, enhanced diagnostics, and a secure PON connection are required, i.e., ILECs looking to serve the SMB market.



Multi-Services CWDM

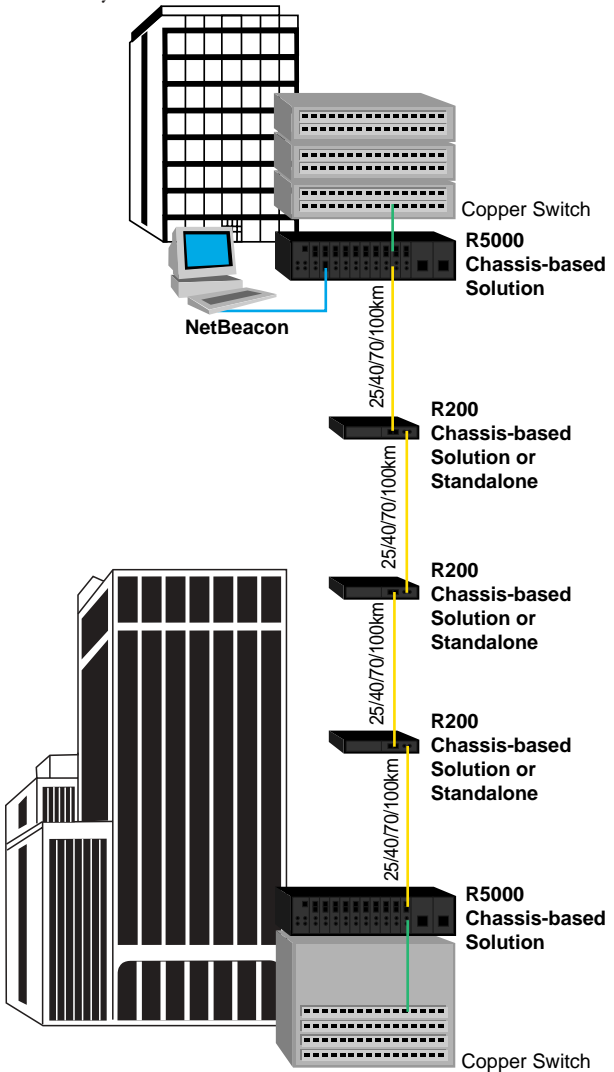
When configured with wavelength-specific CWDM optics, the Multi-Rate Line Card (MRLC) enables service providers to leverage existing fiber infrastructure to provision and manage multiple services over a single fiber pair.



NETWORK APPLICATIONS

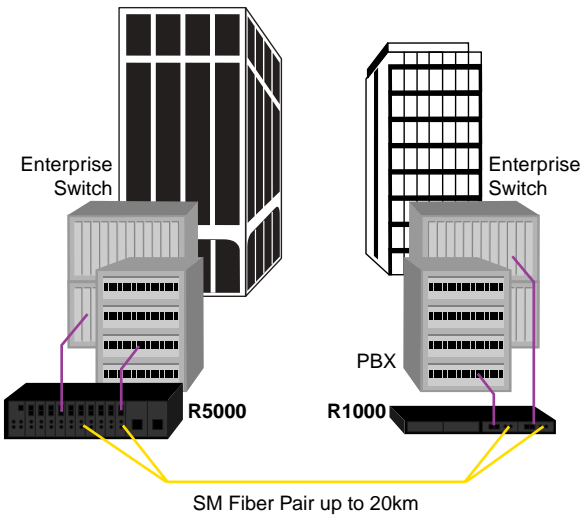
Gigabit Ethernet

Metrobility offers the most resilient and extensive Gigabit Ethernet connectivity product line in the industry. All Gigabit Ethernet products incorporate signal retiming and regeneration to maximize supported cable distance. Units can be cascaded to achieve distances over 280km and provide copper-to-fiber, multimode-to-singlemode, multimode-to-multimode, and singlemode-to-singlemode connectivity.



BWDM

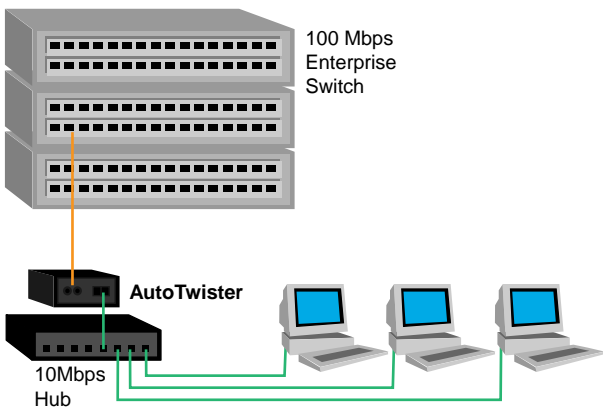
The Metrobility T1/E1 BWDM interface provides cost effective high-speed integration and conversion of T1 or E1 serial copper telco communication lines to fiber optic links up to 20km over a single strand of fiber. The T1/E1 BWDM interface allows for transmission of voice/video/data applications that is totally frame and data independent.



NETWORK APPLICATIONS

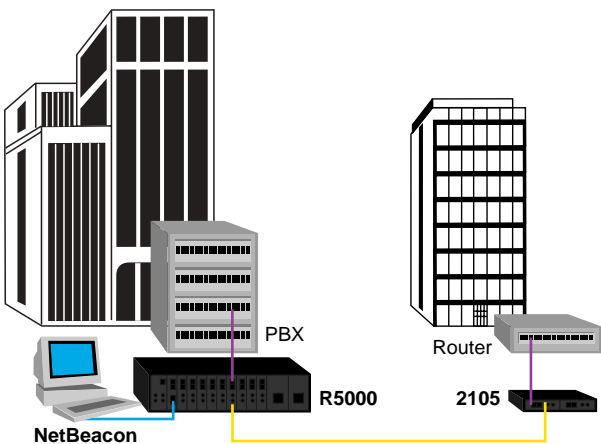
10/100Mbps AutoTwister Solution

There are some obvious cost advantages to using the AutoTwister (M643 or 2643) for migration to higher speed networks. Without the AutoTwister, if a customer has a 10Mbps hub cluster that needs to connect to a 100Mbps enterprise switch, they would need to purchase another 10/100 megabit switch. Using the AutoTwister, they can drastically reduce the cost by eliminating the additional switch and using the AutoTwister to convert from 10Mbps to 100Mbps.



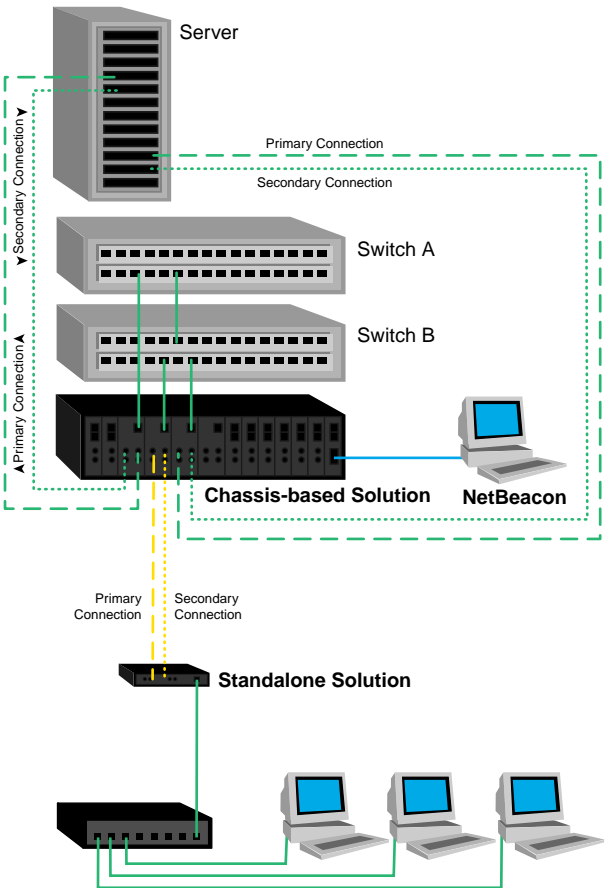
T1/E1 or T3/E3

Converting T1/T3 and E1/E3 signals from copper to fiber provides greater distance and more error-free and secure network segments up to 100km. Extending the distance that T1/T3 or E1/E3 voice and data traffic can travel also eliminates costly repeaters and multiple points of failure in the metro network.



Line Protection and Restoration (LPR)

Redundancy is an essential connectivity tool for high priority and mission-critical applications. If the primary connection fails due to a cable or hardware failure, the LPR interface automatically switches the device's traffic to the secondary connection within 200 microseconds at 100Mbps or 1000Mbps. The LPR interface can also be utilized to provide a switch or server with backup against link, port or device failure, at which time a second switch would take over routing traffic. This interface is available with SONAR in 10Mbps, 100Mbps and 1000Mbps configurations.



TERMINOLOGY

Auto-Recovery: Enables a link to be automatically restored after a link loss event.

BWDM (Bidirectional Wavelength Division Multiplexing): Carries two distinct channels in different directions on a single strand of fiber.

Copper Loss Carry Forward (CLCF): A mechanism that stops transmission of link pulses on the fiber port if the copper port stops receiving link pulses.

CWDM (Coarse Wavelength Division Multiplexing): Utilizes widely spaced, separate wavelengths on a single fiber pair (ITU G.652.C-compliant fiber recommended).

Dynamic Recovery Mode: Enables automatic failover (less than 200 microseconds) to a secondary port on a redundant interface.

EFM: Ethernet in the First Mile as defined in the IEEE 802.3ah standard will reduce operating expenditures and broaden the appeal of Ethernet as a metro access technology.

Link Loss Carry Forward (LLCF): A mechanism that stops the transmission of link signals until a link signal is received from the opposite port.

Link Loss Return (LLR): A mechanism that stops transmission of link pulses out the same port of the interface when there is no incoming link.

Loopback Testing: Enables service providers to remotely troubleshoot the high-speed optical link by sending traffic on the optical fiber connection then reading it back at the central office to see if there are any errors or problems. Loopback testing may be used on all ports – copper or fiber. Eliminates costly on-site visits.

NEBS (National Equipment Building Standards): A major test of quality that is extremely valuable for any organization supplying or purchasing network equipment. Provides criteria for environmental, electrical interference, and electrical safety.

Network Select Mode: Acts as an A/B switch to redirect network traffic to a secondary port on a redundant interface when needed.

OAM: Operations, administration and maintenance support for Ethernet broadband access in the first mile.

Quality of Equipment (QoE): Ensures that the devices responsible for the optical link are constantly being monitored for temperature as well as for the logic voltage level in each interface card.

Quality of Line (QoL): Enables the service provider to identify potential line degradations immediately. Remote Monitoring (RMON) statistics provide real-time QoL information without utilizing customer bandwidth through NetBeacon, Access and Services Line Cards.

Quality of Optical Amplitude (QoOA): Provides an integral optical power meter that monitors the transmit and receive power of the optical transceivers in real time.

Regeneration: Strengthens the signal and removes the noise.

Retiming: Resynchronization of the signal, removing most of the jitter. Retiming ensures that maximum cable distance is achieved.

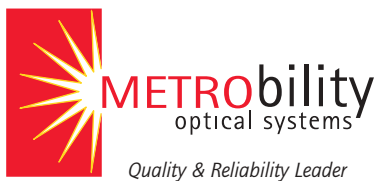
SONAR (Switch on No Activity Received): Enables a redundant interface to sense traffic from the switch and failover to a second port if no data traffic is being received. SONAR provides protection against loss of data activity in addition to link integrity.

THE METROBILITY DIFFERENCE

- Standards-based, multi-level management for both IP-based (direct) and IP-less (proxy-based) remote access.
- IEEE 802.3ah OAM support with unique Metrobility extensions including optical power, temperature, and voltage levels.
- Denial of service safeguards to protect management access.
- Integrated console port to enable on-site maintenance.
- Multi-layer traffic engineering supports traffic prioritization, class of service, and rate limiting.
- Link level and network level loopbacks provide both link and path troubleshooting capabilities.
- Logical Services Loopback provides edge-to-edge service level verification to support individual SLAs.
- Copper Line Quality (CLQ) tests connection to the customer's network to identify and locate problems along the copper cable on the user port, including open circuit, short circuit, or impedance mismatch.
- Wavelength multiplexing solutions (*CWDM and BWDM*) for copper-to-fiber and multimode-to-singlemode fiber maximizes fiber capacity.
- SNMP-based network management software provides end-to-end network views and active remote control of network element.
- Database capability to track trends of optical power, temperature, voltage, and RMON statistics.
- Embedded web functionality allows network managers to manage fiber connections from an Internet browser.
- Patented line protection and restoration (LPR) solutions offer SONAR and network-on-demand features to ensure maximum network uptime.
- High availability features including hot swap redundant AC/DC power supplies, hot swap line cards, and hot swap management cards.
- Highly reliable solutions support media, speed and distance requirements for Ethernet, Fast Ethernet, Gigabit Ethernet, OC-3 and OC-12, and TDM connectivity.
- Signal retiming ensures accurate transmission of data over long distances and eliminates the need for repeaters.
- Flexible, scalable solutions provide the connectivity you need to meet changing network conditions quickly, easily and cost-effectively.



For additional technical and warranty information, please contact Metrobility Optical Systems at 1-800-952-6227 or 1-603-880-1833, or visit our website at www.metrobility.com.



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