CHAPTER 5

Connecting Optical Cables

This chapter describes how to connect the optical cables for the Cisco Metro 1500 series system. It includes the following sections:

Caution Make sure that there is no danger that the cables may inadvertently be pulled or cause anyone to trip when in use.

Note Ports connecting to the user use multimode, single-mode, or a combination of both types of cables depending on the application. Ports on the MUX or DMX use single-mode cables only.

Warning **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.**

Note Remove dust covers and blind plugs immediately before you connect the fiber cable.

Note Clean the fiber ferrules as described in the "Cleaning the System" section on page 3-18. Use canned, dry oil-free compressed air only.

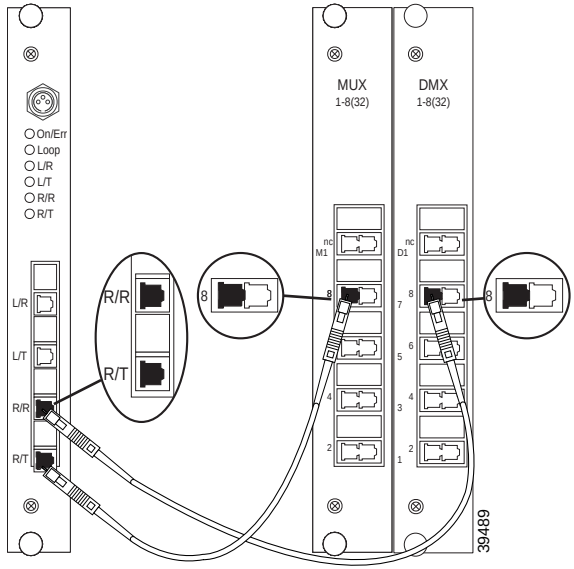
Connecting WCMs to MUX and DMX Modules

To connect a WCM to MUX and DMX modules, follow these steps:

Step 1 Remove the dust cover from one end of a jumper and the blind plug from the WCM connector labeled R/T (remote transmitter). Connect the MiniSC plug to the open connector.

Step 2 Remove the dust cover from the other end of the jumper and the blind plug from the corresponding MUX connector. For example, if you interconnect the seventh WCM, remove the blind plug from the MUX connector labeled 7. (See Figure 5-1.)

Figure 5-1 Connecting a WCM to a MUX and a DMX



Step 3 Remove the blind plug from the WCM connector labeled R/R (remote receiver) and the dust cover from one end of a short jumper. Connect the MiniSC plug to the open connector.

Step 4 Remove the dust cover from the other end of the jumper and the blind plug from the corresponding DMX connector. For example, if you interconnect the seventh WCM, remove the blind plug from the DMX connector labeled 7. (See Figure 5-1.)

Step 5 Place the fiber-optic cables in the cable holder at the bottom of the chassis.

Repeat these steps with all other WCMs of the main chassis and extension chassis.

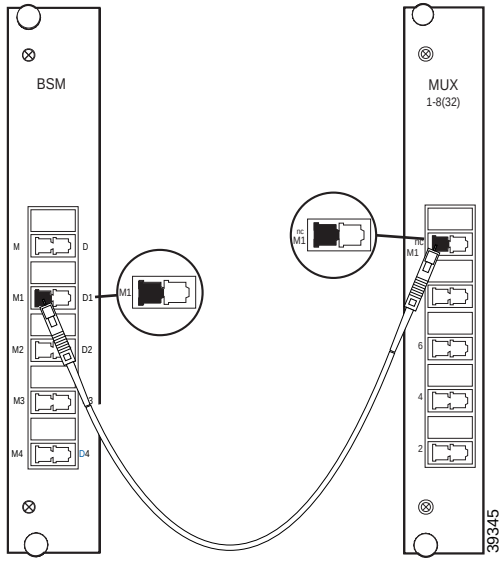
Connecting BSMs with MUX and DMX Modules

To connect a BSM to MUX and DMX modules, follow these steps:

Step 1 Remove the dust cover from one end of a jumper and the blind plug from the MUX connector labeled M1. (Use M1 if you are routing the MUX of the primary chassis.) Connect the MiniSC plug to the open connector.

Step 2 Remove the dust cover from the other end of the jumper and the blind plug from the BSM connector labeled M1. (Use M1 if you are routing the MUX of the primary chassis.) Connect the MiniSC plug to the open connector of the BSM, as shown in Figure 5-2.

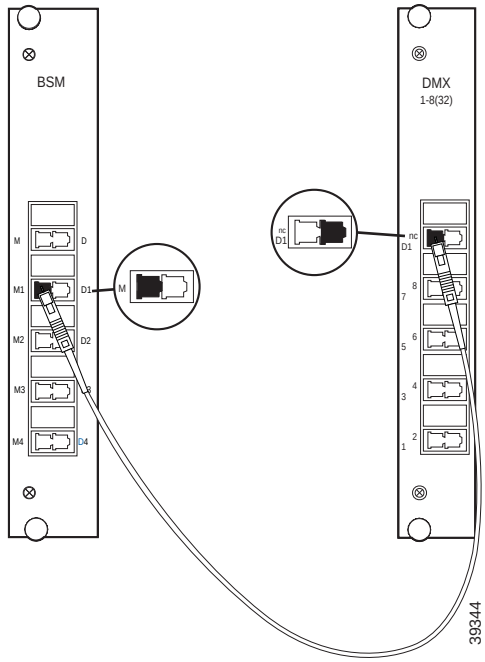
Figure 5-2 Connecting a BSM to a MUX



Step 3 Remove the dust cover from one end of a jumper and the blind plug from the DMX connector labeled D1. (Use D1 if you are routing the DMX of the primary chassis.) Connect the MiniSC plug to the open connector.

Step 4 Remove the dust cover from the other end of the jumper and the blind plug from the BSM connector labeled D1. (Use D1 if you are routing the DMX of the primary chassis.) Connect the MiniSC plug to the open connector of the BSM, as shown in Figure 5-3.

Figure 5-3 Connecting a BSM to a DMX



Step 5 Place the fiber-optic cables in the cable holder of the primary and extension chassis and the rack at the side of both chassis.

Note If you have an RSM installed, proceed to the "Connecting a BSM to an RSM" section on page 5-6. Otherwise skip to the "Connecting Remote Lines to a BSM" section on page 5-7

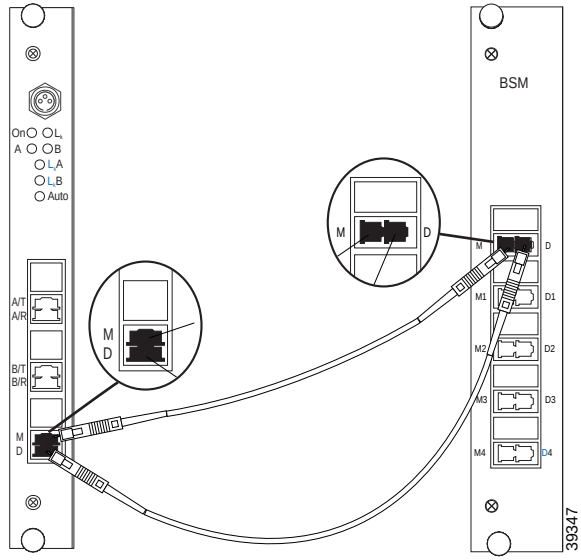
Connecting a BSM to an RSM

To connect a BSM to an optional RSM, follow these steps:

Step 1 Remove the dust cover from one end of a jumper and the blind plug from the BSM connector labeled M. Connect the MiniSC plug to the open connector.

Step 2 Remove the dust cover from the other end of the blind plug from the RSM connector labeled M. Connect the MiniSC plug to the open connector of the RSM, as shown in Figure 5-4.

Figure 5-4 Connecting a BSM to an RSM



Step 3 Remove the dust cover from one end of a jumper and the blind plug from the BSM connector labeled D. Connect the MiniSC plug to the open connector.

Step 4 Remove the dust cover from the other end of the jumper and the blind plug from the RSM labeled D. Connect the plug to the open connector of the RSM, as shown in Figure 5-4.

Step 5 Place the fiber-optic cables in the cable holder of the primary and extension chassis and the rack at the side of both chassis.

Note If you have a BSM installed, proceed to the "Connecting Remote Lines to a BSM" section on page 5-7. Otherwise skip to the "Connecting Remote Lines to RSMs" section on page 5-9.

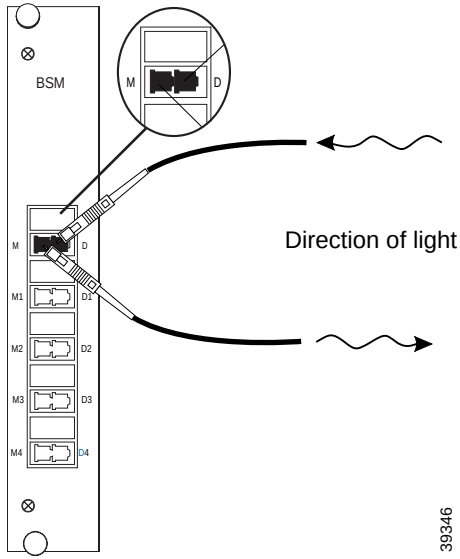
Connecting Remote Lines to a BSM

To connect remote lines to a BSM, follow these steps:

Step 1 Remove the dust cover from the MiniSC plug of the remote transmission fiber of line A, and clean the fiber as described in "Cleaning the Connectors" section on page 3-19.

Step 2 Remove the blind plug from the BSM connector labeled M. Connect the cleaned plug to the open connector of the BSM. (See Figure 5-5.)

Figure 5-5 Connecting Remote Lines to a BSM



Step 3 Remove the dust cover from the MiniSC plug of the remote receiver fiber line, and clean the fiber as described in the "Cleaning the Connectors" section on page 3-19.

Step 4 Remove the blind plug from the BSM connector labeled D. Connect the cleaned plug to the open connector of the BSM, as shown in Figure 5-5.

Step 5 Place the fiber-optic cables in the cable holder of the primary and extension chassis and the rack at the side of both chassis.

Note If you have an optional RSM installed, proceed to the "Connecting Remote Lines to RSMs" section on page 5-9. Otherwise skip to the "Connecting Local Lines to WCMs" section on page 5-10.

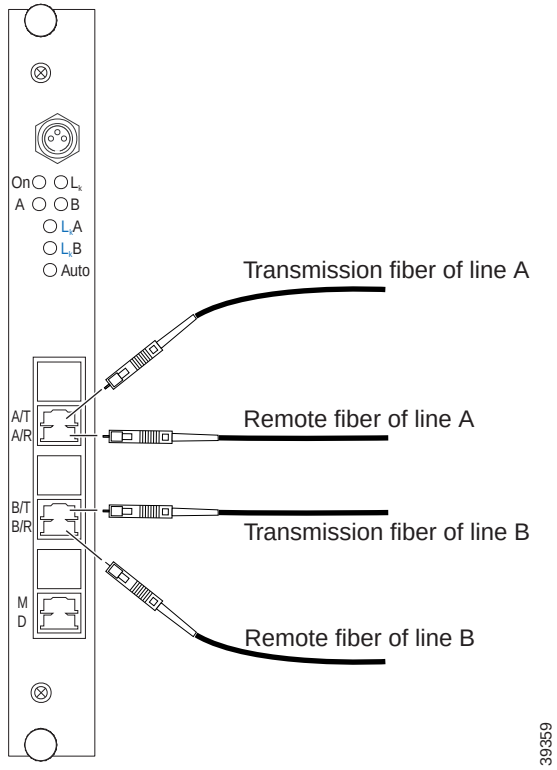
Connecting Remote Lines to RSMs

To connect remote lines to an RSM, follow these steps:

Step 1 Remove the dust cover from the MiniSC plug of the remote transmission fiber of line A, and clean the fiber as described in "Cleaning the Connectors" section on page 3-19.

Step 2 Remove the blind plug from the RSM connector labeled A/T. Connect the cleaned plug to the open connector of the RSM, as shown in Figure 5-6.

Figure 5-6 Connecting Remote Lines to an RSM



Step 3 Remove the dust cover from the MiniSC plug of the remote receiver fiber of line A, and clean the fiber as described in "Cleaning the Connectors" section on page 3-19.

Step 4 Remove the blind plug from the RSM connector labeled A/R. Connect the cleaned plug to the open connector of the RSM. (See Figure 5-6.)

Step 5 Remove the dust cover from the MiniSC plug of the remote transmission fiber of line B, and clean the fiber as described in "Cleaning the Connectors" section on page 3-19.

Step 6 Remove the blind plug from the RSM connector labeled B/T. Connect the cleaned plug to the open connector of the RSM. (See Figure 5-6.)

Step 7 Remove the dust cover from the MiniSC plug of the remote receiver fiber of line B, and clean the fiber as described in "Cleaning the Connectors" section on page 3-19.

Step 8 Remove the blind plug from the RSM connector labeled B/R. Connect the cleaned plug to the open connector of the RSM. (See Figure 5-6.)

Step 9 Place the fiber-optic cables in the cable holder of the primary and extension chassis and the rack at the side of both chassis.

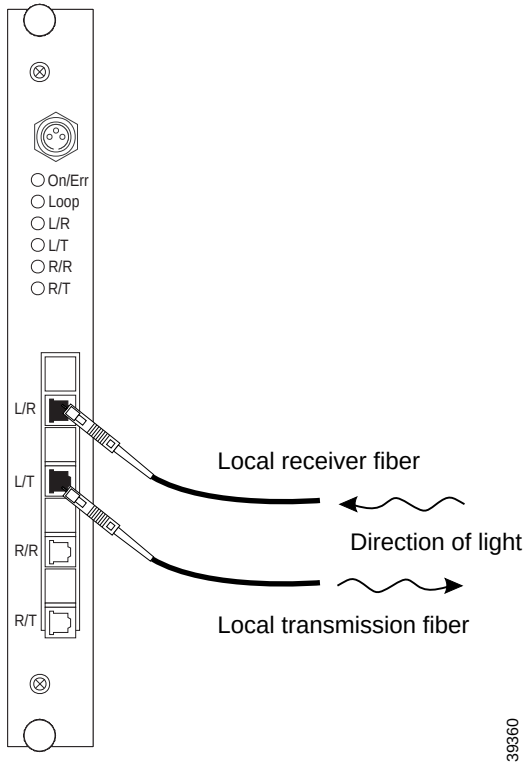
Connecting Local Lines to WCMs

To connect local lines to a WCM, follow these steps:

Step 1 Remove the dust cover from the MiniSC plug of the local receiver fiber and clean the fiber as described in "Cleaning the Connectors" section on page 3-19.

Step 2 Remove the blind plug from the WCM connector labeled L/R. Connect the cleaned plug to the open connector of the WCM. (See Figure 5-7.)

Figure 5-7 Connecting Local Lines to a WCM



Step 3 Remove the dust cover from the MiniSC plug of the local transmission fiber and clean the fiber as described in "Cleaning the Connectors" section on page 3-19.

Step 4 Remove the blind plug from the WCM connector labeled L/T. Connect the cleaned plug to the open connector of the WCM, as shown in Figure 5-7.

Step 5 Place the fiber-optic cables in the cable holder of the primary chassis and extension chassis and the rack at the side of both chassis.

Step 6 Mount the acrylic cover on the front of the chassis.

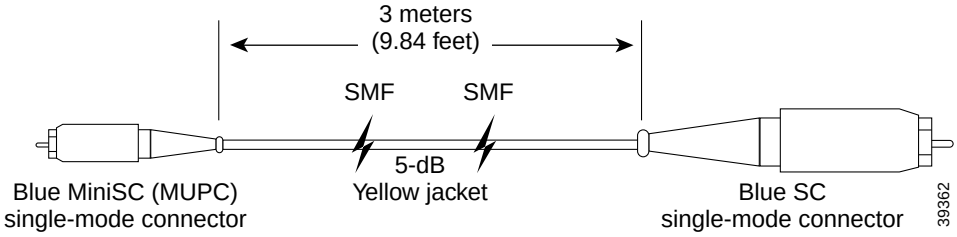
Connecting Fiber Channel or Gigabit Ethernet to a High-Speed Transparent WCM

When connecting a fiber channel or Gigabit Ethernet port to a high-speed transparent WCM on the Cisco Metro 1500 series system, you must ensure that the optical power levels from the fiber channel or Gigabit Ethernet transmitter do not overdrive the local receiver (L/R) port on the WCM. To avoid an overdrive condition, insert an optical attenuation of 5 dB between the fiber channel or Gigabit Ethernet transmitter and the L/R port on the WCM. You can implement this attenuation with either an attenuating single-mode patch cable assembly or an attenuating coupler, which are described in the following sections.

Attenuating Single-Mode Patch Cable

An attenuating single-mode patch cable is a 9.84-ft (3 m) fiber-optic jumper cable with a built-in attenuation of 5 db. (See Figure 5-8.)

Figure 5-8 Attenuating Single Mode Patch Cable Assembly



The attenuating single-mode patch cable assembly should contain Corning SMF-28 or equivalent single-mode fiber.

Attenuating Coupler

As an alternative to the attenuating single-mode patch cable, you can use a 5-dB attenuating coupler. (See Figure 5-9.)

Figure 5-9 Attenuating Coupler

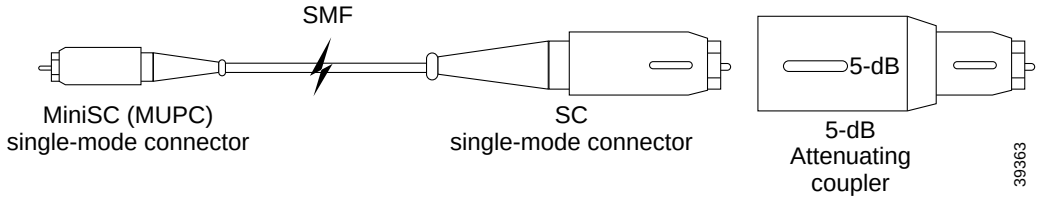


Figure 5-9 shows a conventional MiniSC to SC patch cable, plus the attenuating coupler, which achieves the same effect as the attenuating single-mode patch cable assembly with the built-in attenuation.

Other Limitations and Restrictions

The following limitations and restrictions for connecting fiber channel or Gigabit Ethernet to a high-speed transparent WCM:

- The coupling facility currently requires that at least two LPARs be active for the link to activate and that the link between the two sites be no longer than 15.5 mi (25 km). Installation of the card requires that an LPAR be cycled to clear the loop condition created by the card. If only one LPAR is present, the optical interface is cycled with the LPAR and the loop is once again established.
- When using low-speed applications (200 Mbps and below) with high-speed cards, the application is typically overdriven. As a workaround, add attenuation to the signal coming from the local transmitter port of the Cisco Metro 1500 series system.
- Do not use a multimode patch cable that has been attenuated using core-shifted splicing to attenuate the signal coming from a Cisco Metro 1500 series system. The system interface is always a single-mode laser and the attenuation is not consistent or reliable. In addition, for all interfaces, avoid air-gap attenuators, which have high back reflection that may cause bit errors on the connection.

Caution When connecting Cisco Metro 1500 series systems, you must adhere to the minimum remote link budget, as called out in Table A-9 on page A-15. If you do not adhere to this minimum budget, you might damage the receivers of the channel cards. This damage can only be repaired at the factory and is not covered by the warranty.

Connecting Optical Isolators

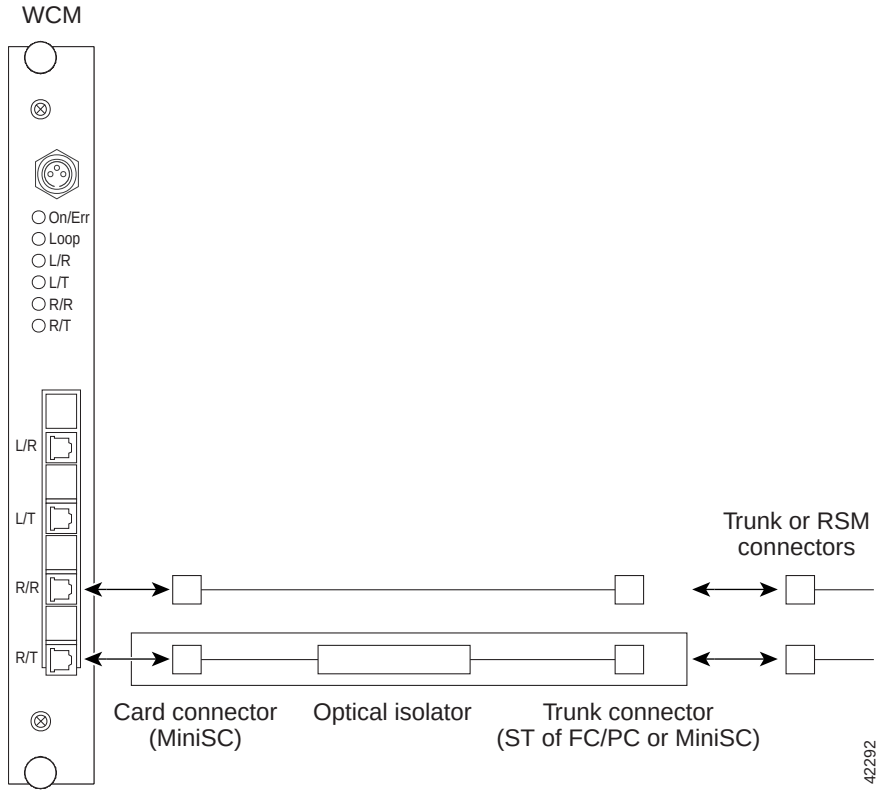
The Cisco Metro 1500 series optical isolator allows direct transmission from a WCM over a remote (or trunk) fiber. The optical isolator enables a WCM to bypass the multiplexer/demultiplexer (MUX/DMX) module in the system chassis. By connecting the WCM to the optical isolator through fiber jumpers, you can transmit directly over the remote fiber and obtain an additional 3 dB to 5 dB for use in your optical budget.

The optical isolator minimizes optical back reflection. Optical back reflection is common in fiber-based transmissions. Back reflection is a small amount of light that is reflected back towards the transmitting optical component. The optical isolator absorbs this reflected light so that the transmitting optical component operates with minimal interference.

Installation Notes

The optical isolator is connected directly to a jumper that extends from the remote connection of the WCM. The optical isolator sits between the WCM and the remote (or trunk) fiber. (See Figure 5-10.)

Figure 5-10 Optical Isolator Connection Scenario



To connect the optical isolator, follow these guidelines:

- The optical connector coming out of a WCM is MUPC type. Cisco stocks fiber jumpers that use an MU-to-SC type connection. This is the standard jumper configuration. However, the isolator can be used with a number of different connector types, if needed.
- The fiber jumper coming out of the WCM is connected to the fiber attached to the optical isolator. For example, two SC connectors are connected.
- The fiber on the other side of the optical isolator is connected to the trunk or remote fiber. For example, two SC connectors are connected.

Testing a Remote Link

The remote loopback feature of the WCM allows you to test the remote optical communications link without disconnecting the system. You must test the remote link to verify that it meets the specifications to ensure proper operation. Tests may already be available from the supplier of the fiber. If no report is available, perform the tests to verify that parameters are within specifications.

Table 5-1 lists the tests required for the remote link and the equipment required to perform each test.

Table 5-1 Tests and Equipment Required

Tests	Equipment Required
Optical link loss 1550 nm specified in dBm referenced to 1 mW	• Laser source at 1310 nm and 1550 nm • A power meter or OTDR[1]
Distance specified in km	OTDR
Optical return loss 1550 nm specified in dB	Reflectometer or OTDR with a reflectometer

1. OTDR = optical time domain reflectometer

To test a remote optical communications link, follow these steps:

Step 1 Disconnect the local lines from the WCMs at both the local and remote systems in the link to be tested.

Step 2 Supply a modulated light to the local receiver of the WCM.

This modulated light switches on the local receiver and the remote transmitter of the local system. The green L/R LED should be on. If the modulated light does not match the clock recovery frequency, assuming a clock recovery is installed and enabled, the Error Indicator LED will be red.

Step 3 Set the remote loopback of the corresponding WCM of the remote system.

The orange loop LED of the WCM in the remote system should be on. The remote receiver, the remote transmitter, and the local transmitter should operate and loopback the received signal to the local system. The R/R, R/T, and L/T LEDs

should be on. If the modulated light does not match the clock-recovery frequency, assuming a clock recovery is installed and enabled, the R/R LED will be red. The remote receiver of the local system sees the signal and transfers it to the local transmitter. The WCM in the local system should have the L/T, L/R, R/T, and R/R LEDs on.

Note If your test results deviate from these results and you cannot correct the problem, contact your Cisco service representative.