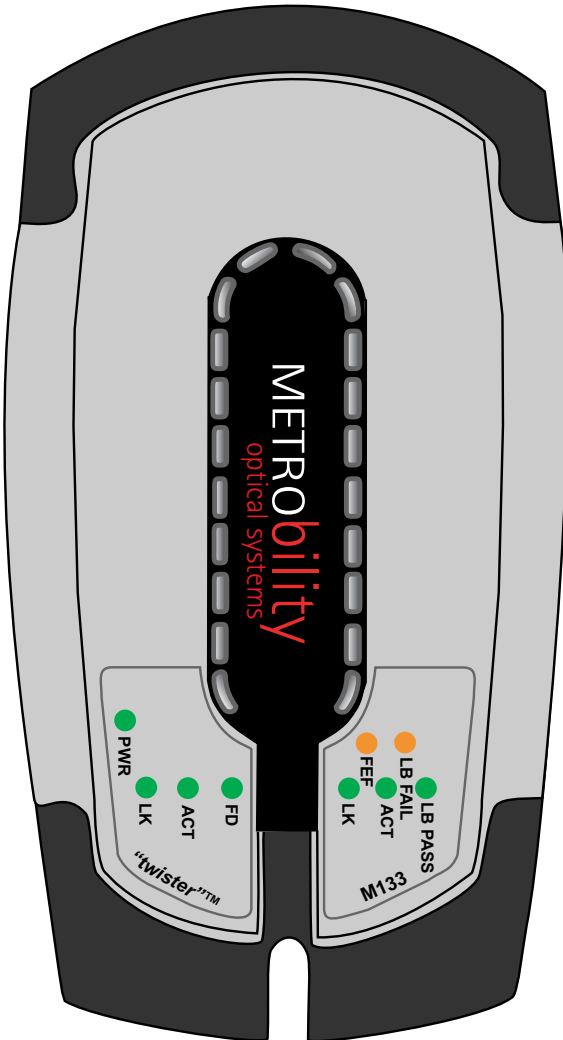# 100Mbps DELTA CLASS
"twister"™

Installation and User's Guide

This manual covers the following Metrobility 100Mbps Delta Class "twister" models:

M133-13 _____   100Mbps TX to 100Mbps FX multimode SC
M133-14 _____   100Mbps TX to 100Mbps FX singlemode SC
M133-15 _____   100Mbps TX to 100Mbps FX multimode ST
M133-16 _____   100Mbps TX to 100Mbps FX singlemode ST
M133-17 _____   100Mbps TX to 100Mbps FX singlemode SC (40km)
M133-1E _____   100Mbps TX to 100Mbps FX multimode MT-RJ
M133-1J _____   100Mbps TX to 100Mbps FX singlemode SC (100km)
M133-1K _____   100Mbps TX to 100Mbps FX multimode LC
M133-1M _____   100Mbps TX to 100Mbps FX singlemode LC
M133-1X _____   100Mbps TX to 100Mbps SC bidirectional wavelength
                division multiplexed (BWDM) 1550/1310nm
M133-1Y _____   100Mbps TX to 100Mbps SC BWDM 1310/1550nm

Contents

Overview

Sleek, compact, and rich in features, Metrobility's 100Mbps Delta Class "twister" looks as impressive as it operates. Designed for desktop use in any modern office, the durable "twister" meets strict US and international EMC regulations. This innovative device allows you to convert from copper to fiber, extend copper-based network distances up to 100km, and test the integrity of the fiber line using remote loopback on the fiber port. New features include a wall mounting option, automatic MDI-X/MDI-II capability, highly visible LEDs on the top, and built-in cable management and protection.

To optimize your Fast Ethernet network, the "twister" provides seamless operation in full- and half-duplex environments. Full signal restoration ensures accurate data transmission throughout the network. The "twister" incorporates both Far End Fault and Link Loss Carry Forward, two troubleshooting functions to help identify the loss of a remote network connection.

On select models, bidirectional wavelength division multiplexing (BWDM) offers an interface that carries two separate channels in different directions through a single strand of fiber. BWDM eliminates the need to install a second fiber and effectively doubles the fiber capacity on existing fiber cables.

Key Features
* Link Loss Carry Forward
* Far End Fault notification
* Remote fiber loopback to test the entire fiber link
* Auto-negotiation on copper port
* Auto-crossover (i.e., no crossover cables to install or switches to set)
* Convenient LED indicators located on the top for high visibility
* Integral cable management and protection
* Wall mountable
* Far End Fault indicator on the fiber port
* Multiple connectivity options, including BWDM
* Fully compliant with IEEE 802.3 and 802.3u
* Stylish, contemporary design in a durable plastic case

Installation Guide

Follow the simple steps outlined in this section to install and start using the Metrobility 100Mbps Delta Class "twister" media converter.

Unpack the "twister" and Accessories

Check that the following parts are included in your box:

- 100Mbps Delta Class "twister"
- Power supply
- Power supply cord (North American shipments only)
- Four (4) rubber feet

Your order has been provided with the safest possible packaging, but shipping damage occasionally does occur. Inspect your order carefully. If you discover any shipping damage, notify your carrier and follow instructions for damage and claims. Save the original shipping carton if return or storage of the unit is necessary.

Attach the Rubber Feet

The "twister" is shipped with four rubber feet located on the black adhesive strip. To install the rubber feet, first turn the "twister" upside-down. Peel the feet from the adhesive strip, then attach one foot to each circular indentation on the unit. This provides an air gap which helps to cool the unit, and also adds stability for desktop operation.

If you are stacking the "twister" on top of another unit, the rubber feet must be attached to the bottom of the "twister".

Choose an Appropriate Location

The "twister" is intended for use in either an office or a residential environment. The unit must be located within six (6) feet of the AC power source being used and placed as far away as possible from electrical noise generating equipment such as copiers, electrostatic printers, and other motorized equipment. If exposed twisted-pair wiring is used nearby, the wiring should be routed as far away as possible from power cords and data cables to minimize interference.

The unit may be oriented in any manner which allows you to make the physical connection to the power supply and leaves a minimum of six (6) inches of space for proper ventilation.

Wall Mounting

The "twister" requires no additional hardware for wall mounting. After selecting an appropriate place for installation, simply align the 1/4" keyhole opening on the bottom of the unit to a screw (6-32 maximum head size) or wall anchor. Once you have it positioned properly, make sure the device is attached securely.

Set the Switches

The "twister" provides a set of six DIP switches located on the back panel. These switches allow you to select from several modes of operation. The default settings are shown below.

Default
DIP Switch
Settings

LLCF FEF AN1 FD1 DSLB RLBK

O

O = OFF
I = ON
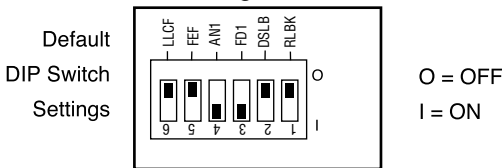
Link Loss Carry Forward Switch (LLCF)

The "twister" incorporates Link Loss Carry Forward (LLCF) functionality as an aid in troubleshooting remote connections. When LLCF is enabled, the loss of inbound link pulses on a port stops the transmission of outbound link pulses on the *opposite* port. For example, if LLCF is enabled, the loss of incoming link pulses at *Port 1* will stop the transmission of link pulses out of *Port 2*. Conversely, if *Port 2* stops receiving link pulses, *Port 1* will not transmit link pulses.

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

Far End Fault Switch (FEF)

The "twister" supports Far End Fault functionality to detect the loss of link by the remote unit's fiber port receiver.

FEF is only applicable to the fiber port. When FEF is enabled on a port, the loss of the inbound link pulses on that port generates an alarm, which is sent out the port's transmitter. FEF also enables a port to read the alarm. To function properly, the FEF setting on both the local and remote "twister" must be the same.

For example, if FEF is enabled on both units and the remote unit's fiber receiver (RX) stops detecting link pulses, then its fiber transmitter (TX) will send an alarm. The local "twister" will receive the alarm and report it through its fiber port FEF LED, which will turn amber. No alarm will be issued if FEF is disabled on the remote unit. The FEF LED will not turn amber if FEF is disabled on the local "twister" because it will not be able to detect the alarm.

Far End Fault is enabled on Port 2 when switch FEF is ON. The unit is shipped with FEF disabled. Refer to Far End Fault in the User Guide section of this manual for more information.

Auto-Negotiation Switch (AN1)
Switch AN1 controls the use of auto-negotiation on the copper port. Auto-negotiation determines whether the port operates at half or full duplex. When AN1 is enabled, the copper port will advertise full duplex capabilities to its connected device, if the duplex switch, FD1, is enabled. The port will advertise half duplex capabilities if FD1 is disabled. If AN1 is disabled, the duplex switch will determine the port's duplex mode. By default, auto-negotiation is enabled.

Duplex Switch (FD1)
Switch FD1 sets the duplex mode for the copper port when auto-negotiation is disabled. The copper port operates at full duplex when FD1 is enabled; and it operates at half duplex when FD1 is disabled. If auto-negotiation is enabled, the FD1 switch setting will determine whether the port advertises full or half duplex (refer to Auto-Negotiation above). The default is set to full duplex enabled.

Copper Port Configuration Table
Use the table below to set the duplex and auto-negotiation DIP switches to obtain specific modes of operation for the copper port.

Copper Port Configuration	FD1	AN1
Full Duplex	ON	OFF
Half Duplex	OFF	OFF
Auto-Negotiate Full Duplex	ON	ON
Auto-Negotiate Half Duplex	OFF	ON

Disable Loopback Switch (DSLB)
This switch determines the response of the fiber port when it receives the remote loopback command. If the DSLB switch is enabled, the port will ignore all remote loopback commands. When the switch is disabled, the port will permit remote loopback to occur. By default, the response switch is disabled, which allows remote loopback.

Remote Loopback Switch (RLBK)

The remote loopback switch allows you to test the fiber connection between a Metrobility Delta Class "twister" and a remote Metrobility x133 unit. Enabling the switch sends a loopback request to the remote fiber port. To run the loopback test properly, the following conditions must be met:

- The remote unit must be a Metrobility x133 standalone converter or line card.
- The DSLB switch on the remote unit must be disabled.

If the conditions are satisfied, the remote loopback sequence will begin. The remote fiber port will go into loopback mode. Next, the local "twister" will generate a test pattern that is sent to the remote unit and then looped back. The local "twister" will read the returned data to verify proper transmission. The LB LED on the local "twister" will indicate whether the test passed (green) or failed (amber). Refer to Remote Loopback for further information.

If the two conditions for remote loopback are not met, the remote loopback test will always fail. By default, remote loopback is disabled.

Connect to the Network

The Metrobility 100Mbps Delta Class "twister" offers the ease of plug-and-play installation. The overhang extension provides built-in protection for the two cable connectors.

When making network connections with the Metrobility "twister", grasp the end of the cable with your index finger on the top of the connector and your thumb on the bottom, as shown in the illustration below. For easier installation, insert the copper cable to the "twister" before connecting the fiber.
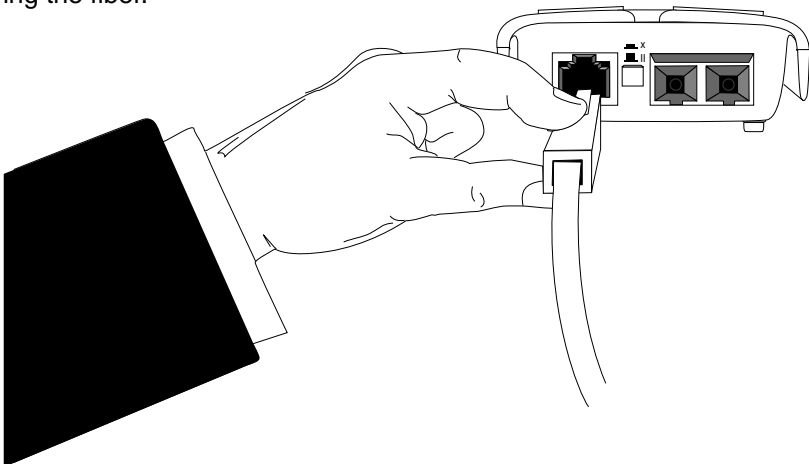
Twisted-Pair Connection

The "twister" provides one shielded RJ-45 connector that supports a maximum segment length of up to 100 meters. Use only Category 5 or 5E UTP/STP cables.
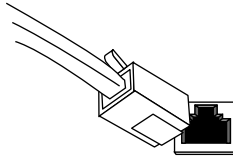
RJ-45

Fiber Optic Connections

- The M133-13, -15, -1E and -1K provide one set of FX multimode SC / ST / MT-RJ / LC connectors, respectively, and support a maximum segment length of up to 2km for remote links.

- The M133-14, -16 and -1M provide one set of FX singlemode SC/ST/ LC connectors, respectively, and support a segment length of up to 20km for remote links.

- The M133-17 provides one set of FX singlemode SC connectors and supports a maximum segment length of up to 40km for remote links.

- The M133-1J provides one set of FX singlemode SC connectors and supports a maximum segment length of up to 100km for remote links.

Once power is applied to the unit, correct connectivity can be verified via the link (LK) LEDs if a device is connected to the remote end of the cable.

ST

LC

BWDM

SC

MT-RJ
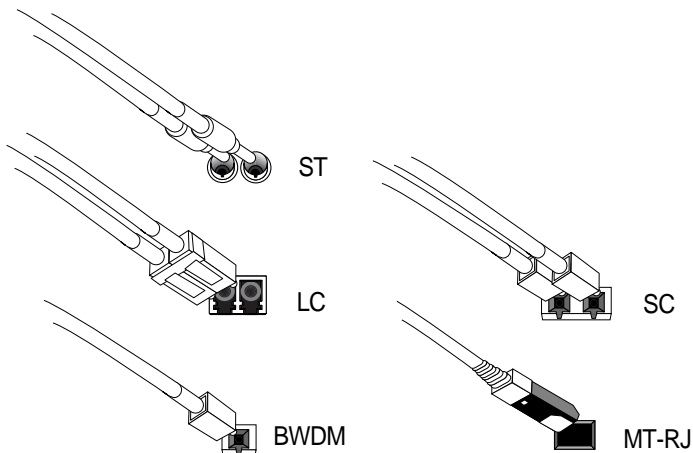
BWDM Connection

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

up to 20km

**Metrobility
-1X Model**

**Metrobility
-1Y Model**
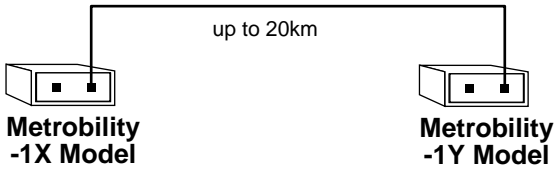
Apply Power

Power is applied to the "twister" through the desktop power supply. To apply power, do the following:

1. Connect the power cord (not included with international shipments) to the AC receptacle on the power supply.

2. Connect the power supply to the DC input power jack located on the back of the "twister".

3. The "twister" is designed with built-in cable management and protection. Turn the unit upside-down and route the DC power cord into one of the two channels located on each side of the unit. See diagram.

4. Plug the power cord into an AC wall outlet. Upon receiving power, the power (PWR) LED turns green, and the "twister" automatically goes into operation providing the appropriate signal translation between connected network segments.

5. Verify valid connections via the link (LK) LEDs, which should be lit.
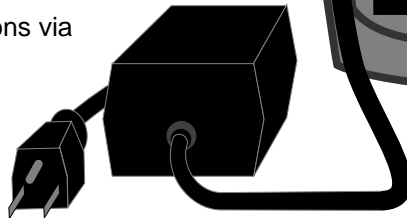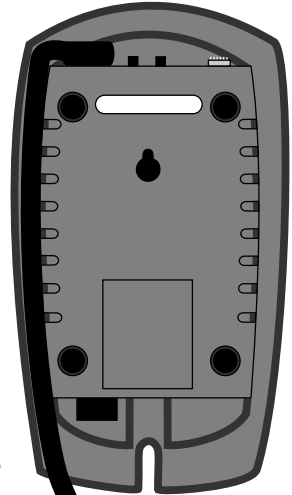
If an additional extension cord is needed to connect the power supply to the outlet, use the guidelines below. While one end of the AC power cord can be fitted with a plug standard for the country of operation, the end that connects to the Metrobility power supply must have a female plug that fits the following type of AC receptacle:

• AC 115V (North America): Use a UL-listed and CSA-certified cord set consisting of a minimum of No. 18 AWG, type SVT or SJT three-conductor cord (5 feet maximum length) and a parallel blade grounding-type attachment plug rated 15A, 125V.

• AC 230V (USA): Use a UL-listed cord set consisting of a minimum No. 18 AWG, type SVT three-conductor cord (15 feet maximum length) and a Tandem blade grounding-type attachment plug rated 15A, 250V.

- 240V (outside USA): Use a cord set consisting of a minimum No. 18 AWG cord and grounding-type attachment plug rated 15A, 250V. The cord set should have the appropriate safety approvals for the country in which the "twister" is being installed and be marked HAR.

User's Guide

This section contains information regarding the operating features of the Metrobility 100Mbps Delta Class "twister".

LED Indicators

The Metrobility 100Mbps Delta Class "twister" provides several LEDs for the visible verification of unit status and proper functionality. The LEDs can assist in troubleshooting and with overall network diagnosis and management.


Copper Port LEDs
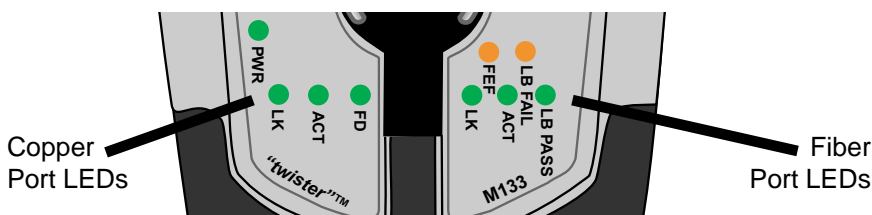
Fiber Port LEDs

| LED Label	LED Name	Color (Status)	Indication
PWR	power	green (steady)	The unit is ON.
Copper Port LEDs			
FD	duplex	green (steady)	The port is in full-duplex mode when lit. It is in half-duplex mode when not lit.
LK	link	green (steady)	Verifies that the port has link established.
ACT	activity	green (flashing)	The port is receiving data.
Fiber Port LEDs			
LB PASS	loopback pass	green (steady)	Local Unit: Test data looped back properly. Remote Unit: Receving loopback test data.
LB FAIL	loopback fail	amber (steady)	Local Unit: Remote loopback test failed. Remote Unit: Port is in remote loopback mode, but not receiving test data.
LK	link	green (steady)	Verifies that the port has link established.
FEF	far end fault	amber (steady)	Far end fault detected. The remote fiber port is not receiving a valid signal from the local unit.
ACT	activity	green (flashing)	The port is receiving data.

Link Loss Carry Forward (LLCF)

The Metrobility Delta Class "twister" incorporates LLCF[*] for troubleshooting remote connections. When LLCF is enabled, the ports do not transmit a link signal until they receive a link signal from the opposite port.

The diagram below shows a typical network configuration with good link status using two "twister" units for remote connectivity. Note that LLCF is enabled as indicated in the diagram below.
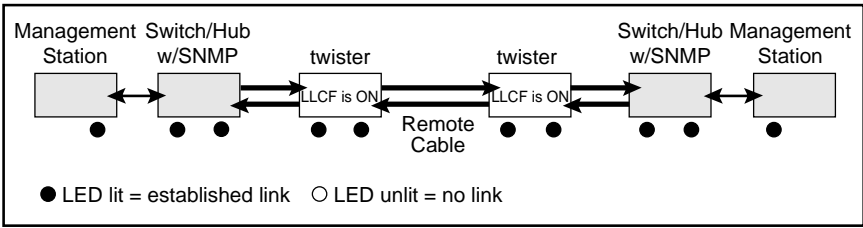
If a connection breaks, each "twister" will carry that link loss forward to a switch/hub which generates a trap to a management station. The network administrator can then determine the source of the problem.
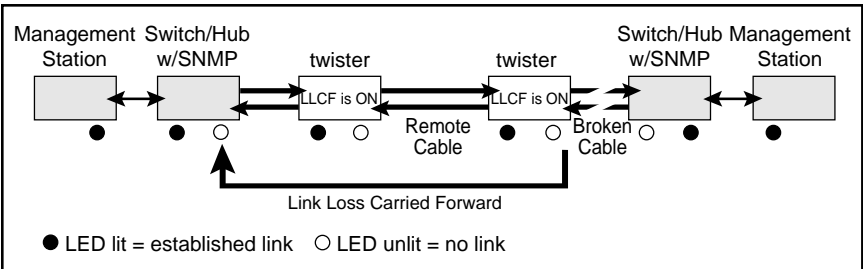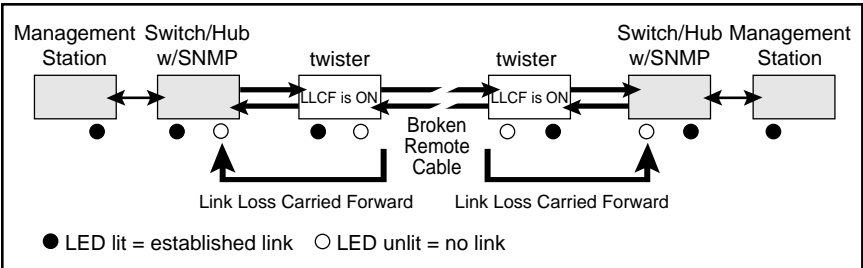
LLCF with Auto-Negotiation

**IMPORTANT:** *To prevent synchronization problems, we recommend that you do not enable both LLCF and auto-negotiation at the same time on the both the local and remote "twister". Disable one of the functions on either unit to ensure quick link establishment.*

When LLCF and auto-negotiation (AN) are enabled simultaneously on both the local and remote units, as shown in the following diagram, it may take a few seconds for the "twister" units to establish link.
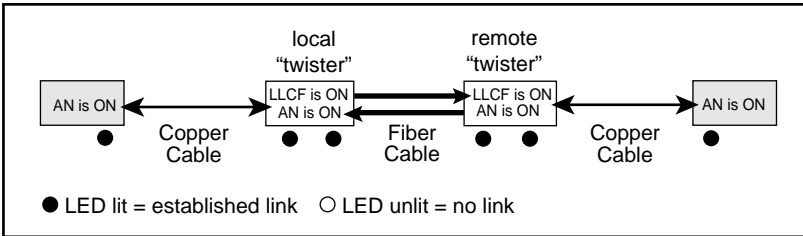
As connections are created, the "twister" units may enter a situation in which the LLCF and auto-negotiation functions become synchronized but slightly out of phase. This will cause continuous up-down link conditions on all ports. That is, the link (LK) LEDs on the ports will blink on and off.

If the condition lasts more than 10 seconds, reset one of the "twister" units, or unplug and then reconnect one of the connectors. The links should be established within a few seconds.

Far End Fault (FEF)

The Metrobility "twister" is designed with Far End Fault[*] functionality to identify the loss of link in the remote unit's fiber receiver. FEF is not applicable to the copper port.

Setting FEF on the fiber optic port enables two operations:
1. It allows the fiber *transmitter* to issue a FEF alarm when the fiber *receiver* fails to detect a valid link.
2. It enables the port to read the FEF alarm, so it can activate its FEF LED.

IMPORTANT: *To function properly, the FEF setting on both the local and the remote "twister" must be the same.*

The diagram below shows a typical network configuration with good link status using two "twister" units with FEF enabled.
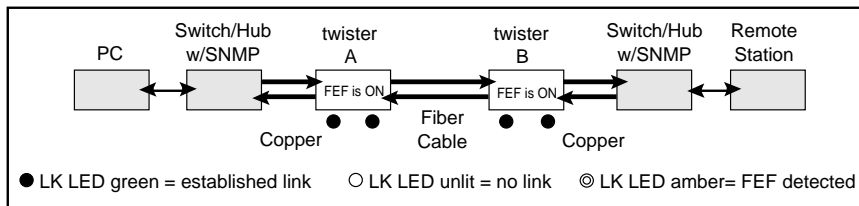
If one of the optical conductors is bad (as shown in the diagram box below), "twister" B will send a FEF alarm to its link partner on "twister" A. "twister" A will report the condition through its amber FEF LED and unlit LK LED.
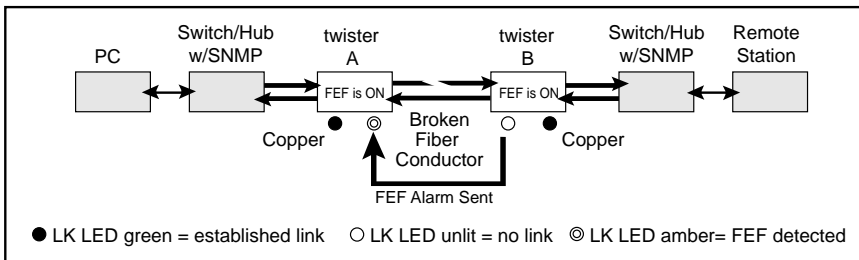
In the example described above, if FEF is disabled on "twister" B, the FEF alarm will not be transmitted to "twister" A. If FEF is disabled on "twister" A, it will not be able to read the FEF alarm and its link (LK) LED will remain green.

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*Units are shipped with the FEF function disabled.

Remote Loopback

The Delta Class "twister" supports remote loopback testing, which is typically used to verify the integrity of the fiber link to and from a remote unit. Use this feature to remotely initiate loopback testing from a central office and to monitor the results without making a trip to the remote site.

Remote loopback is enabled through the DIP switch labeled RLBK on the local "twister". When the switch is set, a request for loopback is sent to the remote fiber port. To run the loopback test properly, the following conditions must be met:
- The remote unit connected to the fiber port must be a Metrobility x133. The remote unit may be another "twister" or a line card.
- The disable loopback (DSLB) response switch on the remote unit must be disabled. DSLB determines whether commands to begin remote loopback are executed or ignored.

If the two conditions are not met, the remote loopback test will always fail.

If the conditions are satisfied, the remote loopback sequence begins:
- The remote unit goes into loopback mode, in which the fiber port returns the incoming traffic back to the sender.
- The local "twister" generates a test pattern that is sent to the remote port and then looped back.
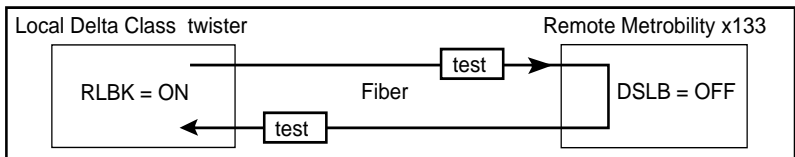
- The local "twister" reads the returned pattern and checks if there are any errors or problems.
- The LB LEDs on the local "twister" indicates whether the operation succeeded (green) or failed (amber). On the remote unit, the LB PASS LED is green when it receives the test pattern, and the LB FAIL LED is amber when it does not.

Remote Loopback Time Out
The fiber port is designed to resume normal data transmission within 15 seconds after receiving the remote loopback command. If the RLBK switch is still enabled on the local "twister" after the time-out period occurs, the remote port will repeat the loopback sequence. During this transitional period, when the remote port has reset itself and is no longer looping back the test pattern, the LB FAIL LED on the local "twister" may briefly turn amber. For example if the RLBK switch is ON for 40 seconds, the LB FAIL LED may briefly turn amber after 15 seconds and again after 30.

If the RLBK switch setting on the local "twister" is changed from ON to OFF before the remote card resets itself, the LB FAIL LED on the remote unit may be amber for a few seconds. This is because the remote port has not timed out and is still in loopback mode waiting to receive test patterns. The remote port will resume normal operation after the time out occurs, which will be in less than 15 seconds.

Time Out Indications

Local LB FAIL LED		Remote LB FAIL LED	
Color (status)	Indication	Color (status)	Indication
Amber (brief)	Remote port has reset itself to begin passing data, however, the remote loopback switch is still enabled on the local unit.	Amber (less than 15 seconds)	The remote loopback switch on the local unit has been disabled, but the remote port has not timed out yet.

Topology Solution

Enterprise Switch

Servers with
100Mbps NICs

**Metrobility
M133**

Enterprise

100Mbps Switch

**Metrobility
M133**

2km multimode F/O

**Metrobility
M133**

2km multimode F/O

**Metrobility
M133**

**Metrobility
M133**

100Mbps Switch

20km singlemode F/O

Twisted-pair Links
F/O Links
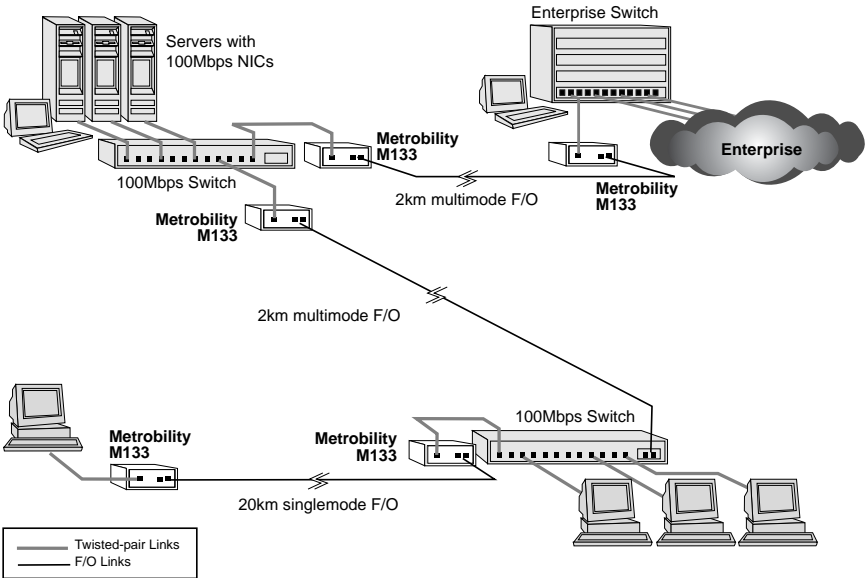
Technical Specifications

Network Connections

Twisted-Pair Interface

Connector _____ Shielded RJ-45, 8-pin modular jack
Impedance _____ 100 Ohms nominal
Signal Level Output (peak differential) _____ 0.95 to 1.05V
Signal Level Input _____ 200mV minimum
Supported Link Length _____ 100m
Cable Type _____ Category 5 or 5E UTP/STP

Multimode Fiber Optic Interface
(M133-13, M133-15, M133-1E, M133-1K)
Connector _____ SC, ST, MT-RJ, LC
Wavelength _____ 1310nm
RX Input Sensitivity _____ -31 dBm minimum (M133-13, -15)
_____ -32 dBm minimum (M133-1K)
Output Power _____ -20 dBm minimum (M133-1K)
_____ - 23.5 dBm to -14 dBm (50/125 µm)
_____ -20 dBm to -14 dBm (62.5/125 µm)
Supported Link Length _____ up to 2km full duplex
Cable Type _____50/125, 62.5/125 µm F/O

Singlemode Fiber Optic Interface
(M133-14, M133-16, M133-1M)
Connector _____ SC, ST, LC
Wavelength _____ 1310nm
RX Input Sensitivity _____ -31 dBm minimum (M133-14, -16)
_____ -32 dBm minimum (M133-1M)
Output Power _____ -15 dBm to -8 dBm
Supported Link Length _____ up to 20km full duplex
Cable Type _____9/125 µm F/O

Singlemode Fiber Optic Interface — long haul distance support
(M133-17)
Connector _____ SC
Wavelength _____ 1310nm
RX Input Sensitivity _____ -34 dBm maximum
Output Power _____ -6 dBm to 0 dBm
Supported Link Length _____ up to 40km full duplex
Cable Type _____9/125 µm F/O

Singlemode Fiber Optic Interface — extended long haul distance support
(M133-1J)
Connector _____ SC
Wavelength _____ 1550nm
RX Input Sensitivity _____ -34 dBm minimum
Output Power _____ -5 dBm to 0 dBm
Supported Link Length _____ up to 100km full duplex
Cable Type _____9/125 µm F/O

Singlemode BWDM Fiber Optic Interface
Connector _____ SC
RX Input Sensitivity _____ -32 dBm minimum
Output Power _____ -15 dBm to -8 dBm
Supported Link Length _____ up to 20km full duplex
Cable Type _____ 9/125 µm single-strand F/O
(M133-1X)
    TX Wavelength _____ 1550nm
    RX Wavelength _____ 1310nm
(M133-1Y)
    TX Wavelength _____ 1310nm
    RX Wavelength _____ 1550nm

Data Rate
Data Rate _____ 100Mbps full duplex
_____ 200Mbps half duplex

Power
AC Input _____ 100-240V AC 50/60 Hz
DC Output _____ + 5V @ 2Amp, 10W
M133 Power Consumption _____ + 5V @ 0.5Amp, 2.5W

Environmental
Operating Temperature _____ 0° to 50° C
Storage Temperature _____ -25° to 70° C
Relative Humidity _____5% to 95% non-condensing
Physical Case _____ Impact-resistant plastic construction
Dimensions _____ 7" L x 3.75" W x 1.5" H
_____ 17.8 cm x 9.5 cm x 3.8 cm
Weight (including power supply) _____ 1.2 lbs, 0.55 kg

Product Safety, EMC, and Compliance Statements

This equipment complies with the following requirements:

- UL
- CSA
- FCC Part 15, Class A
- EN55022 Class A (emissions)
- Class 1 Laser Product

- CE
- EN60950 (safety)
- EN55024: 1998 (immunity)
- DOC Class A (emissions)
- IEC 825-1 Classification

This product shall be handled, stored and disposed of in accordance with all governing and applicable safety and environmental regulatory agency requirements.

The following *FCC* and *Industry Canada* compliance information is applicable to North American customers only.

USA FCC Radio Frequency Interference Statement

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

Caution: *Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

Canadian Radio Frequency Interference Statement

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

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

Warranty and Servicing

Three-Year Warranty for the Metrobility 100Mbps "twister"
Metrobility Optical Systems, Inc. warrants that every Metrobility 100Mbps Delta Class "twister" will be free from defects in material and workmanship for a period of THREE YEARS. This warranty covers the original user only and is not transferable. Should the unit fail at any time during this warranty period, Metrobility will, at its sole discretion, replace, repair, or refund the purchase price of the product. This warranty is limited to defects in workmanship and materials and does not cover damage from accident, acts of God, neglect, contamination, misuse or abnormal conditions of operation or handling, including overvoltage failures caused by use outside of the product's specified rating, or normal wear and tear of mechanical components.

To establish original ownership and provide date of purchase, complete and return the registration card or register the product online at www.metrobility.com. If product was not purchased directly from Metrobility, please provide source, invoice number and date of purchase.

To return a defective product for warranty coverage, contact Metrobility Customer Service for a return materials authorization (RMA) number. Send the defective product postage and insurance prepaid to the address provided to you by the Metrobility Technical Support Representative. Failure to properly protect the product during shipping may void this warranty. The Metrobility RMA number must be clearly on the outside of the carton to ensure its acceptance.

Metrobility will pay return transportation for product repaired or replaced in-warranty. Before making any repair not covered by the warranty, Metrobility will estimate cost and obtain authorization, then invoice for repair and return transportation. Metrobility reserves the right to charge for all testing and shipping costs incurred, if test results determine that the unit is without defect.

This warranty constitutes the buyer's sole remedy. No other warranties, such as fitness for a particular purpose, are expressed or implied. Under no circumstances will Metrobility be liable for any damages incurred by the use of this product including, but not limited to, lost profits, lost savings, and incidental or consequential damages arising from the use of, or inability to use, this product. Authorized resellers are not authorized to extend any other warranty on Metrobility's behalf.
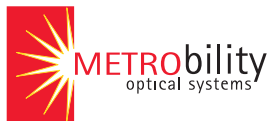
Product Manuals
The most recent version of this manual is available online at
http://www.metrobility.com/support/manuals.htm

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

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

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