



PRODUCT DOCUMENTATION

BTI 7000 Series Test and Turn-up Guide

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Preface

This preface explains who should read this guide, related documentation, and documentation conventions.

Audience

This guide is primarily intended for all BTI 7000 Series installers, operators and network planners.

Features of the BTI 7000 Series

For detailed information about this release, see the *BTI 7000 Series Release Notes* for this release.

BTI 7000 Series common equipment

The following table lists the shelves and other common equipment introduced as part of the BTI 7000 Series. For detailed information, see the *BTI 7000 Series Product Guide* and the *BTI 7000 Series Common Equipment Installation Guide*.

BTI 7000 Series common equipment

Equipment	PEC
BTI 7060	BT7A50AA
BTI 7060 with rear access -48V	BT7A50AR
BTI 7060 Cooling Unit (CU)	BT7A52DA, BT7A52EA
BTI 7060 Main Shelf Interface (MSI)	BT7A53BA, BT7A53BB
BTI 7060 Expansion Shelf Interface (ESI)	BT7A54BA
BTI 7060/BTI 7200 System Control Processor (SCP)	BT7A20CA
BTI 7060 AC Power Assembly Kit	BT7A50BA
BTI 7060 AC Power Module	BT7A58AA

BTI 7000 Series common equipment (Continued)

Equipment	PEC
BTI 7060 Filler Panel Kit	BT7A55EA
2U Cover – ANSI	BT7A5070
2U Cover – ETSI	BT7A5071
BTI 7030	BT7A56AA
BTI 7030 Cooling Unit (CU)	BT7A57BA
BTI 7030 Main Shelf Interface (MSI)	BT7A53CA, BT7153CB, BT7A53BB
BTI 7030 System Control Processor (SCP)	BT7A21BA
BTI 7030 AC Power Assembly Kit	BT7A56CA
BTI 7030 AC Power Module	BT7A58BA
1U Cover – ANSI	BT7A5670
1U Cover – ETSI	BT7A5671
BTI 7020	BT7A56BA
BTI 7200	BT7A51AA
BTI 7200 with rear access -48V	BT7A51AR
BTI 7200 Cooling Unit (CU)	BT7A52EA
BTI 7200 Main Shelf Interface (MSI)	BT7A53EA
BTI 7200 Common Communication Module (CCM)	BT7A54EA
BTI 7200 ANSI shelf cover	BT7A5180
BTI 7200 ETSI shelf cover	BT7A5181
BTI 7200 Air Deflector	BT7A59EA
BTI 7200 Installation kit	BT7A5034
BTI 7200 Pack of 5 Mounting Bracket Pairs (7200)	BT7A5035
BTI 7200 Pack of 5 Center Guides	BT7A5036
Single Expansion Shelf Kit (2x 1310 SFP, 1x Dual SM Patch Cord 1.5m)	BP1A58LA-01.5
Single Expansion Shelf Kit (2x 1310 SFP, 1x Dual SM Patch Cord 2m)	BP1A58LA-02

The BTI 7000 Series shelves support a wide range of modules. For the list of modules supported, see the *BTI 7000 Series Product Guide*.

The following table lists the BTI graphical user interface management software suite. For detailed information about each application, refer to the documentation set for the application.

Management software suite

proNX Management Suite
proNX Service Manager (PSM)
proNX 900 Node Controller (proNX 900)

Equipment compliance

The following table provides agency-compliance information for BTI 7000 Series equipment.




Agency	Compliance information
FDA	This equipment is classified by the FDA under IEC 60825, parts 1 and 2, as a Class 1 laser product with a Class 1 hazard rating.
FCC	This equipment complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.
Industry Canada	This Class A digital apparatus complies with Canadian ICES-003.

Organization of the BTI 7000 Series documentation

The following guides are contained in the BTI 7000 Series documentation suite.

- *BTI 7000 Series Alarm and Troubleshooting Guide*
- *BTI 7000 Series Command Line Interface Reference Guide*
- *BTI 7000 Series Common Equipment Installation Guide*
- *BTI 7000 Series Dynamic Optical Layer Engineering Guideline*
- *BTI 7000 Series Management Communications Channel Solutions Guide*
- *BTI 7000 Series Multiplexing Solutions Guide*
- *BTI 7000 Series Muxponder Solutions Guide*
- *BTI 7000 Series Operations Solutions Guide*
- *BTI 7000 Series Optical Amplifier and DCM Solutions Guide*
- *BTI 7000 Series packetVX Solutions Guide*
- *BTI 7000 Series Product Guide*
- *BTI 7000 Series SNMP Overview Guide*
- *BTI 7000 Series Test and Turn-up Guide*
- *BTI 7000 Series TLI Reference Guide*
- *BTI 7000 Series Transceiver InformationGuide*
- *BTI 7000 Series Transponder Solutions Guide*
- *BTI 7000 Series Upgrade Guide*
- *BTI 7000 Series Release Notes*
- *BTI 7000 Series Quick Installation Notes (various)*

Documentation conventions

Convention	Description
Note	Means reader take note. Notes contain helpful suggestions or background information.
 Caution	Means reader be careful. Equipment damage or loss of data can result from your actions.
 Warning	Means reader be careful. Harm to yourself or others can result from your actions.
 Laser Warning	Invisible laser radiation can be emitted from the aperture ports of amplifier circuit packs when no fiber cable is connected. Avoid exposure and do not stare into open apertures to avoid permanent eye damage.

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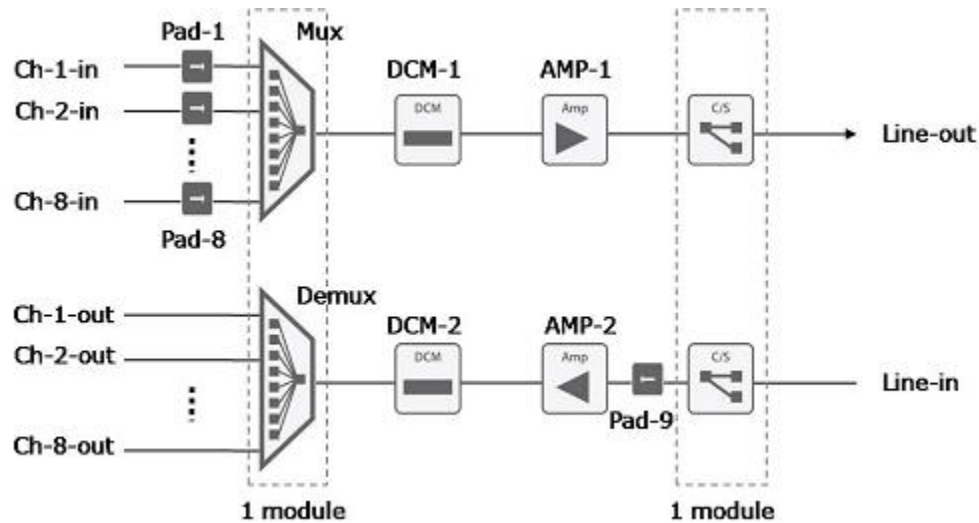
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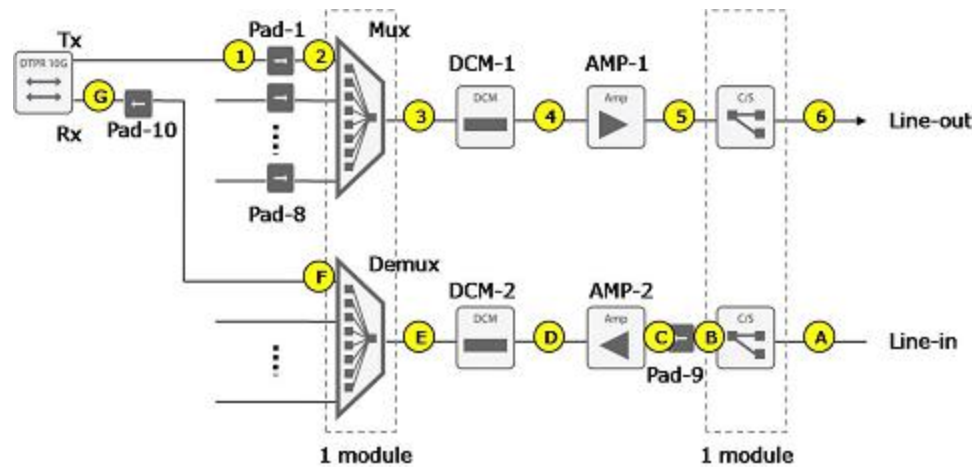
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1.0 Test and turn-up process

This chapter provides an overview of the test and turn-up process for the BTI 7000 Series.

The following configurations are used in this document to illustrate the examples that are used to explain the test and turn-up process.





Process overview

This section provides an overview of the test and turn-up process.

1 Validate the Bill of Material for the site.

The installation and commissioning report provided for each site includes a list of the materials that are required to be installed at that site. Check that the Bill of Material in the installation report for that location matches the equipment that is available on site including part numbers and quantities.

2 Commission the BTI 7000 Series NE.

The installation and commissioning report provided for each site includes information provided to commission the network element such as:

- NE IP address, sub-net mask and default gateway
- site information such as name and number
- SNMP community string information and trap receiver details
- user profiles and access rights
- time and date information

Refer to [Chapter 4, “Commissioning the BTI 7000 Series”](#) for details on commissioning the network element.

3 Install and provision the optical modules.

Use the installation and commissioning report provided for the site. This defines the slot location for each of the optical modules (Mux/Demux, OADM filters, optical amplifiers, DCM, OSC coupler/splitter). The installation report also includes provisioning information for optical modules where this is required.

Refer to [Chapter 5, “Installing and provisioning optical modules”](#) for details on installing and provisioning optical modules.

4 Deploy and provision OSC.

If an OSC channel is to be deployed at a network element, insert the appropriate OSC SFPs into the SCP following the SFP/XFP assignment table provided in the installation and commissioning report. Provision the OSC ports on the SCP and connect fibers to the SFPs on the OSC coupler/splitter module.

Refer to [Chapter 7, “Optical Supervisory Channel \(OSC\)”](#) for details on and provisioning OSC.

5 Install and provision the service modules and SFP/XFPs.

Use the installation and commissioning report provided for the site which defines the slot locations in the shelf for each of the service modules.

Use the SFP/XFP assignment table provided in the installation and commissioning report to install the appropriate SFP/XFP in the required slots.

Use the installation and commissioning report provided to provision the appropriate client service modules.

Refer to [Chapter 8, “Installing and provisioning service modules and SFP/XFPs”](#) for details on provisioning service modules and SFP/XFPs.

6 Test the service modules and SFP/XFPs.

- Measure the transmit power of each SFP/XFP using a power meter. Ensure that the measured value is within the specified limits for the device.
- The SFP/XFP assignment table in the installation and commissioning report may define a Maximum Tx power for the interface. If so, check that the Tx power measured does not exceed this value. If the measured value exceeds the value in the table, apply an appropriate attenuation pad to reduce the Tx power to below the limit defined.
- Connect transmit of the SFP/XFP through an appropriate attenuation pad to a power meter and measure the power. Now connect to the receive port and check the port Rx power PM value proNX 900. Compare the measured power with the power reported by the port level PM (from proNX 900) and ensure that the values are within +/-1dB
- If an appropriate tester is available, connect this to the client interface with appropriate padding and set the protocol of the tester to match that of the provisioned port protocol. Connect the transmit port of the line SFP/XFP through an appropriate attenuation pad to the receive port of the line SFP/XFP and perform a loopback test from the client interface to the trunk interface. This will validate both the operation of the transceivers and the provisioning of the service module.

Note Loopback tests are not possible on a PacketVX service module.

7 Connect the service modules to the optical modules.

With the service modules installed, provisioned and validated, connect these modules to the appropriate optical module(s) as defined by the fiber assignment table in the installation and commissioning report. All internal fibers should be labeled appropriately.

Use the attenuator table in the installation and commissioning report to identify any service module ports (SFP/XFP) that require either Transmit or Receive pads.

Connect the transmit fibers from the SFP/XFP on the service modules to the appropriate filter port as defined in the fiber assignment table, but do not connect the receive fibers. It is important to verify the received optical power and pad it appropriately (if required) before connecting a receive fiber to an SFP/XFP.

Refer to [Chapter 10, “Connecting service modules to the optical mux/demux”](#) for details on connecting service modules to optical modules.

8 Test the optical continuity of the NE.

Connect the Line side Tx port (from a mux/demux, OADM filter, OSC port, or amplifier, whichever component is facing the plant fiber) through an appropriate attenuation pad to the line side Rx port of the component (OSC, mux/demux or OADM filter, or amplifier). For each of the wavelengths present, use an optical power meter to verify that there is power received from the appropriate demux channel/OADM drop filter port.

Refer to [Chapter 11, “Testing end-to-end continuity”](#) for details on testing the optical continuity of the NE.

9 Test the end-to-end continuity.

Connect the line output and input fibers from the outside plant fiber to the appropriate component (OSC filter, mux/demux, amplifier etc).

If the outside plant fiber has been connected at other locations in the link, there will be optical power at the receive ports (demux channel/OADM drop ports) of the deployed filter. These ports should not be connected to the equivalent SFP/XFP receive port. Optionally at this point the OSNR can be captured/recorded using an OSA at the output port (or monitor port if available) of the deployed amplifier(s).

For each of the receive ports on the filter, measure the received power. If an attenuation pad is suggested within the attenuator table of the installation and commissioning report, connect the appropriate attenuator and measure the optical power. If the optical power exceeds the defined specification limits, adjust the attenuator pad value such that the measured power is within the defined limits.

If protection groups have been defined on the network, provision and test the protection paths for each service.

Refer to [Chapter 11, “Testing end-to-end continuity”](#) for details on testing the end-to-end continuity of services.

10 Wrap up.

Prior to leaving the site, the installation team should:

- Back up the NE database either to a local/remote PC or to the local SCP.
- Using the TL1 interface to the NE, perform a RTRV-INV (Retrieve Inventory) for the site and record the results or append them to the installation and commissioning report.
- Clear the rack and floor area of debris, equipment, and packaging. Make sure that any spare parts, documentation or CDs are appropriately stored. Ensure that all fibers are appropriately managed within the shelf and rack. Ensure that all shelf covers are closed and secured as appropriate with local guidelines.

1.1 Prerequisites

The following prerequisites are necessary prior to turning up a system:

- All sites have shelves and common equipment installed with appropriately terminated and labeled power cables, power plant and fusing is installed, LAN cables between the shelf and the local switch are labeled, and fiber patch connections between the shelf location and the ODF panel are labeled. Refer to the *Common Equipment Installation Guide* for details.
- Installation team have access to all tools and additional equipment required to perform the turn-up including: screw drivers, optical power meter, fiber cleaning kit, label maker, laptop with proNX 900 s/w (if not using TL1), RJ45 cable (or serial cable if preferred), spare attenuation pads (3dB, 5dB, 10dB, 15dB), optional OSA if required and a CD copy of the NE software load that is installed on the system.
- Installation team have been provided with an installation and commissioning report. This report may be obtained from the engineer responsible for the network design.
- Installation team for each site have a copy of the *Test and Turn-Up Guide* and have reviewed the safety and fiber management sections.
- Installation team for each site have a copy of the relevant BTI solutions guide for the client service modules to be deployed (Muxponder, Transponder or PacketVX)

2.0 Safety considerations

This chapter provides safety information for the BTI 7000 Series.

- 2.1, “Optical precautions”
- 2.2, “Safety symbol and label”
- 2.3, “Optical Backreflection Safety: principle of operation”
- 2.4, “Querying the backreflection photo-detector”

2.1 Optical precautions

- Terminate all laser and SFP or XFP transceiver outputs properly before connecting laser inputs.
- Disconnect the input end of an optical fiber jumper cable before disconnecting the output end.
- Handle glass fiber with care. Glass fiber can be broken if mishandled.
- Protect skin from exposed glass fiber. It can penetrate the skin.
- The BTI 7000 Series equipment should be used in a controlled access area. Limit the number of personnel that have access to the optical transmission systems. Personnel should be properly trained on laser safety and authorized, if access to laser emissions is required.
- Limit the use of laser test equipment to authorized, trained personnel during installation and service. This precaution includes using optical loss test (OLT) set, optical spectrum analyzer (OSA), and optical time domain reflectometer (OTDR) equipment.
- Exclude any unauthorized personnel from the immediate laser radiation area during service and installation when there is a possibility that the system may become energized. Consider the immediate service area to be a temporary laser-controlled area.
- The BTI 7000 Series system functions in the 850-nm to 1620-nm wavelength window that is considered invisible radiation. Laser light being emitted by a fiber, a pigtail, or a bulkhead connector cannot be seen by the naked eye. Use appropriate eye protection during fiber-optic system installation or maintenance whenever there is potential for laser radiation exposure, as recommended by the company's health and safety procedures. Observe this precaution whether or not warning labels have been posted.
- During installation or service, a broken optical fiber or non-terminated connector should only be viewed with an indirect image converter or with a filtered optical instrument of optical density sufficient to reduce the exposure levels below the appropriate maximum permissible exposure, unless it has been verified that all optical transmitters are turned off and will remain off during the installation or service operation.
- During all splicing operations that require viewing the end of a fiber of an SG3a, SG3b or SG4 optical-fiber communication systems, the laser source on the fiber involved shall be de-energized or viewing the systems incorporating personal protection shall be employed. A responsible person(s) shall verify that the system is de-energized before splicing proceeds. Where applicable, ensure compliance with lockout/tagout requirements of OSHA Standard 29 CFR Part 1910.147.

2.2 Safety symbol and label

All BTI 7000 Series products are classified by the FDA as a class 1 laser product with a class 1 hazard rating.

BTI 7000 Series equipment has a caution label located on each laser circuit pack. The caution consists of caution text and a laser warning symbol.

Read and understand all caution labels before working with the equipment.

Laser Safety Warning Label



Laser Safety Warning Label



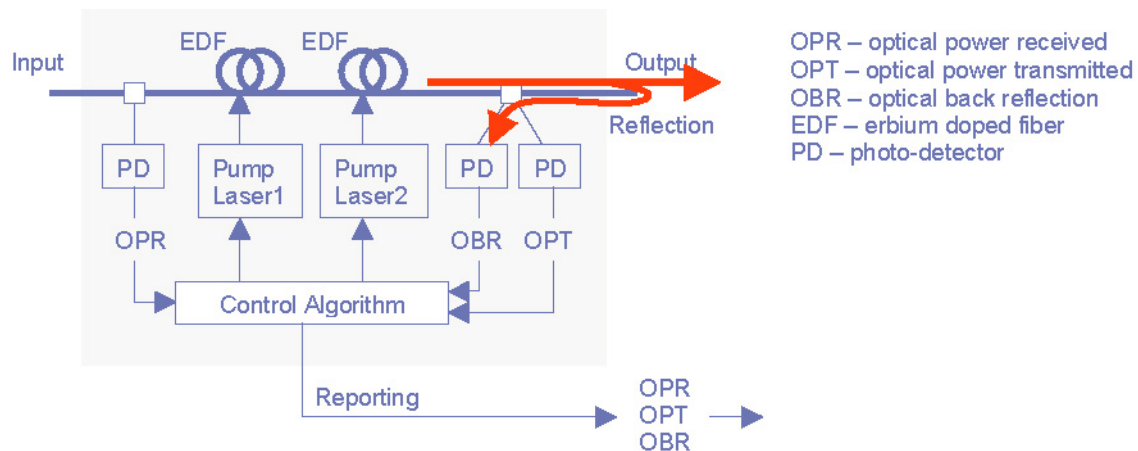
2.3 Optical Backreflection Safety: principle of operation

The Optical Backreflection Safety feature is a laser eye-safety mechanism designed to detect that the output port of an optical amplifier has been disconnected. This feature is supported on the following optical amplifier modules:

- DWDM C-Band Booster Amplifier (OBA) . See 2.3.1, “About Optical Backreflection on the OBA and SBA” for more information.
- DWDM Optical Line Amplifier (OLA)
- Optical Line Amplifier with 0–15 dB Mid-Stage Access (OLAM)
- Single-Channel/Sub-Band Booster Amplifier (SBA) See 2.3.1, “About Optical Backreflection on the OBA and SBA” for more information.
- DWDM C-Band Low Gain Amplifier (LGA)
- DWDM C-Band Mid Gain Amplifier (MGA)
- DWDM C-Band Mid Gain Amplifier with Mid-stage access (MGM)

The backreflection photo-detector on the output port of the optical amplifier measures the reflected optical power (see the following figure). When the reflected optical power exceeds -4 dBm, the amplifier switches to EYESAFE mode. In this mode, the first pump laser is turned off and the second pump laser runs in constant power mode with an output of 0 dBm. The amplifier provides little or no signal amplification in this mode.

Figure 2-3 Optical Amplifier block diagram



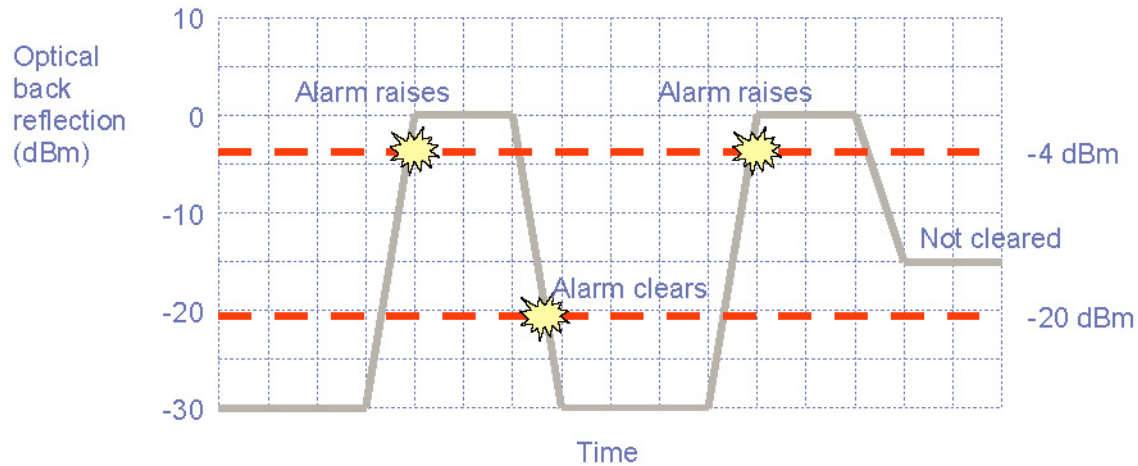
The threshold to transition to EYESAFE mode (OBR-HTS = -4 dBm) cannot be changed. The rationale for this value is as follows:

- 4% of the transmitted light is reflected from surface of a disconnected output connector.
- Safety is a concern when output power is 10 dBm or greater.
- The threshold equals 4% of 10 dBm, or the threshold of -4 dBm is 4% of 10 dBm.

The amplifier reverts to COGAIN/COPWR mode when backreflection is less than or equal to -20 dBm. The design includes hysteresis (-4 dBm to raise and -20 dBm to clear) so that the amplifier does not toggle between COGAIN/COPWR and EYESAFE modes.

To ensure optical performance, we recommend that backreflection is -23dBm.

Figure 2-4 Optical backreflection safety raising and clearing



2.3.1 About Optical Backreflection on the OBA and SBA

For the following optical amplifiers, the backreflection behavior is slightly modified.

- DWDM C-Band Booster Amplifier (OBA)
- Single-Channel and Sub-Band Booster Amplifier (SBA).

Instead of fixed values for the raising and clearing of the optical backreflection alarm, the thresholds are relative to the current output power of the amplifier. A disconnected fiber has a back reflection of approximately 4% (14 to 17 dB).

Raising the alarm

To raise the alarm, the back reflection reading must be greater than the transmitted output power of the amplifier minus 14 to 17 dB (that is, with a transmitted output power of +12 dBm, the reflection must be greater than -2 to -5 dBm).

Clearing the alarm

To clear the alarm, the following factors must occur:

- 1 The backreflection alarm must be currently raised, and
- 2 The backreflection reading must be less than the transmitted output power of the amplifier minus 20 dB. (that is, with a transmitted output power of 0 dBm, the reflection must be less than -20 dBm).

2.4 Querying the backreflection photo-detector

The power measured by the backreflection photo-detector can be queried. The system reports the optical back reflected power (OBR) as a percentage of output power (OPT), that is, in dB, and not as an absolute value. The absolute value can be calculated by adding OPT and OBR. For example, if OPT is 11 dBm and OBR is -31 dB, the absolute power is -20 dBm.

proNX 900 Node Controller plots OBR (in dB) as a function of time. Although the graph returned shows the OBR-HTS threshold, the threshold should be disregarded as it is reported in dBm.

3.0 Fiber management

This chapter provides fiber management information for the BTI 7000 Series.

- [3.1, “Fiber and cable routing requirements”](#)
- [3.2, “Managing optical fibers”](#)

3.1 Fiber and cable routing requirements

The BTI 7000 Series is designed to keep fibers and cables from overlapping. Handles on individual modules enable easy module insertion and removal and also provide fiber guidance.

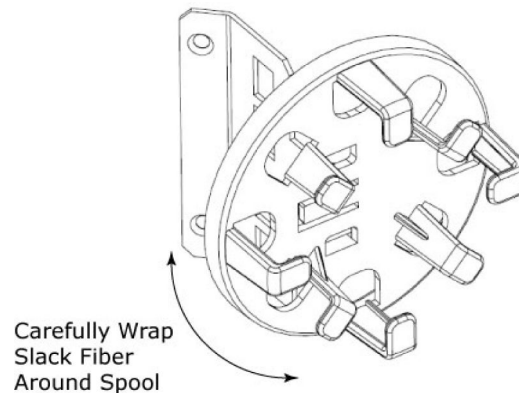
3.1.1 Fiber management spool for BTI 7060

The fiber management spool is an optional device that stores fiber slack for 2.0 mm fiber patch cables. It does not have any operational impact if it is not installed.

Note	The fiber management spool is not intended to be used for storing off bay fiber slack due to the spool's limited storage capability. Fiber slack storage for off bay fiber is solved by using a recommended fiber management tray that can be located at the top of the frame.
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Note	Due to space constraints with ETSI racks, the fiber management spool can be used only on shelves installed in ANSI racks.
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Fiber spool for the BTI 7060

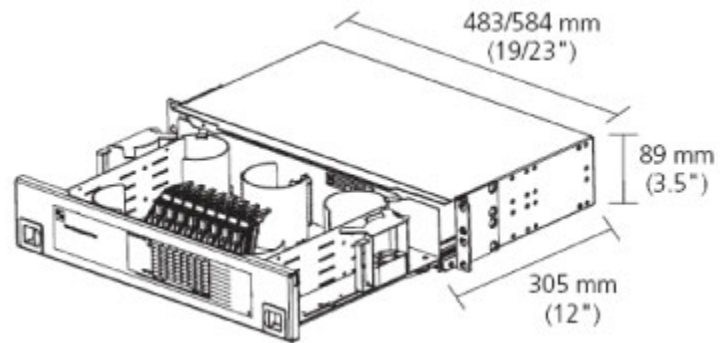


Note	The fiber management spool is available only with the ANSI cover and does not fit in ETSI or 19-inch network racks. It is not sold separately.
-------------	--

3.1.2 Fiber management trays

Although an optional customer consideration, fiber management trays are recommended to accommodate fiber splicing, slack storage, and fiber termination. These units are generally available in various depths from fiber equipment suppliers and they are easily mounted in cabinets and frames.

The following figure shows the fiber management tray.

Figure 3-2 Fiber Management Tray

3.2 Managing optical fibers

The BTI 7000 Series modules are designed with handles that are useful for managing the optical fiber cables. Once the optical fiber cables are connected to their respective modules, run the cables to the right.

3.2.1 Cabling sequence

It is recommended that once the modules are installed in the shelf, to start connecting the fiber optic cables to the modules from the lower right side. This is the easiest place to start given the angle of the optical connectors on the modules.

For convenience of access, complete the cabling on the lowest row of modules first and then move progressively up to the next row, again by starting from the right side and then proceeding to the left.

3.2.1.1 Recommendations for fiber optic cables with long boots

For fiber optic cables that have long boots, the boot can be obstructed by the module handles or the length of the boot can create too small a bending radius for the cable. As a result, some connector positions may not permit the easy management of the fiber using the module handles.

To avoid this situation, carefully position the cable around the outside of the first module handle to the right as indicated in the following figure.

Top View of Optical Fiber Management for Cables with Long Boots



Short-booted fiber optic cables do not generally pose such a problem.

3.2.1.2 Recommendation for SCP and ESI modules

Due to the tight spacing requirements of the system control processor (SCP) and the expansion shelf interface (ESI) modules in ANSI systems, fiber patch cables with 40 degree boots are recommended. The following table lists the special fiber patch cables that are available.

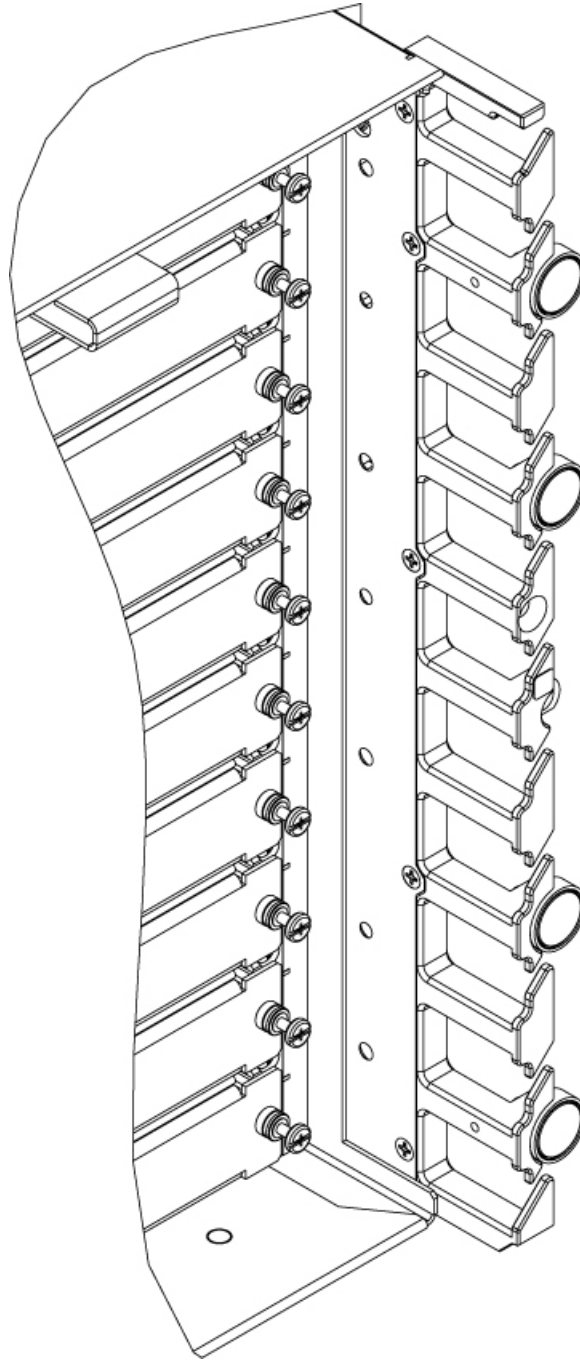
Table 3-1 Fiber patch cables

Order Code	Description
BP1A59EA-10	Dual LC-LC expansion shelf patch cord with 40 degree boot - 10 m in length

In ETSI systems, fiber patch cables with 40 degree boots do not provide enough clearance. Cut-boot fiber patch cables must be used with the SCP and the ESI modules in ETSI systems. Contact your BTI representative for a list of recommended vendors of cut-boot fiber patch cables. Cut-boot fiber patch cables do not comply with NEBS requirements.

3.2.1.3 Recommendations for fiberling a BTI 7200

Each row of modules on a BTI 7200 shelf has its own fiber exit point on the right-hand side of the shelf. The fibers exit the shelf through the right-hand shelf cover bracket, as seen in the following illustration.



If you intend to use the padlock loops to lock the shelf cover, extend the loops before you connect fibers to modules in the slots near the loops (slots 2 and 4 for the top loop, and slots 18

and 20 for the bottom loop). Otherwise the padlock loops become obstructed by the fibers and cannot be extended.

Due to tight spacing, the use of an optical attenuator with a straight-boot fiber patch cable may result in too small of a bending radius for the most right-hand fibers on a BTI 7200 shelf. In this case, fiber patch cables with 40 degree boots are recommended. Listed in the following table are the special fiber patch cables that BTI stocks.

Table 3-2 Fiber patch cables with 40 degree boots

Order Code	Description
BP1A59EA-10	Dual LC-LC expansion shelf patch cord with 40 degree boot - 10 m in length

The following photographs illustrate fibers on a BTI 7200 shelf.





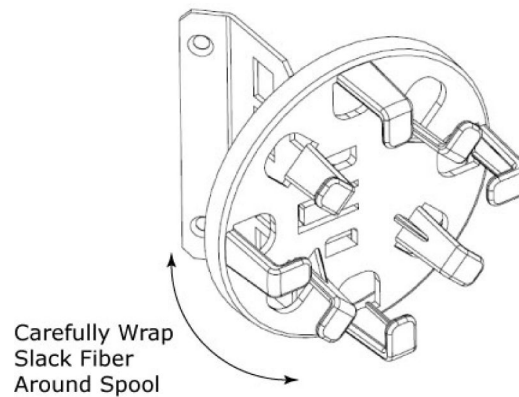
3.2.2 Using the fiber management spool

The fiber management spool is a device used with the BTI 7060 that stores slack for 2.0 mm fiber patch cables that connect modules together through intrashelf fiber cables. The fibers are easily wrapped around the spool to take up any slack that exists.

Note The fiber management spool is not intended to be used for storing off bay fiber slack due to the spool's limited storage capability. Fiber slack storage for off bay fiber is solved by using a recommended fiber management tray that can be located at the top of the frame.

The following figure shows the fiber spool in position.

Fiber Management Spool



4.0 Commissioning the BTI 7000 Series

This chapter provides information about commissioning the BTI 7000 Series.

- 4.1, “Starting up the system”
- 4.2, “Establishing a proNX 900 session using Ethernet”
- 4.3, “Provisioning site information”
- 4.4, “Provisioning the date and time on the system”
- 4.5, “Provisioning IP address parameters”
- 4.6, “About community strings”
- 4.7, “About trap receivers”
- 4.8, “Security management”

4.1 Starting up the system

The BTI 7000 Series performs a system initialization when power is switched on.

The System Control Processor (SCP) performs a self-test, memory check and other diagnostic checks.

4.1.1 Communication ports on the BTI 7000 Series

The BTI 7000 Series supports the following physical management communications ports:

- Management LAN port
- Craft LAN port
- RJ-45 craft serial port

The following figures shows the location of the three communication ports on the BTI 7030 main shelf interface and the SCP.

Figure 4-1 BTI 7030 MSI module

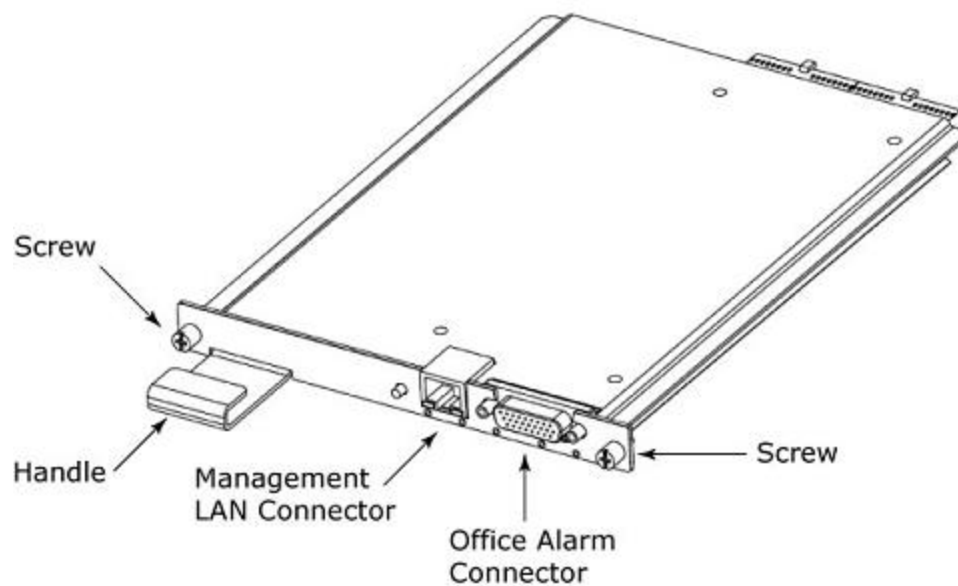
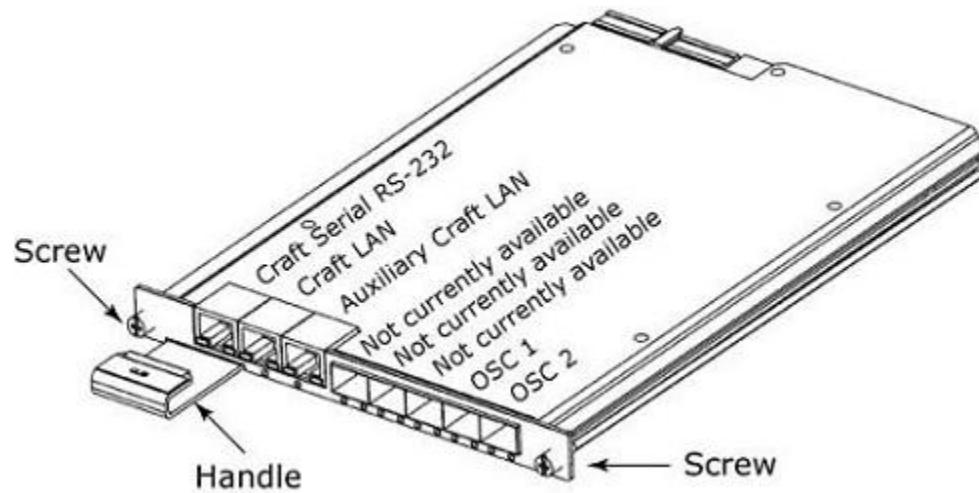


Figure 4-2 BTI 7030 SCP module key features

The following figures show the location of the three communication ports on the BTI 7060 and BTI 7200 main shelf interface and the SCP.

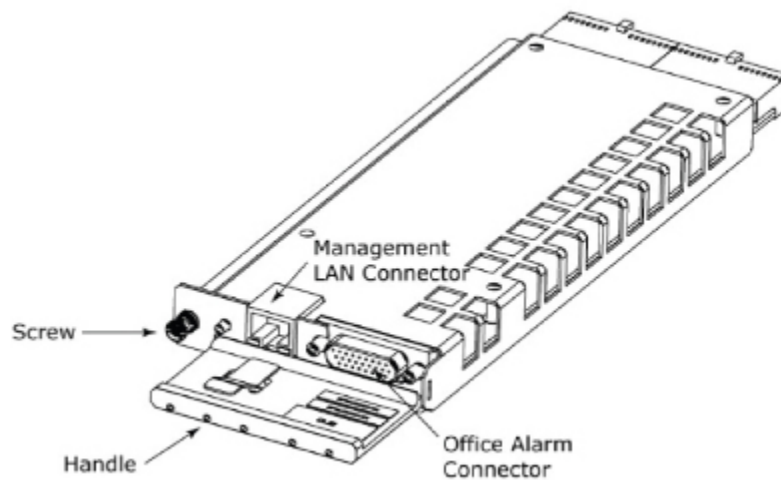
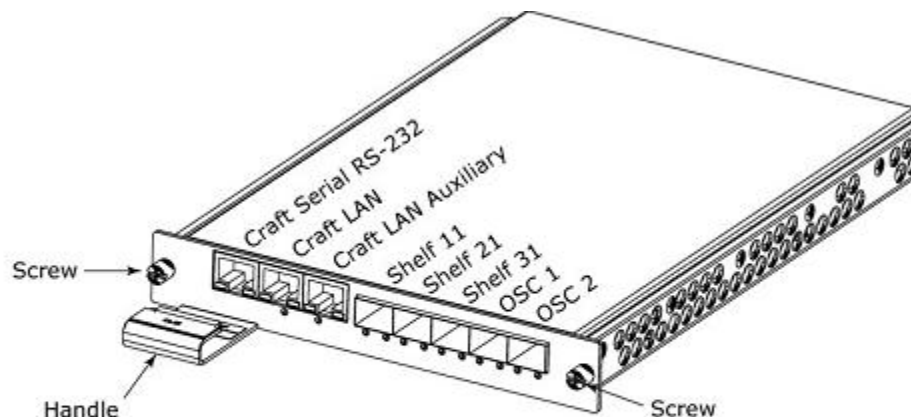
Figure 4-3 BTI 7060 MSI module

Figure 4-4 BTI 7060 and BTI 7200 SCP module

Note The type of Ethernet cable is not a restriction. The Ethernet transceiver automatically determines the signaling requirements.

The Ethernet ports are set to Auto-Negotiate. To ensure optimum communication between the BTI 7000 Series and connected equipment, BTI recommends that you set the equipment to Auto-Negotiate, as well.

The BTI 7000 Series supports the communications ports listed in the following table:

Table 4-1 Management access ports

Port number	Service	Configurable	Closeable	Service can be stopped	Usage
161	SNMP	No	No	No	SNMP management, proNX 900
3022	SSH - TL1	No	No	No	SSH mode TL1 protocol over an encrypted link
3082	TL1 (proNX 900)	No	No	No	proNX 900 TL1 interface (exclusive to proNX 900)
3083	Telnet - TL1 (user)	No	No	No	TL1 ASCII user interface
3084	Telnet - CLI	No	No	No	CLI user interface
8022	SSH - CLI	No	No	No	SSH CLI
20, 21	FTP client	No	NA	NA	System upgrades (outbound only)

Table 4-1 Management access ports (Continued)

Port number	Service	Configurable	Closeable	Service can be stopped	Usage
162	SNMP traps	Yes	NA	NA	SNMP alarm reporting (outbound only)

4.2 Establishing a proNX 900 session using Ethernet

Use 4.2.2, “Method One: Connecting through the management LAN”, or 4.2.3, “Method Two: Connecting through the craft LAN port” to establish an Ethernet connection to the system.

Note The same functions are available through the craft LAN and the management LAN interfaces.

The following table lists the IP addresses for the BTI 7000 Series LAN communication ports.

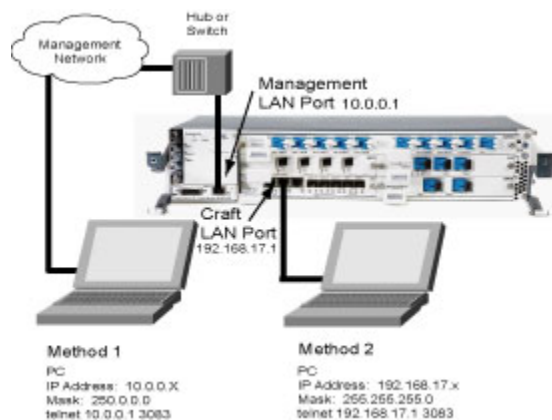
Table 4-2 IP Addresses

Communications Port	Default IP Address	Default IP Mask	Default IP Gateway
Default IP Addresses			
Management LAN Port	10.0.0.1	255.0.0.0	0.0.0.0
Craft LAN Port	192.168.17.1	255.255.255.0	0.0.0.0
For a PC Connected To:			
Management LAN Port	10.x.y.z Where x and y are 0 to 255, and $2 \leq z \leq 254$	255.0.0.0	
Craft LAN Port	192.168.17.z Where $2 \leq z \leq 254$	255.255.255.0	

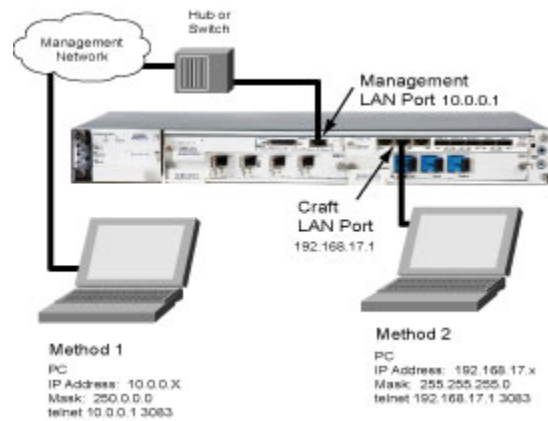
Note The Ethernet ports are set to Auto-Negotiate. To ensure optimum communication between the system and your equipment, we recommend that you set your equipment to Auto-Negotiate, as well.

The following illustrations shows the two methods to use when establishing a TL1 session using Ethernet.

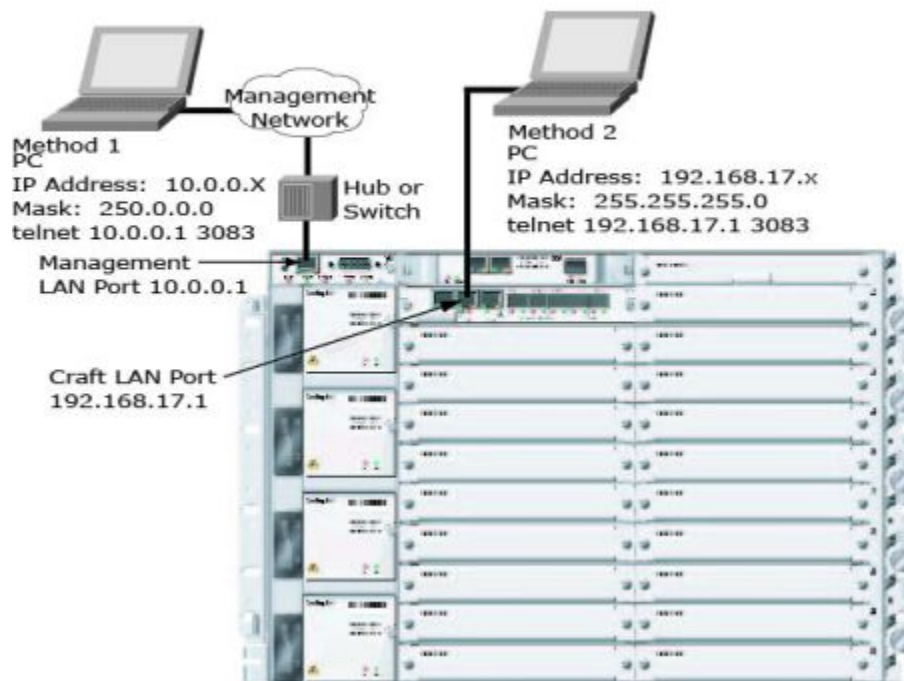
Establishing a proNX 900 session on the BTI 7060 using Ethernet



Establishing a proNX 900 session on the BTI 7030 using Ethernet



Establishing a proNX 900 session on the BTI 7200 using Ethernet

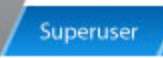



4.2.1 Connecting to the BTI 7000 Series

This section explains the basic requirements for connecting to the BTI 7000 Series.

4.2.2 Method One: Connecting through the management LAN

Authorization required

A gray rectangular button with the text "Authorization Required" in white.A blue rectangular button with the text "Superuser" in white.A blue rectangular button with the text "Provisioning" in white.A blue rectangular button with the text "Maintenance" in white.A blue rectangular button with the text "Surveillance" in white.

Use this procedure to connect a PC, or router, to the BTI 7000 Series equipment through a hub or switch that is connected to the management LAN port.

To connect a PC directly to the management LAN port on the BTI 7000 Series, you require a CAT 5 shielded, grounded Ethernet cable of sufficient length with RJ-45 male connectors.

The Ethernet LAN ports automatically determine what device is attached and they automatically configure the input and output signals for the Ethernet cable used.

Step 1 Provision the IP Address

If not yet configured, provision the BTI 7000 Series with the IP address of your intended management Ethernet LAN.

Step 2 Connect the BTI 7000 Series Ethernet Cables

- a) Insert one end of a shielded and grounded Ethernet cable in the management LAN port.
- b) Insert the other end of the shielded and grounded Ethernet cable in the RJ-45 female Ethernet LAN connector on your hub or switch.

Step 3 Connect the Computer Ethernet Cables

- a) Insert one end of a shielded and grounded Ethernet cable in the RJ-45 female Ethernet LAN connector on your PC.
- b) Insert the other end of the shielded and grounded Ethernet cable in the RJ-45 female connector of your management LAN.


Step 4 Start a proNX 900 Session

Step 5 Log on to the BTI 7000 Series using the proNX 900

You have successfully completed this procedure.

4.2.3 Method Two: Connecting through the craft LAN port

Authorization required

A gray rectangular button with the text "Authorization Required" in white.A blue rectangular button with the text "Superuser" in white.A blue rectangular button with the text "Provisioning" in white.A blue rectangular button with the text "Maintenance" in white.A blue rectangular button with the text "Surveillance" in white.

Use this procedure to connect a PC to a BTI 7000 Series shelf through the craft LAN port.

The BTI 7030 Ethernet LAN ports automatically determine what device is attached and they automatically configure the input and output signals for the Ethernet cable used.

Step 1 Provision the IP Address

If not yet configured, provision the BTI 7000 Series shelf with the IP address of your intended craft Ethernet LAN.

Step 2 Connect the Ethernet Cable

- a) Insert one end of the shielded and grounded Ethernet cable in the craft LAN port.
- b) Insert the other end of the shielded and grounded Ethernet cable in the RJ-45 female Ethernet LAN connector on your PC or laptop.

Step 3 Start a proNX 900 Session**Step 4 Log on to the BTI 7000 Series using the proNX 900**

You have successfully completed this procedure.

4.2.4 Changing the default IP address and mask

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To change the default IP address information for a network element, use the following TL1 command:

Note When the ED-IP command changes the IP address information, all open sessions for that interface are terminated.

```
ED-IP:[TID]:<aid>:[CTAG]::[IPADDR=<ipaddr>],[IPMASK=<ipmask>],
[MEDIARATE=<mediarate>],[C1=<custom>],[GATEWAY=<gateway>]:[<pst>],[<sst>;
```

Example command

```
ED-IP:NE-117:IP-1-5-2:100:::IPADDR=50.1.1.1,IPMASK=255.255.255.0,
MEDIARATE=AUTO, GATEWAY=10.1.1.1;
```

4.2.5 Changing the default gateway

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To change the default gateway for the network element, use the following TL1 command:

```
ED-SYS:[TID]::[CTAG]::[NEID=<neid>],[NENAME=<nename>],[GATEWAY=<gateway>],
[SECGATEWAY=<secgateway>],[SITEID=<siteid>],[SITENAME=<sitename>],[TZ=<tz>],
[AUTODST=<autodst>],[AUTOP=<autop>],[AINSTMR=<ainstmr>],[STP=<stp>],
[CONTACT=<contact>;
```

Note The gateway address must be within the same subnet as the provisioned network.

Example command

```
ED-SYS:BTI7000::100::NEID=34,NENAME=Trenton02, GATEWAY=156.12.4.12,SITEID=572,SITENAME=Trenton,TZ=USAEASTERN, AUTODST=Y;
```

4.3 Provisioning site information

4.3.1 Editing the network element, site, and time zone

Authorization Required Superuser Provisioning Maintenance Surveillance

To edit system-wide provisioning information, use the following TL1 command:

```
ED-SYS:[TID]::[CTAG]:::[NEID=<neid>],[NENAME=<nename>],[GATEWAY=<gateway>],
[SECGATEWAY=<secgateway>],[SITEID=<siteid>],[SITENAME=<sitename>],[TZ=<tz>],
[AUTODST=<autodst>],[AUTOP=<autop>],[AINSTMR=<ainstmr>],[STP=<stp>],
[CONTACT=<contact>;
```

Example command

```
ED-SYS:BTI7000::100::TZ=CANADAEASTERN,AUTODST=Y;
```

Note North American daylight-saving-time rules are automatically supported when AUTODST=Y is applied.

4.3.2 Setting the system identification code

Authorization Required Superuser Provisioning Maintenance Surveillance

To set the system identification code (SID) for a network element, use the following TL1 command:

```
SET-SID:[TID]::[CTAG]:::<sid>;
```

Example command

```
SET-SID:BTI7000::100::BTI700023;
```

4.3.3 Retrieving the network element, site, time zone, and uptime

Authorization Required Superuser Provisioning Maintenance Surveillance

To retrieve the network element, site, time zone and uptime information, use the following TL1 command:

```
RTRV-SYS:[TID]::[CTAG]::;
```

Example command and response

```
RTRV-SYS:BTI7000::100::;
```

```
BTI7000 10-03-02 18:48:12
M 100 COMPLD
  "::TYPE=BTI7000,NEID=0,NENAME=BTI7000,GATEWAY=10.1.1.1,
SITEID=0,SITENAME=SITE1,TZ=USAEASTERN,AUTODST=Y,UPTIME=5122-08-34,
AUTOP=ISAINSTMR=00-00,STP=OFF,CONTACT=Technical
support at 555-5555"
;
```

4.3.4 Retrieving the vendor, model, NE type and software version

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To retrieve the vendor, model, network element type and software version, use the following TL1 command:

```
RTRV-NETTYPE:[TID]::[CTAG]::;
```

Example command and response

```
RTRV-NETTYPE:BTI7000::100::;
```

```
BTI7000 06-01-27 10:26:49
M 100 COMPLD
  "BTI,BTI 7060,WDM,8.1.0"
;
```

4.4 Provisioning the date and time on the system

4.4.1 Editing the date and time

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To edit the time and date of the system, using the following TL1 command:

```
ED-DAT:[TID]::[CTAG]::[<yymmdd>],[<hhmmss>;
```

Note The valid two-digit date range is from 70-01-01 to 36-02-06 that represents 1970-01-01 (GMT) to 2036-02-06 (GMT).

Example command

```
ED-DAT:BTI7000::100:10-11-30,13-34-00;
```

4.4.2 Editing the date and time during a daylight-saving-time transition

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Inaccurate date and time settings can occur if you set the date and time on the system during a daylight-saving-time (DST) transition. When a time zone changes to or from DST, the local time can roll back by one hour (for example, 2:00 A.M. becomes 1:00 A.M.). The local time during this hour is ambiguous (for example, 1:15 A.M. occurs twice on the day that the time zone switches from DST).

To edit the date and time during a daylight-saving-time transition, use the following TL1 commands:

```
ED-DAT:[TID]::[CTAG]::[<yymmdd>],[<hhmmss>;
```

```
ED-SYS:[TID]::[CTAG]::[NEID=<neid>],[NENAME=<nename>],[GATEWAY=<gateway>],
[SECGATEWAY=<secgateway>],[SITEID=<siteid>],[SITENAME=<sitename>],[TZ=<tz>],
[AUTODST=<autodst>],[AUTOP=<autop>],[AINSTMR=<ainstmr>],[STP=<stp>],
[CONTACT=<contact>;
```

Step 1 Disable the AUTODST parameter

```
ED-SYS:BTI7000::100::AUTODST=N;
```

Step 2 Set the local time

```
ED-DAT:BTI7000::100::YY-MM-DD,HH-MM-SS;
```

where

YY-MM-DD is the date in a year-month-day format

HH-MM-SS is the time in an hour-minute-second format

for example,

```
ED-DAT:BTI7000::100::10-04-07,00-31-57;
```

Step 3 Re-enable the AUTODST parameter

```
ED-SYS:BTI7000::100::AUTODST=Y;
```

4.4.3 Retrieving the system identifier, date, and time

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To retrieve basic TL1 header information, use the following TL1 command:

```
RTRV-HDR:[TID]::[CTAG]::;
```

Example command and response

```
RTRV-HDR:BTI7000::100::;
```

```
BTI7000 10-11-05 15:00:02
M 100 COMPLD
;
```


4.5 Provisioning IP address parameters

4.5.1 Editing the IP address

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To edit the IP address information for the network element, use the following TL1 command:

Note Using this command can result in temporary loss of contact with the network element.

```
ED-IP:[TID]:<aid>:[CTAG]:::[IPADDR=<ipaddr>],[IPMASK=<ipmask>],
[MEDIARATE=<mediarate>],[C1=<custom>],[GATEWAY=<gateway>]:[<pst>],[<sst>;
```

Example command

```
ED-IP:NE-117:IP-1-5-2:100:::IPADDR=50.1.1.1,IPMASK=255.255.255.0,
MEDIARATE=AUTO, GATEWAY=10.1.1.1;
```

4.5.2 Retrieving the IP address

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To retrieve the IP address information for the network element, use the following TL1 command:

```
RTRV-IP:[TID]:[<aid>]:[CTAG]::;
```

Example command and response

```
RTRV-IP:NE-117::100::;
```

```
NE-117 04-02-02 12:39:57
M 100 COMPLD
"IP-1-5-1:IPADDR=127.0.0.1,IPMASK=255.0.0.0,UNMBRD=N:
OOS-AU,AINS&UEQ&SGEO,,PORTSTATE=DISABLED"

"IP-CRAFT:IPADDR=192.168.17.1,IPMASK=255.255.255.0,:,"

"IP-1-5-2:IPADDR=40.1.1.1,IPMASK=255.255.255.0,IPBCST=40.1.1.255,
TYPE=ETHERNET,UNMBRD=N,SPEED=100,DUPLEX=FULL,MEDIARATE=100FD,MTU=1500,MACADDR
=0010ec4046f7,:IS-NR,,PORTSTATE=FORWARDING"
;
```

Note IP-NMS is the management LAN, IP-CRAFT is the craft LAN, and IP-1-5-(1,2) is the OSC port on the SCP.

4.6 About community strings

SNMP community strings validate access to MIB objects and function as embedded passwords. Up to 30 community strings can be provisioned on the BTI 7000 Series to allow the user to perform *Get* and *Set* operations. Both SNMPv1, and SNMPv2c protocols are supported for any provisioned community string.

The SNMPv3 protocol is supported with the following restrictions:

- Only the noAuthNoPriv level of user-based security is supported.
- Packet Authentication and Privacy are not supported.

Any community string provisioned for SNMPv1 or SNMPv2c can also be used as an SNMPv3 user according to the user-based security model for noAuthNoPriv messaging.

Two community strings are provisioned by default on new installations of BTI 7000 Series NEs:

- public - for read-only access
- private - for read/write access

The following sections provide instructions on how to create and delete community strings on the BTI 7000 Series using the proNX 900:

- [4.6.1, “Provisioning community strings”](#)
- [4.6.2, “Deleting community strings”](#)

For details on using the TL1 command line, see section [4.6.3, “Related TL1 commands for provisioning community strings”](#).

4.6.1 Provisioning community strings

Use this procedure to assign a community string and type of access.



- Step 1** To assign a community string, use the proNX 900 Node Controller. Right-click on the System object (the root object in the tree) in the Navigation Tree pane.
- Step 2** Select **Provision System** from the menu.
- Step 3** Select the **SNMP** tab. Click the **Add** button in the **Communities** portion of the window. The **Add SNMP Community** window is displayed.
- Step 4** In the **Add SNMP Community** window, enter any name or string (up to 20 alphanumeric characters are supported) in the **Community** field to identify the community string.
- Step 5** Select the type of Access from the drop-down menu. In this release, both read and read-write access are supported.

Read access provides read-only access using the `get`, `getNext`, or `getBulk` operations.

Read-write access provides full read and write access.

Step 6 Click **Apply** when you have finished and click the **Close** button.

4.6.2 Deleting community strings

Use this procedure to delete a community string from the SNMP manager.



Step 1 To delete a community string, right-click on the System object (the root object in the tree) in the Navigation Tree pane.

Step 2 Select **Provision System** from the menu.

Step 3 In the **Provision System** window, select the **SNMP** tab. Highlight the string you want to delete in the **Communities** portion of the window. Click the **Delete** button.

Step 4 Click **Apply** when you have finished and click the **Close** button.

4.6.3 Related TL1 commands for provisioning community strings

The following table lists the TL1 commands used to provision community strings:

Table 4-3 Module provisioning commands

Action	TL1 command
Entering a new community string	ENT-SNMP-COMMUNITY: [TID]:<community>:CTAG::<access>;
Editing an existing community string	ED-SNMP-COMMUNITY: [TID]:<community>:CTAG::<access>;
Deleting a community string	DLT-SNMP-COMMUNITY:TID:<community>:CTAG;
Retrieving list of provisioned community strings	RTRV-SNMP-COMMUNITY:[TID]:[<community>]:CTAG;

For more information on TL1 commands, see the *TL1 Reference Guide*.

4.7 About trap receivers

Management stations provisioned to receive trap notifications are called trap receivers. Up to 30 trap receivers can be provisioned on the BTI 7000 Series. A notification for every alarm raise or clear event on the system is sent to each provisioned trap receiver. Traps are also sent for non-alarmed events such as database change messages and threshold crossing alerts. Trap receivers can be provisioned as either receiving SNMPv1, SNMPv2c, or SNMPv3 traps depending on what version of SNMP is supported by the trap receiver. Trap receivers must be provisioned with a community string and optionally may also be provisioned with a UDP port. The community string provisioned for the trap receiver does not need to correspond to any community string provisioned on the BTI 7000 Series for SNMPv1 or SNMPv2c traps. SNMPv3 traps must use a community string that has already been provisioned on the system.

Optionally, the receiver can be provisioned to receive Inform messages. When a trap receiver is provisioned to receive Inform messages, up to three traps are sent to the receiver at five-second intervals until acknowledgement is returned to the agent. Inform messages are supported only if the trap receiver is provisioned for message version SNMPv2.

The following sections provide instructions on how to create and delete trap receivers on the BTI 7000 Series using the proNX 900 Node Controller:

- [4.7.1, “Provisioning trap receivers”](#)
- [4.7.2, “Deleting trap receivers”](#)

For details on using the TL1 command line, see section [4.7.3, “Related TL1 commands for provisioning trap receivers”](#).

4.7.1 Provisioning trap receivers

Use this procedure to provision the destination IP address for each trap receiver on the BTI 7000 Series.



- Step 1** To provision a Trap Receiver, right-click on the System object (the root object in the tree) in the Navigation Tree pane.
- Step 2** Select Provision System from the menu.
- Step 3** Select the SNMP tab. Click the Add button in the Trap Receivers portion of the window.
- Step 4** In the Add SNMP Trap Receiver dialogue, enter:
- any name or string (up to 16 alphanumeric characters are supported) in the Trap Receiver ID field to identify the trap receiver.
 - a valid destination IP address for the trap receiver.
 - the name of the community string in the Community field to be inserted in the trap notification.

- the SNMP Version supported by the Trap Receiver.
- a UDP Port number, if required. The default is 162.
- select Inform as the notification type if desired. The default is Trap.

Step 5 Click Apply when you have finished and click the Close button.

4.7.2 Deleting trap receivers

Use this procedure to delete a trap receiver.



Step 1 To delete a Trap Receiver, right-click on the System object (the root object in the tree) in the Navigation Tree pane.

Step 2 Select Provision System from the menu.

Step 3 Select the SNMP tab. In the Trap Receivers portion of the window, select the Trap Receiver you want to delete. Click the Delete button.

Step 4 Click Apply when you have finished and click the Close button.

4.7.3 Related TL1 commands for provisioning trap receivers

The following table lists the TL1 commands used to provision trap receivers:

Table 4-4 Module provisioning commands

Action	TL1 command
Entering a new trap receiver	ENT-SNMP-TRAPRCV:[TID]:<rcvid>: [CTAG]::<ipaddr>,<community>,<version> : [PORT=<port>],[NOTIFYTYPE=<notiftype>], [TTL=<ttnl>];
Editing an existing trap receiver	ED-SNMP-TRAPRCV:[TID]:<rcvid>:[CTAG]:: [<ipaddr>],[<community>],[<version>] : [PORT=<port>],[NOTIFYTYPE=<notiftype>], [TTL=<ttnl>];
Deleting a trap receiver	DLT-SNMP-TRAPRCV:[TID]:<rcvid>:CTAG;
Retrieving list of provisioned trap receivers	RTRV-SNMP-TRAPRCV:[TID]:[<rcvid>]:CTAG;

For more information on TL1 commands, see the *TL1 Reference Guide*.

4.8 Security management

4.8.1 Security user profiles and authorization levels

The system supports a maximum of 500 user profiles, which can be created using the TL1, CLI, or proNX 900 interface, or any combination of these interfaces.

Each user profile, Superuser, Provisioning, Maintenance, and Surveillance, requires a user identifier and password for authentication purposes. For information, see [4.8.5, “User IDs and password identifiers”](#).

User profiles are associated with standard operator security authorization levels defined in Telcordia TR-NWT-835, as described in the following table.

Table 4-5 Authorization levels

Authorization Level	Access Rights	Default Timeout
Superuser	Full access to all system operations	15 minutes
Provisioning	Full access to all system operations except security operations	30 minutes
Maintenance	Access to system operations except the provisioning and security operations	45 minutes
Surveillance	Read only access	unlimited

Superuser profile

The system has a default Superuser profile whose userid is “admin” and password is “admin”. This profile permits initial connectivity to the system. BTI recommends creating a new Superuser profile and then deleting or disabling the default profile.

The system prevents the editing, disabling, and deleting of the last Superuser profile to ensure that there is always an account with full system access available. The only parameter of the last Superuser profile that can be modified is the password identifier.

4.8.2 Security authorization levels

The BTI 7000 Series supports the standard operator security authorization levels that are defined in Telcordia TR-NWT-835. These levels are defined as follows:

Table 4-6 Authorization levels

Authorization Level	Access Rights	Default Timeout
Superuser	Full access to all system operations.	15 minutes
Provisioning	Full access to all system operations except security operations.	30 minutes
Maintenance	Access to system operations except the provisioning and security operations.	45 minutes

Table 4-6 Authorization levels (Continued)

Authorization Level	Access Rights	Default Timeout
Surveillance	Read only access.	unlimited

The system prevents the editing, disabling and deleting of the last superuser userid to ensure that there is always an account with full system access available. The only parameter of the last superuser userid that can be modified is the password identifier.

4.8.3 Security default userid and password

Important The system has a default security profile with a userid of “admin”, a password of “admin” and an access level of superuser. The default userid permits initial connectivity to the system.

For security, it is recommended to create a new superuser profile and then delete or disable the default userid. The userid and password must not match each other.

For example, the userid “george” cannot have a password of “george”.

Any changes to a userid account are not applicable to the active session. Changes only take effect once a user disconnects and then reconnects to the system.

4.8.4 Security commands and authorization level required

Table 4-7 lists the security commands that are available and the required level of authorization that is required to use the commands.

Table 4-7 Security commands and authorization level required

Command	Superuser	Provisioning	Maintenance	Surveillance
ALW-USER-SECU	X			
CANC-USER-SECU	X			
DLT-SNMP-COMMUNITY	X			
DLT-SNMP-TRAPRCV	X			
DLT-USER-SECU	X			
ED-USER-SECU	X			
ENT-SNMP-COMMUNITY	X			
ENT-SNMP-TRAPRCV	X			
ENT-USER-SECU	X			
INH-USER-SECU	X			
RTRV-ACT-USER	X			
RTRV-ATTR-SECULOG	X			
RTRV-SNMP-COMMUNITY	X			
RTRV-SNMP-TRAPRCV	X			
RTRV-USER-SECU	X			
SET-ATTR-SECULOG	X			

Table 4-7 Security commands and authorization level required (Continued)

Command	Superuser	Provisioning	Maintenance	Surveillance
ACPT-DB-RST	X	X		
CANC-DB-RST	X	X		
CANC-SYS-UPGRD	X	X		
CHK-SYS-UPGRD	X	X		
CMMT-DB-RST	X	X		
CMMT-ES	X	X		
CMMT-SYS-UPGRD	X	X		
DLT-ARP-PROXY	X	X		
DLT-CRS-VCG	X	X		
DLT-CRS-XCVR	X	X		
DLT-EQPT	X	X		
DLT-FE	X	X		
DLT-FFP-XCVR	X	X		
DLT-GE	X	X		
DLT-IP	X	X		
DLT-NGBR	X	X		
DLT-OA	X	X		
DLT-OC48	X	X		
DLT-OSPF	X	X		
DLT-OSPF-AREA	X	X		
DLT-OSPF-IF	X	X		
DLT-ROUTE-STATIC	X	X		
DLT-STM16	X	X		
DLT-XCVR	X	X		
ED-AMD	X	X		
ED-DAT	X	X		
ED-EQPT	X	X		
ED-FE	X	X		
ED-FFP-XCVR	X	X		
ED-GE	X	X		
ED-IP	X	X		
ED-NGBR	X	X		
ED-OA	X	X		
ED-OC48	X	X		
ED-OSPF	X	X		
ED-OSPF-AREA	X	X		
ED-OSPF-IF	X	X		
ED-PORT	X	X		

Table 4-7 Security commands and authorization level required (Continued)

Command	Superuser	Provisioning	Maintenance	Surveillance
ED-SER	X	X		
ED-STM16	X	X		
ED-SYS	X	X		
ED-XCVR	X	X		
ENT-ARP-PROXY	X	X		
ENT-CRS-VCG	X	X		
ENT-CRS-XCVR	X	X		
ENT-EQPT	X	X		
ENT-FE	X	X		
ENT-FFP-XCVR	X	X		
ENT-GE	X	X		
ENT-IP	X	X		
ENT-NGBR	X	X		
ENT-OA	X	X		
ENT-OC48	X	X		
ENT-OSPF	X	X		
ENT-OSPF-AREA	X	X		
ENT-OSPF-IF	X	X		
ENT-ROUTE-STATIC	X	X		
ENT-STM16	X	X		
ENT-XCVR	X	X		
INIT-LOG	X	X		
INIT-REG-GE	X	X		
INIT-REG-OC48	X	X		
INIT-REG-STM16	X	X		
INIT-REG-STS1	X	X		
INIT-REG-VC4	X	X		
INIT-REG-XCVR	X	X		
INVK-DB-RST	X	X		
INVK-SCP-RENUM	X	X		
INVK-SYS-UPGRD	X	X		
LOAD-DB-RST	X	X		
LOAD-SYS-UPGRD	X	X		
SET-SID	X	X		
SET-TH-GE	X	X		
SET-TH-OC48	X	X		
SET-TH-STM16	X	X		
SET-TH-STS1	X	X		

Table 4-7 Security commands and authorization level required (Continued)

Command	Superuser	Provisioning	Maintenance	Surveillance
SET-TH-VC4	X	X		
SET-TH-XCVR	X	X		
SET-TMG-MODE	X	X		
SET-TMREF	X	X		
STA-LOG	X	X		
STP-LOG	X	X		
INIT-SYS	X	X	X	
INVK-DB-BKUP	X	X	X	
OPR-LPBK-GE	X	X	X	
OPR-LPBK-OC48	X	X	X	
OPR-LPBK-STM16	X	X	X	
OPR-LPBK-XCVR	X	X	X	
OPR-OBR-HTSO	X	X	X	
OPR-PROTNSW-STS1	X	X	X	
OPR-PROTNSW-VC4	X	X	X	
OPR-PROTNSW-XCVR	X	X	X	
RLS-LPBK-GE	X	X	X	
RLS-LPBK-OC48	X	X	X	
RLS-LPBK-STM16	X	X	X	
RLS-LPBK-XCVR	X	X	X	
RLS-PRONSW-STS1	X	X	X	
RLS-PRONSW-VC4	X	X	X	
RLS-PROTNSW-XCVR	X	X	X	
RMV-AMD	X	X	X	
RMV-EQPT	X	X	X	
RMV-GE	X	X	X	
RMV-IP	X	X	X	
RMV-OA	X	X	X	
RMV-OC48	X	X	X	
RMV-OSPF	X	X	X	
RMV-OSPF-IF	X	X	X	
RMV-STM16	X	X	X	
RMV-XCVR	X	X	X	
RST-AMD	X	X	X	
RST-EQPT	X	X	X	
RST-GE	X	X	X	
RST-IP	X	X	X	
RST-OA	X	X	X	

Table 4-7 Security commands and authorization level required (Continued)

Command	Superuser	Provisioning	Maintenance	Surveillance
RST-OC48	X	X	X	
RST-OSPF	X	X	X	
RST-OSPF-IF	X	X	X	
RST-STM16	X	X	X	
RST-XCVR	X	X	X	
ACT-USER	X	X	X	X
ALW-MSG-ALL	X	X	X	X
CANC-USER	X	X	X	X
ED-PID	X	X	X	X
INH-MSG-ALL	X	X	X	X
RTRV-ALM-ALL	X	X	X	X
RTRV-ALM-AMD	X	X	X	X
RTRV-ALM-EQPT	X	X	X	X
RTRV-ALM-GE	X	X	X	X
RTRV-ALM-IP	X	X	X	X
RTRV-ALM-OA	X	X	X	X
RTRV-ALM-OC48	X	X	X	X
RTRV-ALM-SECU	X	X	X	X
RTRV-ALM-STM16	X	X	X	X
RTRV-ALM-STS1	X	X	X	X
RTRV-ALM-VC4	X	X	X	X
RTRV-ALM-XCVR	X	X	X	X
RTRV-AMD	X	X	X	X
RTRV-ARP-ALL	X	X	X	X
RTRV-ARP-PROXY	X	X	X	X
RTRV-ATTR-LOG	X	X	X	X
RTRV-COND-ALL	X	X	X	X
RTRV-COND-AMD	X	X	X	X
RTRV-COND-EQPT	X	X	X	X
RTRV-COND-GE	X	X	X	X
RTRV-COND-IP	X	X	X	X
RTRV-COND-OA	X	X	X	X
RTRV-COND-OC48	X	X	X	X
RTRV-COND-SECU	X	X	X	X
RTRV-COND-STM16	X	X	X	X
RTRV-COND-STS1	X	X	X	X
RTRV-COND-VC4	X	X	X	X
RTRV-COND-XCVR	X	X	X	X

Table 4-7 Security commands and authorization level required (Continued)

Command	Superuser	Provisioning	Maintenance	Surveillance
RTRV-CRS-VCG	X	X	X	X
RTRV-CRS-XCVR	X	X	X	X
RTRV-DB-RST	X	X	X	X
RTRV-EQPT	X	X	X	X
RTRV-FE	X	X	X	X
RTRV-FFP-XCVR	X	X	X	X
RTRV-GE	X	X	X	X
RTRV-HDR	X	X	X	X
RTRV-HLP-AID	X	X	X	X
RTRV-HLP-CMD	X	X	X	X
RTRV-HLP-ENUM	X	X	X	X
RTRV-INV	X	X	X	X
RTRV-IP	X	X	X	X
RTRV-LOG	X	X	X	X
RTRV-NETTYPE	X	X	X	X
RTRV-NGBR	X	X	X	X
RTRV-OA	X	X	X	X
RTRV-OC48	X	X	X	X
RTRV-OSPF	X	X	X	X
RTRV-OSPF-AREA	X	X	X	X
RTRV-OSPF-IF	X	X	X	X
RTRV-OSPF-LSDB	X	X	X	X
RTRV-OSPF-NGHBR	X	X	X	X
RTRV-PM-AMD	X	X	X	X
RTRV-PM-GE	X	X	X	X
RTRV-PM-IP	X	X	X	X
RTRV-PM-OA	X	X	X	X
RTRV-PM-OC48	X	X	X	X
RTRV-PM-OSC	X	X	X	X
RTRV-PM-STM16	X	X	X	X
RTRV-PM-STS1	X	X	X	X
RTRV-PM-VC4	X	X	X	X
RTRV-PM-XCVR	X	X	X	X
RTRV-PORT	X	X	X	X
RTRV-ROUTE-ALL	X	X	X	X
RTRV-ROUTE-CONN	X	X	X	X
RTRV-ROUTE-OSPF	X	X	X	X
RTRV-ROUTE-STATIC	X	X	X	X

Table 4-7 Security commands and authorization level required (Continued)

Command	Superuser	Provisioning	Maintenance	Surveillance
RTRV-SER	X	X	X	X
RTRV-STM16	X	X	X	X
RTRV-SYS	X	X	X	X
RTRV-SYS-RENUM	X	X	X	X
RTRV-TH-GE	X	X	X	X
RTRV-TH-OC48	X	X	X	X
RTRV-TH-STM16	X	X	X	X
RTRV-TH-STS1	X	X	X	X
RTRV-TH-VC4	X	X	X	X
RTRV-TH-XCVR	X	X	X	X
RTRV-TMG-MODE	X	X	X	X
RTRV-TMREF	X	X	X	X
RTRV-USER	X	X	X	X
RTRV-VCG	X	X	X	X
RTRV-VERSION	X	X	X	X
RTRV-XCVR	X	X	X	X
SEND-PING	X	X	X	X

4.8.5 User IDs and password identifiers

The user identifier (UID) associated with a user profile must contain one to 10 case-sensitive alphanumeric characters. The password identifier (PID) associated with a user profile must contain six to 10 alphanumeric characters.

All special characters are supported for passwords except the following: - = ; : ‘ “ , ? Also, a profile's UID and its PID must not match. For example, the UID “George6” cannot have a PID of “George6”.

BTI recommends changing the default password of the default Superuser profile (default UID = “admin”; default PID = “admin”), after it is used to log on to the system for the first time.

Although the default password for the system contains five characters, the new PID must contain six to 10 characters.

Note Changes made to any profile are not applicable to the active session. They take effect once a user disconnects and then reconnects to the system.

4.8.5.1 Creating a user profile

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To create a user profile, use the following TL1 command:

```
ENT-USER-SECU:[TID]:<uid>:[CTAG]::<pid>,,<uap>:[TIMEOUT=<timeout>];
```

Example command

```
ENT-USER-SECU:BTI7000:james:100::october,,supuser:TIMEOUT=15;
```

4.8.5.2 Editing a user profile

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To edit a user profile, use the following TL1 command:

```
ED-USER-SECU:[TID]:<uid>:[CTAG]::[<nuid>],[<pid>],[<uap>]:  
[TIMEOUT=<timeout>];
```

Example command

```
ED-USER-SECU:BTI7000:james:100::,city23,:TIMEOUT=60;
```

4.8.5.3 Deleting a user profile

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To delete a user profile, enter the following at the TL1 command line interface:

```
DLT-USER-SECU:[TID]:<uid>:[CTAG];
```

Example command

```
DLT-USER-SECU:BTI7000:james:100::;
```

Note	If the deleted profile is an active session, the session remains in effect until the user logs out.
-------------	---

4.8.5.4 Inhibiting a user profile

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To inhibit a user profile, use the following TL1 command:

```
INH-USER-SECU:[TID]:<uid>:[CTAG];
```

Example command

```
INH-USER-SECU:BTI7000:danny:100::;
```

4.8.5.5 Allowing a user profile

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To allow a user profile, use the following TL1 command:

```
ALW-USER-SECU:[TID]:<uid>:[CTAG];
```

Example command

```
ALW-USER-SECU:BTI7000:danny:100::;
```

4.8.5.6 Retrieving a list of active users

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To retrieve a list of active users, use the following TL1 command:

```
RTRV-ACT-USER:[TID]::[CTAG]::;
```

Example command and response

```
RTRV-ACT-USER:BTI7000::100;
```

```
BTI7000 03-09-29 10:29:39
M 100 COMPLD
admin:SUPERUSER:192.168.172.163:3083
;
```


4.9 Common user commands

4.9.1 Logging in to a TL1 session

To log in to a TL1 session, enter the following syntax at the TL1 command line interface:

```
ACT-USER:[TID]:<uid>:<CTAG>::<pid>;
```

Note After three unsuccessful login attempts, a USERLCKOUT alarm is raised and a security breach is logged. The user must wait about 60 seconds for the alarm to clear before attempting to log in again.

Example

To log in to a TL1 session as the user “admin”, enter the following at the TL1 command line interface:

```
ACT-USER:BTI7000:"admin":100:*****;
```

Response

The BTI 7000 Series sends back a COMPLD message to indicate that the login has completed successfully:

```
BTI7000 02-10-25 18:40:27
M 100 COMPLD
;
BTI7000>
```

Important The system has a default security profile with a userid of “admin”, a password that is the same as the userid, and an access level of superuser. It is recommended that you change the default security profile during system commissioning. Although the default password for the system is five characters in length, it is required for security reasons to change the default password to between six and eight characters in length.

4.9.2 Cancelling a TL1 session

To log out from a TL1 session, enter the following syntax at the TL1 command line interface:

```
CANC-USER:[TID]:<uid>:<CTAG>;
```

Example

To cancel a TL1 session as the user “admin”, enter the following at the TL1 command line interface:

```
CANC-USER:BTI7000:admin:100::;
```

Response

The BTI 7000 Series sends back a COMPLD message to indicate that the CANC-USER command has completed successfully:

```
BTI7000 02-10-25 18:39:44
M 100 COMPLD
;
```

Note Once a user logs out of the BTI 7000 Series, the user should also close the telnet session.

4.9.3 Changing your password

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To change the password of your user profile, use the following TL1 command:

```
ED-PID:[TID]:<uid>:[CTAG]::<oldpid>,<newpid>;
```

Example command

```
ED-PID:BTI7000:james:100::city23,mainstn;
```

Note The new password comes into effect after you log out of the current session.

4.9.4 Retrieving your security credentials

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

To retrieve your security credentials, use the following TL1 command:

```
RTRV-USER:[TID]:[<uid>]:[CTAG]:;;
```

Example command and response

```
RTRV-USER:BTI7000:;;
```

```
BTI7000 05-03-16 14:47:57
M 110 COMPLD
admin:SUPERUSER:TIMEOUT=5,STATUS=IS
;
```

5.0 Installing and provisioning optical modules

This chapter provides information about installing and provisioning optical modules for the BTI 7000 Series.

- 5.1, “Installing Optical Amplifier modules”
- 5.2, “Installing DCF-Type Dispersion Compensation modules”
- 5.3, “Installing Multiplexing modules”
- 5.4, “Installing a ROADM-on-a-blade (ROB)”
- 5.5, “Installing a 40-Channel DWDM Mux/Demux”
- 5.6, “Installing a 96-Channel DWDM Mux/Demux (BT8A96MD01-I02, BT8A96MD02-I02)”
- 5.7, “Installing a 96-Channel Fixed Mux/Demux (BT8A78MD03)”
- 5.8, “Provisioning Optical Amplifier modules”
- 5.9, “Provisioning amplifier settings”
- 5.10, “Provisioning Dispersion Compensation modules”
- 5.11, “DOL hardware provisioning tasks”
- 5.12, “Activating optical services using proNX 900”
- 5.13, “Editing Dispersion Compensation module ports”
- 5.14, “Provisioning non-powered module ports”

5.1 Installing Optical Amplifier modules

Use this procedure to install Amplifier modules.

What you need

- Slot-head or Phillips screwdriver
- Electrostatic discharge (ESD) wrist strap
- Optical Amplifier module
- Isopropyl alcohol and lint-free pads
- Fiber scope to verify that the fiber ends are clean

Prerequisites

- None



Caution

Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).



Laser

Invisible laser radiation can be emitted from the aperture ports of various modules when no fiber cable is connected. Avoid exposure and do not stare into open apertures to avoid permanent eye damage.

Key installation features

The following figures show typical amplifiers and indicate the key features for installation.

Figure 5-1 Single-Channel /Sub-Band Amplifiers (SBA/SPA) and DWDM C-Band Amplifiers (OBA/OPA)

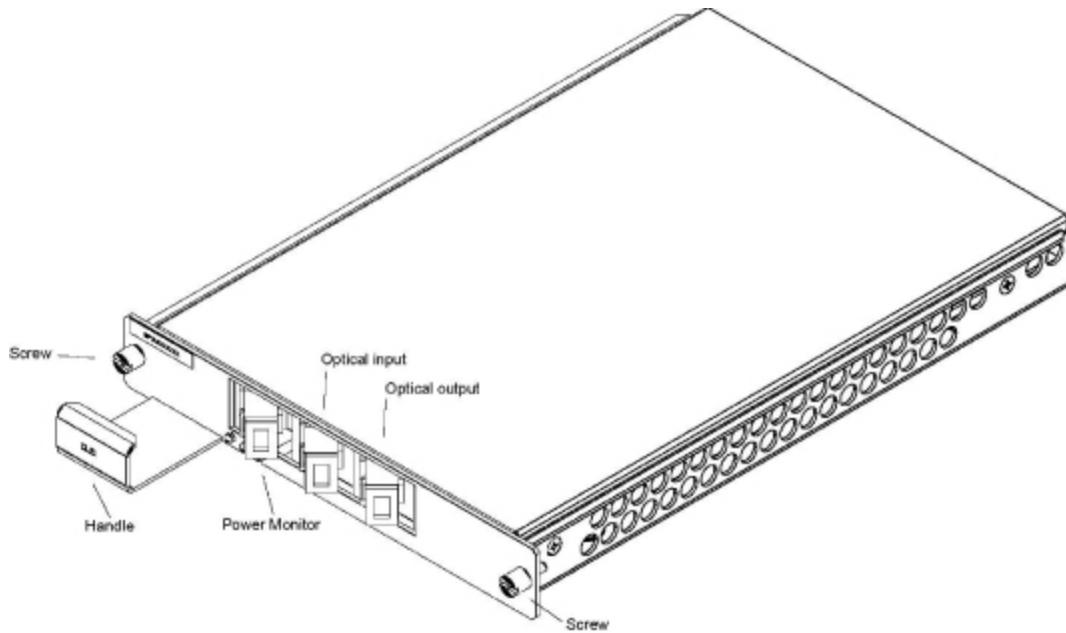


Figure 5-2 DWDM Optical Line Amplifier (OLA)

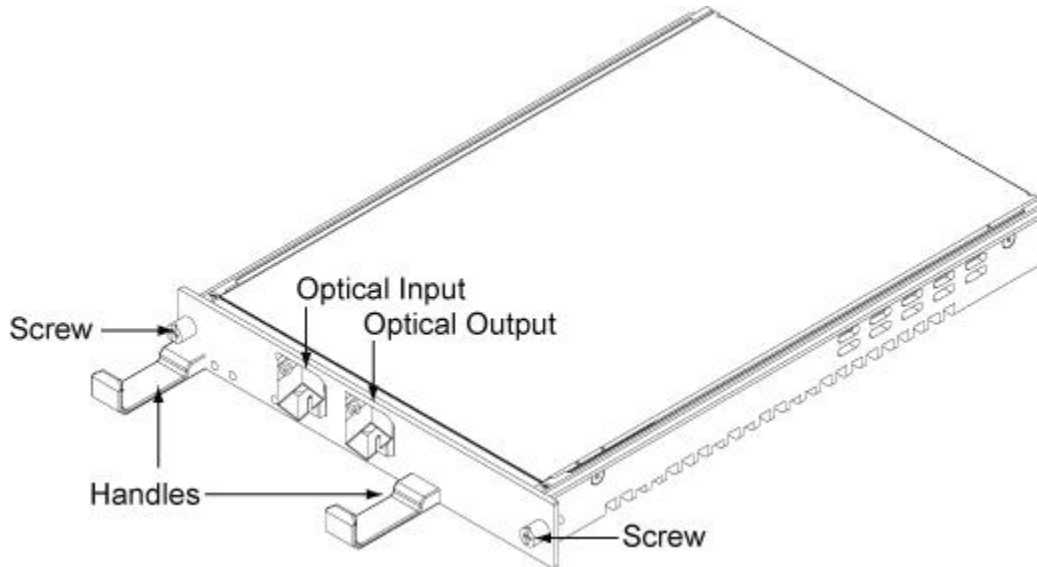


Figure 5-3 Optical Line Amplifier with Mid-Stage Access (OLAM)

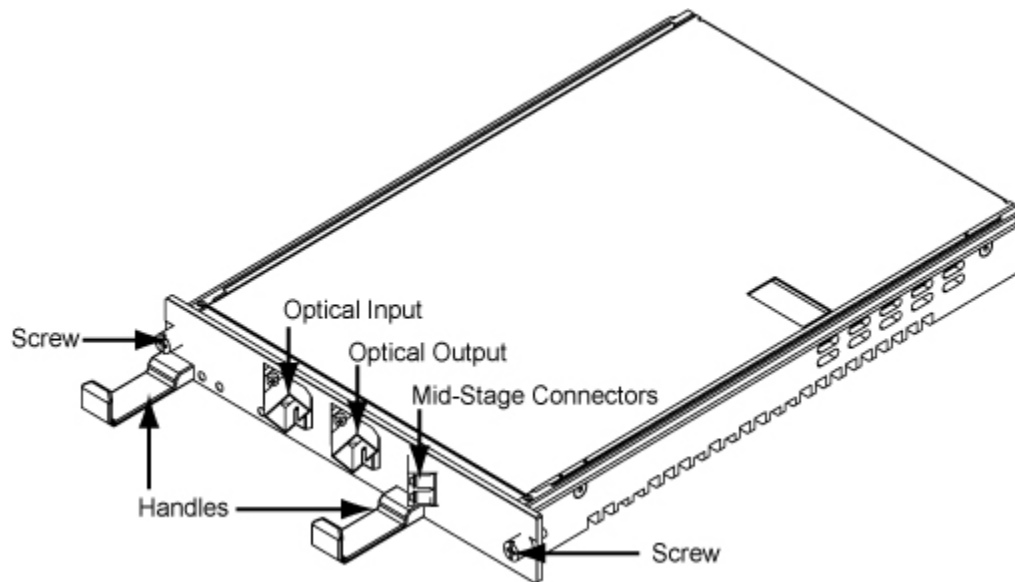


Figure 5-4 DWDM C-Band Low and Mid Gain Amplifiers (LGA/MGA)

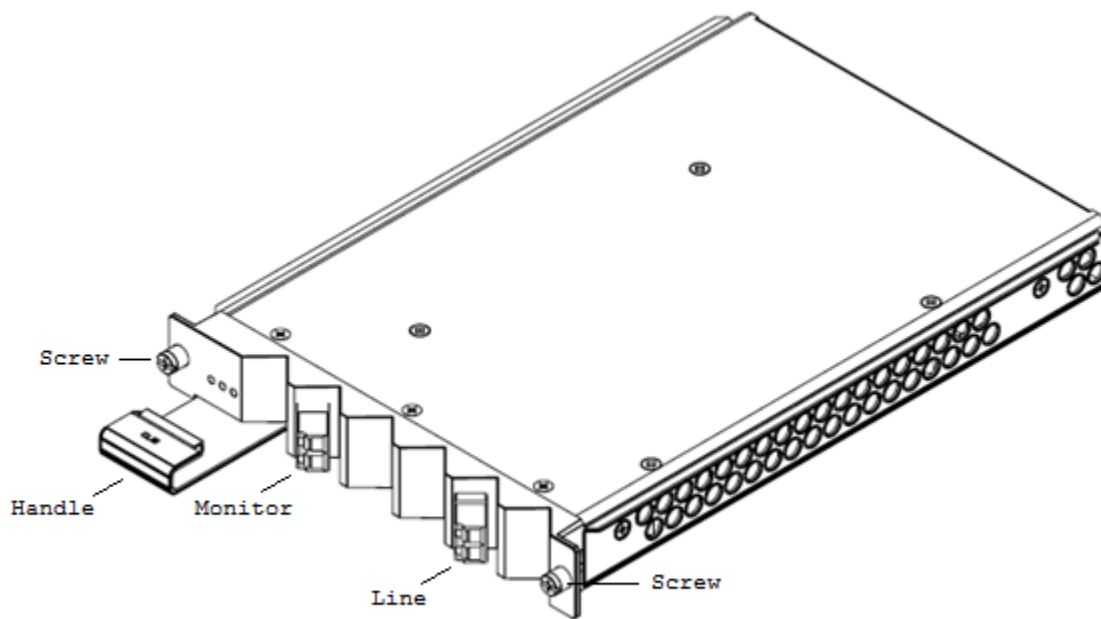
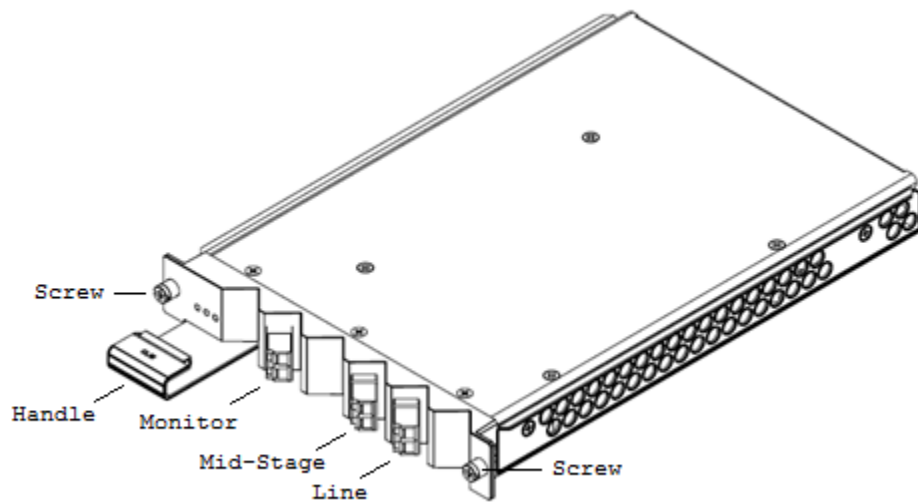


Figure 5-5 DWDM C-Band Mid Gain Amplifier with Mid-Stage Access (MGM)**Installation procedure**

Follow these steps to install an Optical Amplifier module:

Step 1 Insert the Amplifier Module

- a) Align the module to the slot in which it is being inserted.
- b) Carefully push the module straight into the slot.
- c) Push with sufficient pressure until the LEDs come on and the faceplate of the module matches the position of the adjacent module.

Step 2 Attach the Faceplate Screws

- a) Facing the front of the shelf, align the module with its mounting holes.
- b) Using a slot-head or Phillips screwdriver, carefully tighten the two faceplate screws:
 - Partially tighten the center support screw.
 - Partially tighten the other screw.
 - Fully tighten the center support screw.
 - Fully tighten the other screw.

Caution Tighten to a torque that is no more than 4.7 in-lbs.

Step 3 Inspect and clean the Ends of the Fiber Optic Cables

Use lint-free pads with isopropyl alcohol to clean the ends of the fiber optic cables if required.

Step 4 Connect the Optical Cables

Connect the input and output cables to the faceplate of the module.

Step 5 Replace Cables

If any cables were moved to access the slot, replace the cables to their original locations.

You have successfully completed this procedure.

Note A replacement kit of five sets of UC (FC, SC, and ST) removable connector caps is orderable as item BP1A5035.

5.2 Installing DCF-Type Dispersion Compensation modules

Use this procedure to install any DCF-Type Dispersion Compensation module (DCM).

What you need

- Slot-head or Phillips screwdriver
- Electrostatic discharge (ESD) wrist strap
- Dispersion Compensation module
- Isopropyl alcohol and lint-free pads
- 1.25mm and 2.5mm HUXcleaners (recommended)

Prerequisites

- None



Caution

Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).



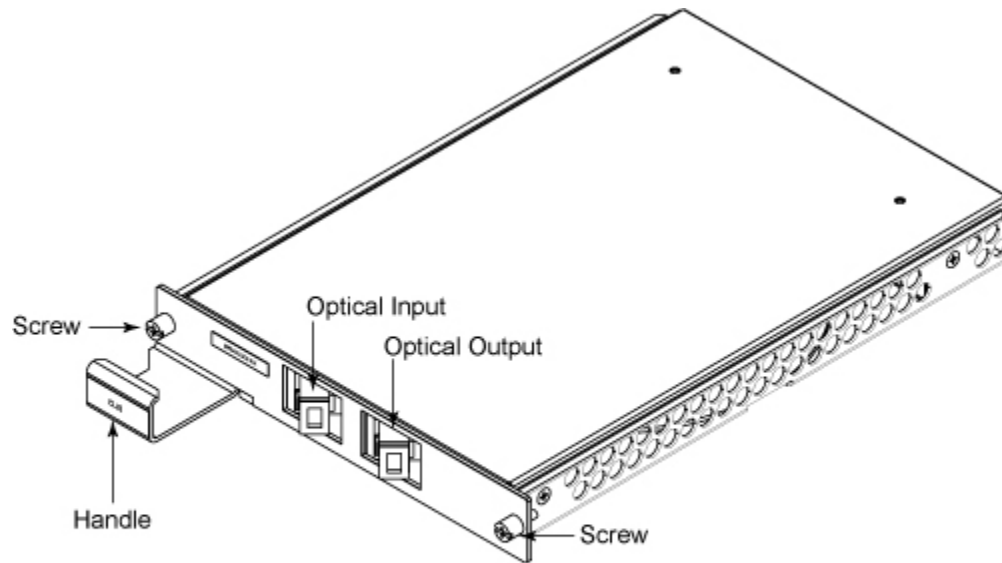
Laser

Invisible laser radiation can be emitted from the aperture ports of various modules when no fiber cable is connected. Avoid exposure and do not stare into open apertures to avoid permanent eye damage.

Key installation features

The following figure shows a DCM and indicates the key features for installation.

Figure 5-6 DCF-Type Dispersion Compensation module



Installation procedure

Follow these steps to install a DCF-Type Dispersion Compensation module:

Step 1 Insert the Module

- a) Align the module to the slot in which it is being inserted.
- b) Carefully push the module straight into the slot.
- c) Push with sufficient pressure until the LEDs come on and the faceplate of the module matches the position of the adjacent module.

Step 2 Attach the Faceplate Screws

- a) Facing the front of the shelf, align the module with its mounting holes.
- b) Using a slot-head or Phillips screwdriver, carefully tighten the two faceplate screws:
 - Partially tighten the center support screw.
 - Partially tighten the other screw.
 - Fully tighten the center support screw.
 - Fully tighten the other screw.

Caution Tighten to a torque that is no more than 4.7 in-lbs.

Step 3 Clean the Ends of the Optical Cables

Use lint-free pads with isopropyl alcohol to clean the ends of the fiber optic cables.

Step 4 Connect the Optical Cables

According to the deployment configuration, connect the input and output optical cables to the faceplate of the module.

Step 5 Replace the Cables

If any cables were moved to access the slot, replace the cables to their original locations.

You have successfully completed this procedure.

5.3 Installing Multiplexing modules

Use this procedure to install Multiplexing modules.

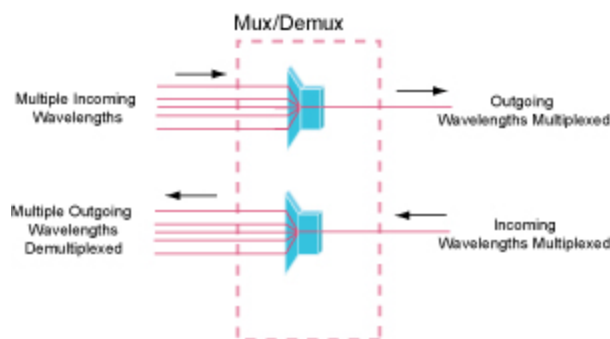
Important The D32BMD24 (32-Channel DWDM Bi-Directional Mux/Demux) and the D32BMD42 (32-Channel DWDM Bidirectional Mux/Demux) modules must be installed in a passive shelf only.

Note The connector interface supports LC connectors only.

Typical deployment

In most cases, a multiplexer/demultiplexer is used to split and combine wavelengths, as shown in the following figure.

Typical deployment of a multiplexer/demultiplexer



What you need

- Slot-head or Phillips screwdriver
- Electrostatic discharge (ESD) wrist strap
- Multiplexing module
- Standard fiber cleaner (1.25 mm HUXcleaner recommended)

Prerequisites

- For 32-Channel Mux/Demux modules, the shelf must be configured to accommodate double-width modules. See the *Common Equipment Installation Guide* for more information.



Laser

Invisible laser radiation can be emitted from the aperture ports of various modules when no fiber cable is connected. Avoid exposure and do not stare into open apertures to avoid permanent eye damage.

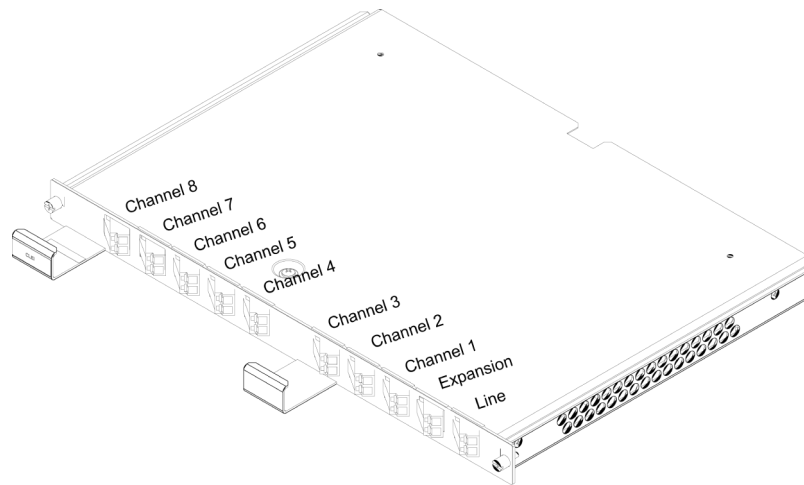


Caution

Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

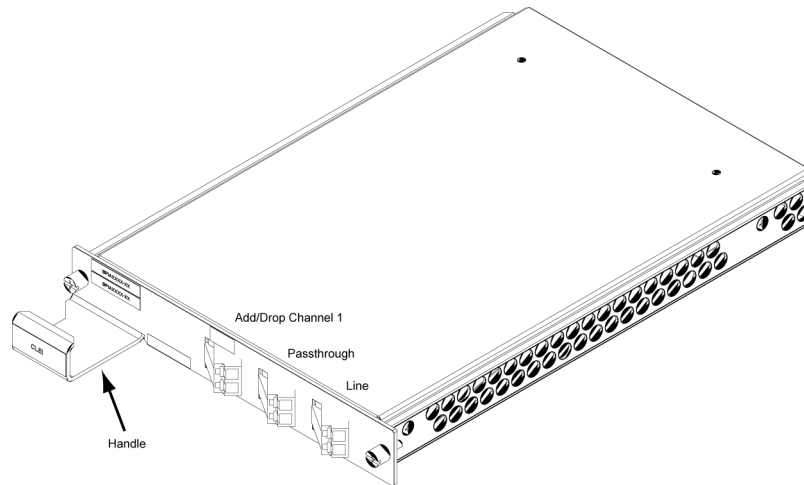
The following figure shows an 8-channel module of the 32-Channel DWDM Mux/Demux.

32-Channel DWDM Mux/Demux module

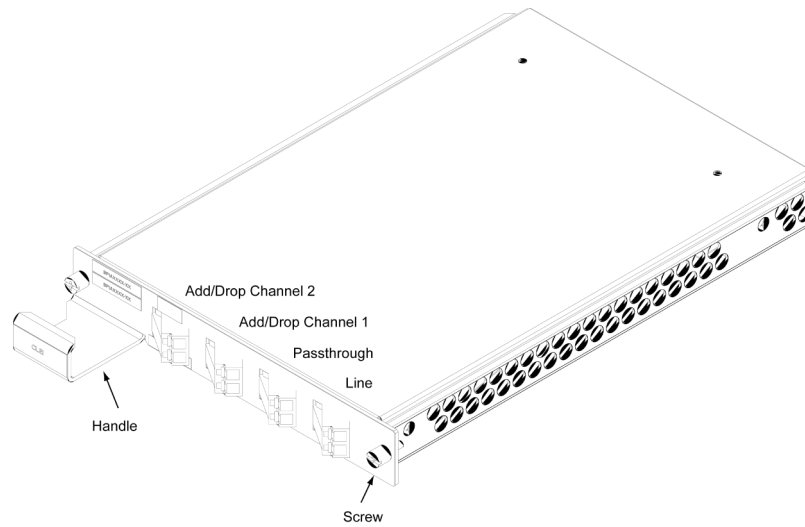


The following figures show the key physical features of the 1-Channel, 2-Channel, and 4-Channel DWDM Optical Add/Drop modules.

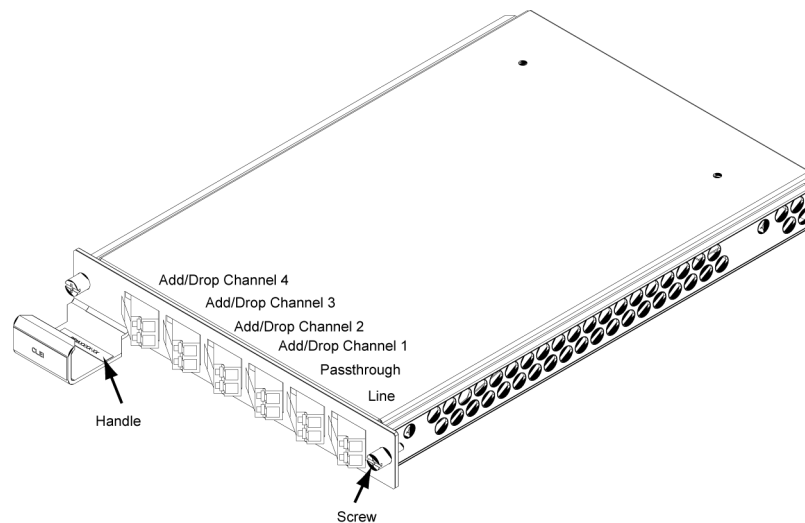
1-Channel OADM



2-Channel OADM



4 -Channel OADM



Installation procedure

To install a Multiplexing modules, follow these steps:

Step 1 Insert the module

Align the with the slot in which the module is being inserted.
Carefully push the module straight into the slot.

Step 2 Attach the Faceplate Screws

Facing the front of the shelf, align the module with its mounting holes.
Using a slot-head or Phillips screwdriver, carefully tighten the faceplate screws:

- Partially tighten the first screw.

- Partially tighten the second screw.
- Fully tighten the first screw.
- Fully tighten the second screw.

Caution Tighten to a torque that is no more than 4.7 in-lbs.

Step 3 Clean the Ends of the Fiber Optic Cables

Use standard fiber cleaners to clean the ends of the fiber optic cables.

Step 4 Connect the Optical Cables

Connect the input and output optical cables to the faceplate of the module.

Note Passive multiplexing modules are shipped with port terminators on their output ports to prevent optical back reflection from occurring on unused ports. Before connecting an optical cable to an output port on a passive multiplexing module, remove the port terminator and dispose of it, and then clean the port. Do not remove a port terminator until you are ready to connect a fiber cable to it. Port terminators are intended for single-use only. Do not re-use a port terminator.

Note If an optical cable is removed from an output port on a passive multiplexing module, install a new port terminator on the port.

Step 5 Replace Cables

If any cables were moved to access the slot, replace the cables to their original locations.
You have successfully completed this procedure.

5.4 Installing a ROADM-on-a-blade (ROB)

Use this procedure to install a ROADM-on-a-blade.

What you need

- Slot-head or Phillips screwdriver
- Electrostatic discharge (ESD) wrist strap
- 2D (ROB2) and/or 4D (ROB4) ROADM-on-a-blade
- Isopropyl alcohol and lint-free pads
- Shelf must have an available double-width, single-height slot.

Important See the *BTI 7000 Series Common Equipment Installation Guide* for information about preparing the slot configuration for a shelf.

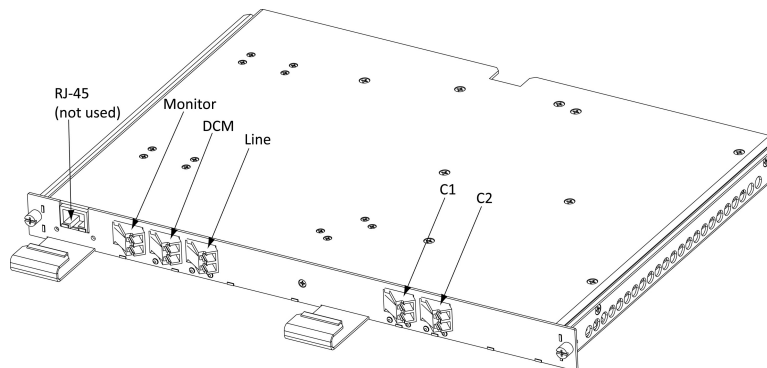


Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

Key installation features

The following figure shows the ROB2 and indicates the key installation features. The difference between a ROB2 and ROB4 is the ROB4 includes two additional client ports—C3 and C4.

Figure 5-12 ROADM-on-a-blade



Installation procedure

Follow these steps to install a ROB :

Step 1 Insert the Module

- a) Align the module to the slot in which it is being inserted.
- b) Carefully push the module straight into the slot.
- c) Push with sufficient pressure until the LEDs come on.

Step 2 Attach the Faceplate Screws

- a) Facing the front of the shelf, align the ROB with its mounting holes.
- b) Using a slot-head or Phillips screwdriver, carefully tighten the two faceplate screws:
 - Partially tighten the first support screw.
 - Partially tighten the other screw.
 - Fully tighten the first support screw.
 - Fully tighten the other screw.

Caution Tighten to a torque that is no more than 4.7 in-lbs.

Step 3 Inspect and clean the Ends of the Fiber Optic Cables

Use an optical fiber scope to inspect the fiber. Use lint-free pads with isopropyl alcohol to clean the ends of the fiber optic cables if required.

Step 4 Connect the Optical Cables

Connect the input and output cables to the faceplate of the module.

Step 5 Replace the Cables

If any cables were moved to access the ROB, replace the cables to their original locations.

You have successfully completed this procedure.

5.5 Installing a 40-Channel DWDM Mux/Demux

The 40-Channel DWDM Mux/Demux is a standalone passive module that is designed to be installed in the following types of racks:

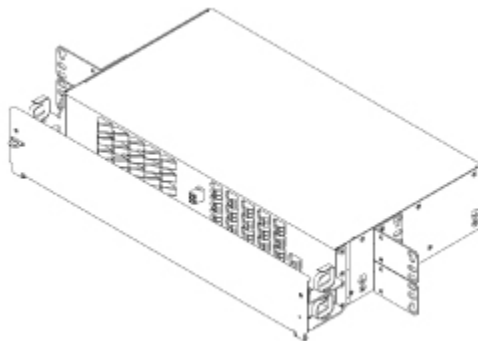
- 23-inch ANSI equipment rack, mid-mount with front cover
- 19-inch ANSI equipment rack, mid-mount with front cover
- 19-inch (450 mm) ETSI equipment rack, front-mount without front cover
- 19-inch (410 mm) ETSI equipment rack, front-mount with front cover
- 21-inch (500 mm) ETSI equipment rack, front-mount without front cover
- 21-inch (500 mm) ETSI equipment rack, front-mount with front cover

What you need

The shelf is shipped with a combination mounting bracket that accommodates both 21-inch and 23-inch rack installations, depending on the orientation of the bracket.

- To install the shelf in a 19-inch rack: Installation kit BT7A5031, containing the 19-inch mounting bracket and hardware.
- To install the shelf in a 19-inch or 21-inch ETSI rack with a front cover: Mounting bracket (19-inch and 21-inch), which is part of the front cover assembly.

Figure 5-13 40-Channel DWDM Mux/Demux



Installation procedure

Follow these steps to install a 40-Channel DWDM Mux/Demux in a rack:

Step 1 Arrange the mounting brackets next to the sides of the shelf.

The 40-Channel DWDM Mux/Demux require two mounting brackets, one for each side of the shelf.

Step 2 Attach the mounting brackets to each side of the shelf chassis using the screws provided. Use two screws for each clamp bracket on the shelf, and tighten to a torque that is no more than 65 in-lbs.

On a 19-inch or 21-inch ETSI rack with a front cover, the mounting bracket (19-inch and 21-inch) is part of the front cover assembly and is pre-configured for a 21-inch installation. To change the bracket to a 19-inch installation, remove the extension.

Step 3 With one person at each side of the shelf, lift the shelf into position in the equipment frame.

Step 4 Align the mounting holes in the mounting bracket with the mounting holes in the equipment frame.

Step 5 Use the M6 Trilobe mounting bolts shipped with the shelf installation kit to mount the shelf in the equipment frame. Use one M6 Trilobe mounting bolt for each mounting bracket on the shelf. Tighten to a torque that is no more than 65 in-lbs.

Step 6 Connect fiber optic cables.

You have successfully completed this procedure.

5.6 Installing a 96-Channel DWDM Mux/Demux (BT8A96MD01-I02, BT8A96MD02-I02)

The 96-Channel DWDM Mux/Demux (BT8A96MD01-I02, BT8A96MD02-I02) is a standalone passive shelf that is designed to be installed in the following types of racks:

Note The 96-Channel DWDM Mux/Demux is currently not NEBS-3 certified.

- 23-inch ANSI equipment rack, mid-mount with front cover
- 19-inch ANSI equipment rack, mid-mount with front cover
- 19-inch (410 mm) ETSI equipment rack, front-mount with front cover
- 21-inch (500 mm) ETSI equipment rack, front-mount with front cover

Note We do not recommend installing the module without the front cover, since the inside of the cover includes the channel plan labeling.

What you need

Brackets: The shelf is shipped with 19-inch brackets in the mid-mount position. The combination 21- and 23-inch brackets are shipped with the installation kit— BT8A7860. These combination brackets allow you to install the module into any of the rack types listed above.

Figure 5-14 96-Channel DWDM Mux/Demux with 19-inch bracket

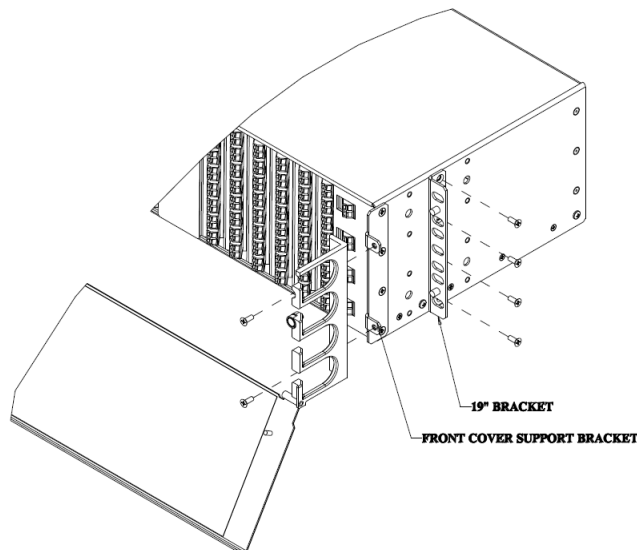
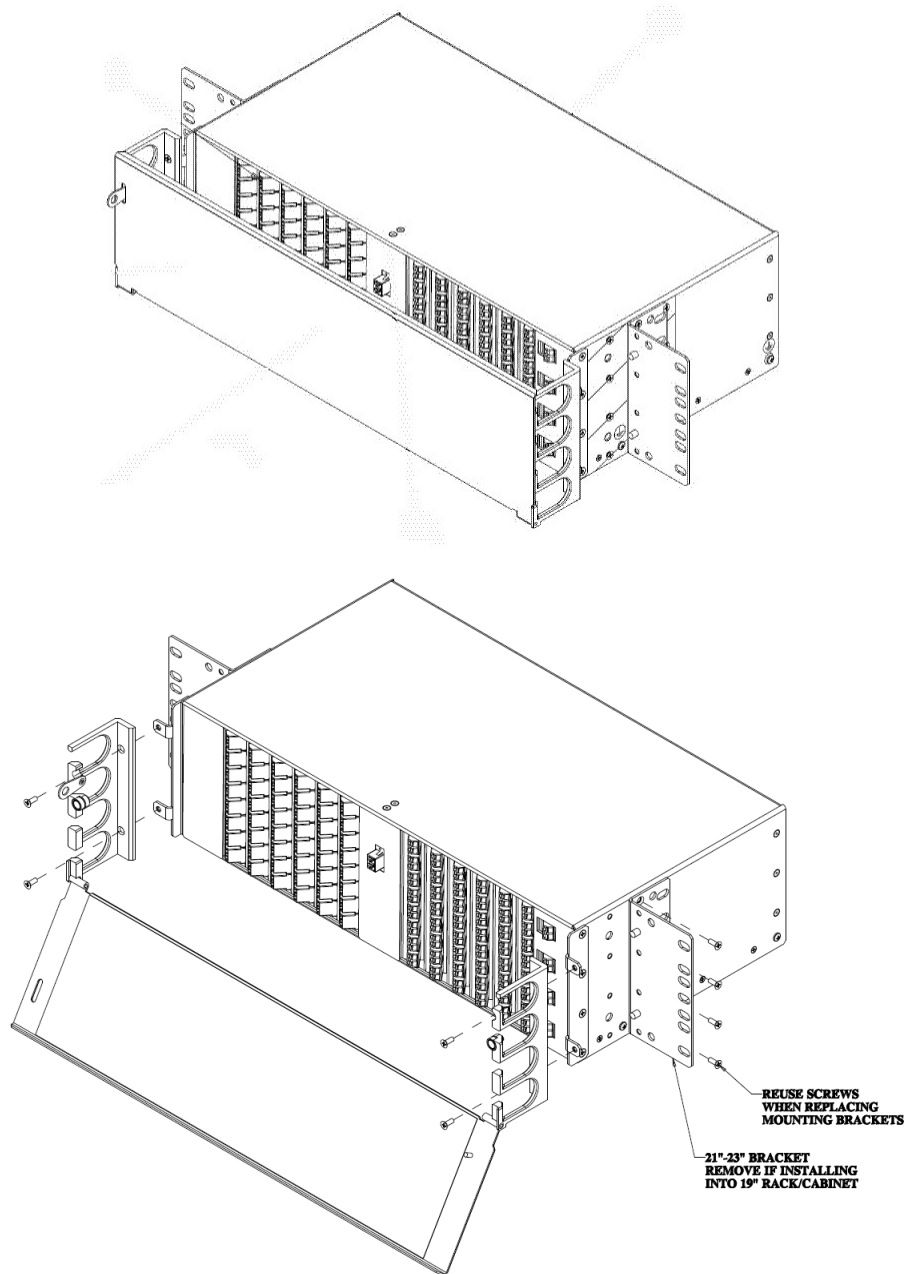


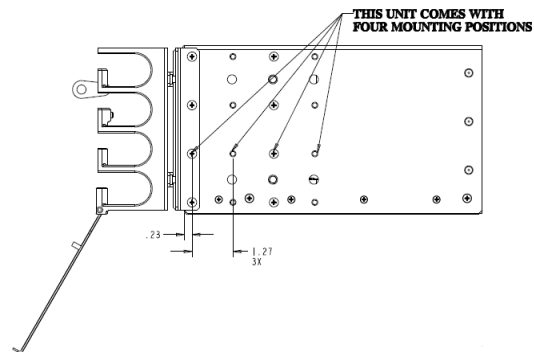
Figure 5-15 96-Channel DWDM Mux/Demux with 23-inch bracket**Installation procedure**

Follow these steps to install a 96-Channel DWDM Mux/Demux:

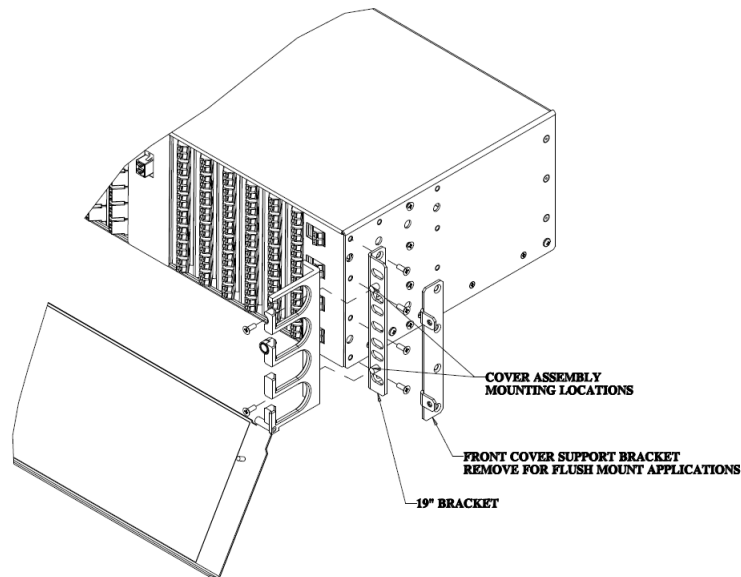
Step 1 Arrange the mounting brackets next to the sides of the shelf.

The 96-Channel DWDM Mux/Demux requires two mounting brackets, one for each side of the shelf.

Note When using the rear three positions for mounting the shelf, the front cover support bracket remains at the front of the shelf.



Note When mounting the shelf flush with the front surface, replace the front cover support brackets with the mounting brackets.



Step 2 Attach the mounting brackets to each side of the shelf using the screws provided.

The front cover and its brackets are attached to the front side of the mounting bracket if center mounting, or the cover mount brackets if mid-mounting. using the 6-32 screws provided. Torque the 6-32 screws to no more than 8.0 in-lbs.

Step 3 With one person at each side of the shelf, lift the shelf into position in the equipment frame.

Step 4 Align the mounting holes in the mounting bracket with the mounting holes in the equipment frame.

Step 5 Use the M6 Trilobe mounting bolts shipped with the shelf installation kit to mount the shelf in the equipment frame. Use one M6 Trilobe mounting bolt for each mounting bracket on the shelf. Tighten to a torque that is no more than 65 in-lbs.

Step 6 Connect fiber optic cables.

You have successfully completed this procedure.

5.7 Installing a 96-Channel Fixed Mux/Demux (BT8A78MD03)

Use this procedure to install a 96-Channel Fixed Mux/Demux (FMD96).

The FMD96 is a standalone, passive module that is designed to be installed directly into the following types of racks:

- 23-inch ANSI equipment rack
- 19-inch ANSI equipment rack
- 19-inch (410 mm) ETSI equipment rack
- 21-inch (500 mm) ETSI equipment rack

Note The FMD96 is not NEBS-3 certified.

The FMD96 is shipped as a complete unit with hinged cover and latch, fiber support, and 21/23-inch mounting bracket attached. An installation kit with a 19-inch mounting bracket and installation hardware is included with the FMD96.

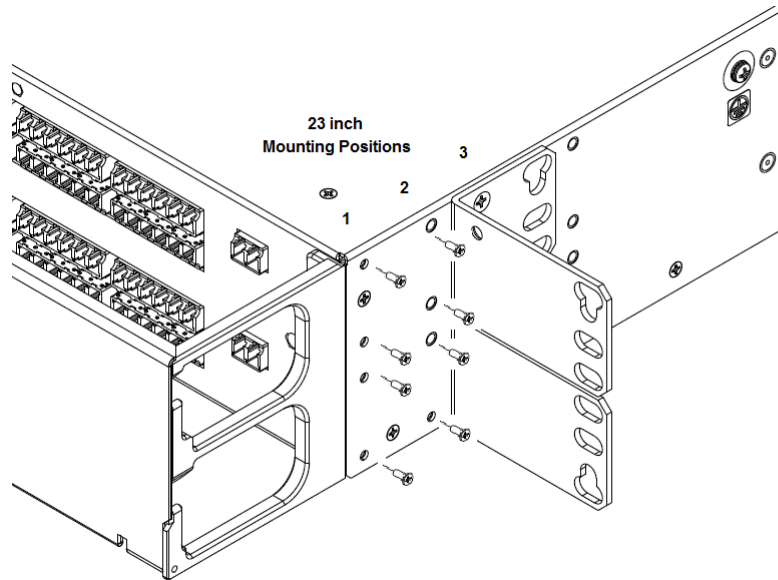
Tools Required

- Installation kit (included)
- Grounding cable
- Grounding cable connector to ground source
- #2 Phillips screwdriver (for ground screw)
- #2 Robertson screwdriver or hex wrench (for fasteners that attach the module to the frame)

Two L-shaped mounting brackets are installed on each side of the FMD96. The mounting brackets attached to the FMD96 are dual-function with the 21 and 23-inch configuration governed by orientation. Three mounting positions are available. Choose the mounting position that ensures the FMD96 is flush with the adjacent . The FMD96 is shipped with the mounting brackets installed in the 23-inch orientation and mounted in the mid position.

Step 1 To install the mounting brackets, choose one of the following options based on the frame requirements and the mounting position.

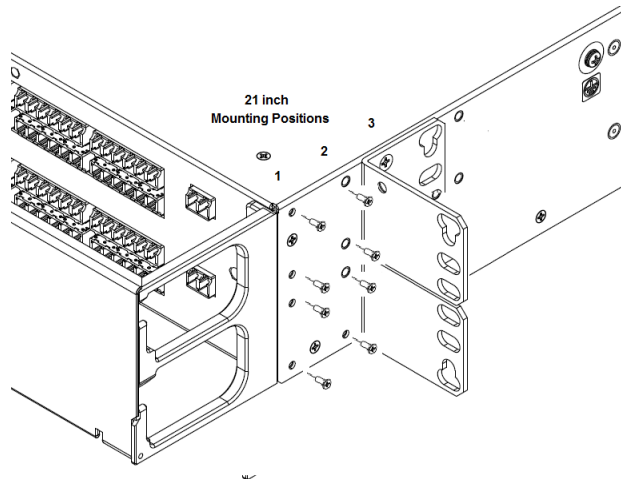
a) To install the 23-inch brackets:

Figure 5-16 23-inch bracket mounting positions

Choose the mounting positions which enable the module to be installed flush with the adjacent .

If required remove the mounting brackets and attach the brackets to the new mounting positions.

b) To install the 21-inch brackets:

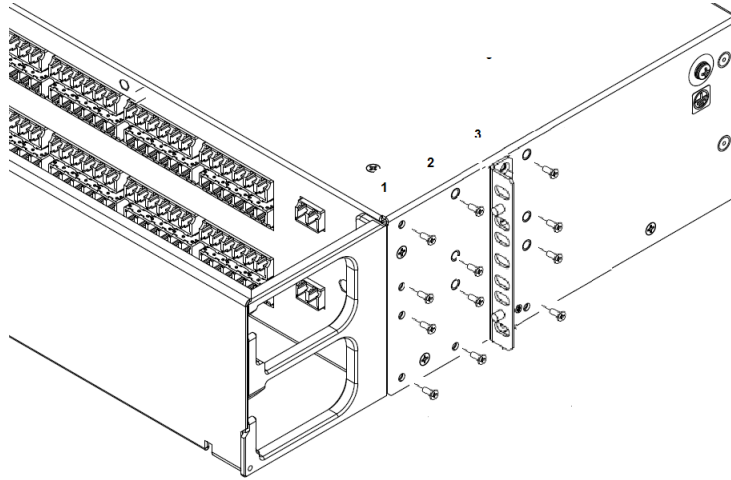
Figure 5-17 21-inch bracket mounting positions

Remove the screws from the 23-inch mounting brackets if installed. Choose the mounting position that enables the module to be installed flush with the adjacent .

Reuse the mounting bracket screws to fasten the 21-inch mounting bracket to the module.

- c) To install the 19-inch brackets:

Figure 5-18 19-inch bracket mounting positions



Remove the 23-inch mounting brackets if installed. Choose the mounting position that enables the module to be installed flush with the adjacent .

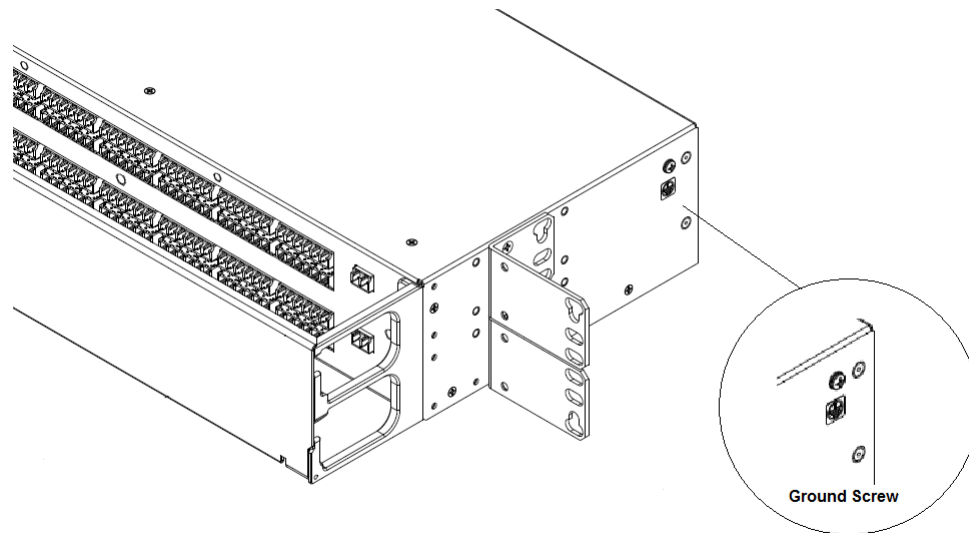
Reuse the mounting bracket screws to fasten the 19-inch mounting bracket to the module.

Step 2 Perform the following to mount the module on the frame or the rack.

- a) With one person at each side of the module, lift the module into position in the equipment frame.
- b) Align the mounting holes in the mounting bracket with the mounting holes in the equipment frame.
- c) Choose the set of mounting screws from the installation kit to mount the shelf into the equipment frame. Use one mounting screw and washer for each mounting bracket attachment. No locking nuts are required as the mounting screws fasten into the threaded screw inserts on the frame.

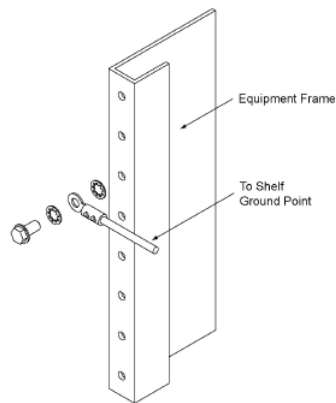
Step 3 Perform the following to ground the module.

- a) Attach the ground cable (not supplied) to the grounding lug supplied in the installation kit.



- b)** Loosen the grounding screw and attach the lug over the ground screw.
- c)** Secure the lug by fastening the ground screw.
- d)** Attach the other end of the ground cable to ground.

The other end is connected to the frame using a biting star lock washer between the lug and the frame, and between the lug and the screw head.



Step 4 Open the cover and connect fibers. The fibers should be routed between the front panel and the front cover to allow for the cover to be opened and closed.

Caution When the ports are optically connected, the module is capable of passing light from all client and line ports at all times. The client and line port connections must be limited to Class 1M (21.3 dBm) Laser Safety Regulations.

Step 5 Close the cover after connecting the fibers.

You have successfully completed this procedure.

5.8 Provisioning Optical Amplifier modules

Optical Amplifier modules may be provisioned before they are physically present in the shelf.

Autoprovisioning support on Optical Amplifier modules

Optical amplifier modules support autoprovisioning. For detailed information about autoprovisioning, see the *Operations Guide*.

When an Optical Amplifier module is inserted into an unprovisioned slot in a shelf, the module is autoprovisioned with its primary state set to the same value as the AUTOP parameter. The supported amplifier is autoprovisioned with its primary state set to the same value as the module, and all provisionable parameters are set to default values.

Provisioning settings and custom settings

When you provision an Optical Amplifier module, you specify settings such as its name and its Product Equipment Code, and provide brief ID information about the module. You can also provision custom information to record information specific to your environment. For example, you may want to record information about equipment usage, upgrades, and maintenance.

An Optical Amplifier module must be provisioned before the amplifier supported on the module can be provisioned. For information, see [5.9, “Provisioning amplifier settings”](#).

When a module is physically present in the shelf, the system checks to see if the module type matches the provisioned Optical Amplifier module type. If the inserted module type does not match the provisioned module type, an equipment mismatch alarm is raised. The alarm clears when the proper module type is inserted or when the provisioning data is updated to resolve the mismatch.

Displaying module information

Once an Optical Amplifier module is provisioned, you can view the settings specified when the module was provisioned, as well as inventory information, such as the module's hardware release number and date of manufacture.

Removing and restoring service

An Optical Amplifier module should be removed from service before it is deleted, so that alarms are not raised. A module that has been removed from service can be restored to service.

Restarting a module

Optical Amplifier modules support both cold and warm restarts. A warm restart lets you restart the software on the module. Although a warm restart is not service affecting, you cannot make configuration changes to the module while the warm restart is in process. A cold restart recycles the power on the module and is service affecting.

Deleting a module

If you want to change the type of Optical Amplifier module that is either preprovisioned or physically present in a shelf, you must first delete it.

This section covers the following topics:

- 5.8.1, “Provision an Optical Amplifier module”
- 5.8.2, “Display Optical Amplifier module information”
- 5.8.3, “Remove an Optical Amplifier module from service”
- 5.8.4, “Restore an Optical Amplifier module to service”
- 5.8.5, “Restart an Optical Amplifier module”
- 5.8.6, “Delete an Optical Amplifier module”

5.8.1 Provision an Optical Amplifier module

Use this procedure to provision an Optical Amplifier module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Shelf must be provisioned.
- Based on the calculations and choices made during the design of the optical link, the following criteria must be known:
 - type of amplifier to be provisioned
 - physical slot in the shelf that the amplifier is to be inserted

Provisioning module settings

Follow these steps to provision an Optical Amplifier module:

- Step 1** In the Navigation pane, right-click a slot, and then click **Provision Module**.
- Step 2** On the **Settings** tab of the **Provision Module** dialog, select an amplifier module in the **Name** list.
- The first available product equipment code (PEC) and, if available, the Common Language Equipment Identification (CLEI) code for the selected module type automatically appear in the **PEC/CLEI** list.
- Step 3** Select the PEC for the module type from the **PEC/CLEI** list.
- Step 4** Optionally, enter information (up to 20 alphanumeric characters) about the module in the **ID** field.
- Step 5** Choose one of the following from the **Initial State** list:

- **IS** — to set the state of the module to In Service
- **OOS** — to set the state of the module to Out of Service

Step 6 Click **Apply**.

Step 7 Optionally, click the **Custom Settings** tab, and then enter information in any of the **Custom** fields.

Step 8 Click **Apply**.

Step 9 Optionally, click **Provision Amplifier** to provision settings for the supported amplifier.

You have successfully completed this procedure.

5.8.2 Display Optical Amplifier module information

Use this procedure to view inventory information for an Optical Amplifier module.



Prerequisites

- Optical Amplifier module must be provisioned.

Displaying module information

Follow these steps to view inventory information for an Optical Amplifier module:

Step 1 In the toolbar, click the System Configuration icon. The System Configuration view displays.

Step 2 In the Navigation pane, right-click a module, and then click **Display Module Inventory**.
The **Display Inventory Information** dialog displays **General**, **Hardware**, **Manufacturing**, and **Testing** parameters for the Optical Amplifier module. See [Table 5-1](#).

Step 3 Click **Close**.

You have successfully completed this procedure.

Table 5-1 Module inventory information

Type	Parameter	Description
General	Full Name	Official name of the module
	Name	Short name of the module
	Shelf Number	The shelf in which the module is installed
	Slot Number	The slot in which the module is installed

Table 5-1 Module inventory information (Continued)

Type	Parameter	Description
Hardware	PEC Code	The product equipment code assigned by the manufacturer
	CLEI Code	The Common Language Equipment Identifier number assigned by Telcordia. The CLEI identifies the physical hardware.
	Release Number	The hardware release number
	Serial Number	The serial number of the module
Manufacturing	Manufacturing Date	The date that the module was manufactured
	Manufacturing Location	The location where the module was manufactured
Testing	Testing Date	The date that the manufacturer tested the module
	Testing Location	The location where the manufacturer tested the module

5.8.3 Remove an Optical Amplifier module from service

Use this procedure to remove an Optical Amplifier module from service.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Optical Amplifier module must be provisioned.

Removing a module from service

Follow these steps to remove an Optical Amplifier module from service:

Step 1 In the Navigation pane, right-click a module, and then click **Provision Module**.

Step 2 On the **Settings** tab of the **Provision Module** dialog, click the **Remove** button beside the **State** field.

Step 3 Click **Yes** in the confirmation dialog.

You have successfully completed this procedure.

5.8.4 Restore an Optical Amplifier module to service

Use this procedure to restore an Optical Amplifier module to service.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Optical Amplifier module must be removed from service.

Restore a module to service

Follow these steps to restore an Optical Amplifier module to service:

- Step 1** In the Navigation pane, right-click a module, and then click **Provision Module**.
- Step 2** On the **Settings** tab of the **Provision Module** dialog, click the **Restore** button beside the **State** field.
- Step 3** Click **Apply**.

You have successfully completed this procedure.

5.8.5 Restart an Optical Amplifier module

Use this procedure to restart an Optical Amplifier module.



Prerequisites

- Optical Amplifier module must be provisioned.

Restarting a module

Follow these steps to perform a cold or warm restart on an Optical Amplifier module:

- Step 1** In the Navigation pane, right-click a module, select **Restart Module**, and then click one of the following:
- **Warm Restart** — to restart the software on the module
 - **Cold Restart** — to cycle the power on the module

- Step 2** In the **Restart** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

Note A CONTCOM (Control Communications Failure with Circuit Pack) alarm is raised during a cold or warm restart of an Optical Amplifier module. For information about this alarm, see the *Alarm and Troubleshooting Guide*.

5.8.6 Delete an Optical Amplifier module

Use this procedure to delete an Optical Amplifier module.



Prerequisites

- The Optical Amplifier module must be removed from service.

Deleting a module

Follow these steps to delete an Optical Amplifier module:

Step 1 In the Navigation pane, right-click a module, and then click **Delete Module**.

Step 2 In the **Delete Module** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

5.9 Provisioning amplifier settings

Provisioning settings and custom settings

When you provision amplifier settings, you specify whether the amplifier will operate in Constant Gain or Constant Power mode, and then specify related settings such as Target Signal Gain or Target Output Power, and Tilt Compensation. You can also provision custom information to record information specific to your environment. For example, you may want to record the type of fiber connected to the amplifier and the ITU-T grid number.

Alarm threshold settings

Amplifiers are preconfigured with default minimum and maximum threshold values for system-level alarms (for example, Optical Power Received, Optical Power Transmitted, and Laser Temperature). You can provision threshold settings for any system-level alarm to a value within the default range.

Displaying amplifier information

Once amplifier settings are provisioned, you can view the settings specified when the amplifier was provisioned, as well as non-provisionable parameters, such as the amplifier's operational status and the laser status.

Removing and restoring service

An amplifier should be removed from service before it is deleted or its settings changed. An amplifier that has been removed from service can be restored to service.

Deleting an amplifier

When you no longer need an amplifier, you can delete it.

This section covers the following topics:

- [5.9.1, “Provision amplifier settings”](#)
- [5.9.2, “Modify amplifier settings”](#)
- [5.9.3, “Display amplifier information”](#)
- [5.9.4, “Remove an amplifier from service”](#)
- [5.9.5, “Restore an amplifier to service”](#)
- [5.9.6, “Delete an amplifier”](#)

5.9.1 Provision amplifier settings

Use this procedure to provision settings for an amplifier supported on an Optical Amplifier module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Optical Amplifier module must be provisioned.

Provisioning amplifier settings

Follow these steps to provision settings for an amplifier:

- Step 1** In the Navigation pane, right-click an amplifier on an Optical Amplifier module, and then click **Provision Amplifier**.
- Step 2** On the **Amplifier** tab of the **Provision Amplifier** dialog, specify values for the amplifier parameters. For information, see [5.9.1.1, “Amplifier settings, timers, and state management parameters”](#).
- Step 3** Click **Apply**.
- Step 4** Optionally, click the **Alarm Thresholds** tab, and specify values for any alarm threshold. For information, see [5.9.1.2, “Amplifier alarm thresholds”](#).
- Step 5** Click **Apply**.

You have successfully completed this procedure.

5.9.1.1 Amplifier settings, timers, and state management parameters

The following table provides information about provisionable and non-provisionable parameters for Optical Amplifier modules.

Table 5-2 Amplifier provisionable parameters

Parameter	Range	Description
Provisioned Mode	Constant Gain	The output power varies directly with the input power, providing a constant amount of gain. This is the default mode and the recommended setting.
	Constant Power	The output power is fixed (i.e., user specified) regardless of the level of input power. This setting should be used for single channel applications only.
Target Signal Gain	OBA: 10.0 dB	Note This parameter is used when Provisioned Mode = Constant Gain.
	OLA: 16.0 to 26.0 dB	
	OLAM: 19.0 to 29.0 dB	
	OPA: 24.0 dB	
	SPA: 27.0 dB	
	SBA: 18.0 dB	
	LGA: 5.0 to 16.0 dB (default 5.0)	
	MGA: 16.0 to 26.0 dB (default 16.0)	
	MGM: 19.0 to 29.0 dB (default 19.0)	

Table 5-2 Amplifier provisionable parameters (Continued)

Parameter	Range	Description
Target Output Power	OBA: -5 to 18 dBm	The power of the transmitted signal Note This parameter is used when Provisioned Mode = Constant Power.
	OLA: -7 to 16 dBm	
	OLAM: -5 to 18 dBm	
	OPA: -8 to 8 dBm	
	SPA: -8 to 5 dBm	
	SBA: 3 to 19 dBm	
	LGA: -5 to 20 dBm (default -5)	
	MGA: -7 to 16 dBm (default -7)	
	MGM: -7 to 18 dBm (default -7)	
Channel	SPA, SPB: 1530.33nm to 1561.42nm (40 channels ITU Grid)	The wavelength to be amplified by the SPA or SBA
Tilt Compensation	OLAM: -3.0 to 3.0 dB	The value by which to compensate for the tilt introduced by the external device or fiber in the output power profile. The default setting is 0 dB.
	LGA: -3.0 to 3.0 dB	
	MGA: -3.0 to 3.0 dB	
	MGM: -3.0 to 3.0 dB	
Auto-In Service Timer	00-00 to 96-00	The automatic in-service timer for the amplifier in the format HH-MM. The default is 08-00.
Initial State	IS	The initial state of the amplifier. Note The amplifier defaults to the initial state of the module.
	OOS	
	AINS	
ID 1, ID 2	Up to 32 alphanumeric characters per field	Identifier information about the amplifier
Fiber Type	DSF	The fiber type that connects to the amplifier
	NDSF	
	NZDSF	
Custom 1, Custom 2, Custom 3	Up to 255 alphanumeric characters per field	Custom fields for operating company information.
Remote ID	Up to 255 alphanumeric characters per field	Identifier of the remote device connected to the local port. See the <i>proNX Service Manager User Guide</i> for more details.
Grid	LGA, MGA, MGM, OBA, OPA:	ITU-T wavelength grid number
	20nm	
	50GHz	
	100GHz	
	200GHz	
Number of channels	OBA, OPA: 0 to 40	The number of DWDM channels carried by the amplifier.
	LGA, MGA, MGM: 0 to 96	

Table 5-3 Amplifier read-only parameters

Parameter	Range	Description
Gain Room ¹ (refresh)	Not applicable	The supported gain range. Depending on the input power level, this may be different from the stated gain range for this amplifier. Note Applies to LGA, MGA, MGM only.
Tilt Compensation Room ² (calculate/refresh)	Not applicable	The usable range for tilt compensation is dependent on the VOA setting of the amplifier. The VOA cannot fall below 0. The calculator takes into account the VOA setting to quickly show the usable range for the amplifier. This range may be different from the stated tilt compensation range for this amplifier.
Monitor Port Loss	Not applicable	The loss through the monitor port. This tap loss can be used to calibrate external instruments connected to the monitor port. Note Applies to LGA, MGA, MGM only.
Active Auto-In Service Timer	Hours-Minutes	The time left on the AINS timer in the format HH-MM.
State	IS OOS	The operational state of the amplifier.
Amplifier Mode	Constant Output Constant Gain Eye Safe Shutdown None	Indicates the operational status of the amplifier. Note When the amplifier is removed from service, the laser turns off automatically.
Laser Status	On Off	Indicates whether the laser is on or off

¹This is the range from the Gain Margin Minimum (gainmarmin) value to the Gain Margin Maximum (gainmarmax) value as seen from the CLI (TL1).

²This is the range from the Tilt Margin Minimum (tiltmarmin) value to the Tilt Margin Maximum (tiltmarmax) value as seen from the CLI (TL1).

Important For information about Eye Safe mode, see [2.3, “Optical Backreflection Safety: principle of operation”](#) and [2.4, “Querying the backreflection photo-detector”](#).

5.9.1.2 Amplifier alarm thresholds

The following table provides information about amplifier alarm thresholds.

Table 5-4 Amplifier alarm thresholds

Alarm	Description	Range	Default
Case Temperature High Alarm Threshold (CTEMP-HT)	OBA, OPA, OLA, OLAM, SBA, SPA:	45°C to 75°C	60°C

Table 5-4 Amplifier alarm thresholds (Continued)

Alarm	Description	Range	Default
	Raised when the temperature of the optical amplifier module exceeds the alarm threshold		
Case Temperature High Shutdown Threshold (CTEMP-HTS)	OBA, OPA, OLA, OLAM, SBA, SPA: Raised when the high temperature shutdown threshold for the optical amplifier module has been crossed	75°C	75°C
Optical Power Received Low Threshold (OPR-LT)	Raised when the input signal to the optical amplifier crosses below the lower threshold	OPA: -38 to -10 dBm OBA: -18 to 10 dBm OLA: -31 to -5 dBm OLAM: -31 to -5 dBm SBA: -18 to 9 dBm SPA: -38 to -10 dBm LGA: -26 to 7 dBm MGA: -38 to -3 dBm MGM: -42 to -4 dBm	-36 -16 -29 -29 -16 -36 -21 -33 -36
Optical Power Received High Threshold (OPR-HT)	Raised when the input signal to the optical amplifier crosses above the upper threshold	OPA: -35 to 0 dBm OBA: -15 to 11 dBm OLA: -28 to 1 dBm OLAM: -28 to -4 dBm SBA: -15 to 10 dBm SPA: -35 to -9 dBm LGA: -18 to 10 dBm MGA: -30 to 0 dBm MGM: -33 to -1 dBm	0 11 -4 -4 10 -9 10 0 -1
Optical Power Transmitted Low Threshold (OPT-LT)	Raised when the output signal from the optical amplifier crosses below the lower threshold	OPA: -11 to 10 dBm OBA: -8 to 20 dBm OLA: -10 to 16 dBm OLAM: -8 to 18 dBm SBA: 0 to 18 dBm SPA: -11 to 7 dBm LGA: -5 to 17 dBm MGA: -7 to 13 dBm MGM: -7 to 15 dBm	-9 -6 -8 -6 2 -9 -5 -7 -7
Optical Power Transmitted High Threshold (OPT-HT)	Raised when the output signal from the optical amplifier crosses above the higher threshold	OPA: 8 to 11 dBm OBA: -5 to 21 dBm OLA: -7 to 17 dBm OLAM: -5 to 19 dBm SBA: 3 to 19 dBm	11 21 17 19 19

Table 5-4 Amplifier alarm thresholds (Continued)

Alarm	Description	Range	Default
		SPA: -8 to 8 dBm	8
		LGA: -2 to 20 dBm	20
		MGA: -4 to 16 dBm	16
		MGM: -4 to 18 dBm	18
Optical Back Reflection High Shutdown Threshold	Raised when the optical power reflected back along the fiber from one or more reflective events exceeds the alarm threshold	OBA, OPA, OLA, OLAM, SBA, SPA: -4 dBm	-4 dBm
		LGA, MGA, MGM: -18 dBm	-18 dBm
Laser Temperature Low Shutdown Threshold	OBA, OPA, OLA, OLAM, SBA, SPA: Raised when the temperature of the pump laser is below the alarm threshold	16°C	16°C
Laser Temperature High Shutdown Threshold	OBA, OPA, OLA, OLAM, SBA, SPA: Raised when the temperature of the pump laser is above the alarm threshold	34°C	34°C
Mid-Stage Loss High Threshold (MSLOSS-HT)	OLAM, MGM: Raised when a mid-stage insertion loss high threshold is exceeded in a mid-stage amplifier	OLAM: 5 to 15	15
		MGM: 5 to 18	16
Second-Stage Input Optical Power Received High Threshold (SSIOPR-HT)	OLAM, MGM: Raised when a second stage input optical power received (OPR) high threshold has been crossed	OLAM: -16 to 7	5.5
		MGM: -27 to 20	20
Second-Stage Input Optical Power Received Low Threshold (SSIOPR-LT)	MGM: Raised when a second stage input optical power received (OPR) low threshold has been crossed	-30 to 17	-30
First-Stage Output Optical Power Transmitted High Threshold (FSOOPT-HT)	MGM: Raised when a first stage output optical power transmitted (OPT) high threshold has been crossed	-7 to 20	20
First-Stage Output Optical Power Transmitted Low Threshold (FSOOPT-LT)	MGM: Raised when a first stage output optical power transmitted (OPT) low threshold has been crossed	-25 to 15	-23
High Temperature Alarm Threshold (TEMPHT)	LGA, MGA, MGM: Raised when the temperature of the module is above the alarm threshold.	70°C	70°C
High Temperature Shutdown Threshold (TEMPHTS)	LGA, MGA, MGM: Raised when the temperature of the module is above the shutdown threshold.	80°C	80°C

5.9.2 Modify amplifier settings

Use this procedure to modify provisioned settings for an amplifier.



Prerequisites

- Amplifier must be removed from service.

Modifying amplifier settings

Follow these steps to modify provisioned settings for an amplifier:

- Step 1** In the Navigation pane, right-click an amplifier on an Optical Amplifier module, and then click **Provision Amplifier**.
- Step 2** On the **Amplifier** tab of the **Provision Amplifier** dialog, modify values for the parameters. For information, see [5.9.1.1, “Amplifier settings, timers, and state management parameters”](#).
- Step 3** Click **Apply**.
- Step 4** Optionally, click the **Alarm Thresholds** tab, and then modify the value for any alarm threshold. For information, see [5.9.1.2, “Amplifier alarm thresholds”](#).
- Step 5** Click **Apply**.

You have successfully completed this procedure.

5.9.3 Display amplifier information

Use this procedure to display information for an amplifier on an Optical Amplifier module.



Prerequisites

- Amplifier settings must be provisioned.

Displaying amplifier information

Follow these steps to display information for an amplifier:

- Step 1** In the Navigation pane, right-click an amplifier on an Optical Amplifier module, and then click **Provision Amplifier**.
- Step 2** In the **Provision Amplifier** dialog, click the **Amplifier**, **Custom Info**, or **Alarm Thresholds** tab to view amplifier information. For more information, see the following:
- [5.9.1.1, “Amplifier settings, timers, and state management parameters”](#)

- 5.9.1.2, “Amplifier alarm thresholds”

Step 3 Click **Close**.

You have successfully completed this procedure.

5.9.4 Remove an amplifier from service

Use this procedure to remove an amplifier from service on an Optical Amplifier module.



Prerequisites

- Amplifier settings must be provisioned.

Removing an amplifier from service

Follow these steps to remove an amplifier from service:

Step 1 In the Navigation pane, right-click an amplifier on an Optical Amplifier module, and then click **Provision Amplifier**.

Step 2 On the **Amplifier** tab of the **Provision Amplifier** dialog, click the **Remove** button beside the **State** field.

Step 3 Click **Yes** in the confirmation dialog.

You have successfully completed this procedure.

5.9.5 Restore an amplifier to service

Use this procedure to restore an amplifier to service on an Optical Amplifier module..



Prerequisites

- Amplifier must be out of service.

Restore an amplifier to service

Follow these steps to restore an amplifier to service:

Step 1 In the Navigation pane, right-click an amplifier on an Optical Amplifier module, and then click **Provision Amplifier**.

Step 2 On the **Amplifier** tab of the **Provision Amplifier** dialog, click the **Restore** button beside the **State** field.

Step 3 Click **Close**.

You have successfully completed this procedure.

5.9.6 Delete an amplifier

Use this procedure to delete an amplifier on a Optical Amplifier module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Amplifier must be removed from service.

Deleting an amplifier

Follow these steps to delete an amplifier:

Step 1 In the Navigation pane, right-click an amplifier on an Optical Amplifier module, and then click **Delete Amplifier**.

Step 2 In the **Delete Amplifier** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

5.10 Provisioning Dispersion Compensation modules

Dispersion Compensation modules may be provisioned before they are physically present in the shelf.

Provisioning settings and custom settings

When you provision a Dispersion Compensation module, you specify settings such as its name and its Product Equipment Code, and provide brief ID information about the module. You can also provision custom information to record information specific to your environment. For example, you may want to record information about equipment usage, upgrades, and maintenance.

A Dispersion Compensation module must be provisioned before the port settings on the module can be edited. For information, see [5.13.1, “Edit Dispersion Compensation module port settings”](#).

When a module is physically present in the shelf, the system checks to see if the module type matches the provisioned Dispersion Compensation module type. If the inserted module type does not match the provisioned module type, an equipment mismatch alarm is raised. The alarm clears when the proper module type is inserted or when the provisioning data is updated to resolve the mismatch.

Displaying module information

Once a Dispersion Compensation module is provisioned, you can view the settings specified when the module was provisioned, as well as inventory information, such as the module's hardware release number and date of manufacture.

Removing and restoring service

A Dispersion Compensation module should be removed from service before it is deleted. A module that has been removed from service can be restored to service.

Deleting a module

If you want to change the type of Dispersion Compensation module that is either preprovisioned or physically present in a shelf, you must first delete it.

This section covers the following topics:

- [5.10.1, “Provision a Dispersion Compensation module”](#)
- [5.10.2, “Display Dispersion Compensation module information”](#)
- [5.10.3, “Remove a Dispersion Compensation module from service”](#)
- [5.10.4, “Restore a Dispersion Compensation module to service”](#)
- [5.10.5, “Delete a Dispersion Compensation module”](#)

5.10.1 Provision a Dispersion Compensation module

Use this procedure to provision settings for a Dispersion Compensation module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Shelf must be provisioned.

Provisioning module settings

Follow these steps to provision settings on a Dispersion Compensation module:

- Step 1** In the Navigation pane, right-click a slot, and then click **Provision Module**.
- Step 2** On the **Settings** tab of the **Provision Module** dialog, choose a module in the **Name** list.
The first available product equipment code (PEC) and, if available, the Common Language Equipment Identification (CLEI) code for the selected module type automatically appear in the **PEC/CLEI** list.
- Step 3** Select the PEC for the module type from the **PEC/CLEI** list.
- Step 4** Optionally, enter information (up to 20 alphanumeric characters) about the module in the **ID** field.
- Step 5** Choose one of the following from the **Initial State** list:
- **IS** — to set the state of the module to In Service
 - **OOS** — to set the state of the module to Out of Service
- Step 6** Click **Apply**.
- Step 7** Optionally, click the **Custom Settings** tab, and then enter information in any of the **Custom** fields.
- Step 8** Click **Close**.

You have successfully completed this procedure.

5.10.2 Display Dispersion Compensation module information

Use this procedure to display inventory information for a Dispersion Compensation module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Dispersion Compensation module must be provisioned.

Displaying module information

Follow these steps to display inventory information for a Dispersion Compensation module:

Step 1 In the Navigation pane, right-click a module, and then click **Display Module Inventory**.

The **Display Inventory Information** dialog displays **General**, **Hardware**, **Manufacturing**, and **Testing** parameters for the Dispersion Compensation module. See [Table 5-5](#).

Step 2 Click **Close**.

You have successfully completed this procedure.

Table 5-5 Module inventory information

Type	Parameter	Description
General	Full Name	Official name of the module
	Name	Short name of the module
	Shelf Number	The shelf in which the module is installed
	Slot Number	The slot in which the module is installed
Hardware	PEC Code	The product equipment code assigned by the manufacturer
	CLEI Code	The Common Language Equipment Identifier number assigned by Telcordia. The CLEI identifies the physical hardware.
	Release Number	The hardware release number
	Serial Number	The serial number of the module
Manufacturing	Manufacturing Date	The date that the module was manufactured
	Manufacturing Location	The location where the module was manufactured
Testing	Testing Date	The date that the manufacturer tested the module
	Testing Location	The location where the manufacturer tested the module

5.10.3 Remove a Dispersion Compensation module from service

Use this procedure to remove a Dispersion Compensation module from service.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Dispersion Compensation module must be in service.

Removing a module from service

Follow these steps to remove a Dispersion Compensation module from service:

Step 1 In the Navigation pane, right-click a module, and then click **Provision Module**.

Step 2 On the **Settings** tab of the **Provision Module** dialog, click the Remove button beside the **State** field.

Step 3 Click **Close**.

You have successfully completed this procedure.

5.10.4 Restore a Dispersion Compensation module to service

Use this procedure to restore a Dispersion Compensation module to service.



Prerequisites

- Dispersion Compensation module must be removed from service.

Restore a module to service

Follow these steps to restore a Dispersion Compensation module to service:

Step 1 In the Navigation pane, right-click a module, and then click **Provision Module**.

Step 2 On the **Settings** tab of the **Provision Module** dialog, click the **Restore** button beside the **State** field.

Step 3 Click **Close**.

You have successfully completed this procedure.

5.10.5 Delete a Dispersion Compensation module

Use this procedure to delete a Dispersion Compensation module.



Prerequisites

- Dispersion Compensation module must be removed from service.

Deleting a module

Follow these steps to delete a Dispersion Compensation module:

Step 1 In the Navigation pane, right-click a module, and then click **Delete Module**.

Step 2 In the **Delete Module** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

5.11 DOL hardware provisioning tasks

This section describes the following provisioning tasks:

- 5.11.1, “Provisioning a ROADM Terminal”
- 5.11.2, “Provisioning a line amplifier node”
- 5.11.3, “Provisioning a ROADM node”
- 5.11.4, “Provisioning a line equalizing node”
- 5.11.5, “Provisioning an amplifier terminal”
- 5.11.6, “Adding the 40-channel or 96-channel Mux/Demux”
- 5.11.7, “Re-provisioning a ROADM terminal to a ROADM node”
- 5.11.8, “Re-provisioning a ROADM node to a ROADM terminal”
- 5.11.9, “Re-provisioning a Line Equalizing node to a ROADM node”
- 5.11.10, “Re-provisioning a ROADM node to a Line Equalizing node ”

5.11.1 Provisioning a ROADM Terminal

Use this procedure to provision settings for a ROADM Terminal.



Prerequisites

- Equipment must be provisioned prior to beginning this procedure. For detailed information about equipment and configuration requirements, refer to "Provisioning the DOL hardware" in the *BTI 7000 Series Dynamic Optical Layer Engineering Guideline*.

Provision a ROADM terminal

Follow these steps to provision settings for a ROADM terminal:

Step 1 In the toolbar, click the Optical Layer button.



Step 2 In the Navigation pane, right-click **Optical Groups** and choose **Create New Group**.

Step 3 On the **Group Info** tab of the **Create New Group** dialog, type a unique Group ID.

Step 4 From the **Group Type** drop-down menu, choose **ROADM Terminal**. Click **OK**.

Step 5 In the Navigation pane expand **Optical Groups**. Right-click the new group and click **Assign Equipment**.

Step 6 From the **Add Equipment** dialog, assign the ROB module to this group. Choose the degree from the **Degree Id** pull-down menu.

Step 7 Click **OK**.

The new equipment is listed, by degree, in the Navigation pane. For information about activating services, refer to [5.12, “Activating optical services using proNX 900”](#).

You have successfully completed this procedure.

5.11.2 Provisioning a line amplifier node

Use this procedure to provision settings for a line amplifier node.



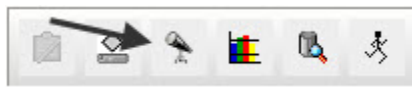
Prerequisites

- Equipment must be provisioned prior to beginning this procedure. For detailed information about equipment and configuration requirements, refer to "Provisioning the DOL hardware" in the *BTI 7000 Series Dynamic Optical Layer Engineering Guideline*.

Provision line amplifier nodes

Follow these steps to provision settings for a line amplifier node:

Step 1 In the toolbar, click the Optical Layer button.



Step 2 In the Navigation pane, right-click **Optical Groups** and choose **Create New Group**.

Step 3 From **Group Info**, type a unique Group ID.

Step 4 From the **Group Type** drop-down menu, choose **Line Amplifier Node**. Click **OK**.

Step 5 In the Navigation pane expand **Optical Groups**. Right-click the new group and click **Assign Equipment**.

Step 6 From the **Add Equipment** dialog, assign the equipment to the **Line Amplifier Node** Group. Choose a degree from the **Degree Id** pull-down menu.

Step 7 Click **OK**.

The new equipment is listed in the Navigation pane. For information about activating services, refer to [5.12, “Activating optical services using proNX 900”](#).

You have successfully completed this procedure.

5.11.3 Provisioning a ROADM node

Use this procedure to provision settings for a ROADM node.



Prerequisites

- Equipment must be provisioned prior to beginning this procedure. For detailed information about equipment and configuration requirements, refer to "Provisioning the DOL hardware" in the *BTI 7000 Series Dynamic Optical Layer Engineering Guideline*.

Provision ROADM nodes

Follow these steps to provision settings for a ROADM node:

Step 1 In the toolbar, click the Optical Layer button.



Step 2 In the Navigation pane, right-click **Optical Groups** and choose **Create New Group**.

Step 3 On the **Group Info** tab of the **Create New Group** dialog, type a unique Group ID.

Step 4 From the **Group Type** drop-down menu, choose **ROADM Node**. Click **OK**.

Step 5 In the Navigation pane expand **Optical Groups**. Right-click the new group and click **Assign Equipment**.

Step 6 From the **Add Equipment** dialog, assign the equipment to this group. Choose a degree from the **Degree Id** pull-down menu.

Step 7 Click **OK**.

The new equipment is listed in the Navigation Tree. For information about activating services, refer to [5.12, "Activating optical services using proNX 900"](#)

You have successfully completed this procedure.

5.11.4 Provisioning a line equalizing node

Use this procedure to provision settings for a line equalizing node.



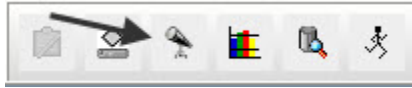
Prerequisites

- Equipment must be provisioned prior to beginning this procedure. For detailed information about equipment and configuration requirements, refer to "Provisioning the DOL hardware" in the *BTI 7000 Series Dynamic Optical Layer Engineering Guideline*.

Provision line equalizing nodes

Follow these steps to provision settings for a line equalizing node:

Step 1 In the toolbar, click the Optical Layer button.



Step 2 In the Navigation pane, right-click **Optical Groups** and choose **Create New Group**.

Step 3 On the **Group Info** tab of the **Create New Group** dialog, type a unique Group ID.

Step 4 From the **Group Type** drop-down menu, choose **Line Equalizing Node**. Click **OK**.

Step 5 In the Navigation pane expand **Optical Groups**. Right-click the new group and click **Assign Equipment**.

Step 6 From the **Add Equipment** dialog, assign the equipment to this group. Choose a degree from the **Degree Id** drop-down menu.

Step 7 Click **OK**.

The new equipment is listed in the Navigation pane. For information about activating services, see [5.12, “Activating optical services using proNX 900”](#)

You have successfully completed this procedure.

5.11.5 Provisioning an amplifier terminal

Use this procedure to provision settings for an amplifier terminal.



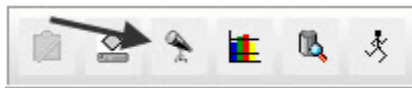
Prerequisites

- Equipment must be provisioned prior to beginning this procedure. For detailed information about equipment and configuration requirements, refer to "Provisioning the DOL hardware" in the *BTI 7000 Series Dynamic Optical Layer Engineering Guideline*.

Provisioning amplifier terminals

Follow these steps to provision settings for an amplifier terminal:

Step 1 In the toolbar, click the Optical Layer button.



Step 2 In the Navigation pane, right-click **Optical Groups** and choose **Create New Group**.

- Step 3** On the **Group Info** tab of the **Create New Group** dialog, type a unique Group ID.
- Step 4** From the **Group Type** drop-down menu, choose **Amplifier Terminal**. Click **OK**.
- Step 5** In the Navigation pane expand **Optical Groups**. Right-click the new group and click **Assign Equipment**.
- Step 6** From the **Add Equipment** dialog, assign the equipment to this group. Choose a degree from the **Degree Id** pull-down menu.
- Step 7** Click **OK**.

The new equipment is listed in the Navigation pane. For information about activating services, see [5.12, “Activating optical services using proNX 900”](#)

You have successfully completed this procedure.

5.11.6 Adding the 40-channel or 96-channel Mux/Demux

Use this procedure to add the 40-channel or 96-channel Mux/Demux.



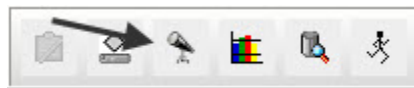
Prerequisites

- Equipment must be provisioned prior to beginning this procedure.

Provisioning amplifier settings

Follow these steps to provision settings for an amplifier terminal:

- Step 1** In the toolbar, click the Optical Layer button.



- Step 2** In the Navigation pane, right-click **Optical Groups** and choose **View Mux/Demux**.
- Step 3** From the **Mux/Demux Equipment** dialog, click **Add Mux/Demux**.
- Step 4** From the **Provision Mux/Demux** dialog, add the slot number and choose a **PEC Code** from the drop-down menu . Click **OK** .
- Step 5** Repeat Steps 3 and 4 until all Mux/Demux units are added.
- Step 6** Click **OK**.

You have successfully completed this procedure.

5.11.7 Re-provisioning a ROADM terminal to a ROADM node

Use this procedure to provision BTI ROADM-on-a-blade (ROB) modules when you change the nodal configuration from a ROADM terminal to a ROADM node.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- These steps assume you are using the proNX 900 Node Controller to perform provisioning tasks.
- The ROADM Terminal is provisioned with DOL hardware assigned to Degree 1 in the Group.
- A ROADM node configuration requires two ROB modules. You should have, on hand, a ROB module that is ready to be installed.
- You should be familiar with installing ROB modules. Refer to the section "Installing ROADM-on-a-blade modules," in this guide.

Note Existing traffic on provisioned channels is not affected by this procedure. However, if a C2 port is provisioned on the ROB module, the port must first be deleted before continuing.

Re-provision a ROADM terminal

Follow these steps to change a ROADM terminal configuration to a ROADM node configuration:

Step 1 Install a ROB module.

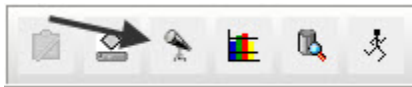
Refer to the section "Installing ROADM-on-a-blade modules," in this guide.

Step 2 Attach the ROB fibers:

- a) Line fibers to the appropriate downstream card.
- b) C1 fibers to the appropriate Mux/Demux.
- c) C2 fibers to the ROB module in Degree 1.
- d) If applicable, DCM fibers to the appropriate DCM module, otherwise, loopback the DCM fibers.

Step 3 Open a proNX 900 session.

In the toolbar, click the Optical Layer icon.



Step 4 Navigate to the ROADM Terminal group that includes the ROB module you are re-provisioning.

Expand the group navigational tree and locate the module.

Step 5 Verify that the administrative state of the ROB is Auto-in-service (AINS) or In-Service (IS).

Right-click on the ROB module and select **View OSC Info**. Click the **General** tab to view the administrative status.

Step 6 Edit the ROADM Terminal group to change the settings to a ROADM node.

- a) Navigate to the group name and right-click. Select **Edit Group** to open the **Provision Group** dialog.
- b) Change the **Group Type** to ROADM Node. Click **Update**.
- c) Click **Add** to open the **Add Equipment** dialogue. From the **Equipment Id** drop-down menu, choose the ROB module that you installed for the ROADM node.
- d) From the **Degree Id** drop-down menu, choose 2. Click **OK**. You are brought back to the **Provision Group** dialog.
- e) Click **Add**. From the **Equipment Id** drop-down menu, choose the appropriate Mux/Demux module for Degree 2. Click **OK**.
- f) From the **Degree Id** drop-down menu, choose 2. Click **OK**. You are brought back to the **Provision Group** dialog.
- g) Optional. If you are adding DCMs, follow the steps, above, for adding equipment to the group.

Step 7 When you complete adding equipment, from the **Provision Group** dialog click **OK**, to close the dialog and complete editing the group.

Step 8 If required, provision ODCC, including OSPF interfaces, or GCC to communicate with downstream network elements (NEs). Refer to the *BTI 7000 Series Management Communication Channels Solution Guide*.

Step 9 Provision the cross-connects on Degree 2 and downstream NEs, as required. Refer to the chapter "Activating services using the proNX 900 Node Controller," in this guide.

Step 10 Verify that the administrative state of the Mux/Demux modules are Auto-in-service (AINS) or In-Service (IS).

Right-click on the ROB module and select **View WDM Info**. Click the **Admin** tab to view the administrative status.

Step 11 Check the traffic integrity.

You have successfully completed this procedure.

5.11.8 Re-provisioning a ROADM node to a ROADM terminal

Use this procedure to provision BTI 2D ROADM-on-a-blade (ROB2) modules when you change the nodal configuration from a ROADM node to a ROADM terminal.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

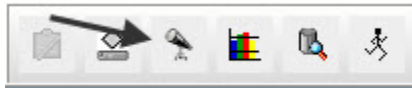
- These steps assume you are using the proNX 900 Node Controller to perform provisioning tasks.
- The ROADM Terminal is provisioned with DOL hardware assigned to Degrees 1 and 2 in the group.

Re-provision a ROADM node

Follow these steps to change a ROADM node configuration to a ROADM terminal configuration:

Step 1 Open a proNX 900 session.

In the toolbar, click the Optical Layer icon.



Step 2 Delete the cross-connects.

- a) Navigate to the ROADM node group that you are re-provisioning. Right-click on the group and select **Provision Cross Connects**, to open the **Optical Cross Connects** dialog.
- b) Right-click in the row of a cross-connect and select **Delete**. Click **OK**.
- c) Repeat this step for each cross-connect in the group.

Step 3 Edit the ROADM Node group to change the settings to a ROADM Terminal.

- a) Navigate to the group name and right-click. Select **Edit Group** to open the **Provision Group** dialog.
- b) From the **Equipment** tab, right-click in the row of a Degree 2 module. Select **Remove from Group** and click **OK**.
- c) Repeat the same procedure for the Degree 2 Mux/Demux module in the group.
- d) If applicable, repeat the same procedure for associated Degree 2 DCMs.

Step 4 Change the **Group Type** to ROADM Terminal. Click **Update**.

Step 5 Click **OK** to close the **Provision Group** dialog.

Step 6 Check the traffic integrity.

Step 7 If required, remove ODCC, including OSPF interfaces, or GCC to communicate with downstream network elements (NEs). Refer to the *BTI 7000 Series Management Communication Channels Solution Guide*.

You have successfully completed this procedure.

5.11.9 Re-provisioning a Line Equalizing node to a ROADM node

Use this procedure to provision BTI ROADM-on-a-blade (ROB) modules when you change the nodal configuration from a Line Equalizing node to a ROADM node.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- These steps assume you are using the proNX 900 Node Controller to perform provisioning tasks.
- The Line Equalizing node is provisioned with DOL hardware assigned to Degrees 1 and 2 in the Group.

Note Existing traffic on provisioned channels is not affected by this procedure.

Re-provision a Line Equalizing node

Follow these steps to change a Line Equalizing node configuration to a ROADM node configuration:

Step 1 Attach the C1 fibers to the appropriate Mux/Demux.

Step 2 Open a proNX 900 session.

In the toolbar, click the Optical Layer icon.



Step 3 Navigate to the Line Equalizing group that includes the ROB module you are re-provisioning.

Expand the group navigational tree and locate the module.

Step 4 Edit the Line Equalizing group to change the settings to a ROADM node.

- Navigate to the group name and right-click. Select **Edit Group** to open the **Provision Group** dialog.
- Change the **Group Type** to ROADM Node. Click **Update**. Click **Add** to open the **Add Equipment** dialog.
- From the **Equipment Id** drop-down menu, choose the appropriate Mux/Demux module for Degree 1.
- From the **Degree Id** drop-down menu, choose 1. Click **OK**. You are brought back to the **Provision Group** dialog.
- Click **Add**. Repeat sub-steps c. and d. to choose the appropriate Mux/Demux module for Degree 2. Click **OK**.

- Step 5** When you complete adding equipment, from the **Provision Group** dialog click **OK**, to close the dialog and complete editing the group.
- Step 6** Provision the cross-connects on Degrees 1 and 2, and downstream NEs, as required. Refer to the chapter "Activating services using the proNX 900 Node Controller," in this guide.
- Step 7** Check the traffic integrity.

You have successfully completed this procedure.

5.11.10 Re-provisioning a ROADM node to a Line Equalizing node

Use this procedure to provision BTI ROADM-on-a-blade (ROB) modules when you change the nodal configuration from a ROADM node to a Line Equalizing node.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- These steps assume you are using the proNX 900 Node Controller to perform provisioning tasks.
- The ROADM Node is provisioned with DOL hardware assigned to Degrees 1 and 2 in the Group.

Note Existing ROADM Node traffic on Add/Drop provisioned channels is affected by this procedure.

Re-provision a ROADM node

Follow these steps to change a ROADM node configuration to a node configuration:

- Step 1** De-provision the add/drop cross-connects on Degrees 1 and 2, and downstream NEs, as required. Refer to the chapter "Activating services using the proNX 900 Node Controller," in this guide.

- Step 2** Open a proNX 900 session.

In the toolbar, click the Optical Layer icon.



- Step 3** Navigate to the ROADM node group that includes the ROB module you are re-provisioning.

Expand the group navigational tree and locate the module.

- Step 4** Edit the ROADM node group to change the settings to a Line Equalizing node.

- a) Navigate to the group name and right-click. Select **Edit Group** to open the **Provision Group** dialog.
- b) Remove the appropriate Mux/Demux from Degree 1. Right-click in the row that includes the Mux/Demux for Degree 1, and click **Remove from Group**.
- c) Remove the appropriate Mux/Demux from Degree 2. Right-click in the row that includes the Mux/Demux for Degree 2 and click **Remove from Group**.
- d) From the **Group Type** drop-down menu, choose Line Equalizing Node. Click **Update**.

Step 5 Click **OK** to close the **Provision Group** dialog and complete editing the group.

Step 6 Check the traffic integrity.

You have successfully completed this procedure.

5.12 Activating optical services using proNX 900

Activating optical services using the proNX 900 involves provisioning cross connections for DOL equipment. This section describes activating services on the following DOL configurations:

- ROADM Terminal
- Line Amplifier Node
- ROADM Node
- Line Equalizing Node
- Amplifier Terminal

5.12.1 Provisioning wavelength cross connections for DOL equipment

Wavelength channel cross connections are provisioned to configure channel traffic through a ROADM-on-a-blade (ROB)-based DOL node. The channel cross connection consists of a source and destination that specifies a channel route through the DOL node. All channel cross connections on the DOL are bi-directional.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Equipment must be provisioned prior to provisioning cross connections.

Each optical configuration has different cross-connection requirements.

Configuration	Cross Connection	Supporting Information
ROADM Terminal	Create an Add-Drop cross connection for each service.	There is only one degree on a ROADM Terminal. All cross connections are in Degree 1.
ROADM Node	Channels (services) that traverse the node: create a Pass-Through cross connection for each service.	The system takes care of creating the bidirectional channel. You do not have to specify a degree.
	Channels (services) that added/dropped at the node: create an Add-Drop cross connection for each service on each of the degrees.	
Line Equalizing Node	Create a Pass-Through cross connection for each service that traverses the node.	
Line Amplifier Node	None. All services are passed through automatically.	
Amplifier Terminal	None. All services are added/dropped automatically.	

Provisioning cross connections

Follow these steps to provision DOL equipment cross connections:

Step 1 In the toolbar, click the Optical Layer button.



Step 2 In the Navigation pane, expand **Optical Groups**, right-click a group and choose **Provision Cross Connects**.

Step 3 On the **Optical Cross Connects** dialog, select **Create New Cross Connect**.

Step 4 On the **Create Cross Connect** dialog, set the connection type, Degree, and Channel for the cross connect.

Step 5 Click **OK**.

Step 6 Repeat steps 3 and 4 until all cross connects are complete.

You have successfully completed this procedure.

5.12.2 Viewing cross connections for DOL equipment

Use this procedure to View cross connects for DOL equipment.



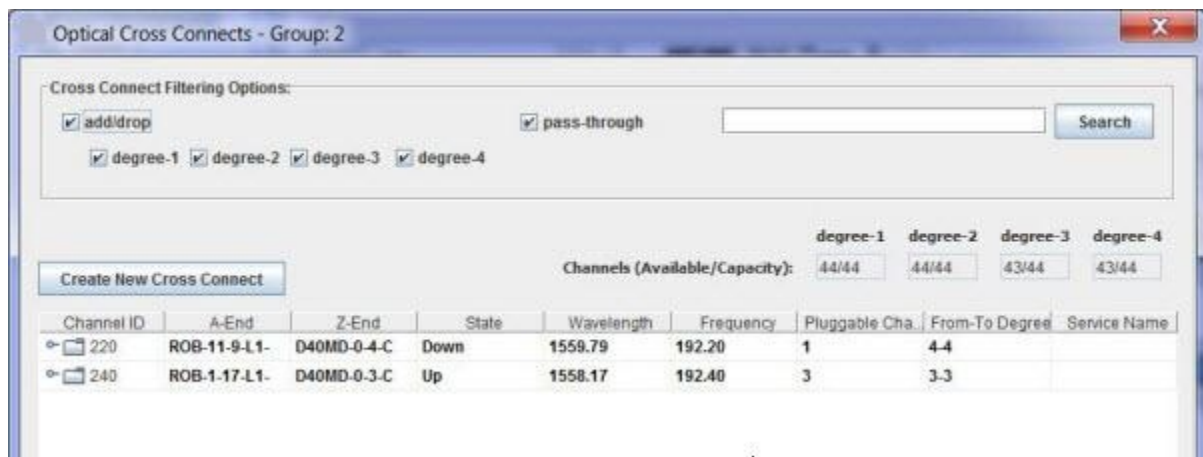
Prerequisites

- Cross connects must be provisioned prior to viewing.

Follow these steps to view cross connects for DOL equipment:

Step 1 In the toolbar, click the **Optical Layer** button.

Step 2 In the Navigation pane, expand **Optical Groups**, right-click a group and choose **Provision Cross Connects**. The **Optical Cross Connects - Group: <group number>** dialog appears.



Step 3 In the **Cross Connect Filtering Options** section, select or deselect the add/drop, degree and pass-through options to filter your view of the existing cross connections. To perform a custom filter, enter a text string in the **Search** field.

Step 4 Click **Cancel** to close the dialog without making changes.

You have successfully completed this procedure.

5.12.3 Deleting wavelength cross connections for DOL equipment

Use this procedure to delete cross connections for DOL (Dynamic Optical Layer) equipment.



Step 1 In the toolbar, click the Optical Layer button.



Step 2 In the Navigation pane, expand **Optical Groups**, right-click a group and choose **Provision Cross Connects**.

Step 3 On the **Optical Cross Connects** dialog, right-click a single row that includes the cross connection you are deleting. Select **Delete**.

Step 4 Click **OK**.

You have successfully completed this procedure.

5.13 Editing Dispersion Compensation module ports

Editing port settings

When you provision the port on a Dispersion Compensation module, you can provide brief ID information about the port, as well as the type of fiber connected to it. You can also provision custom information to record information specific to your environment.

Displaying and modifying DCM module port information

Once a port on a Dispersion Compensation module is provisioned, you can view the settings specified when the port was provisioned, and you can modify any of this information.

This section covers the following topics:

- 5.13.1, “Edit Dispersion Compensation module port settings”
- 5.13.2, “Display Dispersion Compensation module port information”

5.13.1 Edit Dispersion Compensation module port settings

Use this procedure to edit port settings for a Dispersion Compensation module (DCM).

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- DCM must be provisioned.

Editing port settings

Follow these steps to edit port settings for a Dispersion Compensation module:

Step 1 In the Navigation pane, right-click a port on a DCM, and then click **Edit Port**.

Step 2 In the **Edit DCM Port** dialog, enter values for the following port parameters:

- **ID 1, ID 2** — up to 32 alphanumeric characters per field to identify the DCM port

Note The information you enter in the **ID 1** field appears at the port in the Navigation pane.

- **Fiber Type** — the type of fiber that connects to the port. Select one of the following from the list:
 - **DSF**
 - **NDSF**
 - **NZDSF**
- **Grid** — the ITU-T grid number (C-Band DCMs only)

- **Custom 1, Custom 2, Custom 3** — up to 255 alphanumeric characters per field for information specific to the operating environment

Step 3 Click **Apply**.

You have successfully completed this procedure.

5.13.2 Display Dispersion Compensation module port information

Use this procedure to display information for a port on a Dispersion Compensation module (DCM).



Prerequisites

- DCM port must be provisioned.

Displaying module information

Follow these steps to display information for a DCM port:

Step 1 In the Navigation pane, right-click a port on a DCM module, and then click **Edit Port**.

The **Edit DCM Port** dialog displays the following information for the port.

- **ID 1, ID 2** — information identifying the DCM port
- **Fiber Type** — the type of fiber that connects to the port
- **Grid** — the ITU-T grid number (C-Band DCMs only)
- **Custom 1, Custom 2, Custom 3** — information specific to the operating environment

Step 2 Optionally, modify any of the parameter values, and then click **Apply**,

Step 3 Click **Close**.

You have successfully completed this procedure.

5.14 Provisioning non-powered module ports

Non-powered modules are devices that do not require a source of energy to function. The following BTI 7000 Series modules are considered non-powered devices:

- CWDM Optical Add-Drop Modules (C1ADM, C2ADM and C4MD)
- 1310nm and C-Band Coupler/Splitter
- CWDM and DWDM Splitter/Combiner (CDSC)
- DWDM Bi-Directional Coupler/Splitter (CS)
- 32-Channel DWDM Mux/Demux (D32MD1-4)
- DWDM Optical Add-Drop Modules (D1ADM, D2ADM, and D4ADM)
- SMF Dispersion Compensating Fiber Modules (SMF20, SMF40, SMF60 and SMF80)

Once these devices are entered into the BTI 7000 Series using the ENT-EQPT command, the ports on the non-powered modules are automatically provisioned by the system.

This section covers the following topics:

- [5.14.1, “Modifying the parameters of a Multiplexing module port”](#)
- [5.14.2, “Retrieving the parameters of a Multiplexing module port”](#)

5.14.1 Modifying the parameters of a Multiplexing module port

Use this procedure to modify the definable parameters of a port on a Multiplexing module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

The port is provisioned.

Step 1 Enter the command ED-PORT, specifying new parameter values as required.

```
ED-PORT:[TID]:<aid>:[CTAG]::[ID1=<id1>][,ID2=<id2>][,FIBER=<fiber>]
[,GRID=<grid>][,CHNLS=<chnls>][,C1=<custom1>][,C2=<custom2>]
[,C3=<custom3>],[REMOTEID=<remoteid>];
```

where

TID is the target identifier

aid is access identifiers. See the following table.

CTAG is the correlation tag

Example input

```
ED-PORT:BTI7000:C1ADM-1-3-1:100:::C1=Under Test;
```

You have successfully completed this procedure.

Equipment type	AID
C1ADM Line	C1ADM-(1,11,21,31)-(1-20)-(1-2)
C1ADM Pass Through	C1ADM-(1,11,21,31)-(1-20)-(1-2)-P
C1ADM Channel	C1ADM-(1,11,21,31)-(1-20)-(1-2)-(1-16)
C2ADM Line	C2ADM-(1,11,21,31)-(1-20)-1
C2ADM Pass Through	C2ADM-(1,11,21,31)-(1-20)-1-P
C2ADM Channel	C2ADM-(1,11,21,31)-(1-20)-1-(1-16)
C4MD Line	C4MD-(1,11,21,31)-(1-20)-1
C4MD Expansion Port	C4MD-(1,11,21,31)-(1-20)-1-E
C4MD Channel	C4MD-(1,11,21,31)-(1-20)-1-(1-16)
CDSC Line	CDSC-(1,11,21,31)-(1-20)-1
CDSC Channels	CDSC-(1,11,21,31)-(1-20)-1-C
CDSC Channels	CDSC-(1,11,21,31)-(1-20)-1-D
CS Line	CS-(1,11,21,31)-(1-20)-(1,2)
CS DWDM Port	CS-(1,11,21,31)-(1-20)-(1,2)-(1-9)
CS Channel	CS-(1,11,21,31)-(1-20)-(1,2)-D
D32MD1 Line	D32MD1-(1,11,21,31)-(1,3,5...19)-1
D32MD1 Upgrade	D32MD1-(1,11,21,31)-(1,3,5...19)-1-E
D32MD1 Channel	D32MD1-(1,11,21,31)-(1,3,5...19)-1-(1-8)
D32MD2 Line	D32MD2-(1,11,21,31)-(1,3,5...19)-1
D32MD2 Upgrade	D32MD2-(1,11,21,31)-(1,3,5...19)-1-E
D32MD2 Channel	D32MD2-(1,11,21,31)-(1,3,5...19)-1-(9-16)
D32MD3 Line	D32MD3-(1,11,21,31)-(1,3,5...19)-1
D32MD3 Upgrade	D32MD3-(1,11,21,31)-(1,3,5...19)-1-E
D32MD3 Channel	D32MD3-(1,11,21,31)-(1,3,5...19)-1-(17-24)
D32MD4 Line	D32MD4-(1,11,21,31)-(1,3,5...19)-1
D32MD4 Upgrade	D32MD4-(1,11,21,31)-(1,3,5...19)-1-E
D32MD4 Channel	D32MD4-(1,11,21,31)-(1,3,5...19)-1-(25-32)
D1ADM Line	D1ADM-(1,11,21,31)-(1-20)-1
D1ADM Port	D1ADM-(1,11,21,31)-(1-20)-1-P
D1ADM Channel	D1ADM-(1,11,21,31)-(1-20)-1-(1-32)
D2ADM Line	D2ADM-(1,11,21,31)-(1-20)-1
D2ADM Port	D2ADM-(1,11,21,31)-(1-20)-1-P
D2ADM Channel	D2ADM-(1,11,21,31)-(1-20)-1-(1-32)
D4ADM Line	D4ADM-(1,11,21,31)-(1,3,5...19)-1
D4ADM Port	D4ADM-(1,11,21,31)-(1,3,5...19)-1-P
D4ADM Channel	D4ADM-(1,11,21,31)-(1,3,5...19)-1-(1-32)

Equipment type	AID
D4MD Line	D4MD-(1,11,21,31)-(1-20)-1
D4MD Channel	D4MD-(1,11,21,31)-(1-20)-1-(1-32)

5.14.2 Retrieving the parameters of a Multiplexing module port

Use this procedure to retrieve the parameters of a port.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

The port is provisioned.

Step 1 Enter the command RTRV-PORT.

```
RTRV-PORT:[TID]:[<aid>]:[CTAG]:;
```

where

TID is the target identifier

aid is the access identifier. See [5.14.1, “Modifying the parameters of a Multiplexing module port”](#).

CTAG is the correlation tag

Example command and response

```
RTRV-PORT:BTI7000::100::;
```

```
BTI7000 03-11-12 11:42:00
M 100 COMPLD "C1ADM-1-6-1:"
"C1ADM-1-6-1-9:WAVELENGTH=1451"
"C1ADM-1-6-1-P:"
;
```

Table 5-6 Multiplexing module port information fields

Parameter	Range of Values	Description
ID1	1 to 32 alphanumeric characters	The identifier that describes the port
ID2	1 to 32 alphanumeric characters	The identifier that describes the port
FIBER	DSF NDSF (SMF-28) NZDSF	The fiber type that connects to the port
GRID	50 GHz 100 GHz 200 GHz	ITU-T wavelength grid numbers
		Note Applies to DWDM multiplexers only

Table 5-6 Multiplexing module port information fields (Continued)

Parameter	Range of Values	Description
CHNLS	0 to 40	The number of DWDM channels
C1, C2, C3	1 to 256 alphanumeric characters	The custom fields for specific operating company information
WAVELENGTH	.	The wavelength in nm

You have successfully completed this procedure.

6.0 Connecting optical components

This chapter provides information about connecting optical components for the BTI 7000 Series.

- 6.1, “Connector types and accessories”
- 6.2, “About universal connectors”
- 6.3, “Maintaining Fiber Optic Connectors”
- 6.4, “Using HUXCleaners”
- 6.5, “Cleaning universal connectors”
- 6.6, “Connecting fibers between an amplifier with mid-stage access and a DCM ”
- 6.7, “LC-SC DCM patch cord kit”
- 6.8, “Basic cascading of OADMs to provide mux/demux functionality”
- 6.9, “OADM survivability of upstream and downstream traffic”
- 6.10, “Cascading OADMs for survivability and future growth”

6.1 Connector types and accessories

Listed below are the various connector types that can be ordered with BTI 7000 Series optical devices. In addition, compatible accessories are also listed.

ST (Straight-tip) connector

The ST connector is a fiber optic bayonet connector that uses a radial track for locking purposes.

FC (Fixed connection) connector

The FC connector has a key-aligned notch that is tightened by a thread locking coupling nut.

SC (Subscriber) connector

The SC connector uses a push to engage, and a pull to disengage technology. The connector was designed to increase the density of connectors on a patch panel.

LC (Lucent) connector

The LC connector is a smaller version of the SC connector.

UC (Universal) connector

The universal connector consists of two distinct parts: a “connector base” that is permanently mounted into the faceplate of a module, and a “connector cap” that serves as the external connector port. Each UC kit contains an FC, ST, and SC cap.

The principal advantage is that the universal connector parts can be easily accessed for cleaning of the optical elements.

In addition, a variety of connector caps are available that permit the use of FC, SC and ST patch cord connectors. All connector caps can be removed and replaced without special tools.

UPC (Ultra Physical Contact) connector

The UPC is a fiber optic connector with a polish style of a ceramic fiber optic ferrule that is used for connection. The ferrule is inside the connector, and the fiber glass from the fiber optic cable plugs into the ferrule for connection. The different polish of the connector ferrule determines the performance on the back reflection. The UPC has at least 50dB of back reflection.

6.1.1 Connectors available on modules

Table 6-1 Modules with Various Connectors

Module	Connector Type
Packet Services	
packetVX 12/2 (2 XFP ports)	LC
packetVX 24/2 (2 XFP ports)	LC
packetVX 24/4 (4 XFP ports)	LC

Table 6-1 Modules with Various Connectors (Continued)

Module	Connector Type
packetVX 80 (8 XFP ports)	LC
packetVX 12/2 (2 XFP ports)-Extended Temperature	LC
packetVX 24/2 (2 XFP ports)-Extended Temperature	LC
packetVX 24/4 (4 XFP ports)-Extended Temperature	LC
Muxponder	
2-Port GbE Muxponder	LC
8-Port Multiprotocol Muxponder	LC
10-port Multiprotocol Muxponder	LC
Transponders	
Dual 2.5G Multiprotocol Transponder	LC
Dual 4G Multiprotocol Transponder	LC
Dual 10G Multiprotocol Transponder	LC
Dual 10G Multiprotocol Transponder Lite	LC
10G Multiprotocol Transponder	LC
Optical Multiplexing modules	
1-Channel CWDM OADM	LC
Double 1-Channel CWDM OADM	LC
2-Channel CWDM OADM	LC
4-Channel CWDM Mux/Demux	LC
32-Channel DWDM Mux/Demux	LC
32-Channel Bidirectional DWDM Mux/Demux - Modules 24, 42, 12, and 21	LC
1-Channel DWDM OADM	LC
2-Channel DWDM OADM	LC
4-Channel DWDM OADM	LC
CWDM and DWDM Splitter/Combiner	LC
1310nm and C-Band Coupler / Splitter	LC
Double Bidirectional Coupler/Splitter	LC
CWDM and DWDM Splitter/Combiner	LC
40-Channel DWDM Mux/Demux	LC
96-Channel DWDM Mux/Demux	LC/UPC
Amplifiers	
DWDM C-Band Booster Amplifier	UC (FC, SC, ST)
DWDM C-Band Pre-Amplifier	UC (FC, SC, ST)
Optical Line Amplifier	SC
Optical Line Amplifier with 0-15 dB Mid-stage Access	SC
Single Channel and Sub-Band Booster Amplifier	UC (FC, SC, ST)
Single Channel and Sub-Band Pre-Amplifier	UC (FC, SC, ST)

Table 6-1 Modules with Various Connectors (Continued)

Module	Connector Type
Dispersion Compensation	
SMF Dispersion Compensation Module 20 km	SC
SMF Dispersion Compensation Module 40 km	SC
SMF Dispersion Compensation Module 60 km	SC
SMF Dispersion Compensation Module 80 km	SC
SMF C-Band DCM 40 km	UC (FC, SC, ST)
SMF C-Band DCM 60 km	UC (FC, SC, ST)
SMF C-Band DCM 80 km	UC (FC, SC, ST)
DOL Modules	
Dispersion Compensation Modules (Expandable)	
Dispersion Compensation Module - SMF 5 km	LC
Dispersion Compensation Module - SMF 10 km	LC
Dispersion Compensation Module - SMF 15 km	LC
Dispersion Compensation Module - SMF 20 km	LC
Dispersion Compensation Module - SMF 30 km	LC
Dispersion Compensation Module - SMF 40 km	LC
Dispersion Compensation Module - SMF 50 km	LC
Dispersion Compensation Module - SMF 60 km	LC
Dispersion Compensation Module - SMF 70 km	LC
Dispersion Compensation Module - SMF 80 km	LC
Dispersion Compensation Module - SMF 90 km	LC
Dispersion Compensation Module - SMF 100 km	LC
DWDM Line Amplifier	
DLA2 (line/pre+booster)	LC
DWDM - ROADM-on-a-blade	
2D ROADM-on-a-blade	LC
4D ROADM-on-a-blade	LC

6.2 About universal connectors

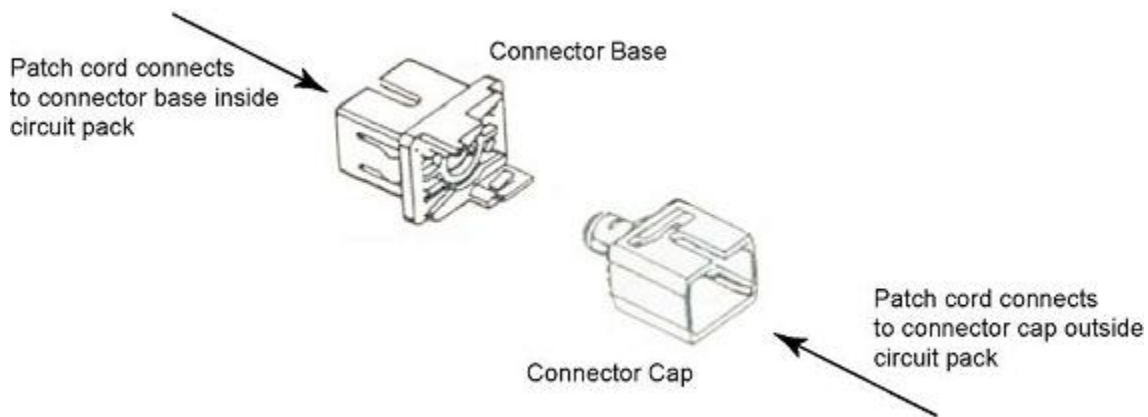
A universal connector consists of two distinct parts: a “connector base” that is permanently mounted into the faceplate of a module, and a “connector cap” that serves as the external connector port.

The principal advantage is that the universal connector parts can be easily accessed for cleaning of the optical elements.

In addition, a variety of connector caps are available, which permits the use of FC, SC and ST patch-cord connectors. All connector caps can be removed and replaced without special tools.

The following figure shows the various parts of a universal connector.

Figure 6-1 Parts of a universal connector



6.3 Maintaining Fiber Optic Connectors

This section contains the following topics:

- 6.3.1, “Inspecting fiber optic connectors”
- 6.3.2, “Cleaning fiber optic connectors”

6.3.1 Inspecting fiber optic connectors

Protective dust plugs should be left on connectors when they are not in use. The fiber used on the optical components of the modules has a light carrying core that is less than 10 millionths of a meter in diameter. Therefore, a single microscopic piece of dust on a connector end-face can significantly block the light traveling through the fiber. Accurate and repeatable measurements require clean connections.



Invisible laser radiation can be emitted from the aperture ports of various modules when no fiber cable is connected. Avoid exposure and do not stare into open apertures to avoid permanent eye damage.

Using an optical fiber scope, visually inspect all fiber optic interconnects prior to use. A minimum of 200x magnification is required for proper inspection.

Use the following procedure to inspect a fiber connector.

Use the following guidelines to achieve the best possible performance:

- Using an optical fiber scope, visually inspect fiber ends for signs of damage.
- Use dry connections whenever possible.
- Keep connectors covered when not in use.
- Use care in handling all fiber optic connectors.

The primary hazard of exposure to laser radiation from an optical fiber communications system is damage to the eye by accidental exposure to the beam emitted by a laser source, or from viewing a connector attached to an energized fiber.

Before using an optical scope to examine the fiber, ensure that optical power is not emitted from the fiber. Use of a handheld optical fiber scope (that is, where the output is sent to a video display) prevents accidental exposure to the beam emitted by a laser source.

Keep all interconnects as clean as possible. When cleaning fiber connectors, be sure to use appropriate cleaning methods.

6.3.2 Cleaning fiber optic connectors

Use this procedure to clean a fiber connector.

Important Improper cleaning can result in high attenuation due to dirt or dust, or can cause mechanical damage to the fiber end face, resulting in decreased performance.

- Step 1** Verify that the opposite end of the fiber is disconnected from its laser source.
- Step 2** Using an optical fiber scope, inspect the end of the fiber face.
- Step 3** If the fiber end-face condition is ideal, no further action is required.
If you need to clean or repolish the fiber end-face, use the instructions in the cleaning procedure that follows.
- Step 4** Use a new, lint-free, nonabrasive cleaning pad, lens paper, or swab to clean the fiber end. Move the cleaning pad back and forth across the fiber end several times. If using a swab, gently rotate the swab as you wipe across the end-face. When done, discard the used pad or paper.
- Step 5** Obtain a filtered, dry, compressed air dust remover. Aim the duster at a shallow angle to the fiber end-face and blow across the connector end face from a distance of 6 to 8 inches.
- Step 6** Verify that the opposite end of the fiber is still disconnected from its laser source.
- Step 7** Verify that the fiber optic connector is free from dirt and dust. To inspect the connector, use an optical fiber scope that uses an indirect image converter or a filtered optical instrument of optical density (OD) sufficient to reduce the exposure levels below the appropriate maximum permissible exposure.
- Step 8** Do one of the following:
- If the fiber optic connector is clean, cover the connector with a protective dust cover until ready for use.
 - If the fiber-optic connector is not completely clean, continue with the next step.
- Step 9** Clean the fiber end by moving the cleaning pad back and forth across the fiber end several times. If using a swab, gently rotate the swab as you wipe across the end face.
- Step 10** Immediately dry the fiber end with a clean, dry, lint-free cleaning pad or lens paper.
- Step 11** Discard the optical cleaning pads and lens paper.
- Step 12** Use a filtered, dry, compressed air dust remover. Aim the duster at a shallow angle to the fiber end face and blow across the connector end-face from a distance of 6 to 8 inches.
- Step 13** Verify that the fiber optic connector is free from dirt and dust. To inspect the connector, use an optical fiber scope that uses an indirect image converter or a filtered optical instrument of optical density (OD) sufficient to reduce the exposure levels below the appropriate maximum permissible exposure.
- Step 14** Once the fiber is clean, cover the connector with a protective dust cover until ready for use.

You have successfully completed this procedure.

6.3.3 Cleaning transceivers

When cleaning transceivers, use a 1.25 mm cotton-tipped swab to insert into the receptacle. The swabs can be used to clean the optical surface and to clean debris from the inner sleeve. Use extreme care as it is easy to scratch the optical plane.

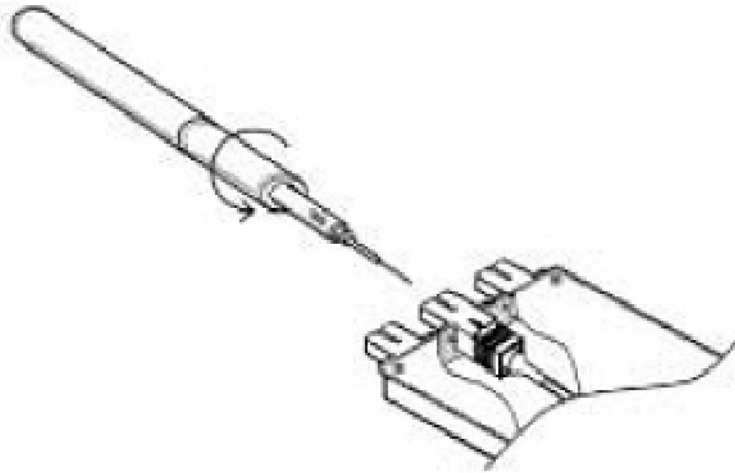
6.4 Using HUXCleaners

BTI Systems stocks HUXCleaners that are designed for the correct depth cleaning of FC, SC, ST, and LC type adapters. The HUXCleaner is available in two versions:

- 2.5 mm ferrule cleaner for FC, SC and ST adapters
- 1.25 mm ferrule cleaner for LC adapters

The following illustration shows how to operate the HUXCleaner.

Figure 6-2 HUXCleaners



Use the following procedure to operate the HUXCleaner.

Step 1 Uncap the HUXCleaner and insert the cleaning tip inside the adapter

Remove the cap from the HUXCleaner and insert the cleaning tip inside the adapter.

Step 2 Push with 200 g of pressure

Apply a gentle 200 g (or 0.5 pound) of pressure to the HUXCleaner and rotate the light grey dial two-to-three turns clockwise.

Step 3 Turn the rotator

Before removing the HUXCleaner from the adapter, turn the rotator just one click (30°) clockwise.

Step 4 Remove and cap the HUXCleaner

When the HUXCleaner is not in use, keep the cap on the HUXCleaner to prevent any contamination of the cleaning tip.

You have successfully completed this procedure.

6.5 Cleaning universal connectors

Each universal connector assembly is inspected for debris before it is packaged. During use, the assembly can become contaminated with debris from multiple connections or environmental contaminants. This debris is best observed using a 200x scope with backlighting from any safe white light source. If debris is found on the connector optical surfaces, use the following procedure to safely clean it.



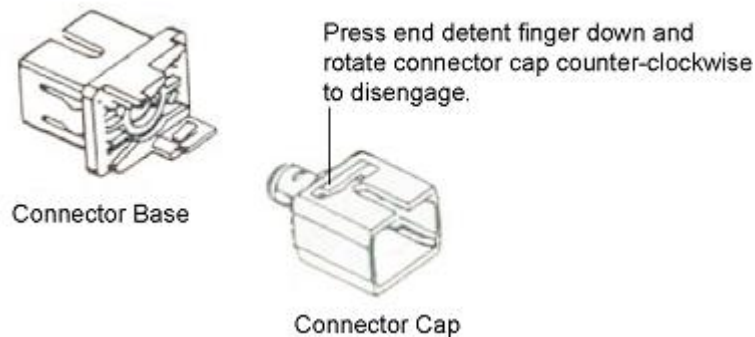
Invisible laser radiation can be emitted from the aperture ports of various modules when no fiber cable is connected. Avoid exposure and do not stare into open apertures to avoid permanent eye damage.

Use the following procedure to clean universal connectors:

Step 1 Disengage the Universal Connector

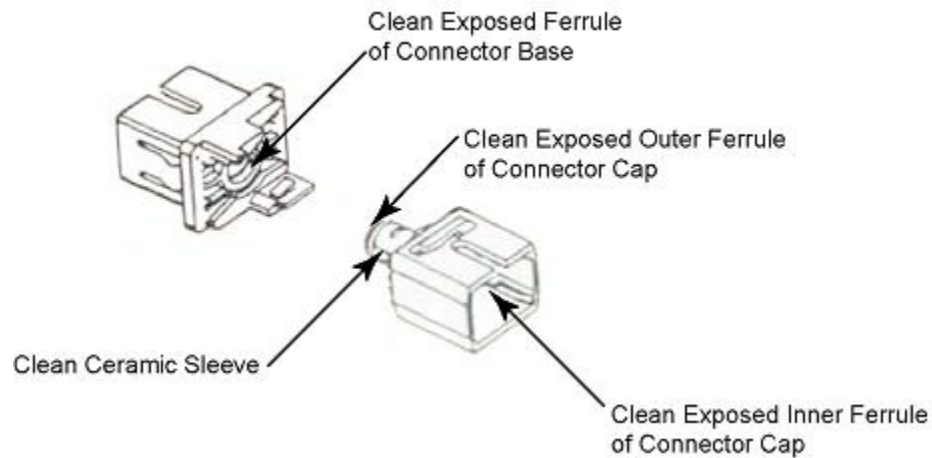
To separate the connector cap from the connector base, do the following:

- a) With a patch cord inserted into the connector cap, gently grasp the patch cord sleeve and press the detent finger end of the connector cap.
- b) Still holding the detent finger down, rotate the connector cap counter-clockwise to disengage, and then the pull connector cap straight out.



Step 2 Clean the optical surfaces

Using clean, dry compressed air or gas, hold the optical surfaces approximately one inch from the end of the nozzle and blow onto the optical surfaces. One inch is a safe distance to prevent damage.



Step 3 Check for debris

Caution Never insert a cleaning stick of any kind into the connector.

Look into the connector housing with a 200x scope. If debris is still present, repeat steps 1 through 3 until the element is clean, then proceed to the next step.

Note If the connector base or connector cap is damaged, cleaning will not improve the performance.

Step 4 Reconnect the Universal Connector

After cleaning, ensure that there is no patch cord attached to the connector cap, and then do the following:

- a) Align the connector cap to the connector base with the connector cap turned slightly counter-clockwise to the connector base
- b) Carefully insert the ceramic sleeve of the connector cap into the connector base and then turn the connector cap clockwise until you hear an audible click as the connector cap latches to the connector base.
- c) Confirm that the connector cap has locked onto the connector base by gently pulling the connector cap straight out. The connector cap should hold firmly to the connector base.

You have successfully completed this procedure.

6.6 Connecting fibers between an amplifier with mid-stage access and a DCM

Use the following procedure to connect the fiber patch cables between an amplifier with mid-stage access (e.g. OLAM, MGM) and a Dispersion Compensation module (DCM).

Note For on-shelf optical connections and intrashelf connections, BTI recommends using short 0.5 m fiber patch cords.

- Step 1** For convenience, provision the amplifier and DCM modules adjacent to each other.
- Step 2** Using a fiber patch cable with LC connectors on both ends, connect the fibers to the appropriate input and output LC connectors on the DCM.
- Step 3** Carefully wrap the fiber patch cable around the fiber management spool to take up slack in the fibers.
- Step 4** Connect the other ends of the fiber patch cables to the appropriate second-stage input and first-stage output connectors on the amplifier.
- Step 5** Connect the first-stage input and second-stage output connectors on the amplifier to their respective output and input fibers on the DCM.

Note Do not wrap the main input and output fibers around the fiber management spool. Use an appropriate fiber slack management system inside the rack or cabinet to manage the main input and output optical fibers.

6.7 LC-SC DCM patch cord kit

The LC-SC DCM patch cord kit converts DCMs with LC connectors to accept SC connectors. DCMs with SC connectors are available.

Note	The LC-SC DCM patch cord kit requires one adapter bracket position on the fiber management spool/adapter bracket assembly.
-------------	--

Note	This procedure applies to a BTI 7060 shelf with a fiber management spool.
-------------	---

Installation recommendation

To install the LC-SC DCM patch cord, do the following:

- 1 Mount the adapter in the most convenient opening on the adapter bracket.
- 2 Run the patch cord with the SC connector to the amplifier module.
- 3 Carefully wrap the patch cord around the fiber management spool to store any slack in the patch cord.
- 4 Run the patch cord with the LC connector to the DCM module.
- 5 Carefully wrap the patch cord around the fiber management spool to store any slack in the patch cord.

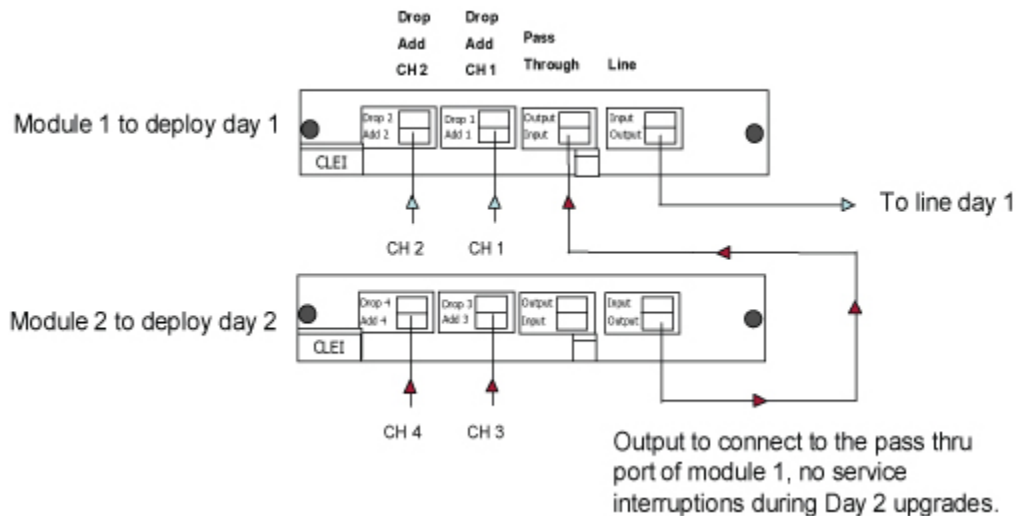
6.8 Basic cascading of OADMs to provide mux/demux functionality

Optical add/drop modules (OADM) can be cascaded to provide the functional equivalent of a mux/demux.

In the following example, a two-channel OADM is deployed on Day 1 with two input wavelengths that are combined into a composite output from the line port.

On Day 2, a second two-channel OADM is deployed that adds channels three and four. The composite line output from the second OADM is added to the first OADM through the pass through port. This results in the four wavelengths being combined into a composite output from the line port of the first OADM.

Two-wavelength OADMs serving as a mux/demux



A third wavelength could be added to the first OADM through the pass through port, making the second OADM unnecessary.

6.9 OADM survivability of upstream and downstream traffic

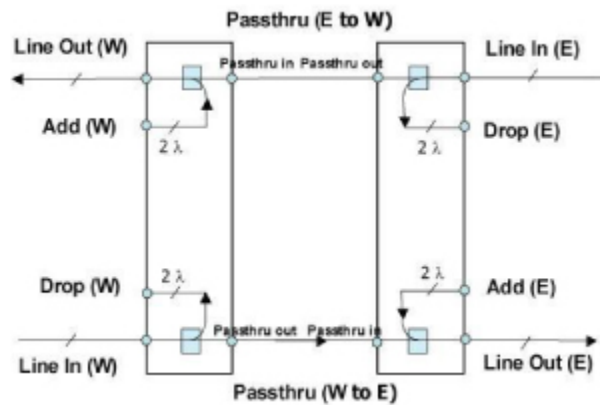
Optical add/drop modules (OADM) can be combined to ensure that upstream and downstream traffic can survive even if there is a module failure at a line site.

In the following example, a pair of two-channel OADMs are deployed where two wavelengths are dropped and then added back to the composite signal that passes through the site. Traffic upstream and downstream from a line site failure is not affected.

The inbound composite traffic is connected to the line in port of the first OADM. The two selected wavelengths are dropped by the first OADM and the remaining composite traffic exits through the pass through output port of the first OADM. The composite traffic is then connected to the pass through input port of the second OADM. At the second OADM, two selected wavelengths are added back to the composite traffic that exits through the line output port.

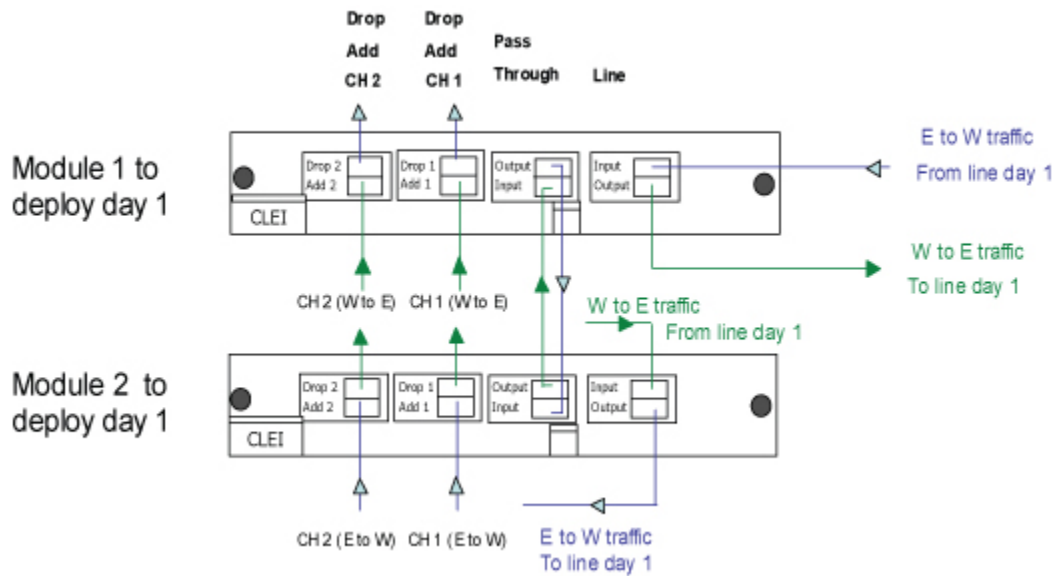
For traffic flowing in the opposite direction, the remaining OADM ports are used.

OADM survivability of upstream and downstream traffic



The following figure indicates what the fiber connections would look like for this example.

OADM survivability fiber connections



6.10 Cascading OADMs for survivability and future growth

The concepts of OADM cascading and survivability can be combined to provide a robust configuration that allows for future growth in the number of wavelengths that are added and dropped at a site.

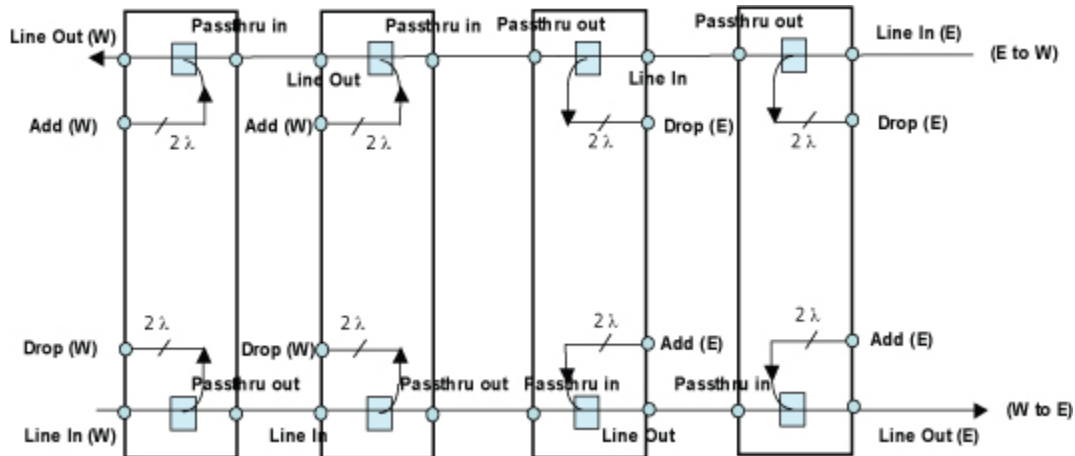
In the following example, four two-channel OADMs are deployed where four wavelengths are dropped and then added back to the composite signal that passes through the site. Traffic upstream and downstream from a line site failure is not affected.

The inbound composite traffic is connected to the line in port of the first OADM. The first two selected wavelengths are dropped by the first OADM and the remaining composite traffic exits through the pass through output port of the first OADM. The composite traffic is then connected to the line input port of the second OADM. At the second OADM, two more wavelengths are dropped and the remaining composite traffic exits through the pass through output port.

The composite traffic is then connected to the pass through input port of the third OADM. At the third OADM, two selected wavelengths are added back to the composite traffic that exits through the line output port. The composite traffic is then connected to the pass through input port of the fourth OADM. At the fourth OADM, two more selected wavelengths are added back to the composite traffic that exits through the line output port.

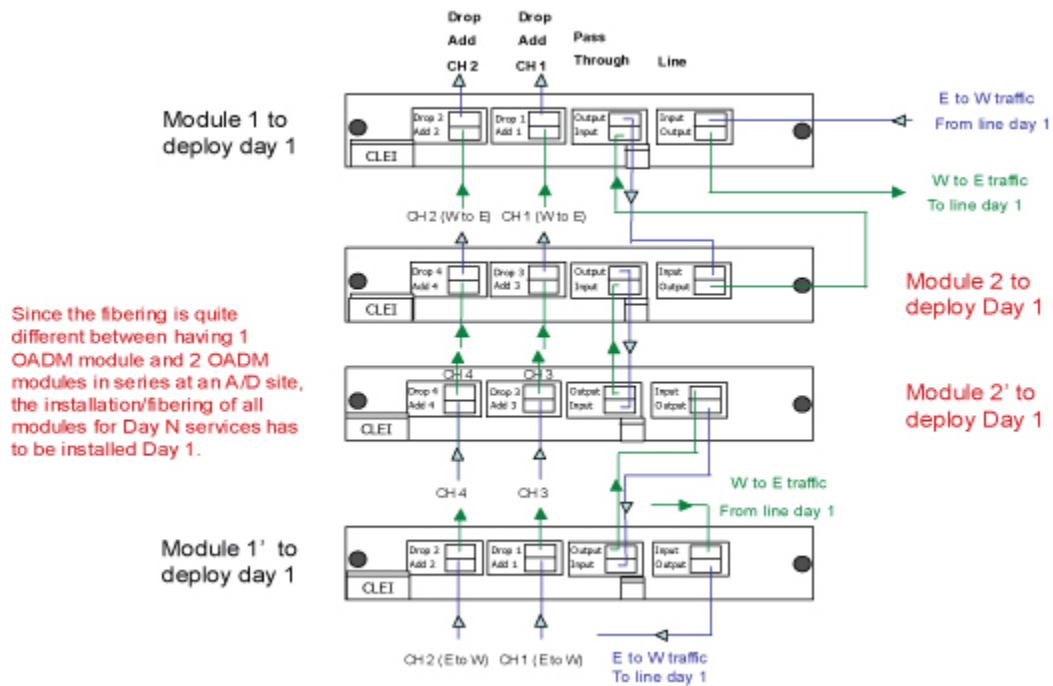
For traffic flowing in the opposite direction, the remaining OADM ports are used.

Cascading OADMs for survivability and future growth



The following illustration indicates what the fiber connections would look like for this example.

Cascading OADMs for survivability and future growth fiber connections



7.0 Optical Supervisory Channel (OSC)

This chapter provides information about the OSC for the BTI 7000 Series.

- [7.1, “Provisioning tasks”](#)
- [7.2, “DOL Optical Data Communications Channel ”](#)
- [7.3, “Installing and fibering a Coupler/Splitter module”](#)

7.1 Provisioning tasks

To provision the OSC, perform the following tasks, enable OSC ports in the Management Ethernet tab of the Provision System dialog box.

STP is enabled or disabled globally on the whole system. STP is enabled by default and applies to the OSC ports and the MSI port.

The Management Ethernet dialog consists of two tabs:

- **Basic** — for enabling OSC
- **Advanced** — for configuring the IP address of an OSC port and for configuring and viewing advanced IP interface parameters for an OSC ports

7.1.1 Enabling OSC ports

Use this procedure to enable OSC ports.



Step 1 In the Navigation pane, right-click on BTI 7000 Series, and click **Provision System**.

Step 2 Click the **Management Ethernet** tab.

Step 3 In the **Provision System** dialog, click the **Basic** tab.

Step 4 On the **Basic** tab, in **OSC Settings**, enable the OSC port(s).

- **Enable OSC 1 Port** — enables OSC functionality on the SCP. The OSC port is IS when it is enabled.
- **Enable OSC 2 Port** — enables OSC functionality on the SCP. The OSC port is IS when it is enabled.

Step 5 Click **Apply** and **Close**.

You have successfully completed this procedure.

7.1.2 Provision management Ethernet settings

The SCP provides OSC functionality for remote shelf management. The SCP has two SFP-based OSC ports supporting 1310, 1511, and 1611 nm channels for DWDM applications and 1451 nm channels for CWDM applications. The OSC integrated on the SCP must be combined with a separate Coupler/Splitter module for full functionality.

Caution Changing the craft Ethernet port settings may result in temporary loss of connection to the BTI 7000 Series network element.

7.1.2.1 Provision Ethernet settings

Use this procedure to provision the Ethernet settings on the management LAN port.

Step 1 In the Navigation pane, right-click on BTI 7000 Series, and click **Provision System**.

Step 2 In the **Provision System** dialog, click the **Management Ethernet** tab.

Step 3 On the **Advanced** tab, enter a valid IP address, mask, and default gateway.

Step 4 Click **Apply** and **Close**.

You have successfully completed this procedure.

7.1.2.2 Viewing Ethernet Info

Use this procedure to view the Ethernet Info and OSC Settings on the Management Ethernet Port.

Step 1 In the Navigation pane, right-click on BTI 7000 Series, and click **Provision System**.

Step 2 In the **Provision System** dialog, click the **Management Ethernet** tab.

Step 3 Click the **Advanced** tab.

The table below lists the information that is displayed.

Step 4 Click **Close**.

You have successfully completed this procedure.

Parameter	Description
MAC Address	Standardized data link layer address that is required for every port or device that connects to a LAN. Other devices in the network use these addresses to locate specific ports in the network.
Broadcast Address	A special address reserved for sending a message to all stations.
Interface Speed	Displays the media rate at which the BTI 7000 Series is connecting to a NE via the Management Ethernet port.
MTU size	Maximum packet size, in bytes, that the Craft Ethernet interface can handle.

7.1.3 Add static routes

A static route is a predefined route to a specific network and/or a device such as a host. Use this procedure to provision a static route.

Step 1 In the physical view window of the proNX 900, right-click on the SCP, and select **Provision Static Routes**.

Step 2 In the **Static Routes** tab, click **Add**.

Step 3 In the **Add Static Route** dialog box, enter:

- the IP address of the destination network in the **Network** field. This address must be a valid network address. An example of a network IP address is 10.1.1.0.

- the subnet mask of the destination network in the **Mask** field. An example of a Mask is 255.255.255.0.
- the IP address of the next hop router in the **Next Hop** field.
- a weight for the route in the **Admin Distance** field (optional). Based on this weight (a number) the route may or may not be preferred. The admin Distance range is 1 to 254. If you do not specify a number, the administrative distance is set to 1 by default.

Step 4 Click **Apply** and **Close**.

7.1.4 Delete static routes

Use this procedure to delete a static route.

Step 1 In the physical view window of the proNX 900, right-click on the SCP, and select **Provision Static Routes**.

Step 2 In the **Static Routes** tab, select the static route to be deleted and click the **Delete** button.

7.2 DOL Optical Data Communications Channel

The Optical Data Communications Channel (ODCC) is an OSC data link between DOL network elements (NE) which is used for management communications. The ODCC can be configured to be part of a management communications network to support remote access to management interfaces of an NE that is not directly connected to the management LAN.

The ODCC can be manually provisioned provided that the supporting OSC link exists.

The ODCC supports a configurable administrative status attribute (primary state), which can be set to In-service (IS) or Out-of-service (OOS).

When provisioned, if the administrative status of the ODCC is not specified, it is set to Out-of-service if the administrative status of the supporting OSC link is Out-of-service. Otherwise it is set to In-service.

When In-service, the ODCC is enabled to serve as an unnumbered interface to the external-facing network management IP stack.

When Out-of-service, the ODCC is disabled.

If OSPF is provisioned on the NE, the ODCC can be added as an OSPF interface.

The administrative status of the ODCC can be set to In-service or Out-of-service while configured as an OSPF interface.

The ODCC can be removed as an OSPF interface.

The ODCC can be manually de-provisioned.

De-provisioning of the ODCC object is not permitted if the ODCC is still provisioned as an OSPF interface.

The ODCC does not support auto-provisioning or auto-deprovisioning.

7.3 Installing and fibering a Coupler/Splitter module

Use this procedure to install and connect a BTI 7000 Series coupler/splitter module on the BTI 7000 Series main shelf.

What you need

- Slot-head or Phillips screwdriver
- Electrostatic discharge (ESD) wrist strap
- Coupler/splitter module
- Isopropyl alcohol and lint-free pads

Prerequisites

- None



Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

Installation procedure

Follow these steps to install a coupler/splitter module:

Step 1 At the shelf:

- a) If a module is in the slot in which you want to install the module and its coupler/splitter assembly, do the following. Otherwise, go to step 2.
- b) Facing the front of the shelf, locate the module screws.
- c) Using a slot-head or Phillips screwdriver, unfasten module screws.
- d) Using the handle, carefully pull the module out.

Step 2 Insert the module and its Coupler/Splitter assembly.

- a) Align the module and its coupler/splitter assembly to the slot in which the module is being inserted.
- b) Carefully push the module straight into the slot.

Step 3 Attach the faceplate screws.

- a) Facing the front of the shelf, align the module and its coupler/splitter with its mounting holes.
- b) Using a slot-head or Phillips screwdriver, carefully tighten the faceplate screws:
 - Partially tighten the center support screw.
 - Partially tighten the other screw.

- Fully tighten the center support screw.
- Fully tighten the other screw.

Caution Tighten to a torque that is no more than 4.7 in-lbs.

Step 4 Clean the ends of the fiber optic cables.

Use lint-free pads with isopropyl alcohol to clean the ends of the fiber optic cables.

Step 5 Connect the fiber optic cables.

8.0 Installing and provisioning service modules and SFP/XFPs

This chapter provides information about installing and provisioning service modules and SFP/XFPs for the BTI 7000 Series.

- 8.1, “Installing Transponder modules”
- 8.2, “Installing 2-Port GbE Muxponder modules”
- 8.3, “Installing 8-Port and 10-Port Multiprotocol Muxponder modules”
- 8.4, “Installing packetVX modules”
- 8.5, “Installing optical transceivers”
- 8.7, “Provisioning Transponder modules”
- 8.8, “Provisioning ports on Transponder modules”
- 8.9, “Provisioning Muxponder modules”
- 8.10, “Provisioning ports on Muxponder modules”
- 8.11, “Display transceiver information ”
- 8.12, “Basic equipment and switch member configuration”

8.1 Installing Transponder modules

Use this procedure to install any BTI 7000 Series Transponder module.

What you need

- Slot-head or Phillips screwdriver
- Electrostatic discharge (ESD) wrist strap
- Transponder module
- SFP or XFP transceivers
- Isopropyl alcohol and lint-free pads

Prerequisites



Caution

Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).



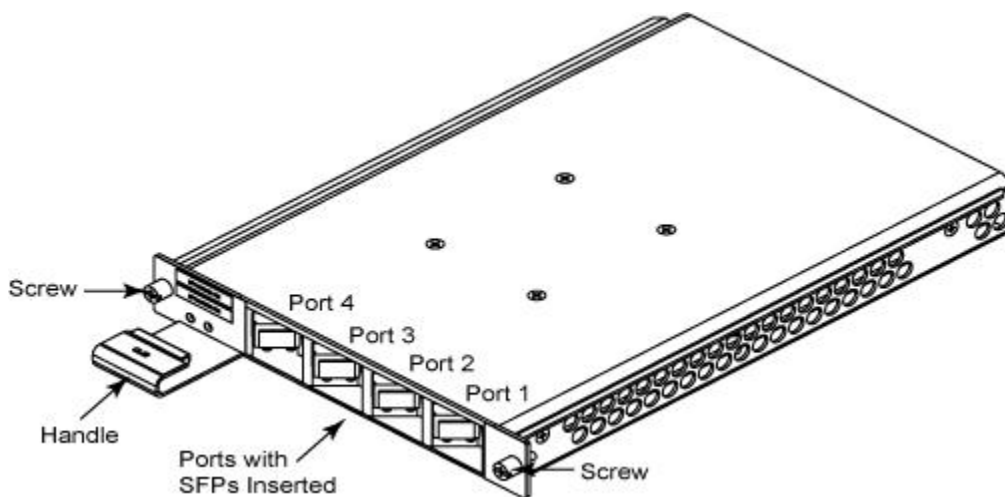
Laser

Invisible laser radiation can be emitted from the aperture ports of various modules when no fiber cable is connected. Avoid exposure and do not stare into open apertures to avoid permanent eye damage.

Key installation features

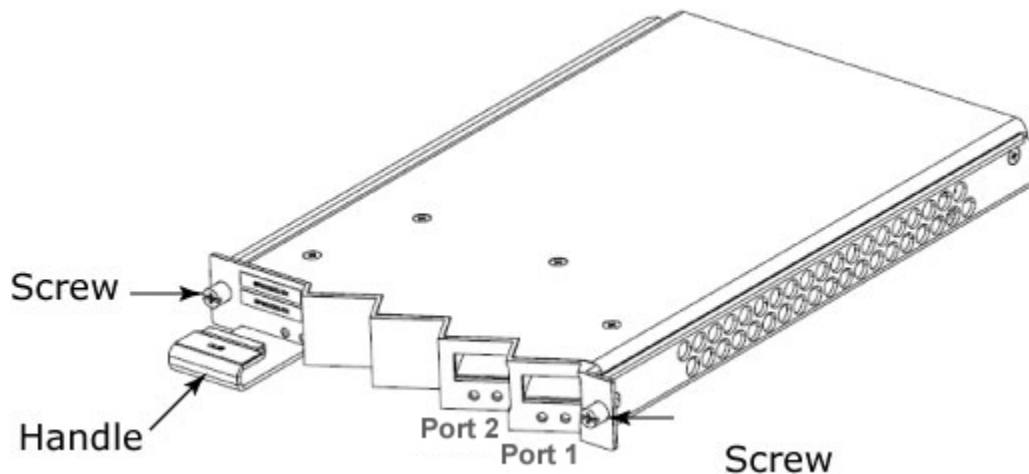
The following figures show Transponder modules and indicate the key features for installing them.

Dual 1G and Dual 2.5G Multiprotocol Transponder modules



Note The following image shows a 10G Multiprotocol Transponder module, but, with the exception of the number of ports, is representative of the Dual 4G Multiprotocol Transponder, the Dual 10G Multiprotocol Transponder, and the Dual 10G Multiprotocol Transponder Lite modules as well.

10G Multiprotocol Transponder module



Installation procedure

Follow these steps to install a Transponder module:

Step 1 Insert the Transponder Module

- a) Align the module to the slot in which it is being inserted.
- b) Carefully push the module straight into the slot.
- c) Push with sufficient pressure until the LEDs come on and the faceplate of the module matches the position of the adjacent module.

Step 2 Attach the Faceplate Screws

- a) Facing the front of the shelf, align the module with its mounting holes.
- b) Using a slot-head or Phillips screwdriver, carefully tighten the two faceplate screws:
 - Partially tighten the center support screw.
 - Partially tighten the other screw.
 - Fully tighten the center support screw.
 - Fully tighten the other screw.

Caution Tighten to a torque that is no more than 4.7 in-lbs.

Step 3 Install the Transceivers

See [8.5, “Installing optical transceivers”](#) for information about installing transceivers, and then return to this procedure

Step 4 Replace the Cables

If any cables were moved to access the module, replace the cables to their original locations.

You have successfully completed this procedure.

8.2 Installing 2-Port GbE Muxponder modules

Use this procedure to install any 2-Port GbE Muxponder module.

What you need

- Slot-head or Phillips screwdriver
- Electrostatic discharge (ESD) wrist strap
- Muxponder module
- SFP transceivers
- Isopropyl alcohol and lint-free pads

Prerequisites

- None



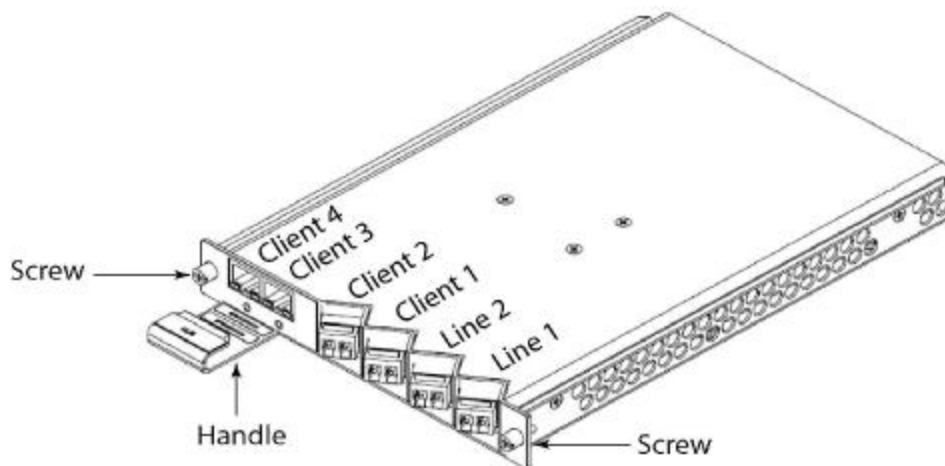
Caution

Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

Key installation features

The following figure shows the 2-Port GbE Muxponder module and indicates the key features for installation.

2-Port GbE Muxponder module



Installation procedure

Follow these steps to install a 2-Port GbE Muxponder module:

Step 1 Insert the Muxponder Module

- a) Align the module to the slot in which it is being inserted.
- b) Carefully push the module straight into the slot.
- c) Push with sufficient pressure until the LEDs come on.

Step 2 Attach the Faceplate Screws

- a) Facing the front of the shelf, align the module with its mounting holes.
- b) Using a slot-head or Phillips screwdriver, carefully tighten the two faceplate screws:
 - Partially tighten the first support screw.
 - Partially tighten the other screw.
 - Fully tighten the first support screw.
 - Fully tighten the other screw.

Caution Tighten to a torque that is no more than 4.7 in-lbs.

Step 3 Insert the Transceivers

See [8.5, “Installing optical transceivers”](#) to insert the transceivers into the module, and then return to this procedure.

Step 4 Replace the Cables

If any cables were moved to access the module, replace the cables to their original locations.

You have successfully completed this procedure.

8.3 Installing 8-Port and 10-Port Multiprotocol Muxponder modules

Use this procedure to install an 8-Port or 10-Port Multiprotocol Muxponder module.

What you need

- Slot-head or Phillips screwdriver
- Electrostatic discharge (ESD) wrist strap
- Muxponder module
- SFP and non tunable XFP transceivers
- Isopropyl alcohol and lint-free pads

Prerequisites

- Shelf must have an available double-width, single-height slot.

Important See the *Common Equipment Installation Guide* for information about preparing the slot configuration for a BTI 7000 Series shelf.



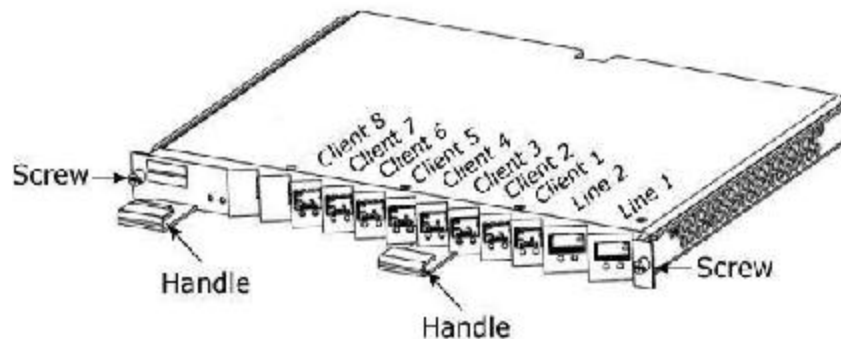
Caution

Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

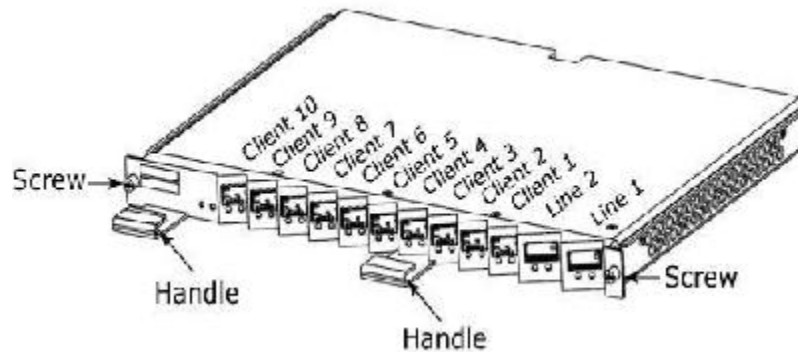
Key installation features

The following figures show the 8-Port and 10-Port Multiprotocol Muxponder modules and indicate the key features for installation.

Figure 8-4 8-Port Multiprotocol Muxponder module



10-Port Multiprotocol Muxponder module



Installation procedure

Follow these steps to install an 8-Port or 10-Port Multiprotocol Muxponder module:

Step 1 Insert the Muxponder Module

- a) Align the module to the slot in which it is being inserted.
- b) Carefully push the module straight into the slot.
- c) Push with sufficient pressure until the LEDs come on.

Step 2 Attach the Faceplate Screws

- a) Facing the front of the shelf, align the module with its mounting holes.
- b) Using a slot-head or Phillips screwdriver, carefully tighten the two faceplate screws:
 - Partially tighten the first support screw.
 - Partially tighten the other screw.
 - Fully tighten the first support screw.
 - Fully tighten the other screw.

Caution Tighten to a torque that is no more than 4.7 in-lbs.

Step 3 Insert the Transceivers

See [8.5, “Installing optical transceivers”](#) to insert the transceivers into the module, and then return to this procedure.

Step 4 Replace the Cables

If any cables were moved to access the module, replace the cables to their original locations.

You have successfully completed this procedure.

8.4 Installing packetVX modules

Use this procedure to install a packetVX module.

What you need

- Slot-head or Phillips screwdriver
- Electrostatic discharge (ESD) wrist strap
- packetVX module
- SFP or XFP transceivers
- Isopropyl alcohol and lint-free pads
- 1.25 mm HUXcleaner (recommended). Use ordering code BP1A5034.

Prerequisites

- If installing a packetVX 12/2 or packetVX 80 module, ensure that a double-width slot is available for it.
- If installing a packetVX 24/2 or 24/4 module, ensure that a double-width, double-height slot is available for it.

Considerations for installing a double-height packetVX module in a BTI 7200 shelf

Double-height packetVX modules (24/2 - BT7A81BA or 24/4 - BT7A81CA) that are new, or that have previously been used in BTI 7060 shelf running R7.x, must have their software upgraded to R8.1 or later to be fully compatible with the BTI 7200 shelf.

To upgrade a packetVX module's software, use one of the following methods:

- Install the packetVX module into one of slots 5, 7, 11, 15, or 17 in the BTI 7200 shelf. By installing into one of these slots, the module's software is automatically upgraded to R8.1, and the module can then be provisioned. If you install the module into any other BTI 7200 slot (3, 9, or 13), the software is not upgraded and the module cannot be provisioned.
- If the packetVX module is being re-deployed from a BTI 7060 shelf, leave the packetVX module in the BTI 7060 shelf, and upgrade the BTI 7060 shelf to R8.1 or later. The packetVX module is upgraded to R8.1 or later as part of the shelf upgrade.

Once a packetVX module is upgraded to Release 8.1 or later, it can be installed in any slot in the BTI 7200 shelf (except for slot 1 in a master shelf, which is reserved for the SCP).

Installation procedure



Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

The following figures show the key mechanical features of the packetVX modules.

Figure 8-6 Key features of the packetVX 12/2 module

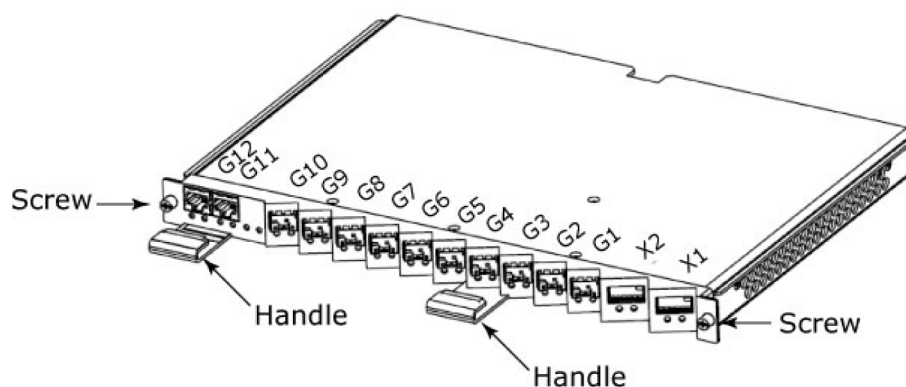


Figure 8-7 Key features of the packetVX 24/2 module

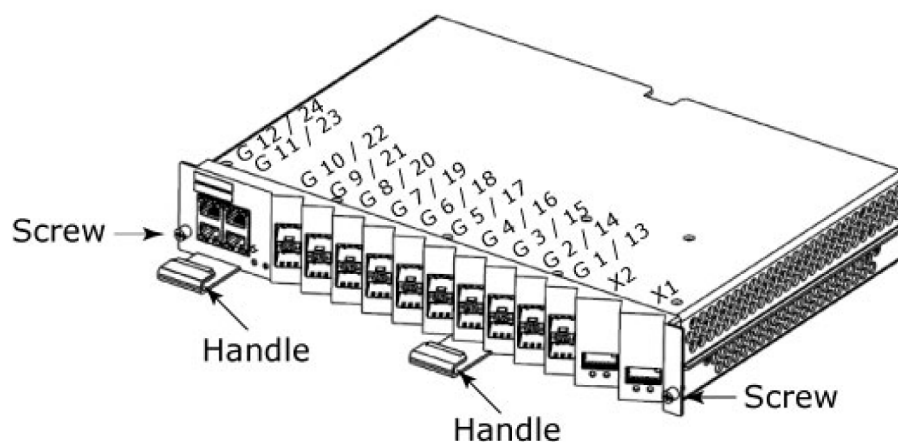


Figure 8-8 Key features of the packetVX 24/4 module

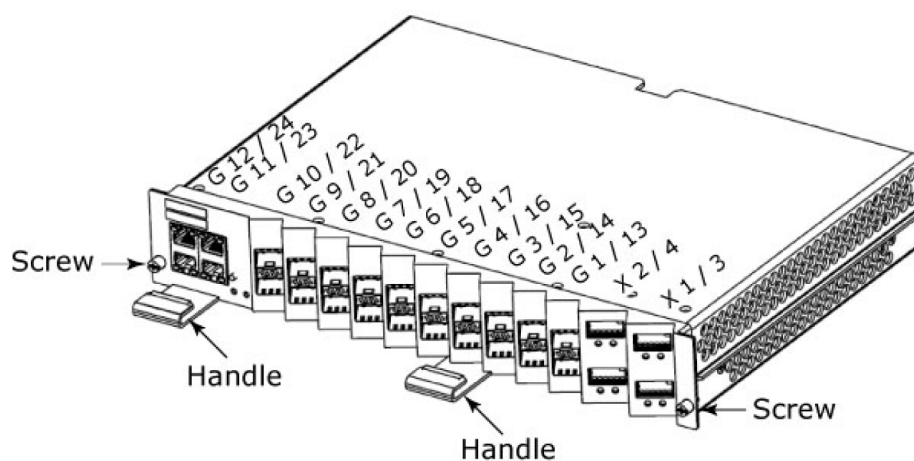
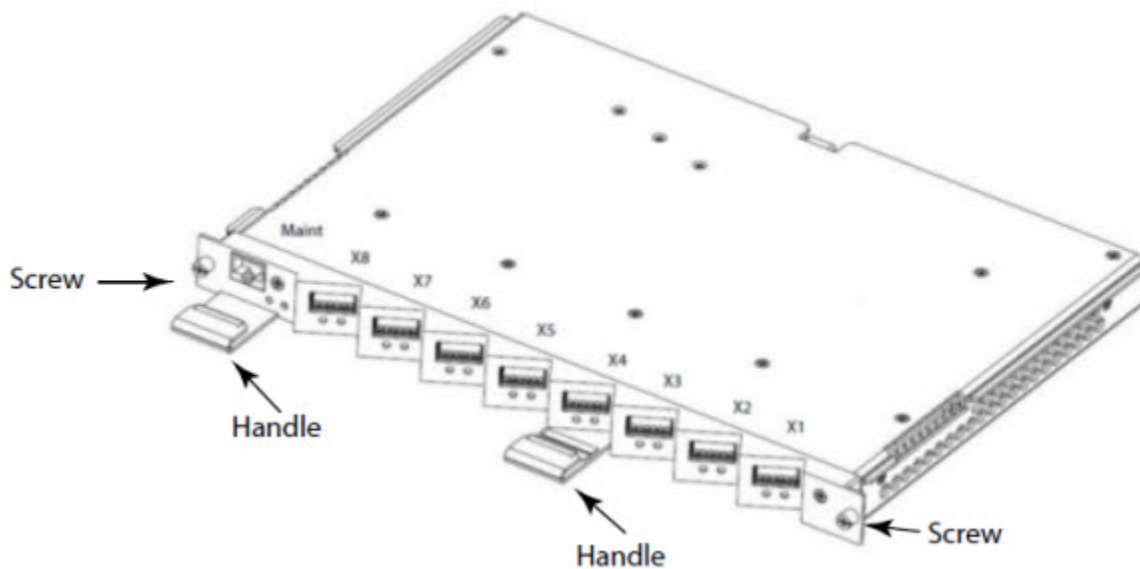


Figure 8-9 Key features of the packetVX 80 module

Use this procedure to install a packetVX module:

Step 1 Insert the module

- a) Align the module to the slot in which it is being inserted.
- b) Carefully push the module straight into the slot.
- c) Push with sufficient pressure until the LEDs come on.

Step 2 Attach the Faceplate Screws

- a) Facing the front of the shelf, align the module with its mounting holes.
- b) Using a slot-head or Phillips screwdriver, carefully tighten the two faceplate screws.
- c) Partially tighten the first screw.
- d) Partially tighten the other screw.
- e) Fully tighten the first screw.
- f) Fully tighten the other screw.

Caution Tighten with no more than 4.7 in-lbs of torque.

Step 3 Insert the SFP or XFP Transceivers

See [8.5, “Installing optical transceivers”](#) or [8.6, “Installing copper transceivers”](#) to insert the SFPs or XFPs into the module, and then return to this procedure.

Step 4 Replace the Cables

If any cables were moved to install the module, replace the cables to their original locations.

You have successfully completed this procedure.

8.5 Installing optical transceivers

Use this procedure to install optical small form factor (SFP) or 10 Gb/s (XFP) transceivers.

What you need

- Electrostatic discharge (ESD) wrist strap
- SFP or XFP transceiver
- Isopropyl alcohol and lint-free pads

Prerequisites

To prevent potential damage from electrostatic discharge, observe the following when handling transceivers:

- Do not remove a transceiver from its packaging until you are ready to install it into a module.
- Do not touch any of the pins, connections, or components of a transceiver.
- Always store or transport a transceiver in anti-static packaging.



Caution

Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).



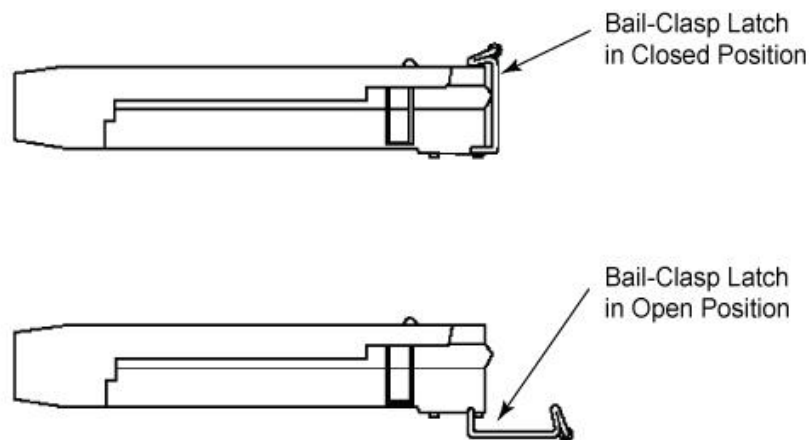
Laser

Invisible laser radiation can be emitted from the aperture ports of various modules when no fiber cable is connected. Avoid exposure and do not stare into open apertures to avoid permanent eye damage.

Transceiver key features

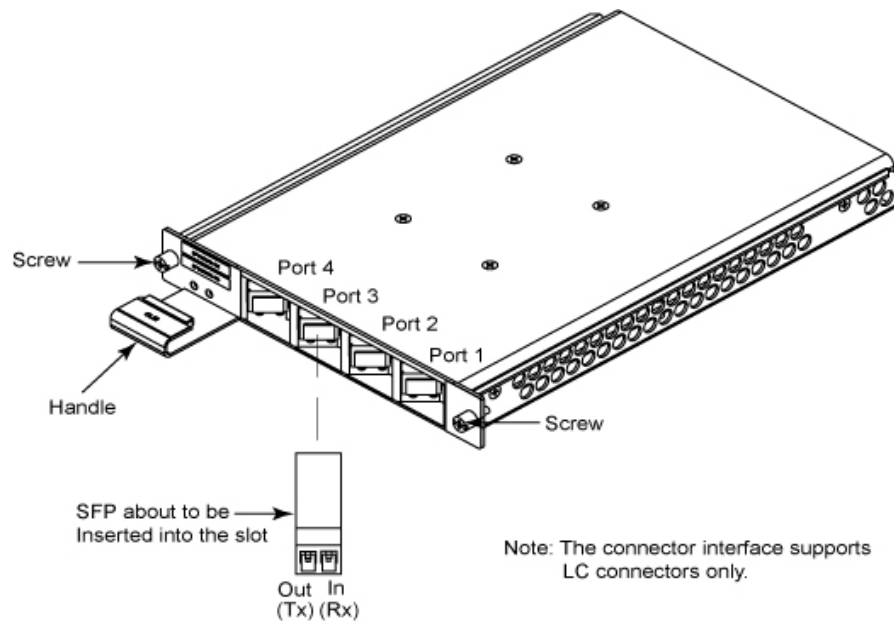
The following figure shows a typical SFP transceiver with a bail-clasp latch.

Figure 8-10 SFP transceiver with a bail-clasp latch



The following figure shows a transceiver about to be inserted into its slot.

Figure 8-11 Transceiver insertion in a generic module



Installation procedure

Step 1 Insert the Transceiver

Note Never insert a transceiver that already has a fiber connected to it. Always fully insert the transceiver first, and then connect the fiber to it.

- a) Hold the transceiver so that the optical connectors face you. On an SFP, the product label is visible. On an XFP, the product label is not visible.
- b) Ensure that the latch is in the closed position.
- c) Align the transceiver to the port in which it is being inserted.
- d) Carefully slide the transceiver straight into the port until it clicks.
 - If the red Fail LED turns on, there is a transceiver fault. To clear the fault, refer to the *Alarm and Troubleshooting Guide*.
 - If the yellow LOS LED turns on, there is no valid modulated signal connected to the transceiver. This condition clears once a valid modulated signal is connected.
- e) Remove the plastic protective cover, if fitted.

Step 2 Clean the Ends of the Fiber Optic Cables

Use lint-free pads with isopropyl alcohol to clean the ends of the fiber optic cables.

Step 3 Connect the Input and Output Optical Cables

Note Before connecting the optical cables to the transceiver, ensure that both the optical cable connectors and the transceiver optical surfaces are clean and that there is no residue on the optical surfaces.

Note The input, or receiver, is on the right side of the transceiver. The output, or transmitter, is on the left side of the transceiver.

- a) Ensure that the latch of the transceiver is in the closed position.
- b) Carefully slide the bottom of the male optical connector along the bottom of the transceiver opening.
- c) Gently push the male optical connector into the transceiver until a distinctive click is heard. Then continue exerting pressure on the connector to ensure a good connection is achieved.

Note A Loss of Signal (LOS) alarm can occur when no coherent modulated signal is connected to the transceiver. To clear an LOS alarm, see the *Alarm and Troubleshooting Guide*.

Important XFPs and DWDM SFPs take about 90 seconds to reach a stable operating temperature. As a result, the REPLUNITFAIL (XFP or SFP Failure) alarm is disabled for 95 seconds after the transceiver is seated. If there is a hardware fault, the REPLUNITFAIL alarm is raised after the 95-second time delay. For more information, see the *Alarm and Troubleshooting Guide*.

You have successfully completed this procedure.

8.6 Installing copper transceivers

Use this procedure to install a copper small form factor (SFP) transceiver with an RJ45 connector.

What you need

- Electrostatic discharge (ESD) wrist strap
- Copper SFP transceiver

Prerequisites

To prevent potential damage from electrostatic discharge, observe the following when handling transceivers:

- Do not remove a transceiver from its packaging until you are ready to install it into a module.
- Do not touch any of the pins, connections, or components of a transceiver.
- Always store or transport a transceiver in anti-static packaging.



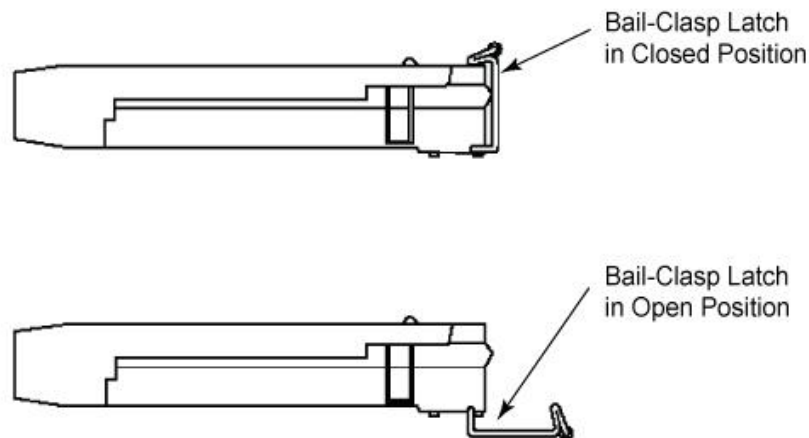
Caution

Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

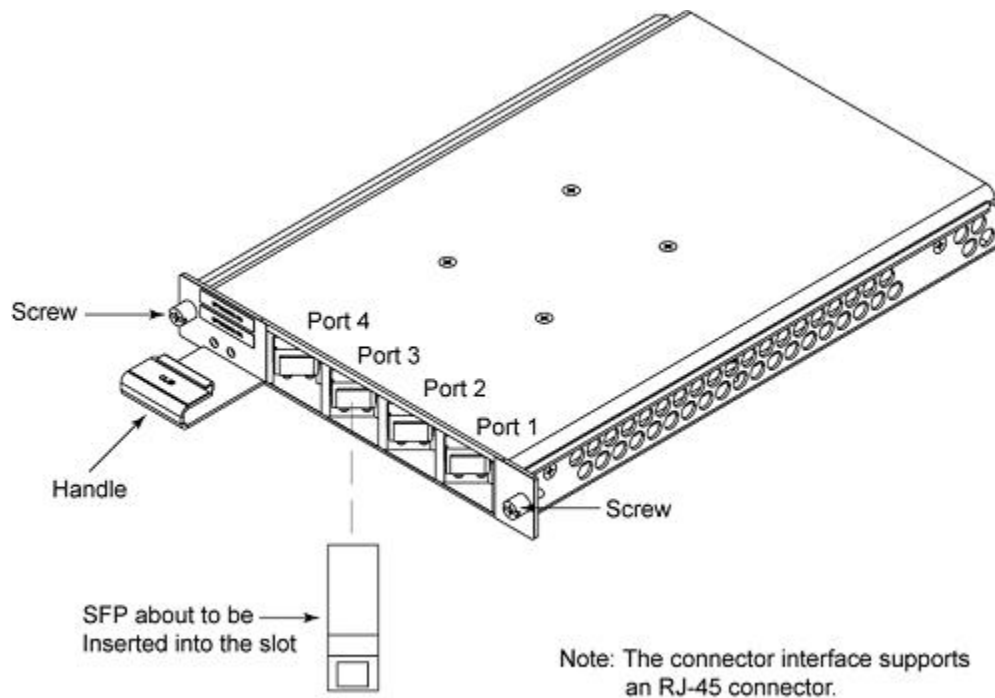
Transceiver key features

The following figure shows a typical SFP transceiver with a bail-clasp latch.

Figure 8-12 SFP transceiver with a bail-clasp latch



The following figure shows a transceiver about to be inserted into its slot.

Figure 8-13 Transceiver insertion in a generic module**Installation procedure**

Note The maximum cable length (CAT5 UTP) is 100 m.

Follow these steps to install a copper SFP transceiver:

Step 1 Insert the Transceiver

Note Never insert a transceiver that already has a CAT5 cable connected to it. Always fully insert the transceiver first, and then connect the CAT5 cable to it.

- a) Hold the transceiver so that the electrical RJ45 connector faces you. On an SFP, the product label is visible.
- b) Ensure that the latch is in the closed position.
- c) Align the transceiver to the port in which it is being inserted.
- d) Carefully slide the transceiver straight into the port until it clicks.
 - If the red Fail LED turns on, there is a transceiver fault. To clear the fault, refer to the *Alarm and Troubleshooting Guide*.
- e) Remove the plastic protective cover, if fitted.

Step 2 Connect an RJ45 cable to each copper SFP transceiver.

Connect an RJ45 cable to each copper SFP transceiver as follows:

- a)** Ensure that the latch of the SFP transceiver is in the closed position
- b)** Push the RJ45 connector into the SFP transceiver until a distinctive click is heard.

Note A Link Down alarm can occur when no signal is connected to the transceiver. To clear a Link Down alarm, refer to the *Alarm and Troubleshooting Guide*.

You have successfully completed this procedure.

8.7 Provisioning Transponder modules

Transponder modules may be provisioned before they are physically present in the shelf.

Provisioning settings and custom settings

When you provision a Transponder module, you specify settings such as its name and its Product Equipment Code, and provide brief ID information about the module. You can also provision custom information to record information specific to your environment. For example, you may want to record information about equipment usage, upgrades, and maintenance.

A Transponder module must be provisioned before a port on the module can be provisioned. When a module is physically present in the shelf, the system checks whether the module type matches the provisioned Transponder module type. If the inserted module type does not match the provisioned module type, an equipment mismatch alarm is raised. The alarm clears when the proper module type is inserted or when the provisioning data is updated to resolve the mismatch.

Displaying module information

Once a Transponder module is provisioned, you can view the settings specified when the module was provisioned, as well as inventory information, such as the module's hardware release number and date of manufacture.

Removing and restoring service

A Transponder module should be removed from service before it is deleted, so that alarms are not raised. A module that has been removed from service can be restored to service.

Restarting a module

Transponder modules support warm restarts and cold restarts. A warm restart lets you restart the software on the module. Although a warm restart is not service affecting, you cannot make configuration changes to the module while the warm restart is in process. A cold restart resets the software on the module and is service affecting.

Deleting a module

If you want to change the type of Transponder module that is either preprovisioned or physically present in a shelf, you must first delete it.

This section covers the following topics:

- [8.7.2, “Provision Transponder module settings”](#)
- [8.7.3, “Display Transponder module information”](#)
- [8.7.4, “Remove a Transponder module from service”](#)
- [8.7.5, “Restore a Transponder module to service”](#)
- [8.7.6, “Restart a Transponder module”](#)
- [8.7.7, “Delete a Transponder module”](#)

8.7.1 Provisioning an up-issued module

This section describes what you need to know about provisioning, when you use an up-issued module in your system environment:

- Available software functionality is dependent on the module issue number. For example, a Transponder -I02 module (BT7A49AA-I02) includes features that are not recognized on the base Transponder (BT7A49AA).
- Before you provision the module, verify the module issue number and the software functionality supported on that module. If you are provisioning a lower issued module and new software features are introduced on a higher issued module, the new features are blocked on the lower issued module. To enable the new features on the lower issued module, you must change the PEC of the lower issue module to the PEC of the higher issued module that includes those features.
- About editing existing provisioning settings:
 - If you attempt to modify settings, which are initially configured on a lower issued module and that module is replaced with a higher issued module, you can modify the existing settings, plus, configure new settings supported on the higher issued module.
 - If settings are configured, initially, on a higher issued module and that module is replaced with a lower issued module, before you can modify settings on the lower issued module, you must first delete the equipment information of the higher issued module. Note that only features supported on the lower issued module can be modified.

8.7.2 Provision Transponder module settings

Use this procedure to provision settings for a Transponder module.



Prerequisites

- Shelf must be provisioned.

Provisioning module settings

Follow these steps to provision settings for a Transponder module:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click the slot that includes the module you are provisioning and click **Provision Module**. The **Provision Module** dialog appears.

The following example displays the **Provision Module** dialog as it appears when you first open the dialog. By default, the **Name** and **PEC/CLEI Code** fields show the first entry of the drop-down menu.

The image shows a 'Provision Module' dialog box with two tabs: 'Settings' and 'Custom Settings'. The 'Settings' tab is selected. It contains two sections: 'General' and 'State Management'. In the 'General' section, there are fields for 'Name' (set to 'C1ADM'), 'PEC / CLEI Code' (set to 'BP1A32AA-01 / WMOAAJXGAA'), 'Shelf Number' (set to '1'), 'Slot Number' (set to '17'), and 'ID' (empty). In the 'State Management' section, there is a field for 'Initial State' (set to 'IS'). At the bottom right, there are three buttons: 'Apply', 'Close', and 'Help'.

Step 3 Select the module that you are provisioning.

Click the **Settings** tab. From the **Name** drop-down menu, select the module type. From the **PEC/CLEI Code** drop-down menu, select the product equipment code (PEC)/ Common Language Equipment Identification (CLEI) code for that module. The module shelf and slot numbers are displayed, automatically.

Step 4 Optional. Create an identifier (ID) for the module.

In the **ID** field, enter up to 20 alphanumeric characters.

Step 5 Specify the operational state of the module. From the **Initial State** drop-down menu, choose one of the following:

- **IS** — In Service
- **OOS** — Out of Service

Step 6 Click **Apply**.

Step 7 Option. Click the **Custom Settings** tab, and add additional information about the settings.

Step 8 Click **Close**.

You have successfully completed this procedure.

8.7.3 Display Transponder module information

Use this procedure to view provisioned and non-provisionable parameters for a Transponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Transponder module must be physically present in the shelf.

Displaying module information

Follow these steps to view parameters for a Transponder module:

Step 1 In the toolbar, click the **System Configuration** button.

Step 2 In the Navigation pane, right-click a module, and then click **Display Module Inventory**.

The **Display Inventory Information** dialog displays **General**, **Hardware**, **Manufacturing**, and **Testing** parameters for the Transponder module. See the following table.

Step 3 Click **Close**.

You have successfully completed this procedure.

Table 8-1 Module inventory information

Type	Parameter	Description
General	Full Name	Official name of the module
	Name	Short name of the module
	Shelf Number	The shelf in which the module is installed
	Slot Number	The slot in which the module is installed
Hardware	PEC Code	The product equipment code assigned by the manufacturer
	CLEI Code	The Common Language Equipment Identifier number assigned by Telcordia. The CLEI identifies the physical hardware.
	Release Number	The hardware release number
	Serial Number	The serial number of the module
	Firmware	The firmware version of the module
	USI	The USI setting
Manufacturing	Manufacturing Date	The date that the module was manufactured
	Manufacturing Location	The location where the module was manufactured

Table 8-1 Module inventory information (Continued)

Type	Parameter	Description
Testing	Testing Date	The date that the manufacturer tested the module
	Testing Location	The location where the manufacturer tested the module

8.7.4 Remove a Transponder module from service

Use this procedure to remove a Transponder module from service.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Transponder module must be provisioned and in service.

Removing a module from service

Follow these steps to remove a Transponder module from service:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click a module, and then click **Provision Module**.

Step 3 On the **Settings** tab of the **Provision Module** dialog, click the **Remove** button beside the **State** field.

Step 4 In the **Remove Entity** dialog, click **Yes**.

Step 5 Click **Close**.

You have successfully completed this procedure.

8.7.5 Restore a Transponder module to service

Use this procedure to restore a Transponder module to service.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Transponder module must be provisioned and out of service.

Restore a module to service

Follow these steps to restore a Transponder module to service:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click a module, and then click **Provision Module**.

Step 3 On the **Settings** tab of the **Provision Module** dialog, click the **Restore** button beside the **State** field.

Step 4 Click **Close**.

You have successfully completed this procedure.

8.7.6 Restart a Transponder module

Use this procedure to restart a Transponder module.



Prerequisites

- Transponder module must be provisioned.

Restarting a Transponder module

Follow these steps to perform a cold or warm restart of a Transponder module:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click a module, select **Restart Module**, and then click one of the following:

- **Warm Restart** — to restart the software on the module
- **Cold Restart** — to cycle the power on the module

Step 3 In the **Restart** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

Note	A CONTCOM (Control Communications Failure with Circuit Pack) alarm is raised during a cold or warm restart of a Transponder module. For information about this alarm, see the <i>Alarm and Troubleshooting Guide</i> .
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8.7.7 Delete a Transponder module

Use this procedure to delete a Transponder module.



Prerequisites

- Transponder module must be provisioned and removed from service.

Deleting a module

Follow these steps to delete a Transponder module:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click a module, and then click **Delete Module**.

Step 3 In the **Delete Module** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

8.8 Provisioning ports on Transponder modules

When you provision a port on a Transponder module, you must specify the protocol and wavelength. You can also provision custom information to record information specific to your environment. For example, you may want to record information about equipment usage, upgrades, and maintenance.

When a transceiver is physically present in a port, the system checks whether the transceiver type matches the provisioned transceiver type. If the inserted transceiver does not match the provisioned transceiver type, alarm is raised. The alarm clears when the proper transceiver type is inserted or when the provisioning data is updated to resolve the mismatch. If a tunable XFP is installed in the port being provisioned, the XFP tunes to the specified wavelength.

Ports on a provisioned Transponder module may be provisioned before the module is physically present in the shelf.

Ports on transponder modules must be provisioned before loopback tests, cross-connections, or protection groups can be provisioned.

Displaying and modifying port information

Once a Transponder port is provisioned, you can view the settings for provisioned and non-provisionable parameters, and modify provisionable parameters.

Removing and restoring service

A port must be removed from service when a loopback test is to be performed or when the port is to be deleted. A port that has been removed from service can be restored to service.

Deleting a port

You can delete a port when you need to change the transceiver type installed in the port.

This section covers the following topics:

- [8.8.1, “Provision port settings on a Transponder module”](#)
- [8.8.2, “Display port information for a Transponder module”](#)
- [8.8.3, “Remove a port from service ”](#)
- [8.8.4, “Restore a port to service”](#)
- [8.8.5, “Delete a port ”](#)

8.8.1 Provision port settings on a Transponder module

Use this procedure to provision settings for a transceiver port on a Transponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Transponder module must be provisioned.

Provisioning port settings

Follow these steps to provision port settings on a Transponder module:

Step 1 In the toolbar, click the **System Configuration** icon.

Step 2 In the Navigation pane, highlight the Transponder module that you are configuring and right-click on a port. Click **Provision Transceiver**. The **Provision Transceiver** dialog appears.

The following tabs are available for configuring a Transponder port : **Transceiver**, **Custom Info**, **Performance**, **Thresholds**, **GCC0**.

The following example displays the **Provision Transceiver** dialog with default values, as it appears before you apply new settings. The **Performance** and **Threshold** tabs become available once you apply the Transceiver settings:

The screenshot shows the 'Provision Transceiver' dialog box with the following sections:

- Tabs:** Transceiver (selected), Custom Info, Performance, Thresholds, GCC0.
- Settings:**
 - Protocol: 10 Gigabit Ethernet LAN with Fo...
 - Wavelength (nm:THz:Ch:DOL): 1310 : n/a : n/a : n/a
 - Phy PM Thld Mon: Disabled
 - Fault Propagation Shutdown: Disabled
 - SD Bit Error Rate: 10^-6
 - Loopback: Disabled
 - Vendor Part Number 1:
 - Transceiver PEC: BP3AM4MS
 - Vendor Part Number 2:
 - Tx Trace Id:
 - Vendor Part Number 3:
 - Expected Trace Id:
 - Laser Control: Manual On
 - Rx Trace Id:
- Cross Connects:**

Source	Destination	Direction
- Timers:**
 - Auto-In Service Timer: 0 days 8 hours 0 minutes
 - Active Auto-In Service Timer: <none> [Refresh]
- State Management:**
 - State: OOS-AU, UEQ [Remove] ☐ AIN S
 - Laser Status: OFF
- Buttons:** Apply, Close, Help

Step 3 Specify the settings for the port. See [Table 8-2](#).

Step 4 Click **Apply**.

You have successfully completed this procedure

Table 8-2 Port provisioning parameters

Tab/Parameter	Range of values	Description
Transceiver tab		
Settings		
Protocol	For a list of protocols supported by Transponder modules, see the <i>Transponder Solutions Guide</i> .	The protocol to be used. Note The protocol specified must fall within the range of bit rates supported by the transceiver.
Wavelength	0 (copper SFPs, GE clients only) 850nm to 1611nm Note For information about wavelengths supported on a tunable XFP, see the <i>Transponder Solutions Guide</i> .	The wavelength to be used
Fault Propagation Shutdown	Enabled Disabled (default) Note When Wavelength = 0, FPSD cannot be enabled. Note When the Protocol parameter is set to 10GELAN, the Fault Propagation Shutdown parameter is Enabled by default. Note Fault Propagation Shutdown must be set to Disabled if Laser Control is set to Manual On or Manual Off .	Enables or disables fault propagation shutdown. For more information, see 8.8.1.2, "Fault Propagation Shutdown and laser status" .
Physical PM Monitoring	Enabled Disabled (default)	Enables or disables monitoring of performance monitoring thresholds for SFP or XFPs with digital diagnostic support. For more information, see 8.8.1.1, "Threshold crossing alerts for transceiver ports" and 8.10.5.5, "Threshold crossing alerts for transceiver ports" .
Loopback	Terminal Facility	Terminal: The egress port transmits its configured maintenance signal.

Table 8-2 Port provisioning parameters (Continued)

Tab/Parameter	Range of values	Description
	Disabled (default)	<p>Note</p> <p>Terminal loopback cannot operate, if a loopback is operating on either port in the cross-connect (Terminal or Facility).</p> <p>Facility:</p> <ul style="list-style-type: none"> non-OTN protocols: the loopback occurs at the cross-point switch. The signal is still forwarded to the framer to analyze the signal for faults and defects. OTN protocols: the loopback occurs inside the framer, to decode and re-encode the E/FEC. <p>Caution</p> <p>Loopback should be performed when the transceiver port is out-of-service (OOS). The port may still be involved in provisioned cross-connects.</p>
SD Bit Error Rate	For 10G Multiprotocol Transponder, Dual 10G Multiprotocol Transponder, and Dual 4G Multiprotocol Transponder modules: 6 to 10, corresponding to 10^{-6} (high) to 10^{-10} (low)	The signal degrade bit error rate.
Transceiver PEC	Not applicable	The transceiver product equipment code .
Vendor Part Number 1, 2, 3	up to 20 characters	<p>The part numbers provided by the transceiver manufacturer.</p> <p>Note</p> <p>If a vendor part number is entered, the REPLUNITMEA alarm for the transceiver is enabled. Therefore, if the system detects a mismatch between the provisioned vendor part number and the number of the transceiver that is inserted in the port, the REPLUNITMEA alarm is raised.</p>
Tx Trace ID	up to 15 alphanumeric characters	The trace ID to transmit.
Expected Trace ID	up to 15 alphanumeric characters	The trace ID that is expected to be received.
Rx Trace ID (read only)	up to 15 alphanumeric characters	The trace ID that was received.
Laser Control	Auto Manual On Manual Off	<p>The laser status control.</p> <p>Set to Auto to let the software control the laser status. Set to</p>

Table 8-2 Port provisioning parameters (Continued)

Tab/Parameter	Range of values	Description
	Note Laser Control must be set to Auto if Fault Propagation Shutdown is Enabled .	Manual On to turn the laser on, Manual Off to turn the laser off.
Timers		
Auto-In Service Timer	days-hours-minutes	The automatic in-service (AINS) timer for the Transponder module. The default is 08-00.
Active Auto-In Service Timer (read only)	days-hours-minutes	The time remaining on the AINS timer
State Management		
State (read only)	IS OOS AINS	Indicates whether the port is in or out of service. The port defaults to the initial state of the module.
Laser Status (read only)	ON OFF IDLE PRBS REMOTE-FAULT ODU2-AIS AIS-L MS-AIS	Indicates the status of the laser. For more information, see 8.8.1.2, "Fault Propagation Shutdown and laser status" .
Custom Info tab		
Information Settings		
ID1, ID2	up to 32 alphanumeric characters per field	Identifier information about the port or transceiver
Fiber Type	DSF (Dispersion-shifted fiber) NDSF (Non-dispersion-shifted fiber) NZDSF (Non-zero dispersion-shifted fiber)	The fiber type that connects to transceiver. By default, the fiber type is set to <not specified>.
Grid	20 nm 50GHz 100GHz 200GHz	The channel frequency grid.
Custom 1, 2, 3	up to 255 alphanumeric characters for each field	Information specific to the operating environment.
Remote ID	up to 255 alphanumeric characters, in the form of <NE IP Address>-<Shelf>-<Slot>-<Port> For example: 172.1.23.456-21-5-1	The identity of the port at the far end.
Performance tab		
PM Collection Status		

Table 8-2 Port provisioning parameters (Continued)

Tab/Parameter	Range of values	Description
Refresh	5, 10, 30, 60, 300, 900, 3600 seconds	Sets, in seconds, how often to update the statistical information. Toggle the Start/Stop button to enable/disable the PM collection.
Current Status	Not applicable	Indicates whether or not the system is collecting the performance metrics.
Bin Type	15 minute bin 1 day bin Untimed bin	The time period for which to collect the performance metrics.
Physical PMs	The PM types displayed are dependent on the protocol you set, from the options in the Transceiver tab. For a description of PMs supported by each Transponder module refer to 8.8.1.3, “ Monitored type (montype) values and threshold crossing alerts (TCA) for Transponder modules ”.	The performance metrics collected.
Thresholds tab	Default threshold values or configured values. For a list of acceptable range values refer to 8.8.1.3, “ Monitored type (montype) values and threshold crossing alerts (TCA) for Transponder modules ”.	This page is used to monitor and modify the PM threshold values for the provisioned module.

8.8.1.1 Threshold crossing alerts for transceiver ports

The following threshold crossing alerts (TCAs) are available to most transceiver ports equipped with SFPs or XFPs. For information about threshold crossing alerts for supported protocols, see the Solutions Guide for the module.

Table 8-3 TCAs for transceiver ports equipped with SFPs or XFPs

TCA	Range	Description
OPTLT	Integer	Optical power transmitted low threshold. This value is retrieved from the SFP/XFP and is not provisionable.
OPTHT	Integer	Optical power transmitted high threshold. This value is retrieved from the SFP/XFP and is not provisionable.
OPRLT	Integer	Optical power received low threshold. This value is retrieved from the SFP/XFP and is not provisionable.
OPRHT	Integer	Optical power received high threshold. This value is retrieved

Table 8-3 TCAs for transceiver ports equipped with SFPs or XFPs

TCA	Range	Description
		from the SFP/XFP and is not provisionable.

These TCAs are available when the digital diagnostics implementation (DDIAGIMP) flag for the transceiver is set to yes (Y) in its inventory entry and the Physical PM Monitor parameter is enabled when the transceiver port settings are provisioned.

8.8.1.2 Fault Propagation Shutdown and laser status

Enabling Fault Propagation Shutdown on Transponder modules

When a fault is raised against a pluggable receiver interface, the corresponding transmitting laser at the far end of the link continues to function and can transmit unreliable information.

Fault propagation shutdown (FPSD) provides a means to quickly shut down a transmitting laser and pass the fault to the downstream device when a receiver signal failure occurs. When FPSD is enabled, the transmit laser is shut down in a fault scenario. When FPSD is disabled, the transmitted signal is the maintenance signal pattern for the provisioned protocol. You enable or disable the FPSD parameter when you provision port settings on a Transponder module.

Note If FPSD is enabled, the port laser control parameter must be set to allow software to automatically control the laser.

For information, see [8.8.1, “Provision port settings on a Transponder module”](#).

Laser status

The proNX 900 Node Controller provides laser status information as a read-only attribute. The following table lists the possible laser status values:

Table 8-4 Laser status values

Laser status	Description
ON	The laser is on and a valid signal is being transmitted.
OFF	The laser is shut down; no signal is being transmitted.
IDLE	The laser is transmitting an IDLE signal, as defined in IEEE 802.3ae. Note Applies only to the protocols GE and 10GELAN.
PRBS	The laser is transmitting the PRBS pattern at the provisioned rate. Note This value does not apply to the BT7A49AA-I02.
REMOTE-FAULT	The laser is transmitting the REMOTE-FAULT signal as defined in IEEE 802.3ae.
ODU2-AIS	The laser is transmitting OTN G.709-compliant ODU2-AIS. Note This value applies only to OTN protocols.
AIS-L	The laser is transmitting SONET AIS-L (Alarm Indication Signal on the Line).

Table 8-4 Laser status values (Continued)

Laser status	Description
	Note This value applies only to SONET protocols.
MS-AIS	The laser is transmitting SDH MS-AIS.
	Note This value applies only to SDH protocols.
LOCAL-FAULT	The laser is transmitting on the client transmit interface.

Rules for FPSD and laser status

In general, if FPSD is enabled for a transceiver port that is not transmitting a valid signal, the laser status is OFF. However, the following are rules that apply to specific modules:

- For the 1G Wavelength Translator, 1G Wavelength Regenerator, and 2.5G Wavelength Regenerator:
 - If FPSD is ENABLED for a transceiver port that is not transmitting a valid signal, the laser status is OFF.
- For the 2.5G Wavelength Manager:
 - If FPSD is ENABLED for a transceiver port that is not transmitting a valid signal, the laser status is OFF.
 - If FPSD is DISABLED for a transceiver port that is not transmitting a valid signal, and the port is provisioned to use a SONET protocol, the laser status is AIS-L.
 - If FPSD is DISABLED for GE protocol, the laser status is IDLE.
- For 10G Multiprotocol Transponder and Dual 10G Multiprotocol Transponder modules:
 - If FPSD is ENABLED for a transceiver port that is not transmitting a valid signal, the laser status is OFF.
 - If FPSD is DISABLED for a transceiver port that is not transmitting a valid signal, and the port is provisioned to use a SONET protocol, the laser status is AIS-L.
 - If FPSD is DISABLED for a transceiver port that is not transmitting a valid signal, and the port is provisioned to use an SDH protocol, the laser status is MS-AIS.
 - If FPSD is DISABLED for a transceiver port that is not transmitting a valid signal, and the port is provisioned to use the protocol 10GELANFEC/EPCMF, 10GELANEFEC/EPCMF, OC192FEC, OC192EFEC, or STM64FEC, STM64EFEC, the laser status is ODU2-AIS.
 - If FPSD is DISABLED for a GE/FC on a 10G Multiprotocol Transponder, the laser status is PRBS for the line port and Local Fault for the client port.
 - If FPSD is DISABLED for a GE/FC on a Dual 10G Multiprotocol Transponder-I02, the laser status is Local-Fault.

8.8.1.3 Monitored type (montype) values and threshold crossing alerts (TCA) for Transponder modules

The following tables describe the protocol Performance Monitoring (PM) types (montype), and list the threshold values that trigger a threshold crossing alert (TCA) on Transponder modules. TCAs are autonomously reported events that signal to the management system that a PM parameter value is reached or exceeds the configured threshold:

- Layer 1 Gigabit Ethernet PMs. See [Table 8-5](#).
- 10GELAN PMs. See [Table 8-6](#).
- SONET PMs. See [Table 8-7](#).
- SDH PMs. See [Table 8-8](#).
- Layer 1 Fibre Channel PMs. See [Table 8-9](#).
- OTN PMs. See [Table 8-10](#).

Table 8-5 Layer 1 Gigabit Ethernet PMs (counters)

PM (montype)	PM threshold default values		Supported modules
	15-minute	1-day	
CV 8B/10B Coding Violations measure the number of 8B/10B coding violations and disparity errors.	382	3820	Dual 4G Multiprotocol Transponder 2.5G Wavelength Manager
ES Errored Seconds measures the number of seconds during which one or more coding violations are detected, or a Loss of Synchronization (LOSYNC) or Loss of Signal (LOS) defect is present.	25	250	Dual 4G Multiprotocol Transponder 2.5G Wavelength Manager
SES Severely Errored Seconds measures the number of seconds during which the number of detected coding violations exceeds the severely errored seconds level (SESLVL), or a Loss of Synchronization (LOSYNC) defect or Loss of Signal (LOS) defect is present. The SESLVL value for Layer 1 Gigabit Ethernet is 1250.	4	40	Dual 4G Multiprotocol Transponder 2.5G Wavelength Manager
UAS Unavailable Seconds measures the number of seconds during which the link was considered unavailable. A link becomes unavailable at the onset of 10 consecutive seconds that qualify as SES, and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES. In seconds that are counted as unavailable, the counting of CV, ES, and SES is inhibited.	10	10	Dual 4G Multiprotocol Transponder 2.5G Wavelength Manager

Table 8-6 10GELAN PMs (counters)

PM (montype)	PM threshold default values		Supported modules
	15-minute bin	1-day bin	
INVBLK Invalid Blocks measures the number of invalid 64/66B coding blocks.	382	3820	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
ES Errored Seconds measures the number of seconds during which one or more errored blocks/code violations are detected, or LOSYNC (Loss of Synchronization) or LOS (Loss of Signal) is detected.	25	250	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
SES Severely Errored Seconds measures the number of detected invalid blocks exceeds the severely errored seconds level (SESLVL), or in which a Loss of Synchronization (LOSYNC) defect or Loss of Frame (LOF) defect is present. The SESLVL value for 10GELAN is 8554.	4	40	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
UAS Unavailable Seconds measures the number of seconds during which the link was considered unavailable. A link becomes unavailable at the onset of 10 consecutive seconds that qualify as SES, and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES. In seconds that are counted as unavailable, the counting of In seconds that are counted as unavailable, the counting of INVBLK, ES, and SES is inhibited	10	10	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
FCSE-RX Total number of received frames with CRC (Cyclic Redundancy Check) errors measures the number of received frames that had a valid length but had either a bad Frame Check Sequence (FCS Error) or a bad FCS with a non-integral number of OCTETS (alignment errors).	0	0	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
FRDR Total number of discarded frames measures the total number of frames dropped due to a lack of resources or other reasons. This number is not necessarily the number of frames dropped, but rather the number of time that dropped frames could be detected.	0	0	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
FRGT Total fragmented Frame Count in Receive Direction measures the total number of received frames that were less than 64 octets long (excluding framing bits, but including Frame Check Sequence (FCS) octets) and had either a bad FCS with a integral number of octets (FCS error) or a bad FCS with a non-integral number of octets (alignment error).	0	0	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder

Table 8-6 10GELAN PMs (counters) (Continued)

PM (montype)	PM threshold default values		Supported modules
	15-minute bin	1-day bin	
JABR Total Jabber Frame Count in Receive Direction measures the total number of received frames that were longer than the maximum frame size ¹ (excluding framing bits, but including Frame Check Sequence (FCS) octets), and had either a bad FCS with an integral number of octets (FCS error) or a bad FCS with a non-integral number of octets (alignment error).	0	0	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
BCST Total Broadcast Frame Count in Receive Direction measures the total number of good frames received that were directed to the broadcast address. (This number does not include frames that were directed to the multicast address.)			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
MCST Total multicast Frame Count in Receive Direction measures the total number of good frames received that were directed to a multicast address. (This number does not include frames that were directed to the broadcast address.)			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
OSIZE Total oversized Frame Count in Receive Direction measures the total number of received frames that were greater than the maximum frame size ¹ in length (excluding framing bits, but including Frame Check Sequence (FCS) octets) but were otherwise well formed.	0	0	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
OVER1518 Total over-1518 Frame Count in Receive Direction measures the total number of frames received that were greater than 1518 bytes but not exceeding the maximum frame size ¹ in length (excluding framing bits, but including Frame Check Sequence (FCS) octets).	0	0	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
SIZE64 Total 64 Byte Frame Count in Receive Direction measures the total number of 64 byte frames received (excluding framing bits, but including Frame Check Sequence (FCS) octets).			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
SIZE65-127 Total 65-127 Byte Frame Count in Receive Direction measures the total number of 65-127 byte frames received (excluding framing bits, but including Frame Check Sequence (FCS) octets).			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
SIZE128-255 Total 128-255 Byte Frame Count in Receive Direction measures the total number of 128-255 byte frames received (excluding			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder

Table 8-6 10GELAN PMs (counters) (Continued)

PM (montype)	PM threshold default values		Supported modules
	15-minute bin	1-day bin	
framing bits, but including Frame Check Sequence (FCS) octets).			
SIZE256-511 Total 256-511 Byte Frame Count in Receive Direction measures the total number of 256-511 byte frames received (excluding framing bits, but including Frame Check Sequence (FCS) octets).			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
SIZE512-1023 Total 512-1023 Byte Frame Count in Receive Direction measures the total number of 512-1023 byte frames received (excluding framing bits, but including Frame Check Sequence (FCS) octets).			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
SIZE1024-1518 Total 1024-1518 Byte Frame Count in Receive Direction measures the total number of 1024-1518 byte frames received (excluding framing bits, but including Frame Check Sequence (FCS) octets).			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
TBYC-RX Total Byte Count in Receive Direction measures the total number of bytes of data (including those in bad frames) received (excluding framing bits, but including Frame Check Sequence (FCS) octets).			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
TFRC-RX Total Frame Count in Receive Direction measures the total number of frames (bad frames, broadcast frames, and multicast frames) received.			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
USIZE Undersized Frames measures the total number of frames received that were less than 64 octets long (excluding framing bits, but including Frame Check Sequence (FCS) octets) and were otherwise well formed.	0	0	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder

¹The maximum frame size on the BT7A49AA and BT7A49AB modules is fixed at 9600 bytes. The maximum frame size on the BT7A49AA-I02 module is fixed at 10200 bytes.

Table 8-7 SONET PMs (counters)

PM (montype)	PM threshold default values		Supporting entities
	15-minute	1-day	
CVS	382	3820	OC3, OC12, OC48, OC192

Table 8-7 SONET PMs (counters) (Continued)

PM (montype)	PM threshold default values		Supporting entities
	15-minute	1-day	
Section Coding Violations measures the number of B1 Bit Interleaved Parity (BIP) errors detected at the section layer.			
ESS Section Errored Seconds measures the number of seconds during which one or more B1 Bit Interleaved Parity (BIP) errors were detected or a Severely Errored Frame (SEF) or a Loss of Signal (LOS) defect was present.	25	250	OC3, OC12, OC48, OC192
SEFS-S Section Severely Errored Framing Seconds measures the number of seconds during which a section SEF defect was present.	2	8	OC3, OC12, OC48, OC192
SESS Section Severely Errored Seconds measures number of seconds during which the number of detected B1 Bit Interleaved Parity (BIP) errors exceeds the severely errored seconds level (SESLVL), or a Severely Errored Frame (SEF) or a Loss of Signal (LOS) defect was present. The SESLVL value for SONET section level is as follows: <ul style="list-style-type: none">OC3 = 155OC12 = 616OC48 = 2392OC192 = 8554	4	40	OC3, OC12, OC48, OC192
UAS-S Section Unavailable Seconds measures the number of seconds during which the SONET section is unavailable. A second is considered UAS-S at the onset of 10 consecutive SESS seconds, and is no longer considered UAS-S after 10 consecutive seconds that are not SESS seconds. In seconds that are counted as unavailable, the counting of CVS, ESS and SESS are inhibited.	10	10	OC3, OC12, OC48, OC192

Note For information about SONET protocols supported on Transponder modules, see the *Transponder Solutions Guide*.

Table 8-8 SDH PMs (counters)

PM (montype)	PM threshold default values		Supported entities
	15-minute	1-day	
RS-EB	0	0	STM16, STM64

Table 8-8 SDH PMs (counters) (Continued)

PM (montype)	PM threshold default values		Supported entities
	15-minute	1-day	
Regenerator Section Errored Blocks measures the number of regenerator section errored blocks. An errored block is one that contains one or more (up to eight per block) B1 Bit Interleaved Parity (BIP) errors.			
RS-BBE	382	3820	STM16, STM64
Regenerator Section Background Block Errors measures the number of errored blocks not occurring during seconds counted as RS-SES seconds.			
RS-ES	25	250	STM16, STM64
Regenerator Section Errored Seconds measures the number of seconds during which one or more errored blocks were detected or a Loss of Frame (LOF) or a Loss of Signal (LOS) defect was present.			
RS-OFS	2	8	STM16, STM64
Regenerator Section out of Frame Seconds measures the number of seconds during which an Out of Frame (OOF) defect was present.			
RS-SES	4	40	STM16, STM64
Regenerator Section Severely Errored Seconds measures the number of seconds during which the number of detected errored blocks exceeds the severely errored seconds level (SESLVL), or a Loss of Frame (LOF) or Loss of Signal (LOS) defect was present. The SESLVL value for SDH regenerator section is 30% of the nominal block rate.			
RS-UAS	10	10	STM16, STM64
Regenerator Section Unavailable Seconds measures the number of seconds during which the regenerator section is unavailable. A second is considered RS-UAS at the onset of 10 consecutive RS-SES seconds, and is no longer considered RS-UAS after 10 consecutive seconds that are not RS-SES seconds. In seconds that are counted as unavailable, the counting of RS-EB, RS-BBE, RS-ES, and RS-SES is inhibited.			

Note For information about SDH protocols supported on Transponder modules, see the *Transponder Solutions Guide*.

Table 8-9 Layer 1 Fibre Channel PMs (counters)

PM (montype)	PM threshold default values		Supported modules
	15-minute	1-day	
CV 8B/10B Coding Violations measures the number of 8B/10B coding violations and disparity errors.	382	3820	Dual 4G Multiprotocol Transponder
INVBLK Invalid Blocks measures the number of invalid 64/66B coding blocks.	382	3820	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
ES Errored Seconds measures the number of seconds during which one or more coding violations are detected, or a Loss of Synchronization (LOSYNC) or Loss of Signal (LOS) defect is present.	25	250	Dual 4G Multiprotocol Transponder Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
SES Severely Errored Seconds measures the number of seconds during which the number of detected coding violations exceeds the severely errored seconds level (SESLVL), or a Loss of Synchronization (LOSYNC) defect or Loss of Signal (LOS) defect is present. The SESLVL value for Fiber Channel is 1250.	4	40	Dual 4G Multiprotocol Transponder Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
UAS Unavailable Seconds measures the number of seconds during which the link was considered unavailable. A link becomes unavailable at the onset of 10 consecutive seconds that qualify as SES, and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES.	10	10	Dual 4G Multiprotocol Transponder Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder

Table 8-10 OTN PMs (counters) supported on SONET/SDH line protocols

PM (montype)	PM threshold default values		Supported modules
	15-minute bin	1-day bin	
NUMBITSCR Number of Bits Corrected measures the total number of bits corrected by the Forward Error Correction (FEC) decoder according to the Reed-Solomon RS(255,239) forward error correction scheme.	0	0	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
NUMBYTESCR Number of Bytes Corrected measures the total number of bytes corrected by the forward error correction scheme.	0	0	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder

Table 8-10 OTN PMs (counters) supported on SONET/SDH line protocols (Continued)

PM (montype)	PM threshold default values		Supported modules
	15-minute bin	1-day bin	
Note			
Not supported on line protocols OC192EFEC and STM64EFEC.			
UNCRCDWRD	10	100	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
Number of Uncorrectable Code Words measures the total number of errored code words received that could not be corrected by the Forward Error Correction scheme.			
BER			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
Bit Error Ratio provides an estimate of the instantaneous Bit Error Ratio of the line by evaluating the ratio of the number of bits corrected to the total bits received over a 10-second time window. Both the instantaneous and average BER values are only valid for relatively low error rates in the signal. If the BER value is reported to be above 10 ⁻³ , it should be disregarded as it is not possible to accurately measure BER values above this level. BER values above this level usually indicate another problem, which should be evident in other PM counts.			
BER-AVG			Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
Average Bit Error Ratio provides an estimate of the average Bit Error Ratio of the line by evaluating the ratio of the number of bits corrected to the total bits received over the duration of the entire collection interval. Both the instantaneous and average BER values are only valid for relatively low error rates in the signal. If the BER value is reported to be above 10 ⁻³ , it should be disregarded as it is not possible to accurately measure BER values above this level. BER values above this level usually indicate another problem, which should be evident in other PM counts.			
OTU-BBE	382	3820	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
OTU-2 Background Block Error measures the number of errored blocks not occurring during seconds counted as OTU-SES seconds.			
OTU-EB	0	0	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
OTU-2 Errored Blocks measures the number of frames containing one or more Bit Interleaved Parity (BIP) errors, using the OTU-2 SM BIP-8 byte in the incoming OTN signal. Up to eight BIP-8 errors can be detected per OTU-2 frame. However, regardless of the number of BIP-8 errors detected, a single frame can count for no more than one errored block.			
Note			
EB counting is suspended when either one of the following faults is active on the port: Loss of Signal, Loss of Frame.			

Table 8-10 OTN PMs (counters) supported on SONET/SDH line protocols (Continued)

PM (montype)	PM threshold default values		Supported modules
	15-minute bin	1-day bin	
OTU-ES OTU-2 Errored Seconds measures the number of seconds during which one or more errored blocks is detected or a Loss of Frame (LOF), Loss of Signal (LOS), or Trace Identifier Mismatch (TIM) defect is present.	25	250	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
OTU-SES OTU-2 Severely Errored Seconds measures the number of seconds during which the number of detected errored blocks exceeds the severely errored seconds level (SESLVL), or a Loss of Frame (LOF), Loss of Signal (LOS), or Trace Identifier Mismatch (TIM) defect was present. The SESLVL value for OTN is 30% of the nominal block rate.	4	40	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
OTU-OFS OTU-2 Out of Frame Seconds measures the number of seconds during which a Out of Frame (OOF) defect was present.	2	8	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder
OTU-UAS OTU-2 Unavailable Seconds measures the number of seconds during which the OTN line is unavailable. A second is considered OTU-UAS at the onset of 10 consecutive OTU-SES seconds, and is no longer considered OTU-UAS after 10 consecutive seconds that are not OTU-SES seconds.	10	10	Dual 10G Multiprotocol Transponder 10G Multiprotocol Transponder

8.8.2 Display port information for a Transponder module

Use this procedure to view provisioned and non-provisionable parameters for port on a Transponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- None

Displaying port information

Follow these steps to view port information for a Transponder module.

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click a port on a module, and then click **Provision Transceiver**.

The **Provision Transceiver** dialog displays the port parameters on the **Transceiver** tab and the **Custom Info** tab. For information on the port parameters, see 8.8.1, “[Provision port settings on a Transponder module](#)”.

Step 3 Click **Close**.

You have successfully completed this procedure.

8.8.3 Remove a port from service

Use this procedure to remove a port on a Transponder module from service.



Prerequisites

- Port must be provisioned and in service.

Removing a port from service

Follow these steps to remove a port on a Transponder module from service:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click a port on a Transponder module, and then click **Provision Transceiver**.

Step 3 On the **Settings** tab of the **Provision Transceiver** dialog, click the **Remove** button beside the **State** field.

Step 4 Click **Close**.

You have successfully completed this procedure.

8.8.4 Restore a port to service

Use this procedure to restore a port on a Transponder module to service.



Prerequisites

- Port must be provisioned and out of service.

Restore a port to service

Follow these steps to restore a port on a Transponder module to service:

- Step 1** In the toolbar, click the System Configuration button.
- Step 2** In the Navigation pane, right-click a port on a Transponder module, and then click **Provision Transceiver**.
- Step 3** On the **Settings** tab of the **Provision Transceiver** dialog, click the **Restore** button beside the **State** field.
- Step 4** Click **Close**.

You have successfully completed this procedure.

8.8.5 Delete a port

Use this procedure to delete a port on a Transponder module.



Prerequisites

- Port must be provisioned and removed from service.
- Port must not be in use in a cross-connection or a protection group.

Deleting a port

Follow these steps to delete a port on a Transponder module:

- Step 1** In the toolbar, click the System Configuration button.
- Step 2** In the Navigation pane, right-click a port on a Transponder module, and then click **Delete Transceiver**.
- Step 3** In the **Delete Transceiver** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

8.9 Provisioning Muxponder modules

Muxponder modules can be provisioned before they are physically present in the shelf. Also, these modules can be manually provisioned if they are present in a shelf and the autoprovisioning parameter (AUTOP) is disabled.

Provisioning settings and custom settings

When you provision a Muxponder module, you specify settings such as its name and its Product Equipment Codepart number, and provide brief ID information about the module. You can also provision custom information to record information specific to your environment. For example, you may want to record information about equipment usage, upgrades, and maintenance.

When a module is physically present in the shelf, the system checks to see if the module type matches the provisioned Muxponder module type. If the inserted module type does not match the provisioned module type, an equipment mismatch alarm is raised. This alarm clears when the proper module type is inserted or when the provisioning data is updated to resolve the mismatch.

A Muxponder module must be provisioned before a port on the module can be provisioned.

Displaying module information

Once a Muxponder module is provisioned, you can view the provisioned settings. You can also view inventory information, such as the module's hardware release number and date of manufacture.

Removing and restoring service

A Muxponder module should be removed from service before it is deleted. A module that has been removed from service can be restored to service. Removing a port from service affects the traffic on that port.

Restarting a module

Muxponder modules support warm restarts and cold restarts. A warm restart lets you restart the software on the module. Although a warm restart is not service affecting, you cannot make configuration changes to the module while the warm restart is in process. A cold restart recycles the power on the module and is service affecting.

Deleting a module

If you want to change the type of Muxponder module that is either preprovisioned or physically present in a shelf, you must first delete it.

This section covers the following topics:

- [8.9.1, “Provision Muxponder module settings”](#)
- [8.9.2, “Display Muxponder module information”](#)
- [8.9.3, “Remove a Muxponder module from service”](#)
- [8.9.4, “Restore a Muxponder module to service”](#)

- [8.9.5, “Restart a Muxponder module”](#)
- [8.9.6, “Delete a Muxponder module”](#)

8.9.1 Provision Muxponder module settings

Use this procedure to provision settings for a Muxponder module.



Prerequisites

- Shelf must be provisioned.

Provisioning module settings

Follow these steps to provision settings for a Muxponder module:

- Step 1** In the toolbar, click the System Configuration button.
- Step 2** In the Navigation pane, right-click a slot, and then select **Provision Module**.
- Step 3** On the **Settings** tab of the **Provision Module** dialog, click **MXP** in the **Name** list.
The first available product equipment code (PEC) and, if available, the Common Language Equipment Identification (CLEI) code for the selected module type automatically appear in the **PEC/CLEI** list.
- Step 4** Optionally, enter information (up to 20 alphanumeric characters) about the module in the **ID** field.
- Step 5** Choose one of the following from the **Initial State** list:
- **IS** — to set the state of the module to In Service
 - **OOS** — to set the state of the module to Out of Service
- Step 6** Click **Apply**.

You have successfully completed this procedure.

8.9.2 Display Muxponder module information

Use this procedure to view provisionable and non-provisionable parameters for a BTI 7000 Series Muxponder module.



Prerequisites

- Muxponder module must be physically present in the shelf.

Displaying module information

Follow these steps to view parameters for a Muxponder module:

- Step 1** In the toolbar, click the System Configuration button.
- Step 2** In the Navigation pane, right-click a Muxponder module, and then click **Display Module Inventory**.
- The **Display Inventory Information** dialog displays **General**, **Hardware**, **Manufacturing**, and **Testing** parameters for the module. See [Table 8-11](#).
- Step 3** Click **Close**.

You have successfully completed this procedure.

Table 8-11 Module inventory information

Type	Parameter	Description
General	Full Name	Official name of the module
	Name	Short name of the module
	Shelf Number	The shelf in which the module is installed
	Slot Number	The slot in which the module is installed
Hardware	PEC Code	The product equipment code assigned by the manufacturer
	CLEI Code	The Common Language Equipment Identifier number assigned by Telcordia. The CLEI identifies the physical hardware.
	Release Number	The hardware release number
	Serial Number	The serial number of the module
Manufacturing	Manufacturing Date	The date that the module was manufactured
	Manufacturing Location	The location where the module was manufactured
Testing	Testing Date	The date that the manufacturer tested the module
	Testing Location	The location where the manufacturer tested the module

8.9.3 Remove a Muxponder module from service

Use this procedure to remove a BTI 7000 Series Muxponder module from service.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Muxponder module must be provisioned.
- Ports, if provisioned, must be removed from service.

Removing a module from service

Follow these steps to remove a Muxponder module from service.

- Step 1** In the toolbar, click the System Configuration button.
- Step 2** In the Navigation pane, right-click a Muxponder module, and then click **Provision Module**.
- Step 3** On the **Settings** tab of the **Provision Module** dialog, click the **Remove** button beside the **State** field.
- Step 4** In the Remove Entity dialog box, click Yes.
- Step 5** Click **Close**.

You have successfully completed this procedure.

8.9.4 Restore a Muxponder module to service

Use this procedure to restore a BTI 7000 Series Muxponder module to service.



Prerequisites

- Muxponder module must be provisioned and out of service.

Restore a module to service

Follow these steps to restore a Muxponder module to service:

- Step 1** In the toolbar, click the System Configuration button.
- Step 2** In the Navigation pane, right-click a Muxponder module, and then click **Provision Module**.
- Step 3** On the **Settings** tab of the **Provision Module** dialog, click the **Restore** button beside the **State** field.
- Step 4** Click **Close**.

You have successfully completed this procedure.

8.9.5 Restart a Muxponder module

Use this procedure to restart a BTI 7000 Series Muxponder module.



Prerequisites

- Muxponder module must be provisioned.

Restarting a Muxponder module

Follow these steps to perform a cold or warm restart of a Muxponder module:

Step 1 In the Navigation pane, right-click a Muxponder module, select **Restart Module**, and then click one of the following:

- **Warm Restart** — to restart the software on the module
- **Cold Restart** — to cycle the power on the module

Step 2 In the **Restart** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

Note A CONTCOM (Control Communications Failure with Circuit Pack) alarm is raised during a cold or warm restart of a Muxponder module. For information about this alarm, see the *Alarm and Troubleshooting Guide*.

8.9.6 Delete a Muxponder module

Use this procedure to delete a BTI 7000 Series Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Muxponder module must be provisioned.
- Cross-connections and ports must be deleted.

Deleting a module

Follow these steps to delete a Muxponder module.

Step 1 In the Navigation pane, right-click a Muxponder module, and then click **Delete Module**.

Step 2 In the **Delete Module** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

8.10 Provisioning ports on Muxponder modules

Ports on a provisioned Muxponder module may be provisioned before the module is physically present in the shelf. Also, ports can be manually provisioned if they are present in a shelf and the autoprovisioning parameter (AUTOP) is disabled.

Provisioning settings and custom settings

When you provision a port on a Muxponder module, you must specify the wavelength to be used. You can also provision custom information to record information specific to your environment. For example, you may want to record information about equipment usage, upgrades, and maintenance.

Ports on Muxponder modules must be provisioned before loopback tests and cross-connections can be provisioned. When a transceiver is installed in a provisioned port, the system checks to see if the transceiver type matches the provisioned transceiver type. If the installed transceiver does not match the provisioned transceiver type, an alarm is raised. The alarm clears when the proper transceiver type is inserted or when the provisioning data is updated to resolve the mismatch. If a tunable XFP is installed in the port being provisioned, the XFP tunes to the specified wavelength.

Displaying and modifying transceiver and port information

You can view inventory information for any transceiver inserted in a Muxponder port. Once a Muxponder port is provisioned, you can view the settings for provisioned and non-provisionable parameters, and modify provisionable parameters.

This section covers the following topics:

- [8.10.1, “Provision port settings on a 2-Port GbE Muxponder module”](#)
- [8.10.2, “Provision port settings on an 8-Port Multiprotocol Muxponder module”](#)
- [8.10.3, “Provision port settings on a 10-Port Multiprotocol Muxponder module”](#)
- [8.10.4, “Bulk port provisioning”](#)
- [8.10.5, “Display port information for a Muxponder module”](#)
- [8.10.6, “Modify port settings on a Muxponder module”](#)
- [8.10.7, “Remove a port from service on a Muxponder module”](#)
- [8.10.8, “Restore a port to service on a Muxponder module”](#)
- [8.10.9, “Delete a port on a Muxponder module”](#)

8.10.1 Provision port settings on a 2-Port GbE Muxponder module

Use this procedure to provision port settings on a 2-Port GbE Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Muxponder module must be provisioned.

Provisioning port settings

Follow these steps to provision port settings on a 2-Port GbE Muxponder.

Important When you provision an OC48 or STM16 line-side port, the associated Virtual Concatenation Groups (VCGs) are automatically created and are fixed. For information about VCGs, see the *Muxponder Solutions Guide*.

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click the Muxponder module port that you want to provision, and then click **Provision Port**.

Step 3 On the **Transceiver** and **Custom Info** tabs of the **Provision Port** dialog, specify the settings for the port. See [Table 8-12](#).

Note The **Protocol** parameter is set by default and cannot be modified.

Step 4 Click **Apply**.

You have successfully completed this procedure.

Table 8-12 2-Port GbE Muxponder port provisioning parameters

Parameter	Range of Values	Description	Applicable Ports
Wavelength	0 (copper SFPs only) 850nm to 1650nm Note When Wavelength is set to 0, Media Rate cannot be set to Auto, and Physical PM Monitoring cannot be set to Enabled.	The wavelength to be used Note This parameter is required.	0 applies only to clients 1 and 2, and only when Protocol = GE 850nm to 1650nm applies to Line 1, Line 2, Client 1, Client 2
Physical PM Monitoring	Enabled Disabled (default) Note When Wavelength is set to 0, Physical PM Monitoring cannot be set to Enabled.	Enables or disables monitoring of threshold crossing alarm (TCA) values for SFPs with digital diagnostic support. For more information, see 8.8.1.1, "Threshold crossing alerts for transceiver ports" and 8.10.5.5, "Threshold crossing alerts for transceiver ports" .	Line 1, Line 2, Client 1, Client 2

Table 8-12 2-Port GbE Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports
Fault Propagation Shutdown	Enabled Disabled (default) Note When Wavelength = 0, FPSD cannot be Enabled . Note Fault Propagation Shutdown must be set to Disabled if Laser Control is set to Manual On or Manual Off .	Enables or disables fault propagation shutdown. For more information, see 8.10.5.4, “Fault Propagation Shutdown and laser status” .	Client 1, Client 2
SD Bit Error Rate	10^{-5} to 10^{-8} Default = 10^{-5}	The signal degrade BER threshold	Line 1, Line 2
Loopback	terminal facility Disabled (default)	Enables or disables a loopback test on a transceiver	facility on Line 1, Line 2, Client 1, Client 2 terminal on Client 1, Client 2
Vendor Part Number 1, 2, 3	up to 20 characters	The part numbers provided by the transceiver manufacturer Note When the system detects a mismatch between the provisioned vendor part number and the vendor part number of the transceiver that is installed in the port, the REPLUNITMEA alarm is raised.	Line 1, Line 2, Client 1, Client 2
Laser Control	Auto (default) Manual On Manual Off Note Laser Control must be set to Auto if Fault Propagation Shutdown is Enabled .	The laser status control. Set to Auto to let the software control the laser status. Set to Manual On to turn the laser on, Manual Off to turn the laser off.	Line 1, Line 2, Client 1, Client 2
Transceiver PEC	1 to 11 alphanumeric characters	The product equipment code Note When a value is entered, the system compares it to the PEC of the transceiver that is installed in the port. Also, the vendor part numbers are ignored.	Line 1, Line 2, Client 1, Client 2

Table 8-12 2-Port GbE Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports
Media Rate	Auto (default) 1000FD Note When Wavelength = 0, Media Rate cannot be set to Auto.	The Ethernet speed and duplex rate in Mbps	Client 1, Client 2
Auto-In Service Timer	days-hours-minutes	The automatic in-service (AINS) timer for the Muxponder module. The default is 0-8-00.	Line 1, Line 2, Client 1, Client 2
Active Auto-In Service Timer	days-hours-minutes	The time remaining on the AINS timer	Line 1, Line 2, Client 1, Client 2
Initial State	IS OOS AINS	The state of the port The port defaults to the initial state of the module.	Line 1, Line 2, Client 1, Client 2
ID 1	up to 32 alphanumeric characters	Identifier information for the port or transceiver	All ports
Fiber Type	DSF NDSF NZDSF	The fiber type that connects to the transceiver	Line 1, Line 2, Client 1, Client 2
Custom 1	up to 256 alphanumeric characters	Information specific to the operating environment	All ports

8.10.2 Provision port settings on an 8-Port Multiprotocol Muxponder module

Use this procedure to provision port settings on an 8-Port Multiprotocol Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Muxponder module must be provisioned.

Provisioning port settings

Follow these steps to provision port settings on an 8-Port Multiprotocol Muxponder module.

Important When you provision a line-side port, default Virtual Concatenation Groups (VCGs) are automatically created. For information about VCGs, see the *Muxponder Solutions Guide*.

Step 1 In the Navigation pane, right-click the Muxponder module port that you want to provision, and then click **Provision Port**.

Step 2 On the **Transceiver** and **Custom Info** tabs of the **Provision Port** dialog, specify the settings for the port. See [Table 8-13](#).

Note For the ports **Line 1** and **Line 2**, the **Protocol** parameter is set by default and cannot be modified.

Step 3 Click **Apply**.

You have successfully completed this procedure.

Table 8-13 8-Port Multiprotocol Muxponder port provisioning parameters

Parameter	Range of Values	Description	Applicable Ports and Protocols
Protocol	See the <i>Muxponder Solutions Guide</i> .	The protocol to be used	Clients 1 to 8
Wavelength	0 (copper SFPs only) 850nm to 1650nm Note This parameter cannot be set to 0 when Media Rate = Auto or when Physical PM Monitoring = Enabled.	The wavelength to be used Note This parameter is required.	0 applies to clients 3 to 8; only when Protocol = GE 850nm to 1650nm applies to all ports and protocols
Physical PM Monitoring	Enabled Disabled (default) Note When Wavelength is set to 0, Physical PM Monitoring cannot be set to Enabled.	Enables or disables monitoring of threshold crossing alarm (TCA) values for SFP and XFPs with digital diagnostic support. For more information, see 8.8.1.1, "Threshold crossing alerts for transceiver ports" and 8.10.5.5, "Threshold crossing alerts for transceiver ports" .	All ports and protocols
Fault Propagation Shutdown	Enabled Disabled (default) Note When Wavelength = 0, FPSD cannot be Enabled . Note Fault Propagation Shutdown must be set to Disabled if Laser Control is set to Manual On or Manual Off .	Enables or disables fault propagation shutdown. For more information, see 8.10.5.4, "Fault Propagation Shutdown and laser status" .	Clients 3 to 8; only when Protocol = GE, FC1, or FC2
SD Bit Error Rate	10^{-5} to 10^{-12}	The signal degrade BER threshold	Line 1, Line 2

Table 8-13 8-Port Multiprotocol Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
	Default = 10 ⁻⁶		Clients 1 to 4; SONET/SDH protocols only
Loopback	Terminal Facility Disabled (default)	Enables or disables a loopback test on a transceiver	Facility on all ports Terminal on Clients 1 to 8
Transceiver PEC	1 to 11 alphanumeric characters	The product equipment code Note When a value is entered, the system compares it to the PEC of the transceiver that is inserted in the port. Also, the vendor part numbers are ignored.	All ports and protocols
Line mapping	None (only SONET/SDH framing) OTU1 (SONET/SDH into an OTU1 frame) SUBODU1 – OTU1 (no SONET/SDH framing; four ODU1s into an OTU1 frame)	The type of line mapping into an OTN frame Note This parameter cannot be changed when the line port is connected or when cross line protection is enabled. Note This parameter can be changed only when both line ports are in the OOS-MA state.	Line1, Line 2 Note The value of this parameter must be the same for both line ports.
Media Rate	Auto 1000FD (default) Note When Wavelength is set to 0, Media Rate cannot be set to Auto.	The Ethernet speed and duplex rate in Mbps Note This parameter can be set to Auto only when GFP Mode = GFP-F. Note When Wavelength = 0, this parameter cannot be set to Auto.	Clients 3 to 8; only when Protocol = GE
GFP Mode	GFP-T (default) GFP-F	The GFP mapping mode Note This parameter cannot be changed when the client port is connected.	Clients 3 to 8; only when Protocol = GE, FC1, or FC2 Note FC1 and FC2 support only GFP-T. Note On a GE client port, this parameter cannot be set to

Table 8-13 8-Port Multiprotocol Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
			GFP-T when Flow Control = Local or when Media Rate = Auto.
TOH Transparency	No (default) Yes Note For more information about TOH Transparency, see the <i>Muxponder Solutions Guide</i> .	Bytes A1/A2 and B1 in the section overhead transparency for the client are either terminated or transported transparently. Yes = asynchronous connections are transported transparently. No = A1, A2, and B1 are regenerated. Note This parameter cannot be changed when the client port is connected. Note This parameter can be changed only when the client port is in the OOS-MA state.	Clients 1 to 4; SONET/SDH protocols only
DCC Transparency	No (default)	Specifies whether the Section DCC (SDCC), specifically the D1, D2, and D3 bytes, for the synchronous client is transported transparently Note This parameter cannot be changed when the client port is connected. Note This parameter can be changed only when the client port is in the OOS-MA state.	Clients 1 to 4; only when Protocol = OC12/STM4 Note For more information about SDCC Transparency, see the <i>Muxponder Solutions Guide</i> .
Transparency Channel	1 (default) to 12 for OC12 1 (default) to 4 for STM4	The cross-connected timeslot on which DCC transparency is transported	Clients 1 to 4; only when Protocol = OC12/STM4
Flow Control	Transparent (default) Local	The type of flow control	Clients 3 to 8; only when Protocol = GE Note For information about flow control, see the <i>Muxponder Solutions Guide</i> .

Table 8-13 8-Port Multiprotocol Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
Vendor Part Number 1, 2, 3	Up to 20 characters	<p>The part numbers provided by the transceiver manufacturer</p> <p>Note</p> <p>When the system detects a mismatch between the provisioned vendor part number and the vendor part number of the transceiver that is inserted in the port, the REPLUNITMEA alarm is raised.</p>	All ports and protocols
Laser Control	Auto (default) Manual On Manual Off <p>Note</p> <p>Laser Control must be set to Auto if Fault Propagation Shutdown is Enabled.</p>	<p>The laser status control.</p> <p>Set to Auto to let the software control the laser status. Set to Manual On to turn the laser on, Manual Off to turn the laser off.</p>	All ports and protocols
Auto-In Service Timer	Days-hours-minutes	<p>The automatic in-service (AINS) timer for the Muxponder module.</p> <p>The default is 08-00.</p>	All ports and protocols
Initial State	IS OOS AINS	<p>The state of the port</p> <p>The port defaults to the initial state of the module.</p>	All ports and protocols
ID 1	Up to 32 alphanumeric characters	Identifier information for the port or transceiver	All ports and protocols
Fiber Type	DSF NDSF NZDSF Multimode	The fiber type that connects to the transceiver	All ports and protocols
Custom 1	Up to 256 alphanumeric characters	Information specific to the operating environment	All ports and protocols
Remote ID	Valid IP address	<p>The remote IP address of the connection in dotted decimal notation, and the <shelf>, <slot>, and <port> of the remote end.</p> <p>For example, 10.1.205.4-21-1-1 describes a connection where the remote end is at 10.1.205.4 on shelf 21, slot 1, and port 1.</p>	All ports and protocols

8.10.3 Provision port settings on a 10-Port Multiprotocol Muxponder module

Use this procedure to provision port settings on a 10-Port Multiprotocol Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Muxponder module must be provisioned.

Provisioning port settings

Follow these steps to provision port settings on a 10-Port Multiprotocol Muxponder module.

Important When you provision an OC192 or STM64 line-side port, default Virtual Concatenation Groups (VCGs) are automatically created. For information about VCGs, see the *Muxponder Solutions Guide*.

Step 1 In the Navigation pane, right-click the Muxponder module port that you want to provision, and then click **Provision Port**.

Step 2 On the **Transceiver** and **Custom Info** tabs of the **Provision Port** dialog, specify the settings for the port. See [Table 8-14](#).

Note For the ports **Line 1** and **Line 2**, the **Protocol** parameter is provisionable to either OC192/STM64 or OTU2 and can be modified for these range of values.

Step 3 Click **Apply**.

You have successfully completed this procedure.

Table 8-14 10-Port Multiprotocol Muxponder port provisioning parameters

Parameter	Range of Values	Description	Applicable Ports and Protocols
Protocol	See the <i>Muxponder Solutions Guide</i> .	The protocol to be used	Clients 1 to 10
Wavelength	0 (copper SFPs only) 850nm to 1650nm Note For information about wavelengths supported on a tunable XFP, see the <i>Muxponder Solutions Guide</i> .	The wavelength to be used Note This parameter is required.	0 applies to clients 1 to 10; only when Protocol = GE 850nm to 1650nm applies to all ports and protocols

Table 8-14 10-Port Multiprotocol Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
	Note This parameter cannot be set to 0 when Media Rate = Auto or when Physical PM Monitoring = Enabled.		
Physical PM Monitoring	Enabled Disabled (default) Note When Wavelength is set to 0, Physical PM Monitoring cannot be set to Enabled.	Enables or disables monitoring of threshold crossing alarm (TCA) values for SFP with digital diagnostic support. For more information, see 8.8.1.1, "Threshold crossing alerts for transceiver ports" and 8.10.5.5, "Threshold crossing alerts for transceiver ports" .	All ports and protocols
Fault Propagation Shutdown	Enabled Disabled (default) Note When Wavelength = 0, FPSD cannot be Enabled . Note Fault Propagation Shutdown must be set to Disabled if Laser Control is set to Manual On or Manual Off .	Enables or disables fault propagation shutdown. For more information, see 8.10.5.4, "Fault Propagation Shutdown and laser status" .	Clients 1 to 10; only when Protocol = GE, FC1, FC2, or FC4
SD Bit Error Rate	10^{-5} to 10^{-12} Default = 10^{-6}	The signal degrade BER threshold	Line1, Line 2 Clients 1 to 4; SONET/SDH protocols only
Loopback	Terminal Facility Disabled (default)	Enables or disables a loopback test on a transceiver	Facility on all ports Terminal on Clients 1 to 10
Transceiver PEC	1 to 11 alphanumeric characters	The product equipment code Note When a value is entered, the system compares it to the PEC of the transceiver that is inserted in the port. Also, the vendor part numbers are ignored.	All ports and protocols
Line mapping	None (SONET/SDH framing)	The type of line mapping into an OTN frame	Line1, Line 2

Table 8-14 10-Port Multiprotocol Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
	OTU2 (SONET/SDH into an OTU2 frame) ODU1 – OTU2 (no SONET/SDH framing; four ODU1s into an OTU2 frame)	Note This parameter cannot be changed when the line port is connected or when line protection is enabled. Note This parameter can be changed only when both line ports are in the OOS-MA state.	Note The value of this parameter must be the same for both line ports. Note When this parameter is set to ODU1 – OTU2, only L1 can be used as the source of a connection. Note Line 2 cannot be provisioned with Line Mapping = ODU1-OTU2 if Line 1 is not provisioned; that is, L2 cannot be used as the only line if the Line Mapping = ODU1-OTU2.
Media Rate	Auto 1000FD (default) Note When Wavelength is set to 0, Media Rate cannot be set to Auto.	The Ethernet speed and duplex rate in Mbps Note This parameter can be set to Auto only when GFP Mode = GFP-F. Note When Wavelength = 0, this parameter cannot be set to Auto.	Clients 1 to 10; only when Protocol = GE
GFP Mode	GFP-T (default) GFP-F	The GFP mapping mode Note This parameter cannot be changed when the client port is connected.	Clients 1 to 10; only when Protocol = GE, FC1, FC2, or FC4 Note FC1, FC2, and FC4 support only GFP-T. Note On a GE client port, this parameter cannot be set to GFP-T when Flow Control = Local or when Media Rate = Auto.
TOH Transparency	No (default) Yes	Bytes A1/A2 and B1 in the section overhead transparency for the client are either terminated or transported transparently.	Clients 1 to 4; OC48/STM16 clients only, asynchronous connections only

Table 8-14 10-Port Multiprotocol Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
		<p>Yes = asynchronous connections are transported transparently. No = A1, A2, and B1 are regenerated.</p> <p>Note</p> <p>This parameter cannot be changed when the client port is connected.</p> <p>Note</p> <p>This parameter can be changed only when the client port is in the OOS-MA state.</p>	<p>Note</p> <p>For more information about TOH Transparency, see the <i>Muxponder Solutions Guide</i>.</p>
DCC Transparency	No (default) Yes	<p>Specifies whether the Section DCC (SDCC), specifically the D1, D2, and D3 bytes, for the synchronous client is transparently transported.</p> <p>Note</p> <p>This parameter cannot be changed when the client port is connected.</p> <p>Note</p> <p>This parameter can be changed only when the client port is in the OOS-MA state.</p>	<p>Clients 1 to 4; only when Protocol = OC12/STM4 or OC48/STM16</p> <p>Note</p> <p>For more information about SDCC Transparency, see the <i>Muxponder Solutions Guide</i>.</p>
Transparency Channel	1 (default) to 12 for OC12 1 (default) to 48 for OC48 1 (default) to 4 for STM4 1 (default) to 16 for STM16	The cross-connected timeslot on which DCC transparency is transported	Clients 1 to 4; only when Protocol = OC12/STM4 or OC48/STM16
Flow Control	Transparent (default) Local	The type of flow control	<p>Clients 1 to 10; only when Protocol = GE</p> <p>Note</p> <p>For information about flow control, see the <i>Muxponder Solutions Guide</i>.</p>
Vendor Part Number 1, 2, 3	Up to 20 characters	<p>The part numbers provided by the transceiver manufacturer</p> <p>Note</p> <p>When the system detects a mismatch between the</p>	All ports and protocols

Table 8-14 10-Port Multiprotocol Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
		provisioned vendor part number and the vendor part number of the transceiver that is inserted in the port, the REPLUNITMEA alarm is raised.	
Laser Control	Auto (default) Manual On Manual Off Note Laser Control must be set to Auto if Fault Propagation Shutdown is Enabled .	The laser status control. Set to Auto to let the software control the laser status. Set to Manual On to turn the laser on, Manual Off to turn the laser off.	All ports and protocols
Auto-In Service Timer	Days-hours-minutes	The automatic in-service (AINS) timer for the Muxponder module. The default is 0-8-00.	All ports and protocols
Initial State	IS OOS AINS	The state of the port The port defaults to the initial state of the module.	All ports and protocols
ID 1	Up to 32 alphanumeric characters	Identifier information for the port or transceiver	All ports and protocols
Fiber Type	DSF NDSF NZDSF Multimode	The fiber type that connects to the transceiver	All ports and protocols
Custom 1	Up to 256 alphanumeric characters	Information specific to the operating environment	All ports and protocols
Remote ID	Valid IP address	The remote IP address of the connection in dotted decimal notation, and the <shelf>, <slot>, and <port> of the remote end. For example, 10.1.205.4-21-1-1 describes a connection where the remote end is at 10.1.205.4 on shelf 21, slot 1, and port 1.	All ports and protocols

8.10.4 Bulk port provisioning

Systems that contain many ports of the same type can be provisioned quickly using bulk port provisioning.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Before you can bulk provision ports, you must provision the modules.
- At least one Master Port must be provisioned and available for port cloning.

The following table provides details about the bulk port provisioning parameters:

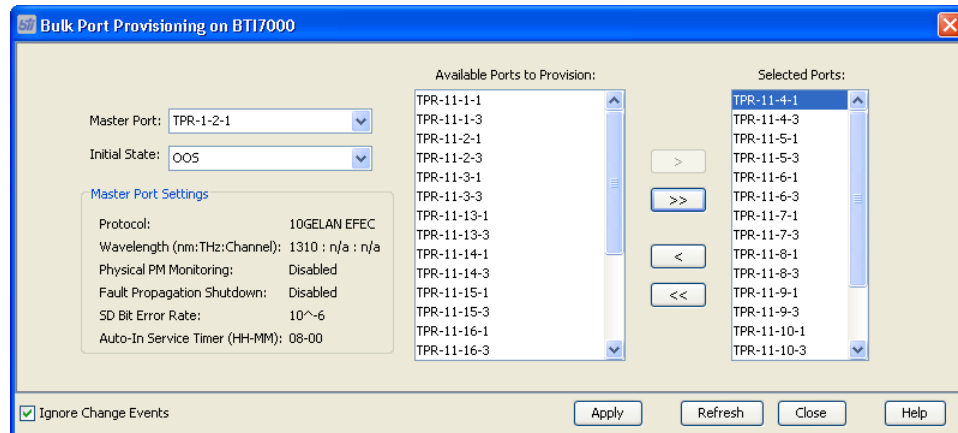
Parameter	Description	Configurable
Master Port	Contains a list of provisioned ports available for cloning	Yes
Initial State	List of initial states for the ports to be cloned. Values are: <ul style="list-style-type: none"> • OOS (Out of Service) • IS (In Service) • AINS (Auto-In-Service) 	Yes
Master Port Settings	Contains some of the provisioned parameters of the selected master Port that will be applied to the ports. The following parameters are common to all ports: <ul style="list-style-type: none"> • Protocol • Wavelength • Physical PM Monitoring • Fault Propagation Shutdown • SD Bit Error Rate Additional items for Muxponder ports: <ul style="list-style-type: none"> • Line Mapping • Media Rate 	Yes
Available Ports to Provision	Lists the available unprovisioned ports that are compatible with the selected master port.	Yes
Selected ports	Lists the ports to which you want to apply master port provisioning. When a port is added to this list, it is removed from the Available Ports list.	Yes
Ignore Change Events	Parameter is available only during the provisioning phase. When checked, blocks messages about change notifications such as: <ul style="list-style-type: none"> • a port in the Master Port list has been deleted • a port in the Available Ports list has been provisioned • a port in the Selected Ports list has been provisioned • a card of the Master Port's parent class has been provisioned or deleted 	Yes

Use this procedure to bulk provision ports on modules.

Step 1 On the Tools menu, select **Bulk Tools > Bulk Port Provisioning**. Alternatively, right-click on Main Shelf graphic on the right and choose **Bulk Port Provisioning**.

You can also right-click on the System or Shelf in the Navigation tree and choose **Bulk Port Provisioning**. When you access bulk port provisioning from the Navigation tree, only the ports specific to the shelf are available.

The Bulk Port Provisioning window displays.



Step 2 From the **Master Port** drop-down box, select a Master port. The settings for the selected Master Port display in the Master Port Settings area.

Step 3 From the **Initial State** drop-down box, select an initial state for the port.

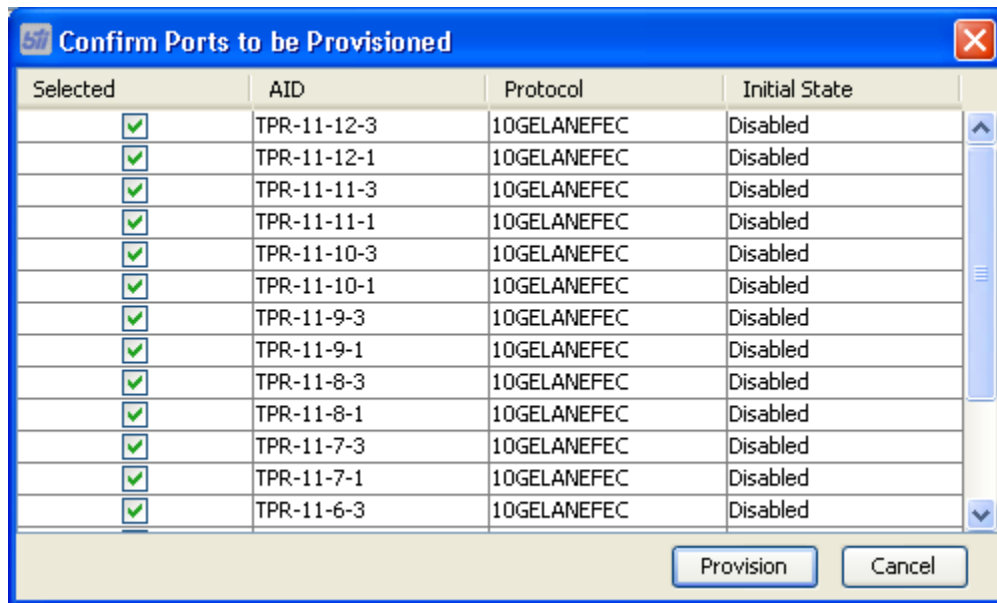
Step 4 In the **Available Ports to Provision** list, shift-click to highlight the ports that are to be provisioned.

Step 5 To move ports:

- Click the Move Right button (>) to move the items selected in the **Available Ports** list to the **Selected Ports** list.
- Click the Move All Right button (>>) to move the entire **Available Ports** list to the **Selected Ports** list.
- Click the Move Left button (<) to move the items selected in the **Selected Ports** list to the **Available Ports** list.
- Click the Move All Left button (<<) to move the entire **Selected Ports** list to the **Available Ports** list.

Step 6 Click **Apply**.

The ports are moved to the **Selected Ports** list and are cloned with the Master port and with the initial state settings. A confirmation window displays with the ports to be provisioned. A confirmation window appears, prompting you to review all the objects that are to be created. You can remove individual items from the list, if required, by unchecking the **Selected** box.



Step 7 Click **Provision**.

8.10.5 Display port information for a Muxponder module

Use this procedure to view provisioned and non-provisionable parameters for a port on a BTI 7000 Series Muxponder module.



Prerequisites

- Port must be provisioned.

Displaying port information

Follow these steps to view port information for a Muxponder module:

Step 1 In the Navigation pane, right-click a port on a Muxponder module, and then click **Provision Port**.

The **Provision Port** dialog displays the port parameters on the **Transceiver** and **Custom Info** tabs. See the following topics for information:

- [8.10.5.1, “Port information for 2-Port GbE Muxponder modules”](#)
- [8.10.5.2, “Port information for 8-Port Multiprotocol Muxponder modules”](#)
- [8.10.5.3, “Port information for 10-Port Multiprotocol Muxponder modules”](#)

Step 2 Click **Close**.

You have successfully completed this procedure.

8.10.5.1 Port information for 2-Port GbE Muxponder modules

Table 8-15 Port information for 2-Port GbE Muxponder modules

Parameter	Range of Values	Description	Applicable Ports
Protocol	See the <i>Muxponder Solutions Guide</i> .	The protocol in use	All ports and protocols
Wavelength	0 (copper SFPs only) 850nm to 1650nm	The wavelength in use	0 applies to clients 1 and 2; only when Protocol = GE 850nm to 1650nm applies to Line 1, Line 2, Client 1, Client 2
Physical PM Monitoring	Enabled Disabled (default)	Enables or disables monitoring of threshold crossing alarm (TCA) values for SFP with digital diagnostic support. For more information, see 8.8.1.1, "Threshold crossing alerts for transceiver ports" and 8.10.5.5, "Threshold crossing alerts for transceiver ports" .	Line 1, Line 2, Client 1, Client 2
Fault Propagation Shutdown	Enabled Disabled (default)	Enables or disables fault propagation shutdown. For more information, see 8.10.5.4, "Fault Propagation Shutdown and laser status" .	Client 1, Client 2
SD Bit Error Rate	10^{-5} to 10^{-8} Default = 10^{-6}	The signal degrade BER threshold	Line 1, Line 2
Loopback	Terminal Facility Disabled (default)	Enables or disables a loopback test on a transceiver	Facility on Line 1, Line 2, Client 1, Client 2 Terminal on Client 1, Client 2
Vendor Part Number 1, 2, 3	Up to 20 characters	The part numbers provided by the transceiver manufacturer	Line 1, Line 2, Client 1, Client 2
Laser Control	Auto Manual On Manual Off	The laser status control	Line 1, Line 2, Client 1, Client 2
Transceiver PEC	1 to 11 alphanumeric characters	The product equipment code	Line 1, Line 2, Client 1, Client 2
Media Rate	Auto (default) 1000FD	The Ethernet speed and duplex rate in Mbps	Client 1, Client 2, Client 3, Client 4
Speed	10 100	The speed of the port	Client 3, Client 4

Table 8-15 Port information for 2-Port GbE Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable Ports
Duplex	Full	The duplex mode	Client 3, Client 4
MAC Address	Integer	The MAC address expressed as 00-00-00-00-00-00	Client 3, Client 4
MTU Size	Integer (default = 9600)	The maximum transmission unit (that is, packet size) of the port	Client 3, Client 4
Cross Connects	n/a	Provides Source, Destination, Type, and Switch Mate information about any cross-connections provisioned on the module	Line 1, Line 2, Client 1, Client 2
Auto-In Service Timer	Days-Hours-Minutes	The automatic in-service (AINS) timer for the Muxponder module. The default is 0-8-00.	Line 1, Line 2, Client 1, Client 2
Active Auto-In Service Timer	Days-Hours-Minutes	The time remaining on the AINS timer	Line 1, Line 2, Client 1, Client 2
Primary, Secondary State	IS OOS AINS	Indicates state of the port	All ports and protocols
Laser Status	On Off	The status of the transmit laser	Line 1, Line 2, Client 1, Client 2
ID 1	Up to 32 alphanumeric characters	Identifier information for the port or transceiver	All
Fiber Type	DSF NDSF NZDSF	The fiber type that connects to the transceiver	Line 1, Line 2, Client 1, Client 2
Custom 1	Up to 256 alphanumeric characters	Information specific to the operating environment	All

8.10.5.2 Port information for 8-Port Multiprotocol Muxponder modules

Table 8-16 Port information for 8-Port Multiprotocol Muxponder modules

Parameter	Range of Values	Description	Applicable Ports and Protocols
Protocol	See the <i>Muxponder Solutions Guide</i> .	The protocol in use	All ports and protocols
Wavelength	0 (copper SFPs only) 850nm to 1650nm	The wavelength in use	0 applies to clients 3 to 8; only when Protocol = GE 850nm to 1650nm applies to all ports and protocols

Table 8-16 Port information for 8-Port Multiprotocol Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
Physical PM Monitoring	Enabled Disabled (default)	Enables or disables monitoring of threshold crossing alarm (TCA) values for SFP with digital diagnostic support. For more information, see 8.8.1.1, "Threshold crossing alerts for transceiver ports" and 8.10.5.5, "Threshold crossing alerts for transceiver ports" .	All ports and protocols
Fault Propagation Shutdown	Enabled Disabled (default)	Enables or disables fault propagation shutdown. For more information, see 8.10.5.4, "Fault Propagation Shutdown and laser status" .	Clients 3 to 8; only when Protocol = GE, FC1, or FC2
SD Bit Error Rate	10^{-5} to 10^{-12} Default = 10^{-6}	The signal degrade BER threshold	Line 1, Line 2 Clients 1 to 4; SONET/SDH protocols only
Loopback	Terminal Facility Disabled (default)	Enables or disables a loopback test on a transceiver	Facility on all ports Terminal on Clients 1 to 8
Transceiver PEC	1 to 11 alphanumeric characters	The product equipment code	All ports and protocols
Line mapping	OTU1 SUBODU1-OTU1 None	The type of line mapping into an OTN frame	Line1, Line 2
Media Rate	Auto (default) 1000FD	The Ethernet speed and duplex rate in Mbps	Clients 3 to 8; only when Protocol = GE
Speed	1000	The speed of the port	Clients 3 to 8; only when Protocol = GE
Duplex	Full	The duplex mode	Clients 3 to 8; only when Protocol = GE
MAC Address	Integer	The MAC address expressed as 00-00-00-00-00-00	Clients 3 to 8; only when Protocol = GE
MTU Size	Integer (default = 9600)	The maximum transmission unit (that is, packet size) of the port	Clients 3 to 8; only when Protocol = GE
GFP Mode	GFP-T (default) GFP-F	The GFP mapping mode	Clients 3 to 8; only when Protocol = GE, FC1, or FC2

Table 8-16 Port information for 8-Port Multiprotocol Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
			Note FC1, FC2 support only GFP-T.
TOH Transparency	No (default) Yes	Bytes A1/A2 and B1 in the section overhead transparency for the client are either terminated or transported transparently. Yes = asynchronous connections are transported transparently. No = A1, A2, and B1 are regenerated.	Clients 1 to 4; SONET/SDH protocols only Note For more information about TOH Transparency, see the <i>Muxponder Solutions Guide</i> .
DCC Transparency	No (default) Yes	Specifies whether the Section DCC (SDCC), specifically the D1, D2, and D3 bytes, for the synchronous client is transparently transported. Note For information about SDCC Transparency, see the <i>Muxponder Solutions Guide</i> .	Clients 1 to 4; only when Protocol = OC12/STM4
Transparency Channel	1 (default) to 12	Specifies the transparency channel	Clients 1 to 4; only when Protocol = OC12/STM4
Flow Control	Transparent (default) Local	The type of flow control	Clients 3 to 8; only when Protocol = GE Note For information, see the <i>Muxponder Solutions Guide</i> .
Vendor Part Number 1, 2, 3	Up to 20 characters	The part numbers provided by the transceiver manufacturer	All ports and protocols
Laser Control	Auto Manual On Manual Off	The laser status control	All ports and protocols
Auto-In Service Timer	Days-hours-minutes	The automatic in-service (AINS) timer for the Muxponder module	All ports and protocols
Active Auto-In Service Timer	Days-hours-minutes	The time remaining on the AINS timer	All ports and protocols
Primary, Secondary State	IS OOS AINS	The state of the port	All ports and protocols

Table 8-16 Port information for 8-Port Multiprotocol Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
Laser Status	ON OFF	The status of the transmit laser	All ports and protocols
ID 1	Up to 32 alphanumeric characters	Identifier information for the port or transceiver	All ports and protocols
Fiber Type	DSF NDSF NZDSF	The fiber type that connects to the transceiver	All ports and protocols
Custom 1	Up to 256 alphanumeric characters	Information specific to the operating environment	All ports and protocols

8.10.5.3 Port information for 10-Port Multiprotocol Muxponder modules

Table 8-17 Port information for 10-Port Multiprotocol Muxponder modules

Parameter	Range of Values	Description	Applicable Ports and Protocols
Protocol	See the <i>Muxponder Solutions Guide</i> .	The protocol in use	All ports and protocols
Wavelength	0 (copper SFPs only) 850nm to 1650nm	The wavelength in use	0 applies to clients 1 to 10; only when Protocol = GE 850nm to 1650nm applies to all ports and protocols
Physical PM Monitoring	Enabled Disabled (default)	Enables or disables monitoring of threshold crossing alarm (TCA) values for SFP with digital diagnostic support. For more information, see 8.8.1.1, "Threshold crossing alerts for transceiver ports" and 8.10.5.5, "Threshold crossing alerts for transceiver ports" .	All ports and protocols
Fault Propagation Shutdown	Enabled Disabled (default)	Enables or disables fault propagation shutdown. For more information, see 8.10.5.4, "Fault Propagation Shutdown and laser status" .	Clients 1 to 10; only when Protocol = GE, FC1, FC2, or FC4
SD Bit Error Rate	10^{-5} to 10^{-12} Default = 10^{-6}	The signal degrade BER threshold	Line1, Line 2 Clients 1 to 4; SONET/SDH protocols only

Table 8-17 Port information for 10-Port Multiprotocol Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
Loopback	Terminal Facility Disabled (default)	Enables or disables a loopback test on a transceiver	Facility on all ports Terminal on Clients 1 to 10
Transceiver PEC	1 to 11 alphanumeric characters	The product equipment code	All ports and protocols
Line mapping	None OTU2 ODU1-OTU2	The type of line mapping into an OTN frame	Line1, Line 2
Media Rate	Auto 1000FD (default)	The Ethernet speed and duplex rate in Mbps	Clients 1 to 10; only when Protocol = GE
Speed	1000	The speed of the port	Clients 1 to 10; only when Protocol = GE
Duplex	Full	The duplex mode	Clients 1 to 10; only when Protocol = GE
Mac Address	Integer	The MAC address expressed as 00-00-00-00-00-00	Clients 1 to 10; only when Protocol = GE
MTU	Integer (default = 9600)	The maximum transmission unit (that is, packet size) of the port	Clients 1 to 10; only when Protocol = GE
GFP Mode	GFP-T (default) GFP-F	The GFP mapping mode	Clients 1 to 10; only when Protocol = GE, FC1, FC2, or FC4 Note FC1, FC2, and FC4 support only GFP-T.
TOH Transparency	No (default) Yes	Bytes A1/A2 and B1 in the section overhead transparency for the client are either terminated or transported transparently. Yes = asynchronous connections are transported transparently. No = A1, A2, and B1 are regenerated.	Clients 1 to 4; OC48/STM16 clients only, asynchronous connections only Note For more information about TOH Transparency, see the <i>Muxponder Solutions Guide</i> .
DCC Transparency	No (default) Yes	Specifies whether the Section DCC (SDCC), specifically the D1, D2, and D3 bytes, for the synchronous client is transparently transported.	Clients 1 to 4; only when Protocol = OC12/STM4 or OC48/STM16 Note For more information about SDCC Transparency, see the <i>Muxponder Solutions Guide</i> .

Table 8-17 Port information for 10-Port Multiprotocol Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
Transparency Channel	1 (default) to 48	The channel on which DCC transparency is transported	Clients 1 to 4; only when Protocol = OC12/STM4 or OC48/STM16
Flow Control	Transparent (default) Local	The type of flow control	Clients 1 to 10; only when Protocol = GE Note For information about flow control, see the <i>Muxponder Solutions Guide</i> .
Vendor Part Number 1, 2, 3	Up to 20 characters	The part numbers provided by the transceiver manufacturer	All ports and protocols
Laser Control	Auto Manual On Manual Off	The laser status control	All ports and protocols
Auto-In Service Timer	Days-hours-minutes	The automatic in-service (AINS) timer for the Muxponder module	All ports and protocols
Active Auto-In Service Timer	Days-hours-minutes	The time remaining on the AINS timer	All ports and protocols
Primary, Secondary State	IS OOS AINS	The state of the port	All ports and protocols
Laser Status	ON OFF	The status of the transmit laser	All ports and protocols
ID 1	Up to 32 alphanumeric characters	Identifier information for the port or transceiver	All ports and protocols
Fiber Type	DSF NDSF NZDSF	The fiber type that connects to the transceiver	All ports and protocols
Custom 1	Up to 256 alphanumeric characters	Information specific to the operating environment	All ports and protocols

8.10.5.4 Fault Propagation Shutdown and laser status

Enabling Fault Propagation Shutdown

If there is a client-side failure at the near end of the link, the corresponding transmitting laser at the far end of the link continues to function and can transmit unreliable information. Muxponder modules support fault propagation shutdown (FPSD), which provides a means to quickly shut down a transmitting laser and pass the fault to the downstream device when a receiver signal failure occurs.

FPSD is supported on Gigabit Ethernet (GE) and Fibre Channel (FC) client side ports only, and may be used to configure the behavior of the transmitted signal on the transmit side of the GE client side ports in the event of a fault scenario.

FPSD operation, which is based on the GFP mode of the clients, supports the following values:

- **ON** — In the event of LAN or WAN failure, or the receipt of Client Signal Fail (CSF), the transmit laser of the client port is shutdown if the client port is GFP-F mapped. If the client port is GFP-T mapped, the transmit laser of the client port is left on.
- **OFF** — In the event of a fault scenario, the transmit laser is not affected.

Note	If FPSD is enabled, the port laser control parameter must be set to allow software to automatically control the laser.
-------------	--

For GFP-F mapped clients, when a fault occurs on the receive port of the client on the near-end Muxponder, and FPSD is enabled on that client, the following takes place:

- 1 The laser on the client on the near-end Muxponder is turned OFF.
- 2 The near-end Muxponder sends a CSF signal in the overhead on the line toward the far-end Muxponder.
- 3 The far-end Muxponder receives the CSF and turns OFF the laser on its corresponding client port.
- 4 The far-end Muxponder raises the Remote Path Failure alarm.

For GFP-F mapped clients, when a fault occurs on the receive port of the line on the near-end Muxponder, and FPSD is enabled on the data clients of that Muxponder, the following takes place:

- 1 The lasers on all data clients with FPSD enabled on the near-end Muxponder are turned OFF.
- 2 The near-end Muxponder sends a CSF signal in the overhead on the line towards the far-end Muxponder.
- 3 The far-end Muxponder receives the CSF signal and turns OFF the lasers on its corresponding clients.
- 4 The far-end Muxponder raises the Remote Path Failure alarm.

For GFP-T mapped clients, when a fault occurs on the receive port of the client on the near-end Muxponder, and FPSD is enabled on that client, the following takes place:

- 1 The near-end Muxponder sends a CSF signal in the overhead on the line toward the far-end Muxponder.
- 2 The far-end Muxponder receives the CSF signal and turns OFF the lasers on its corresponding clients.
- 3 The far-end Muxponder raises the Remote Path Failure alarm.

For GFP-T Mapped clients, when a fault occurs on the receive port of the line on the near-end Muxponder, and FPSD is enabled on the data clients of that Muxponder, the following takes place:

- On the near-end Muxponder, lasers on all data clients on which FPSD is enabled are turned OFF.

LAN-side failure can be any of the following conditions:

- SFP missing
- Loss of signal (LOS) on the GE client side port
- Loss of synchronization (LOSYNC) on the GE client side port

WAN-side failure can be any of the following conditions:

- SFP missing
- XFP missing
- OTN LOS
- OTN LOF
- OTN AIS
- SONET/SDH LOS
- SONET/SDH LOF
- SONET/SDH AIS-L
- SONET/SDH AIS-P
- SONET/SDH LOP-P
- SONET/SDH UEQ-P
- VCG Loss of Multiframe
- VCG Loss of Alignment
- VCG Sequence Mismatch
- Active Line OOS

8.10.5.5 Threshold crossing alerts for transceiver ports

The following threshold crossing alerts (TCAs) are available to most transceiver ports equipped with SFPs or XFPs. For information about threshold crossing alerts for supported protocols, see the Solutions Guide for the module.

Table 8-18 TCAs for transceiver ports equipped with SFPs or XFPs

TCA	Range	Description
OPTLT	Integer	Optical power transmitted low threshold. This value is retrieved from the SFP/XFP and is not provisionable.
OPTHT	Integer	Optical power transmitted high threshold. This value is retrieved from the SFP/XFP and is not provisionable.

Table 8-18 TCAs for transceiver ports equipped with SFPs or XFPs (Continued)

TCA	Range	Description
OPRLT	Integer	Optical power received low threshold. This value is retrieved from the SFP/XFP and is not provisionable.
OPRHT	Integer	Optical power received high threshold. This value is retrieved from the SFP/XFP and is not provisionable.

These TCAs are available when the digital diagnostics implementation (DDIAGIMP) flag for the transceiver is set to yes (Y) in its inventory entry and the Physical PM Monitor parameter is enabled when the transceiver port settings are provisioned.

8.10.6 Modify port settings on a Muxponder module

Use this procedure to modify provisionable settings for a port on a BTI 7000 Series Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- If the Wavelength parameter is to be modified, the port must be removed from service.

Modifying port settings

Follow these steps to modify provisionable port settings on a Muxponder module:

- Step 1** In the Navigation pane, right-click a port on a Muxponder module, and then click **Provision Port**.
- Step 2** In the **Provision Port** dialog, modify the provisionable parameters for the port. See the following topics for information:
- [8.10.1, “Provision port settings on a 2-Port GbE Muxponder module”](#)
 - [8.10.2, “Provision port settings on an 8-Port Multiprotocol Muxponder module”](#)
 - [8.10.3, “Provision port settings on a 10-Port Multiprotocol Muxponder module”](#)
- Step 3** Click **Apply**.

You have successfully completed this procedure.

8.10.7 Remove a port from service on a Muxponder module

Use this procedure to remove a port on a BTI 7000 Series Muxponder module from service.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Port must be provisioned and in service.

Removing a port from service

Follow these steps to remove a port on a Muxponder module from service.

Note	The FE ports on a 2-Port GbE Muxponder module cannot be removed from service.
-------------	---

- Step 1** In the Navigation pane, right-click a port on a Muxponder module, and then click **Provision Port**.
- Step 2** On the **Transceiver** tab of the **Provision Port** dialog, click the **Remove** button beside the **State** field.
- Step 3** In the **Remove Entity** confirmation dialog, click **Yes**.
- Step 4** In the **Provision Port** dialog, click **Close**.

You have successfully completed this procedure.

8.10.8 Restore a port to service on a Muxponder module

Use this procedure to restore a port on a BTI 7000 Series Muxponder module to service.



Prerequisites

- Port must be provisioned and out of service.

Restore a port to service

Follow these steps to restore a port on a Muxponder module to service:

- Step 1** In the Navigation pane, right-click a port on a Muxponder module, and then click **Provision Port**.
- Step 2** On the **Transceiver** tab of the **Provision Port** dialog, click the **Restore** button beside the **State** field.
- Step 3** Click **Close**.

You have successfully completed this procedure.

8.10.9 Delete a port on a Muxponder module

Use this procedure to delete a port on a BTI 7000 Series Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Port must be provisioned and removed from service.
- Port must not be involved in a cross-connection or be provisioned as a timing reference.
- A line port must not have 1+1 Line protection enabled.

Deleting a port

Follow these steps to delete a port on a Muxponder module.

Important When you delete a line-side port on a Muxponder module, the Virtual Concatenation Groups associated with that line-side port are also deleted.

Step 1 In the Navigation pane, right-click a port on a Muxponder module, and then click **Delete Port**.

Step 2 In the **Delete Port** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

8.11 Display transceiver information

Use this procedure to view provisioned and non-provisionable parameters for an SFP or XFP transceiver inserted in a port of a module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- The SFP or XFP transceiver must be physically present in the port.

Displaying SFP or XFP information

Follow these steps to view inventory information for an SFP or XFP transceiver.

Step 1 In the Navigation pane, right-click a port in which a module is installed, and then click **Display Inventory**.

The **Display Inventory Information** dialog displays **General**, **Characteristic**, and **Vendor** parameters for the SFP transceiver. See [Table 8-19](#).

Step 2 Click **Close**.

You have successfully completed this procedure.

Table 8-19 SFP or XFP transceiver inventory information

Parameter	Range of Values	Description
Full Name	Alphanumeric characters	Full name of the transceiver
Name	Alphanumeric characters	Short name of the transceiver (SFP or XFP)
Shelf Number	Integer	The shelf in which the module is installed
Slot Number	Integer	The slot in which the module is installed
Port Number	Integer	The module port in which the transceiver is inserted
Wavelength	Numeric	The wavelength of the transceiver in nm.
Note Some transceivers have a wavelength value that is specified only to the nearest nm, whereas others specify wavelength to the nearest 0.01 nm.		

Table 8-19 SFP or XFP transceiver inventory information (Continued)

Parameter	Range of Values	Description
		Note If a transceiver that does not have a wavelength value specified in its memory is inserted into a module, a REPLUNITUNK alarm is raised against the transceiver.
Minimum Wavelength	Numeric	The minimum wavelength supported, represented in nm with 0.01 nm resolution.
Note This parameter is supported by a tunable XFP only.		
Maximum Wavelength	Numeric	The maximum wavelength supported, represented in nm with 0.01 nm resolution.
Note This parameter is supported by a tunable XFP only.		
Wavelength Spacing	Numeric	The grid spacing in GHz (100GHz, 50GHz)
Note This parameter is supported by a tunable XFP only.		
Reach	Numeric	The maximum transmit distance of the transceiver in kilometers using 9 micron SM fiber.
		Note If a transceiver that does not have a reach value specified in its memory is inserted into a module, a REPLUNITUNK alarm is raised again
Connector Type	LC	The listed transceiver connector type
Digital Diagnostics Implemented	Yes No	The digital diagnostic implementation parameter. When set to Yes, this parameter enables the recording of performance data in historical bins.
		Note If this parameter is set to No or is not specified in the transceiver's memory, all historical bins are filled with dummy values and marked as invalid.
Tx Fault Implemented	Yes No	The transceiver fault implemented parameter on the transceiver
		Note The system allows transceivers that do not use this flag to indicate through the inventory table that the installed transceiver will never indicate a transmitter fault.
Signal Encoding	8B10B	The encoding scheme for the transceiver

Table 8-19 SFP or XFP transceiver inventory information (Continued)

Parameter	Range of Values	Description
	4B5B NRZ MANCHESTER SONET_SCRAMBLER	Note The system does not use the encoding parameter. It is the operating company's responsibility to ensure that both end points of a span use the same encoding.
Minimum bit rate	Integer	The minimum bit rate supported by the transceiver Note If a transceiver inserted in a module port does not have a minimum baud rate value specified in its memory, the system raises a REPLUNITUNK alarm against the transceiver.
Maximum bit rate	Integer	The maximum bit rate supported by the transceiver Note If a transceiver inserted in a module port does not have a maximum baud rate value specified in its memory, the system raises a REPLUNITUNK alarm against the transceiver.
Nominal bit rate	Integer	The nominal bit rate supported by the transceiver Note If a transceiver inserted in a module port does not have a nominal baud rate value specified in its memory, the system raises a REPLUNITUNK alarm against the transceiver.
LOS implemented	Yes No	The loss of signal implementation parameter. When set to Yes, this parameter raises the LOS alarm against the transceiver.
Tx Disable Implemented	Yes No	The transceiver disable implemented parameter. When set to Yes, this parameter disables the transmitter of the transceiver when the module is placed in the Out of Service state.
Media	Electrical Optical Unknown	The type of connector used by the transceiver
PEC Code	String	The product equipment code assigned by the manufacturer
Name	Alphanumeric characters	The name of the transceiver's vendor
Part Number	Alphanumeric characters	The part number assigned to the transceiver by the vendor

Table 8-19 SFP or XFP transceiver inventory information (Continued)

Parameter	Range of Values	Description
OUI	Alphanumeric characters	The vendor's organization unique identifier
CLEI Code	String	The Common Language Equipment Identifier number assigned by Telcordia. The CLEI identifies the physical hardware.
Serial Number	Integer	The serial number of the transceiver
Release Number	Alphanumeric characters	The hardware release number
Manufacturing Date	YYYY-MM-DD	The date that the transceiver was manufactured

8.12 Basic equipment and switch member configuration

This section provides the provisioning procedures required to set up a BTI™ packetVX® switch.

The MEF-based provisioning model incorporates Ethernet services, UNIs, NNIs and E-NNIs. The traditional IEEE 802.1ad Provider Bridge provisioning model uses interfaces and switchports, and requires manual provisioning of VLANs. The switch still supports the traditional IEEE provisioning model; however, the MEF-based model greatly simplifies switch provisioning.

Note BTI strongly recommends using the MEF Ethernet services provisioning model for all provisioning in provider bridge mode.

8.12.1 Create a virtual switch

This procedure explains how to create a virtual switch to which a packetVX module can be associated.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- None

The CLI can be accessed using Telnet or SSH. Telnet is available using port 3084. SSH is available using port 8022.

To use SSH via Linux:

```
tester@site-575 ~ $ ssh admin@10.1.200.112 -p 8022 The authenticity of host
'[10.1.200.112]:8022 ([10.1.200.112]:8022)' can't be established.
DSA key fingerprint is 71:da:4e:81:7c:65:15:3c:d2:72:ac:7a:80:64:57:4a.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '[10.1.200.112]:8022' (DSA) to the list of known
hosts.
This is a private computer system. Unauthorized access or use may lead to
prosecution.
```

Step 1 Access the Privileged EXEC mode

To access the Privileged EXEC mode, enter the following command:

```
enable
```

The CLI prompt should now appear as follows:

```
BTI7000#
```

Step 2 Access the Administration Configuration mode

To access the administration configuration mode, enter the following command:

```
configure terminal
```

The CLI prompt should now appear as follows:

```
BTI7000 (config)#
```

Step 3 Create a virtual switch

To create a virtual switch, enter the following command:

```
virtual-switch <switch_id>
```

where <switch_id> is the virtual switch identifier

For example, the command string might be

```
virtual-switch 1
```

The CLI prompt should now appear as follows:

```
BTI7000:sw1(config)#
```

You have successfully completed this procedure.

8.12.2 Create a packetVX equipment entry

This procedure explains how to create a packetVX equipment entry.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- None

Step 1 Access the Privileged EXEC mode

To access the Privileged EXEC mode enter, the following command:

```
enable
```

The CLI prompt should now appear as follows:

```
BTI7000#
```

Step 2 Access the Administration Configuration mode

To access the administration configuration mode, enter the following command:

```
configure terminal
```

The CLI prompt should now appear as follows:

```
BTI7000(config)#
```

Step 3 Create provisioning information for a packetVX module

To create provisioning information for a packetVX module, enter the following command:

```
equipment <location> [pec <type>]
```

For example, the command string might be

```
equipment 1/1 PEC BT7A81AA
```

The CLI prompt should now appear as follows:

```
BTI7000:sw1(config-eqpt PVX-1/1)#
```

You have successfully completed this procedure.

8.12.3 Add a member to a virtual switch

This procedure explains how to add a packetVX as a member of a virtual switch.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

- A virtual switch must be provisioned.

Step 1 Access the Privileged EXEC mode

To access the Privileged EXEC mode enter, the following command:

```
enable
```

The CLI prompt should now appear as follows:

```
BTI7000#
```

Step 2 Access the Administration Configuration mode

To access the administration configuration mode, enter the following command:

```
configure terminal
```

The CLI prompt should now appear as follows:

```
BTI7000(config)#
```

Step 3 Select a virtual switch

To select a virtual switch, enter the following command:

```
virtual-switch <switch_id>
```

where <switch_id> is the virtual switch identifier

For example, the command string might be

```
virtual-switch 1
```

The CLI prompt should now appear as follows:

```
BTI7000:sw1(config)#
```

Step 4 Add the packetVX as a member of the virtual switch

To add the packetVX as a member of the virtual switch, enter the following command:

```
member <location>
```

where <location> is the location of the packetVX

For example, the command string might be

```
member 1/1
```

The CLI prompt should now appear as follows:

```
BTI7000:sw1(config-member 1/1)#
```

Step 5 Exit to the previous command mode

To exit to the previous command mode, enter the following command:

```
exit
```

The CLI prompt should now appear as follows:

```
BTI7000:sw1(config)#
```

You have successfully completed this procedure.

8.12.4 Define a bridge type

This procedure explains how to define the bridge type for the packetVX virtual switch.

Authorization required



Prerequisites

- None

Step 1 Access the Privileged EXEC mode

To access the Privileged EXEC mode enter, the following command:

```
enable
```

The CLI prompt should now appear as follows:

```
BTI7000#
```

Step 2 Access the Administration Configuration mode

To access the administration configuration mode, enter the following command:

```
configure terminal
```

The CLI prompt should now appear as follows:

```
BTI7000(config)#
```

Step 3 Select a virtual switch

To select a virtual switch, enter the following command:

```
virtual-switch <switch_id>
```

where <switch_id> is the virtual switch identifier

For example, the command string might be

```
virtual-switch 1
```

The CLI prompt should now appear as follows:

```
BTI7000:sw1(config)#
```

Step 4 Configure the bridge mode of the virtual switch

To configure the bridge mode of the virtual switch, enter the following command syntax:

```
bridge-mode {customer|provider}
```

where `customer` defines a customer bridge (802.1Q) and `provider` defines a provider bridge (802.1ad Q-in-Q tagging)

For example, the command string might be

```
bridge-mode customer
```

The CLI prompt should now appear as follows

```
BTI7000:sw1(config)#
```

You have successfully completed this procedure.

9.0 Testing services modules and SFP/XFPs

This chapter provides information about testing the services modules and SFP/XFPs for the BTI 7000 Series.

Note SFP/XFPs on packetVX modules cannot be put into loopback mode because packetVX modules are layer 2 switches.

- [9.1, “Performing loopback tests on transponder modules”](#)
- [9.2, “Performing loopback tests on Muxponder modules”](#)

9.1 Performing loopback tests on transponder modules

The BTI 7000 Series supports two types of loopback tests:

- **Facility:** A loopback test performed on the originating end in the transport network.
- **Terminal:** A loopback test performed on the equipment at the receiving end of the network.

Note For a Transponder Lite module, only a Facility loopback test can be performed.

Loopback tests are performed on transceiver ports to test the following:

- The continuity of a link between two sites mitigating the need to travel to the remote site to test the connection.
- The functionality of a transceiver provisioned in a slot at the time the system is installed to ensure that the transceiver is fully operational before it is placed into service.

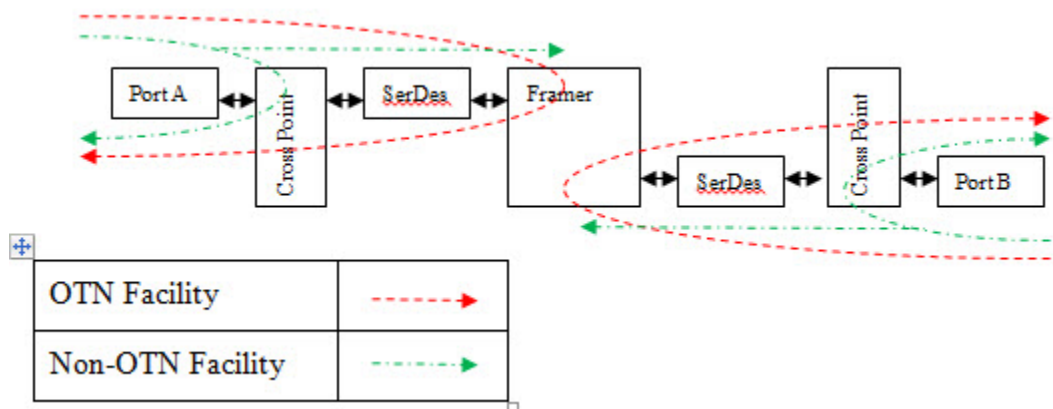
When using OTN protocols, if the input signal is not error-free, the outgoing signal may be modified according to the trace settings and the Fault Proagation Mode for the transceiver port.

If the transceiver port is not set for pass-through, GCC bytes continue to be terminated to maintain the management channel.

Note If a port is in loopback, and a port that can be cross-connected to it is either provisioned or deleted, traffic on the port in loopback can be temporarily affected.

Facility loopback tests on transponder modules

Figure 9-1 Facility loopback



The route the signal follows depends on the protocol that is provisioned.

The following applies for a Facility loopback:

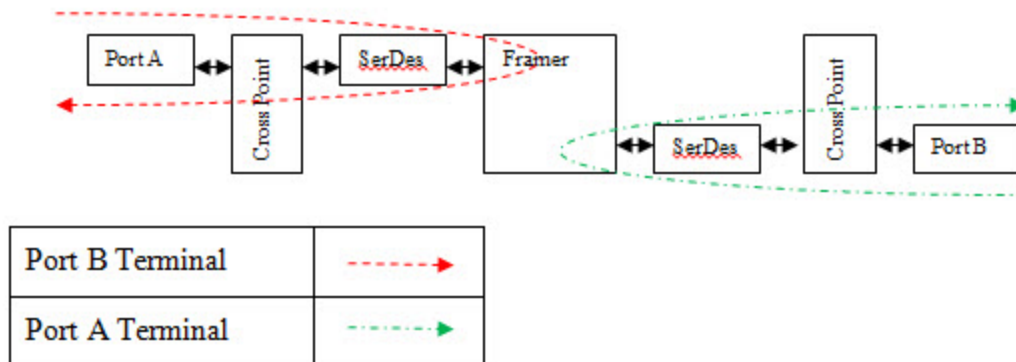
- The transceiver port must be provisioned and out-of-service.
- The route the signal follows through the pack depends on the protocol provisioned.
- If a two-way cross-connect exists, neither port can have a terminal loopback.

For non-OTN protocols, the loopback occurs at the cross-point switch although the signal will still be forwarded to the framer to analyze the signal for faults and defects (LOS, LOF, PMs, etc.).

For OTN protocols, the loopback occurs inside the framer so that the FEC or EFEC is decoded and recoded. This ensures that the looped-back signal can reach back to the sender (without regenerating the FEC, the signal might not reach).

Terminal loopback tests on transponder modules

Figure 9-2 Terminal loopback



The Terminal loopback occurs on the cross-connected port, not the port of the loopback. The figure above shows the route the signal follows in a Terminal loopback.

The following applies for a Terminal loopback:

- The transceiver port must be provisioned and out-of-service.
- A two-way cross-connect must exist.
- Neither port in the cross-connect may have any type of loopback.
- If the transceiver port is in a protection pair:
 - the transceiver port must be in a working (WRK) state.
 - the Standby port must be in an out-of-state management (OOS-MA) or link down (LKDO) state.

Note Terminal loopback cannot be operated if either port in the cross-connect already have a Facility or Terminal loopback.

9.1.1 Perform a loopback test on a Transponder module

Use this procedure to perform a loopback test on a port on a Transponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Port must be provisioned and in the Out-of-Service state.
- The port with which the looped back port is paired must be provisioned to use a compatible protocol, much like it would have to be if it were to be cross-connected to that port. It is recommended that a cross-connect be provisioned between the two ports prior to provisioning the loopback. The system allows you to provision a loopback with incompatible protocols, but traffic will not pass over the loopback.

Note	Before you perform a loopback test for a Y-cable client protection group, be sure you are familiar with Y-cable client protection loopback test considerations; refer to the <i>BTI 7000 Series Transponder Solutions Guide</i> .
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Performing a loopback test

Follow these steps to perform loopback test on a port on a Transponder module:

Step 1 In the toolbar, click the **System Configuration** button.

Step 2 In the Navigation pane, right-click a port on a Transponder module, and then click **Enable Loopback**, and then click one of the following:

- **Facility** — to perform a facility loopback test on a client- or line-side port
- **Terminal** — to perform a terminal loopback test on a client-side port

Note	When a loopback is in progress, the letter "L" appears on the port in the graphical representation of the shelf.
-------------	--

Step 3 In the **Enable Loopback** confirmation dialog, click **Yes** to remove the port from service and start the loopback test.

Step 4 Send a test signal through the loopback link using a bit error rate test (BERT) or packet generator test to check for errors or problems on the link.

Step 5 To end the loopback test, right-click the loopback port in the Navigation pane, and then click **Disable Loopback**.

Step 6 In the **Loopback Disabled** confirmation dialog, click **Yes** to restore the port to service.

You have successfully completed this procedure.

9.2 Performing loopback tests on Muxponder modules

This section provides information about performing loopback tests on Muxponder modules.

This section covers the following topics:

- 9.2.1, “Performing loopback tests on 2-Port GbE Muxponder modules”
- 9.2.2, “Performing loopback tests on 8-Port and 10-Port Multiprotocol Muxponder modules”
- 9.2.3, “Perform a loopback test on a Muxponder module”

9.2.1 Performing loopback tests on 2-Port GbE Muxponder modules

2-Port GbE Muxponder modules support both facility and terminal loopback tests. The following table lists the loopback types that the module entities support.

Table 9-1 Loopback types supported on 2-Port GbE Muxponder modules

Entities	Facility Loopback	Terminal Loopback
OC48 lines (2-Port GbE Muxponder – SONET only)	Supported	Not supported
STM16 lines (2-Port GbE Muxponder – SDH only)	Supported	Not supported
GE clients	Supported	Supported
FE clients	Not supported	Not supported
VCGs	Not supported	Not supported
Path facility objects	Not supported	Not supported

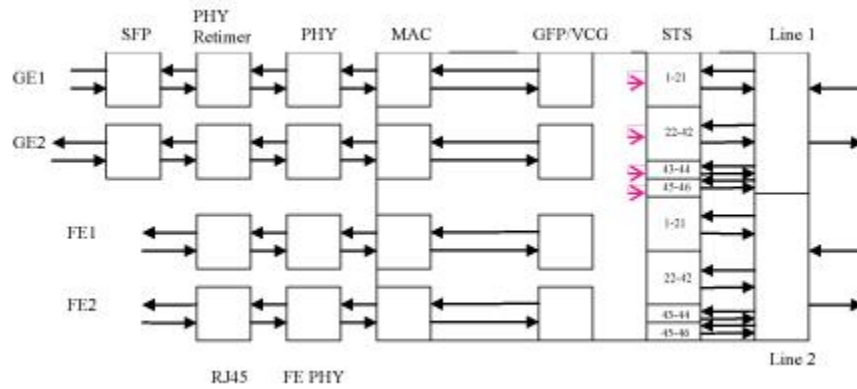
Important A GE port *must* be cross-connected for a terminal loopback test to be successful. For information about provisioning cross-connections, see the *Muxponder Solutions Guide*.

Loopback tests are not persistent and can be performed only on a supported port that is in the Out-of-Service (OOS) state. Performance parameters for a port are available while the port is in a loopback.

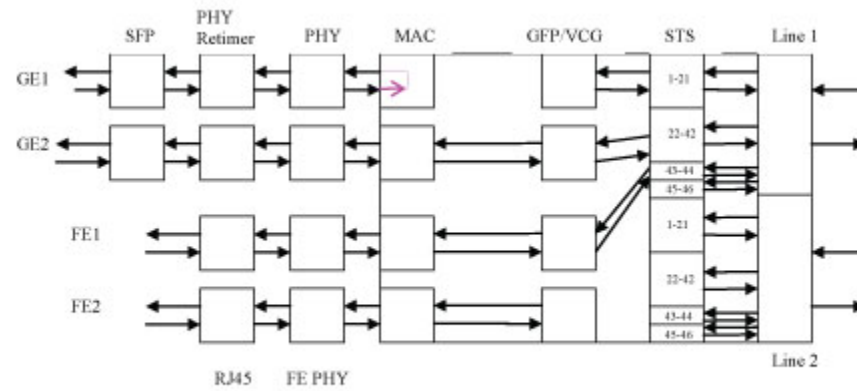
Loopback tests can be manually released. Once a loopback is released and the port is restored to service, end-to-end traffic is immediately restored if the end point is cross-connected and is error- and alarm-free.

The following figures show facility and terminal loopback tests on various entities on a 2-Port GbE Muxponder – SONET module.

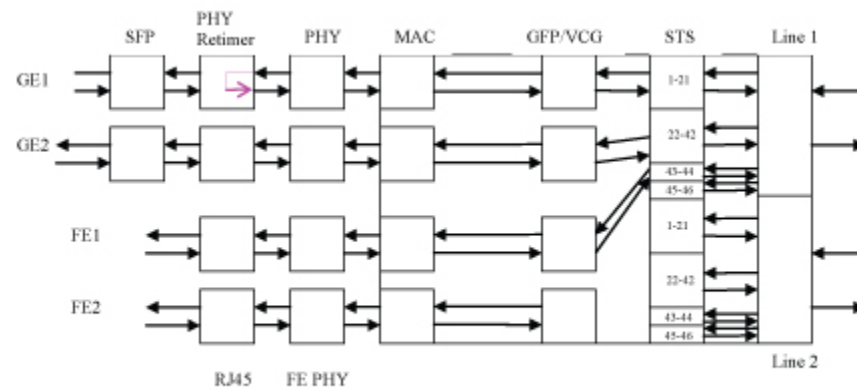
Line-side port facility loopback



GE client-side port facility loopback



GE client-side port terminal loopback



9.2.2 Performing loopback tests on 8-Port and 10-Port Multiprotocol Muxponder modules

8-Port Multiprotocol Muxponder modules and 10-Port Multiprotocol Muxponder modules support both facility and terminal loopback tests. The following tables lists the loopback types that the module entities support. For information about the protocols each module supports, see the *Muxponder Solutions Guide*.

Table 9-2 Loopback types supported on 8-Port and 10-Port Multiprotocol Muxponder modules

Entities	Facility Loopback	Terminal Loopback
SONET/SDH lines	Supported	Not supported
SONET/SDH OTU1	Supported	Not supported
SONET/SDH OTU2 lines	Supported	Not supported
SONET clients	Supported	Supported
SDH clients	Supported	Supported
FC clients	Supported	Supported
GE clients	Supported	Supported
BRI clients	Supported	Supported
VCGs	Not supported	Not supported
Path facility objects	Not supported	Not supported

Important Client ports *must* be bidirectionally cross-connected—from line to client—for a terminal loopback test to be successful. For information about provisioning cross-connections, see the *Muxponder Solutions Guide*.

Note For a line provisioned as OTN on an 8-Port or 10-port Multiprotocol Muxponder, the Forward Error Correction (FEC) is extracted and then recalculated when a facility loopback test is performed.

Note BTI recommends that FPSD be disabled when a loopback test is performed.

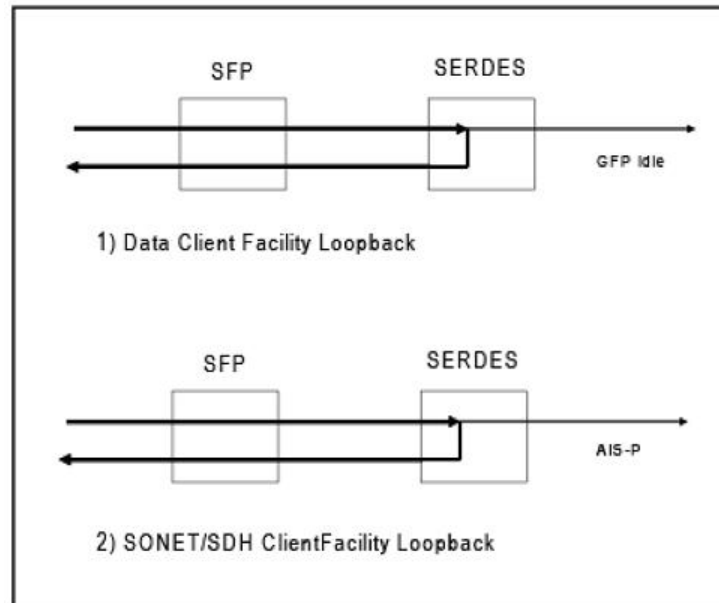
Loopback tests can be performed only on a supported port that is in the Out-of-Service (OOS) state. Performance parameters for a port are available while the port is in a loopback.

Loopback tests are not persistent in the database and are lost if the System Control Processor (SCP) in the shelf is restarted (warm or cold). If the module with a port in loopback is removed from the shelf and then reinserted, the loopback test will persist, as long as the System Control Processor remains in the shelf while the module is absent.

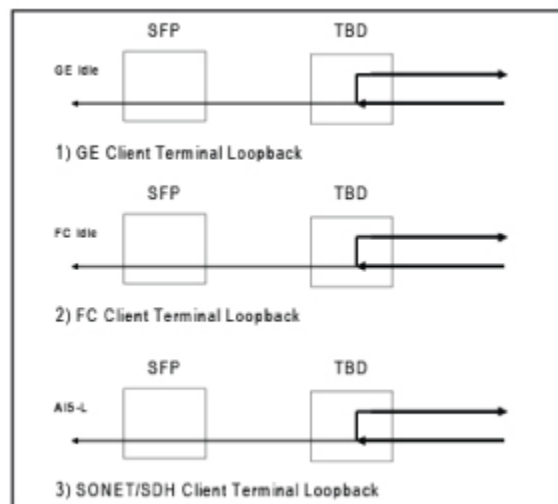
Loopback tests can be manually released. Once a loopback is released and the port is restored to service, end-to-end traffic is immediately restored if the end point is cross-connected and is error- and alarm-free.

The following figures show 8-Port and 10-Port Multiprotocol Muxponder facility and terminal loopback tests on various entities.

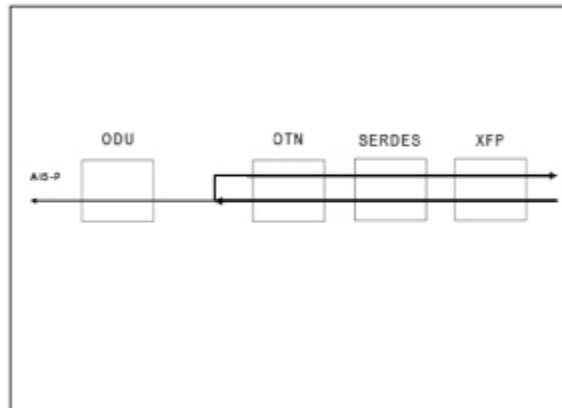
Client-side port facility loopback



Client-side port terminal loopback



Line-side facility loopback



9.2.3 Perform a loopback test on a Muxponder module

Use this procedure to perform a loopback test on a BTI 7000 Series Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Port must be provisioned and in the Out-of-Service state.
- For a terminal loopback test on a client-side port of a 8-Port or 10-Port Multiprotocol Muxponder module, the port must be bidirectionally cross-connected (i.e., line to client).

Performing a loopback test

Follow these steps to perform loopback test on a port on a Muxponder module.

Note You cannot perform a loopback test on an FE port (Client 3, Client 4) of a 2-Port GbE Muxponder module.

Step 1 In the Navigation pane, right-click a port on a Muxponder module, select **Enable Loopback**, and then click one of the following:

- **Facility** — to perform a facility loopback test on a client- or line-side port
- **Terminal** — to perform a terminal loopback test on a client-side port

Note When a loopback is in progress, the letter "L" appears on the port in the graphical representation of the shelf.

Step 2 Send a test signal through the loopback link using a bit error rate test (BERT) or packet generator test to check for errors or problems on the link.

Step 3 To end the loopback test, right-click the loopback port in the Navigation pane, and then click **Disable Loopback**.

Step 4 In the **Loopback Disabled** confirmation dialog, click **Yes** to restore the port to service.

Step 5 Restore the transceiver port to service.

You have successfully completed this procedure.

10.0 Connecting service modules to the optical mux/demux

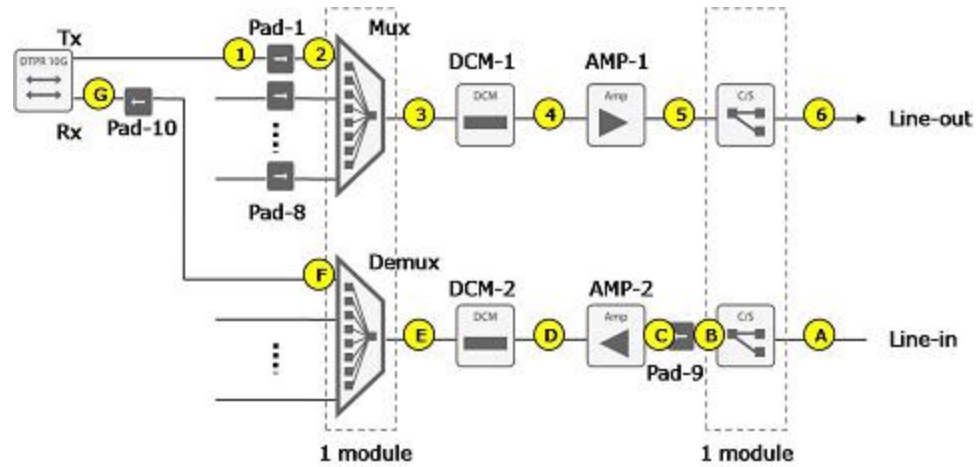
This chapter provides information about connecting service modules to the optical mux/demux for the BTI 7000 Series.

- 10.1, “Connecting fiber and checking power from transmit port of the service module transceiver to the dark fiber”
- 10.2, “Connecting fiber and checking power from dark fiber to the receive port of a transceiver on a service module ”

An example of a typical network is shown below and this chapter walks through each section of fiber, while ensuring that the optical power is within the specifications of the components and transceivers. Your installation and fiber of the NE may or may not use all of the components shown on the example network. Therefore, skip points that do not apply to your installation.

The example network illustrates points along the fiber of an NE and its components, typical of a link with amplifiers where optical power should be measured using an optical power meter and OSNR should be measured using an Optical Spectrum Analyzer (OSA).

Note	During fiber connection, optical power measurements are taken along the fiber links. If measured optical power does not meet the specification of the component, transceiver, or expected value based on losses on the link, refer to the <i>Alarm and Troubleshooting Guide</i> to resolve these issues.
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10.1 Connecting fiber and checking power from transmit port of the service module transceiver to the dark fiber

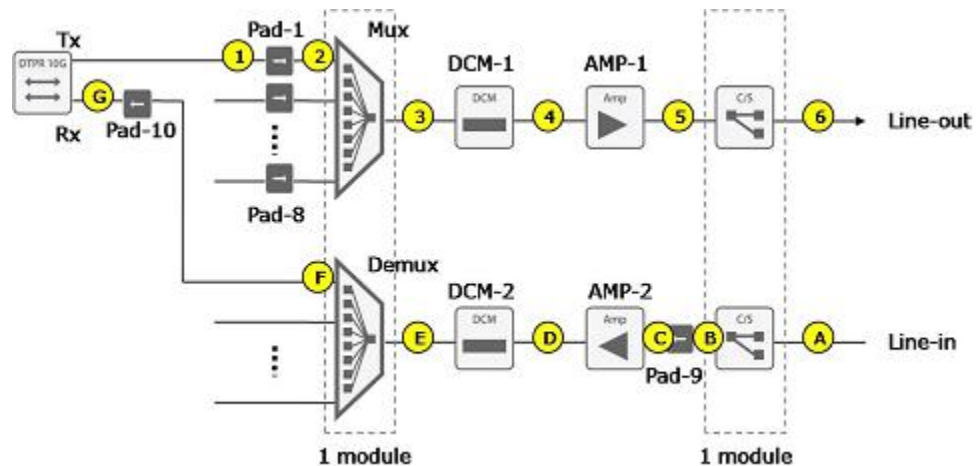
Use this procedure to connect fiber and check power from the transmit port of the service module transceiver to the dark fiber.

Prerequisites

The ports on the service module must be provisioned and must be in service.

The transmit port of the service module transceivers must be transmitting light.

An example of a typical network is shown in the following illustration, and this section walks through each section of fiber, ensuring that the optical power is within the specifications of the components and transceivers. Your installation and fiber of the NE may or may not use all of the components shown in the example network. Therefore, skip points that do not apply to your installation.



The following list explains the points along the fiber connection from the service module transceiver transmit port to the dark fiber:

- Point 1 - 2: Transmit port of the transceiver to Input port of the Mux/Demux or OADM module with or without an Attenuator
- Point 3: Output port of the Mux/Demux or OADM module to Input port of a DCM module
- Point 4: Output port of the DCM module to Input port of an Amplifier module
- Point 5: Output port of the Amplifier module to Input port of a Couple/Splitter module
- Point 6: Output port of the Coupler/Splitter module to the dark fiber or outside plant fiber.

Step 1 Connect and measure the optical power at Point 1 - 2 (Connect and measure the optical power from the output port of the transceiver to Input port of the Mux/Demux or OADM module with or without an Attenuator).

- a) Connect a new fiber to the output port of a transceiver and connect the other end of the fiber to a power meter and measure the output power of the transceiver.
- b) Compare the measured optical power value on the power meter to what is displayed in the proNX 900. If the power value is not what is expected, refer to the *Alarm and Troubleshooting Guide* to resolve this issue. In the Navigation pane of the proNX 900, right-click a port on a service module, and select View Port PM.

Note For SFP transceivers, reported power measurements for OPR and OPT are accurate to +/- 3.0dB.

Note For XFP transceivers, reported power measurements for OPR and OPT are accurate to +/- 2.0dB.

Note The measured transmit power of a transceiver may vary depending on the type of transceiver in the service module.

- c) Depending on the network and the network design provided by the Site Installation work sheet, there may be a requirement to add an attenuator to the transmit fiber before connecting to the Mux/Demux or OADM filter module or to any module downstream. If this is a requirement on the current installation, add the required attenuator to the transmit port of the transceiver and measure the power on the fiber, otherwise, skip the following step.
- d) Ensure the measured optical power at this point (Point #2) is equal to what was measured at Point #1 minus the value of the attenuator added onto this fiber.

Note At this point, if there is no Mux/Demux or OADMs involved in the network design, directly connect the fiber from Point #2 to the DCM or Amplifier or Coupler/Splitter or to the dark fiber leaving to the next site. If any of the above components are part of this network design, continue with the rest of the steps, otherwise, you have successfully completed this procedure.

- e) Remove fiber from the power meter and connect fiber into the correct wavelength 'In' port of the Mux/Demux or OADM module.

Note Depending on the wavelength of the transceiver, the fiber must be connected to the correct wavelength 'In' port on the Mux/Demux or OADM module.

Step 2 Connect and measure the optical power at Point 3 (Connect and measure the optical power from the Line output port of the Mux/Demux or OADM module to Input port of a DCM module).

- a) Connect a new fiber to the output port of a transceiver and connect the other end of the fiber to a power meter and measure the output power of the transceiver.
- b) Connect the other end of the fiber to the power meter and measure the optical power coming out of the 'Line Out' port.

Note If there are multiple channels added to the 'In' port of the Mux/Demux or OADM module, the optical power measured at Point #3 is the total power (composite power) of all the connected channels. In this case, to check each channel power values, connect the fiber to an OSA. If there is only single channel connected to the Mux/Demux or OADM 'In' port, measured value at this point (Point #3) should be equal to what was measured at Point #2 minus the loss of the component. To obtain actual loss values of particular component.

Note At this point, if there is no DCM involved on the network design, directly connect the fiber from Point #3 to the Amplifier or Coupler/Splitter or to the dark fiber leaving to the next site. If any of the above components are part of this network design, continue with the next step. Otherwise, you have successfully completed this procedure.

- c) If there is a DCM module in this network, remove the fiber from the power meter and connect the fiber into the 'In' port of the DCM module.

Step 3 Connect and measure the optical power at Point 4. (Connect and measure the optical power from the Output port of the DCM module to Input port of an Amplifier module).

- a) Connect a new fiber to the 'Out' port of the DCM module and connect the other end of the fiber to the power meter.
- b) Measured power value at this point (Point #4) should be equal to what was measured at Point #3 minus the loss of the DCM component.

Note Depending on type of DCM module used at this point, component loss varies. Not all DCMs have the same loss value.

Note At this point, if there is no amplifier involved in the network design, directly connect the fiber from Point #4 to the Coupler/Splitter or to the dark fiber leaving to the next site. If any of the above components are part of this network design, continue at the next step.

- c) If there is an amplifier module in this network; remove the fiber from the power meter and connect the fiber into the 'In' port of the amplifier module.

Step 4 Connect and measure the optical power at Point 5 (Connect and measure the optical power from the Output port of the amplifier module to Input port of a Couple/Splitter module).

- a) Connect a new fiber to the 'Out' port of the amplifier module and connect the other end of the fiber to the power meter.

Note Depending on type of amplifier used and the provisioning of the amplifier from the Site Installation work sheet provided, the output power of the amplifier may vary.

Note Certain amplifiers that transmit high output power have an Optical Back Reflection High Shutdown Threshold (OBT-HTS) safety feature. This feature ensures that when an open connection is detected or based on the measured reflection power coming back into the output port of the amplifier, the amplifier goes into mute mode. In this mode, the amplifier transmits +/-0 dBm output power, even though the output power should be much higher, and a major Optical Back Reflection Threshold alarm is raised on the system.

- b) The measured power value at this point (Point #5) should be equal to what is displayed in the software. In the Navigation pane of the proNX 900, right-click the amplifier module, and select View Amplifier PM.
- c) If the Optical Back Reflection Threshold alarm is observed and output power measured at Point #5 is around 0 dBm, override the OBR safety feature for up to 600 seconds through software. Otherwise, skip to the following step.

To override the OBR safety feature:

- 1 In the Navigation pane, right-click the Amplifier module, select View Amplifier PM, and click on the Alarm Threshold tab.
- 2 Click 'Override Safety' button and enter from 20 to 600 seconds of safety override time.

Note At this point a minor alarm is raised to inform that the override has been initiated. When the timer expires, this feature turns back on and the amplifier goes into mute mode again.

- 3 While the override is enabled, re-measure the power at Point #5.

Note If there is no Coupler/Splitter module involved in the network design, directly connect the fiber from Point #5 to the to the dark fiber leaving to the next site.

- d) If there is a Coupler/Splitter module in this network; remove the fiber from the power meter and connect the fiber into the 'In' port of the Coupler/Splitter module (DWDM or CWDM 'In' port).
- e) Once the downstream fiber is connected, recheck the amplifier "OBR" performance parameter, and ensure that the value is -25 dBm. If the value is greater than -25dBm, refer to the *Alarms and Troubleshooting Guide* for further instructions to resolve this issue.

Step 5 Connect and measure the optical power at Point 6 (Connect and measure the optical power from the Output port of the Coupler/Splitter module to the dark fiber or outside plant fiber).

- a) Connect a new fiber to the 'Line Out' port of the Coupler/Splitter module and connect the other end of the fiber to the power meter.
- b) The measured power value at this point (Point #6) should be equal to what was measured at Point #5 minus the loss of the Coupler/Splitter component.

Note If there are multiple fibers connected to the coupler ports of the Coupler/Splitter module, the optical power measured at Point #6 is the total power (composite power) of all the connected channels/fibers. In this case, to check each channel power values, connect the fiber to an OSA.

- c) Remove the fiber from the power meter and connect it to the 'In' port on the ODF patch panel into the dark fiber going to the far end NE.

You have successfully completed this procedure.

10.2 Connecting fiber and checking power from dark fiber to the receive port of a transceiver on a service module

Use this procedure to connect fiber and check power from dark fiber to the receive port of a transceiver on a service module.

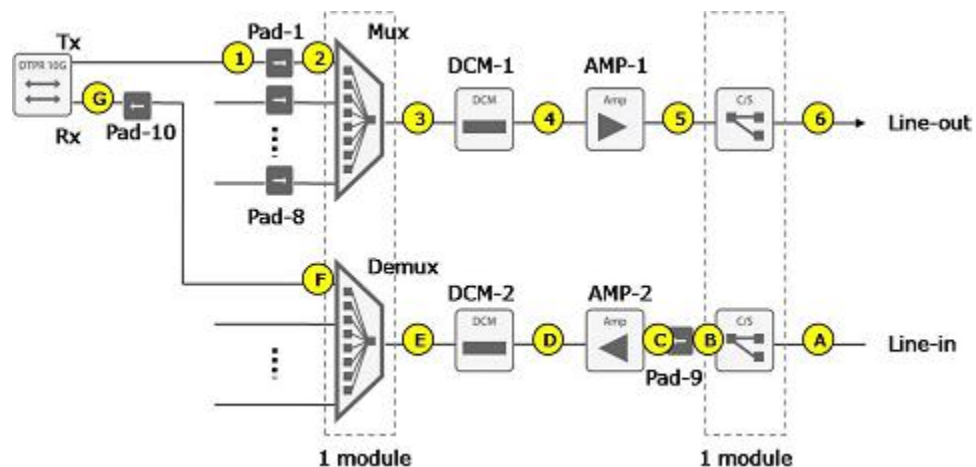
Prerequisites

The ports on the service module must be provisioned and must be in service.

The transmit port of the service module transceivers must be transmitting light.

The dark fiber is connected to the correct ODF ports and the optical power values observed at the near and far end ODF ports are as expected based on the link loss.

An example of a typical network is shown in the following illustration, and this section walks through each section of fiber, ensuring that the optical power is within the specifications of the components and transceivers. Your installation and fiber of the NE may or may not use all of the components shown on the example network. Therefore, skip points that do not apply to your installation.



The following list explains the points along the fiber connection from the dark fiber to the service module transceiver:

- Point A: Input port of the Coupler/Splitter module from the dark fiber or outside plant
- Point B - C: Output port of the Couple/Splitter module to Input port of an Amplifier module with or without an Attenuator
- Point D: Output port of the Amplifier module to Input port of a DCM module
- Point E: Output port of the DCM module to Input port of the Mux/Demux or OADM module
- Point F - G: Output channel port of the specific wavelength port of the Mux/Demux or OADM module with or without Attenuator

Step 1 Connect and measure the optical power at Point A (Connect and measure the optical power at the Input port of the Coupler/Splitter module from the dark fiber or outside plant.).

- a) Connect a new fiber to the ODF port where the light is coming from the far end node. Then, connect the other end of the fiber to the power meter.
- b) Measure the power value at this point (Point #A) and ensure that the measured optical value is as expected based on the dark fiber loss for this application. If the measured value is lower than expected, refer to the *Alarm and Troubleshooting Guide* for further instructions on how to resolve excess optical power loss on a link.

Note If there are multiple channels on this dark fiber coming from the far end NE, the optical power measured at Point #A is the total power (composite power) of all the connected channels. In this case, to check each channel power values, connect the fiber to an OSA.

Note At this point, if there is no Coupler/Splitter module involved on the network design, directly connect the fiber from Point #A to the Amplifier or DCM or Mux/Demux or OADM or to the transceiver 'Input' port, ensure the input power value at the transceiver is within the specification of the transceiver.

- c) Remove the fiber from the power meter or OSA and connect it to the "In" port of the Coupler/Splitter module.

Step 2 Connect and measure the optical power at Point B-C (Connect and measure the optical power from Output port of the Couple/Splitter module to the Input port of an Amplifier module with or without an Attenuator).

- a) Connect a new fiber to the 'Output' port of the Coupler/Splitter module and then, connect the other end of the fiber to the power meter.
- b) Measure the power value at this point (Point #B) and ensure that the measured optical value is as expected.

Note At this Point, the Couple/Splitter module has removed the OSC channel from the rest of the DWDM/CWDM channels on the fiber. Also, if there are multiple channels (DWDM/CWDM) on this fiber coming from far end NE, the optical power measured at Point #B is the total power (composite power) of all the connected channels. In this case, to check each channel power values, connect the fiber to an OSA.

Note Depending on the network and the network design provided by the Site Installation work sheet, there may be a requirement to add an attenuator to this fiber before connecting to the next module in the configuration. If there is a requirement in the current installation, proceed to the next step and add the required attenuator to the fiber before connecting to the next module in the configuration.

- c) Add the required attenuator to the fiber and measure the power on the fiber.

- d) Ensure that the measured optical power at this point (Point #C) is equal to what was measured on Point #B minus the value of the attenuator that was added onto this fiber.

Note At this point, if there is no Amplifier involved in the network design, directly connect the fiber from Point #C to the DCM or Mux/Demux or OADM or to the transceiver 'Input' port, and ensure that the input power value at the transceiver is within the specification of the transceiver.

- e) Remove the fiber from the power meter or OSA and connect it to the "Input" port of the Amplifier module.

Step 3 Connect and measure the optical power at Point D (Connect and measure the optical power from Output port of the Amplifier module to Input port of a DCM module).

- a) Connect a new fiber to the 'Out' port of the Amplifier module and connect the other end of the fiber to the power meter.

Note Depending on type of Amplifier used and the provisioning of the Amplifier from the Site Installation work sheet provided, the output power of the Amplifier may vary.

Note Certain amplifiers that transmit high output power have an Optical Back Reflection High Shutdown Threshold (OBT-HTS) safety feature. This feature ensures that when an open connection is detected or based on the measured reflection power coming back into the output port of the Amplifier, the Amplifier goes into mute mode. In this mode, the Amplifier transmits +/-0 dBm output power, even though the output power should be much higher, and a major Optical Back Reflection Threshold alarm is raised on the system.

- b) The measured power value at this point (Point #D) should be equal to what is displayed in the software. In the Navigation pane of the proNX 900, right-click the amplifier module, and select View Amplifier PM.
- c) If the Optical Back Reflection Threshold alarm is observed and output power measured at Point #5 is around 0 dBm, override the OBR safety feature for up to 600 seconds through software. Otherwise, skip to the following step.

To override the OBR safety feature:

- 1 In the Navigation pane, right-click the Amplifier module, select View Amplifier PM, and click on the Alarm Threshold tab.
- 2 Click the Override Safety button and enter from 20 to 600 seconds of safety override time.

Note A minor alarm is raised to inform that the override has been initiated. When the timer expires, this feature turns back on and the amplifier goes into mute mode again.

- 3 While the override is enabled, re-measure the power at Point #D.

Note If there is no DCM module involved on the network design, directly connect the fiber from Point #D to the Mux/Demux or OADM or to the transceiver 'Input' port, ensure the input power value at the transceiver is within the specification of the transceiver.

- d) If there is a DCM module in this network, remove the fiber from the power meter and connect the fiber into the 'In' port of the DCM module.
- e) Once the downstream fiber is connected, recheck the Amplifier "OBR" performance parameter and ensure that the value here is -25 dBm. If the value is greater than -25dBm, refer to the *Alarm and Troubleshooting Guide* for further instructions to resolve this issue.

Step 4 Connect and measure the optical power at Point E (Connect and measure the optical power from Output port of the DCM module to Input port of the Mux/Demux or OADM module).

- a) Connect a new fiber to the 'Out' port of the DCM module and connect the other end of the fiber to the power meter.
- b) The measured power value at this point (Point #E) should be equal to what was measured at Point #D minus the loss of the DCM component.

Note Depending on type of DCM module used at this point, component loss may vary as not all DCMs have the same loss value.

Note At this point, if there is no Mux/Demux or OADM module involved in the network design, directly connect the fiber from Point #E to the transceiver "Input" port. Ensure the input power value at the transceiver is within the specification of the transceiver.

- c) If there is a Mux/Demux or OADM module in this network, remove the fiber from the power meter and connect the fiber into the 'Line In' port of the Mux/Demux or OADM module.

Step 5 Connect and measure the optical power at Point F-G (Connect and measure the optical power from Output channel port of the Mux/Demux or OADM module with an added Attenuator to the Input port of the transceiver).

- a) Connect a new fiber to the channel specific "Output" port on the Mux/Demux or OADM module and connect the other end of the fiber to the power meter.

Note Depending on the wavelength of the transmit transceiver at the far end, the fiber must be connected to the correct wavelength output port on the Mux/Demux or OADM module.

- b) If the measured power value at this point #F is not what is expected, refer to the *Alarm and Troubleshooting Guide* for further instructions to resolve this issue.

Note Depending on the network and the network design provided by the Site Installation work sheet, there may be a requirement to add an attenuator to the receive port of the transceiver before connecting from the Mux/Demux or OADM filter module in to the service module. If this is a requirement on the current installation, add the required attenuator to the receive port of the transceiver and measure the power on the fiber.

c) Add the required attenuator to the fiber and measure the power on the fiber.

Note BTI recommends that the optical receive power on a transceiver to be at the mid-point of the specification of the transceiver.

- d) Ensure that the measured optical power at this point (Point #G) is equal to what was measured on Point #F minus the value of the attenuator added onto this fiber.
- e) Remove the fiber from the power meter and connect it to the "In" port of the transceiver on the service module.
- f) Compare the measured optical power value on the power meter to what is displayed in the proNX 900. If the power value is not what is expected, refer to the *Alarm and Troubleshooting Guide* to resolve this issue. In the Navigation pane of the proNX 900, right-click a port on a service module, and select View Port PM.

Note For SFP transceivers, reported power measurements for OPR and OPT are accurate to +/- 3.0dB.

Note For XFP transceivers, reported power measurements for OPR and OPT are accurate to +/- 2.0dB.

Note Measured transmit power of a transceiver may vary depending on the type of transceiver in the service module.

You have successfully completed this procedure.

11.0 Testing end-to-end continuity

This chapter provides information about testing the end-to-end optical continuity for the BTI 7000 Series.

- 11.1, “Testing NE-level continuity”
- 11.2, “Testing end-to-end service continuity”

11.1 Testing NE-level continuity

Use this procedure to test the NE-level optical continuity. This testing ensures that for the wavelengths deployed, there is a valid optical path between transmit and receive ports.

What you need

- Optical Power Meter
- Appropriate attenuator pads
- Fiber cleaning kit

Prerequisites

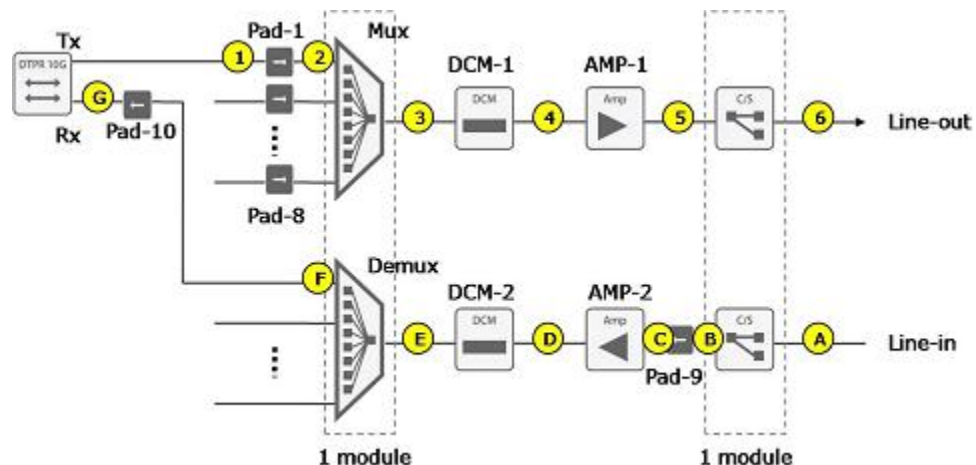
The ports on the service module must be provisioned and must be in service.

The transmit port of the service module transceivers must be transmitting light.

Client service modules have been connected to optical modules in accordance with the installation and commissioning report.

Caution Use an ESD wrist strap whenever you open the equipment, particularly when you are handling circuit packs as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with the skin at one end and with the shelf at the other).

An example of a typical network is shown in the following illustration, and this section walks through each section of fibering, while ensuring that the optical power is within the specifications of the components and transceivers. Your installation and fibering of the NE may or may not use all of the components shown in the example network. Therefore, skip points that do not apply to your installation.



Step 1 Remove existing fibers from the Line out and Line in Mux/Demux or OADM module ports.

Step 2 Connect the Line out port to the Line In port at the Mux/Demux or OADM module using an appropriate attenuator, defined as follows:

- For amplified NEs: If the NE under consideration includes amplifiers either in a booster configuration or in a pre-amplifier configuration, connect the Line Out port to the Line In port (associated with the same fiber pair) using 20dB of attenuation. Ensure that the patchcords used to connect the ports and the attenuator pads are cleaned using the fiber cleaning kit.
- For NEs with no amplifiers: For NEs that have no amplifiers configured, connect the Line Out to the Line In port (associated with the same fiber pair) using 10dB of attenuation. Ensure that the patchcords used to connect the ports and the attenuator pad(s) are cleaned using the fiber cleaning kit.

Step 3 Check for optical power at the demux receive ports. For all wavelengths that have been deployed and connected to the Mux/Demux unit under test, measure the optical power at the demux port and verify that a signal is present. Repeat this process for all other demux ports where an optical signal would be expected.

If there is no optical power received on a port where optical power would be expected, perform the following actions.

- a) Check that the associated transceiver is In Service (IS) and that the laser is ON
- b) Check the fiber connections between the transmitter of the transceiver and the demux port
- c) Check that the fibers connecting Tx to the demux port are clean and inspect using a fiber scope if necessary.

Once this step has been completed and the optical continuity of the NE has been verified, remove the connection between the Line Out port and the Line In port including the associated attenuator.

Step 4 Remove the existing fibers from the Line out and Line in Mux/Demux or OADM module ports, if applicable, and replace it with the previously removed fiber pair in the first step.

You have successfully completed this procedure.

11.2 Testing end-to-end service continuity

Once the NE-level continuity has been confirmed and the line ports have been connected to the appropriate external fiber plant successfully, use this procedure to test the end-to-end continuity for each deployed service.

What you need

- Optical Power Meter
- Appropriate attenuator pads
- Fiber cleaning kit
- Traffic tester with protocols appropriate to the circuit(s) being deployed at the NE

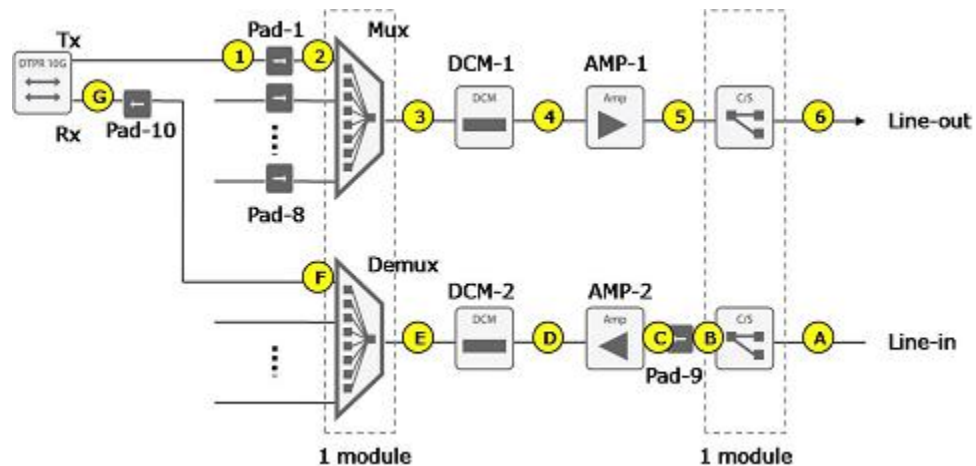
Prerequisites

The Test and Turn-up procedures up to and including Testing the NE-level Continuity must have been completed on this NE and at all of the other NEs where services to or from this NE pass-through or terminate.

Client service modules are in service with cross-connects appropriately provisioned for each service.

Caution Use an ESD wrist strap whenever you open the equipment, particularly when you are handling circuit packs as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with the skin at one end and with the shelf at the other).

An example of a typical network is shown in the following illustration, and this section walks through each section of fibering, while ensuring that the optical power is within the specifications of the components and transceivers. Your installation and fibering of the NE may or may not use all of the components shown in the example network. Therefore, skip points that do not apply to your installation.



Step 1 Measure the optical receive power at the Demux ports.

Up until this point in the process, the fibers connecting the Demux and the transceiver have not been connected. This is because there has been no way to be sure of the expected Rx power level until the transmit connections and line side connections are made at the far end NE(s).

- a) Measure the optical power in dBm at the Demux ports that match the deployed wavelengths and ensure that the received power is within the specified power range for the transceiver used.
- b) If the received power is higher than the specified overload value (maximum), use an attenuation pad to reduce the optical power to within the noted specifications.
- c) With the attenuation pad applied to the Rx fiber, measure the optical power and verify that it is within the specified range of the transceiver in use.
- d) Once the power is within the specification limits, connect the Rx fiber through the attenuation pad to the Rx port of the transceiver.
- e) Compare the measured optical power value on the power meter to what is displayed in software. If the power value is not what is expected, refer to *Alarm and Troubleshooting Guide* to resolve this issue. In the Navigation pane of the proNX 900, right-click a port on a service module, select View Port PM.

Note	For SFP transceivers, reported power measurements for OPR and OPT are accurate to +/- 3.0dB.
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Note	For XFP transceivers, reported power measurements for OPR and OPT are accurate to +/- 2.0dB.
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Note	Measured transmit power of a transceiver may vary depending on the type of transceiver in the service module.
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- f) Make a note of the Rx power measured by the power meter in the appropriate space within the Installation and Commissioning report.
- g) Make sure that the receive connection has been made in an identical fashion at the far end NE for the service

Step 2 Connect and configure the traffic tester.

Once the receive fiber has been connected to the line side optics, connect the traffic tester to the client side interface ensuring that appropriate padding is employed to avoid overloading both the client transceiver and/or the tester optical port receiver. Check the tester documentation for the maximum power levels allowed and pad appropriately.

Configure the traffic tester to generate the protocol which matches the provisioning on the client service module.

Step 3 Configure the far-end physical loop back.

To provide a path for the traffic from source to destination and back to the tester, an optical (physical) loopback is necessary at the far end.

- a)** Arrange to have an optical loop back deployed on the far end client transceiver. Ensure that an appropriate attenuator pad is deployed at the far end on the client transceiver.
- b)** Once the far end transceiver loopback is in place, soak traffic over the end-to-end connection for a minimum of 1 hour.
- c)** If the traffic runs error free for the soak period, disconnect the far end loopback and the tester and repeat the process for the other services that terminate at the NE.
- d)** If the traffic does not run error free over the soak period, debug the connection by setting up terminal loopbacks on the ports starting from the far end and working towards the near end until the problem is isolated. Refer to the *Alarm and Troubleshooting Guide* for further assistance in resolving these issues.

You have successfully completed this procedure.

12.0 Provisioning and testing protected services

This chapter provides information about provisioning and testing protected services for the BTI 7000 Series.

- [12.1, “Provisioning protection groups on Transponder modules”](#)
- [12.2, “Automatic and user-initiated protection switching on Muxponder modules”](#)

12.1 Provisioning protection groups on Transponder modules

This topic describes provisioning line and client protection switching groups. For general information on provisioning Transponder modules refer to the *BTI 7000 Series Transponder Solutions Guide*.

- **line protection:** switching is performed between acting and protecting ports within the same Transponder module. In a protection group, one transceiver port on the Transponder module is provisioned as the working port and the other as the protecting port. Because the protection group works as a 1+1 non-revertive switch, the switching algorithm does not place any preference on either port to be the working facility. At any point, either the working or the protecting port can be carrying traffic if both ports are fault free.
- **client protection:** switching is performed between acting and protecting ports on two separate 10 G Transponder modules.

Prerequisites

Before you provision protection groups, you should be familiar with the provisioning considerations for line and client protection groups. Refer to the *BTI 7000 Series Transponder Solutions Guide*.

12.1.1 Provision line protection groups on a Transponder module

Use this procedure to provision line protection groups on a Transponder module.

Before you provision line protection groups, you should be familiar with the provisioning considerations. Refer to the *BTI 7000 Series Transponder Solutions Guide*.



Provisioning protection switching

Follow these steps to provision a line protection group on a Transponder module:

- Step 1** In the toolbar, click the System Configuration button
- Step 2** In the Navigation pane, select the shelf that you are provisioning.
- Step 3** Select the slot that contains the transponder that you are provisioning for protection. Right-click **Protection Groups** and click **Provision Protection Groups**.
The **Provision Transceiver Protection Groups** dialogue appears.
- Step 4** In the **Protection groups** dialog for the module, click **Add**.
- Step 5** In the **Add Protection Group** dialog, select the **Working Port**.

Note A line protection group is created when you select a line port as the **Working Port**.

The protecting transceiver port is automatically selected in the **Protection** list, and the provisioned **Protocol**, **Wavelength**, and **FPSD** parameters for each port appear.

Step 6 Select the protection switch **Direction**.

Set the direction to UNI (unidirectional) or BI (bidirectional).

Note This option is not available for selection on all transponder modules.

Step 7 Optionally, enter a name for the protection group in the **Protection ID** field.

Step 8 Click **Apply**.

You have successfully completed this procedure.

12.1.2 Display protection-group information for a Transponder module

You can view information about each protection group provisioned on a Transponder module, and you can add or change the ID of provisioned protection groups, which can help you identify a specific protection group when more than one is provisioned on a module.



Follow these steps to view protection-group information for a Transponder module:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click **Protection Groups**, and then click **Provision Protection Groups**.

The **Protection groups** dialog for the module displays the following information for each provisioned protection group:

- **Working** — the working transceiver port
- **Protecting** — the protecting transceiver port
- **Protection ID** — the name of the protection group, if added
- **Protocol** — the protocol used by both transceiver ports
- **FPSD** — the FPSD setting for both transceiver ports
- **Direction** — the protection switch direction (UNI or BI)
- **Working Wavelength** — the wavelength of the working transceiver
- **Protecting Wavelength** — the wavelength of the protecting transceiver

Step 3 Click **Close**.

You have successfully completed this procedure.

12.1.3 Modify protection-group information for a Transponder module

Use this procedure to modify the ID of a protection group on a Transponder module.



Prerequisites

- A protection group must be provisioned on the Transponder module.

Modify protection-group information

Follow these steps to modify the ID of a protection group on a Transponder module:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click **Protection Groups**, and then click **Provision Protection Groups**.

Step 3 In the **Protection groups** dialog for the module, select a protection group, and then click **Edit**.

Step 4 To change the name of the protection group, enter the new name in the **Protection ID** field.

Step 5 To change the name of the protection switch direction, select UNI or BI in the **Direction** field.

Note Not all transponders support changing this option.

Step 6 Click **Apply**.

You have successfully completed this procedure.

12.1.4 Delete a protection group on a Transponder module

When a protection group is no longer required, you can delete it. Use this procedure to delete a protection group on a Transponder module.



Deleting a protection group

Follow these steps to delete a protection group on a Transponder module:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, right-click **Protection Groups**, and then click **Provision Protection Groups**.

Step 3 In the **Protection groups** dialog for the module, select a protection group, and then click **Delete**.

You have successfully completed this procedure.

12.1.5 Transponder protection architectures

This topic provides information about the protection architectures that can be applied using BTI 7000 Series Transponder modules.

Unprotected Wide Area Network (WAN) connectivity

- Architecture providing transmission of a non-resilient client signal between client equipment
- Can be provided by a pair of Transponder modules for a single client signal, or by a Dual Transponder module for two independent clients.
- Failure of client equipment, or a client or line port, or loss of WAN physical connectivity (for example, as a result of a fiber cut) causes the connection to fail

Architecture providing unprotected WAN connectivity



Line or WAN protection

- Protection architecture providing resilient transmission of a client signal between client equipment
- Integrated bridging of a single client equipment signal to both line ports of a Dual Transponder module provides protection in the event of a loss of a line port or loss of WAN physical connectivity
- Protection switching is based on multiple performance-monitoring parameters (i.e., client-equipment dependent). For information, see the *Transponder Solutions Guide*.
- Provides 50ms protection switching based on tail-end switching between redundant WAN signals
- Requires a Dual Transponder module with protection switching (e.g., 1G Wavelength Regenerator, 2.5G Wavelength Regenerator, Dual 2.5G Multiprotocol Transponder, Dual 4G Multiprotocol Transponder, Dual 10G Multiprotocol Transponder, or Dual 10G Multiprotocol Transponder Lite)

- Line protection is not supported at the same time as client protection on the same Transponder module.

Architecture providing line or WAN protection



12.2 Automatic and user-initiated protection switching on Muxponder modules

Automatic path protection switching

Muxponder modules support automatic UPSR/SNCP path protection switching, which is enabled when a 2-WayPR cross-connection is provisioned. UPSR/SNCP path protection is supported on line ports only and takes place on STS (SONET)/VC-4 (SDH) path facility objects. For information about cross-connections and path facility objects, see the *Muxponder Solutions Guide*.

On 8-Port Multiprotocol Muxponder modules, line mapping must be set to NONE or OTU1. On 10-Port Multiprotocol Muxponder line mapping must be set to NONE or OTU2 .

On 2-Port GbE Muxponder modules, the following faults can result in automatic protection switching:

- Line Out of Service
- OCn/STMn Rx Loss of Signal
- OCn/STMn Rx Loss of Frame
- OCn/STMn Rx AIS
- OCn/STMn Rx Signal Degrade
- STS/VC-4 Rx AIS
- STS/VC-4 Loss of Pointer
- STS/VC-4 Unequipped
- STS/VC-4 Signal Degrade

On 8-Port and 10-Port Multiprotocol Muxponder modules, the following faults can result in automatic protection switching:

- Line Out of Service
- OCn/STMn Loss of Signal
- OCn/STMn Loss of Frame
- OCn/STMn AIS-L
- OCn/STMn Path Signal Degrade
- STS/VC-4 AIS-P
- STS/VC-4 Loss of Pointer
- STS/VC-4 Unequipped
- STS/VC-4 Signal Degrade

For OTUn-mapped lines on 8-Port and 10-Port Multiprotocol Muxponder modules, the following faults can result in automatic protection switching:

- OTUn Loss of Signal
- OTUn Loss of Frame
- OTUn SD
- OTUn AIS
- STS/VC-4 AIS-P
- STS/VC-4 LOP
- STS/VC-4 Unequipped
- STS/VC-4 Signal Degrade

Automatic 1+1 OTN Line Protection on 8-Port and 10-Port Muxponder modules

For automatic 1+1 OTN Line Protection, line mapping must be set to OTU1 or SubODU1-OTU1 on 8-Port Multiprotocol Muxponder modules, and to OTU2 or ODU1-OTU2 on 10-Port Multiprotocol Muxponder modules.

Line protection cannot be enabled when connections are present.

Line 1 must be configured as the working line when line protection is enabled.

An automatic protection switch takes place only if one of the following faults is present. The priority is indicated in parenthesis; the higher priority faults cause a switch to a line with a lower priority fault:

- OTUn LOS (HI)
- OTUn LOF (HI)
- OTUn SD (LO)
- ODUUn-AIS (HI)

User-initiated protection switching

In addition to automatic protection switching, Muxponder modules supports user-initiated protection switching. This allows for a manual switch to a line or a path, a forced switch to a line or a path, or locking out a line or a path from being switched to. When a forced or locked out protection switch is no longer required, it can be released. The following also apply:

- A line or path can be manually switched to the other line or path.
- A line or path can be forced switched to the other line or path.
- A forced line or path switch can be manually released.
- A line or path can be locked out from switching to the other line or path.
- A lockout of protection can be manually released.

Protection-switching hierarchy

The following is the protection-switching hierarchy, in *descending* order, for Muxponder modules:

- 1 Lockout: Prevents switching to the locked signal (line or path)
- 2 Auto – OOS: Causes a switch to the protecting signal, unless a Lockout is in effect or the protecting signal is OOS
- 3 Auto – Signal Fail: Causes a switch to the protecting signal, unless a Lockout is in effect or the protecting signal is OOS
- 4 Force: Causes a switch to the protecting signal, unless a Lockout is in effect on the protecting signal, the protecting signal is in an OOS state, or the protecting signal has failed. A switch will occur if the protected signal is in a degraded state.
- 5 Auto – Signal Degrade: Causes a switch to the protecting signal, unless a higher priority switch is in effect or the protecting signal has a higher priority fault
- 6 Manual: Causes a switch to the protecting signal, unless a switch of an equal or higher priority is in effect

This section covers the following topics:

- [12.2.1, “Initiate path protection switching on a Muxponder module”](#)
- [12.2.2, “Release path protection switching on a Muxponder module”](#)
- [12.2.3, “Initiate 1+1 OTN line protection switching on a Muxponder module”](#)
- [12.2.4, “Release automatic 1+1 OTN line protection switching on a Muxponder module”](#)

12.2.1 Initiate path protection switching on a Muxponder module

Use this procedure to initiate a path protection switch on a BTI 7000 Series Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- A 2WAYPR cross-connection must be provisioned.

Protection switching rules

- The protection path cannot be on the same line-side port as the working path.

Initiating path protection switching

Follow these steps to initiate protection switching on a Muxponder module:

- Step 1** In the Navigation pane, right-click a port on a Muxponder module, and then click **Provision Cross Connects**.
- Step 2** In the **Provision Cross Connects** dialog, choose **Active** on the **Display Type** list.
- Step 3** Verify the working and standby paths in the list, and then click **Close**.
- Step 4** In the Navigation pane, right-click a port on the module, and then click **Provision Path Protection**.

Step 5 In the **Path Protection** dialog, choose a working path from the **Active** list to perform a manual or forced switch, or choose a standby path from the **Standby** list to perform a lockout.

Step 6 Click the button that corresponds to the type of protection switch to be operated.

Step 7 In the **Operate protection switch** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

12.2.2 Release path protection switching on a Muxponder module

Use this procedure to release a path protection switch on a Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- A protection switch must be provisioned.
- The initiated protection switch is either Forced or Lockout.

Releasing protection switching

Follow these steps to release a user-initiated path protection switch on a Muxponder module:

Step 1 In the Navigation pane, right-click the module, and click **Provision Path Protection**.

Step 2 In the **Path Protection** dialog, choose the switch you want to release, and then click the **Release** button.

Step 3 In the **Release Switch** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

12.2.3 Initiate 1+1 OTN line protection switching on a Muxponder module

Use this procedure to initiate 1+1 OTN line protection switch on a BTI 7000 Series Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- No connections are allowed when initiating line protections

Protection switching rules

Initiating line protection switching

- 1 The protection path cannot be on the same line-side port as the working path.

Follow these steps to initiate 1+1 OTN line protection switching on a Muxponder module:

- Step 1** In the Navigation pane, right-click the Muxponder module, and then click **Provision Line Protection**.
- Step 2** In the **Line Protection** dialog, click **Add**.
- Step 3** In the **Add line protection** dialog, choose Line 1 from the **Working** list and Line 2 from the **Protecting** list, and then click **Apply**.
- Step 4** In the **Line Protection** dialog, choose the protection pair, and then click the **Protection Switch** button.
- Step 5** In the **Protection Switch** dialog, choose **Manual Switch**, **Forced Switch**, or **Lockout**, and then click **Apply**.
- Step 6** In the **Operate protection switch** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

12.2.4 Release automatic 1+1 OTN line protection switching on a Muxponder module

Use this procedure to release an automatic 1+1 OTN Line protection switch on a Muxponder module.



Prerequisites

- A protection switch must be provisioned.
- The initiated protection switch is either Forced or Lockout.

Releasing protection switching

Follow these steps to release a user-initiated Automatic 1+1 OTN Line protection switch on a Muxponder module:

- Step 1** In the Navigation pane, right-click the module, and click **Provision Line Protection**.
- Step 2** In the **Line Protection** dialog, choose the switch you want to release, and then click the **Release** button.
- Step 3** In the **Release Switch** confirmation dialog, click **Yes**.

You have successfully completed this procedure.

13.0 Specifications

This chapter provides specifications for the BTI 7000 Series.

- 13.1, “Special considerations for amplified systems”
- 13.2, “Single-channel/Sub-band amplifier specifications”
- 13.3, “DWDM amplifier specifications”
- 13.4, “SFP specifications”
- 13.5, “XFP specifications ”
- 13.6, “Optical Supervisory Channel integrated on the System Control Processor”
- 13.7, “CWDM Multiplexer specifications”
- 13.8, “DWDM Multiplexer specifications”
- 13.9, “Double DWDM Bidirectional Coupler/Splitter specifications”
- 13.10, “Dispersion management”

13.1 Special considerations for amplified systems

The following information is applicable for all BTI 7000 Series amplification modules.

13.1.1 About back reflection

The Optical Back Reflection High Threshold Safety (OBR-HTS) alarm feature is implemented on amplifiers that are capable of producing output power greater than 10 dBm. The Optical Back Reflection threshold is -4 dBm. For systems using these high-power amplifiers, the Optical Return Loss (ORL) must be higher than 24 dB to prevent shutdown of the amplifier lasers.

13.1.2 Nonlinear fiber effects in single-channel amplified systems

In single-channel non-amplified optical systems, the optical power coupled into a fiber is usually too low to induce any nonlinear effects in the fiber. The only impairments that the fiber will introduce are attenuation and dispersion. When amplifiers are introduced into these systems, the launch power can become high enough to trigger undesirable nonlinear effects in the fiber that will further degrade signal integrity. Stimulated Brillouin Scattering (SBS) and Self-Phase Modulation (SPM) are two power-dependent effects that can significantly limit the launch power in a single-channel amplified link and restrict system reach.

Stimulated Brillouin Scattering (SBS)

SBS is a scattering process in which a portion of the forward propagating light energy is reflected back, resulting in power loss and increasing noise in the system. In an amplified system, for amplifiers upstream from the fiber, the reflected power can trigger the optical back reflection safety mechanism, resulting in either a reduction of the amplifier's output power or the complete shutdown of the amplifier. Two approaches can be used to manage SBS:

- 1 Limit the signal input power to the fiber to below the power threshold at which the intensity of scattered light started to grow exponentially.
- 2 Increase the power threshold by increasing the laser linewidth since the SBS threshold is directly proportional to the linewidth of the signal.

When a typical communication-grade laser with a linewidth of a few MHz and modulated to transmit data at a rate of 10 Gbps is used, the SBS threshold in NDSF can be as low as 6 dBm. In addition to laser linewidth, the SBS threshold is also proportional to fiber attenuation and the effective area of the fiber. Hence, the threshold is different in different fiber types. More precise values need to be further determined for a given modulated laser linewidth, fiber attenuation, and the effective area of the fiber.

Increasing the laser linewidth of the signal to increase the SBS threshold has the undesirable effect of increasing the dispersion penalty. In order to avoid excessive dispersion penalty, the laser drive current can be modulated with a low-frequency sinusoidal dither. Typical dithering signals have frequencies in the kHz range. The peak-to-peak intensity modulation of the signal is a few percent, and the effective modulated laser linewidth increases from tens of MHz to a few hundred MHz. For external modulated lasers, a dither signal can be applied to the phase modulation input of the external modulator to suppress SBS as well. The SBS threshold

increases due to the addition of the dithering signal and can be estimated once the resultant laser linewidth is known.

Contact BTI for more information on SBS effects when designing optical links.

Self-Phase Modulation (SPM)

Self-Phase Modulation (SPM) results from the power dependency of the refractive index of the fiber. It leads to spectral broadening of the optical signal. The frequency chirp induced by SPM further interacts with the dispersion in the fiber, changing the rate at which the pulse broadens. Ignoring dispersion in the fiber, the SPM threshold is a function of the physical property of the fiber, including the nonlinear index, attenuation, and effective area of the fiber.

Unlike SBS, where dithering can be used to increase the threshold, there are no effective ways of managing SPM other than to take these parameters that affect SPM into consideration when designing a system. For a single-channel system with span lengths of about 150 km, the SPM threshold is in the range of 10 dBm for NDSF. This threshold can be used as a guideline only. The system penalty as a result of SPM is impacted by:

- transmitted pulse shape
- bit rate
- exact dispersion characteristics of the fiber, including the effects of dispersion compensation, together with other deviations from assumed fiber parameter values

Contact BTI for more information on SPM effects when designing optical links.

13.2 Single-channel/Sub-band amplifier specifications

The Single-channel/Sub-band amplifiers do not employ a gain flattening filter. As a result, the gain spectrum has the spectral shape typical of erbium-doped fiber amplifiers and the gain ripple across the C-band is high. Since the gain ripple is low in Band 1 and Band 2, these amplifiers are suitable as banded amplifiers within these two bands. The Single-channel/Sub-band amplifiers are currently not qualified for applications in the two high ripple sub-bands: 1538.19 nm to 1543.73 nm (Band 3) and 1530.33 nm to 1535.82 nm (Band 4). Contact BTI to assess the performance of this amplifier for applications in these two wavelength bands.

While the SBA is intended for applications after the Mux and/or the transmitter, and the SPA is intended for applications before the Demux and/or before the receiver, these amplifiers can be used in any application where the input/output power and gain requirements meet the specifications of the amplifier. In order to determine which amplifier is most appropriate for the application in question, the overall gain, power and noise performance requirements must be evaluated, as well as other operational considerations of the optical link under study.

For amplified single-channel OC-3 applications, contact BTI for more information.

Notes on optical specifications for single-channel amplifiers

- 1 When the input power falls below the minimum specified level, the signal is still amplified, but the accuracy of the input power, gain, and output power will not meet the specifications provided.
- 2 When the input power exceeds the maximum specified level, the signal is still amplified, but the accuracy of the input power, gain, and output power will not meet the specifications provided.
- 3 All specifications quoted are for worst-case temperature and aging scenarios.

This section covers the following topics:

- [13.2.1, “Single-channel/Sub-band Booster Amplifier \(SBA\)”](#)
- [13.2.2, “Single-channel/Sub-band Pre-Amplifier \(SPA\)”](#)

13.2.1 Single-channel/Sub-band Booster Amplifier (SBA)

Amplifier features

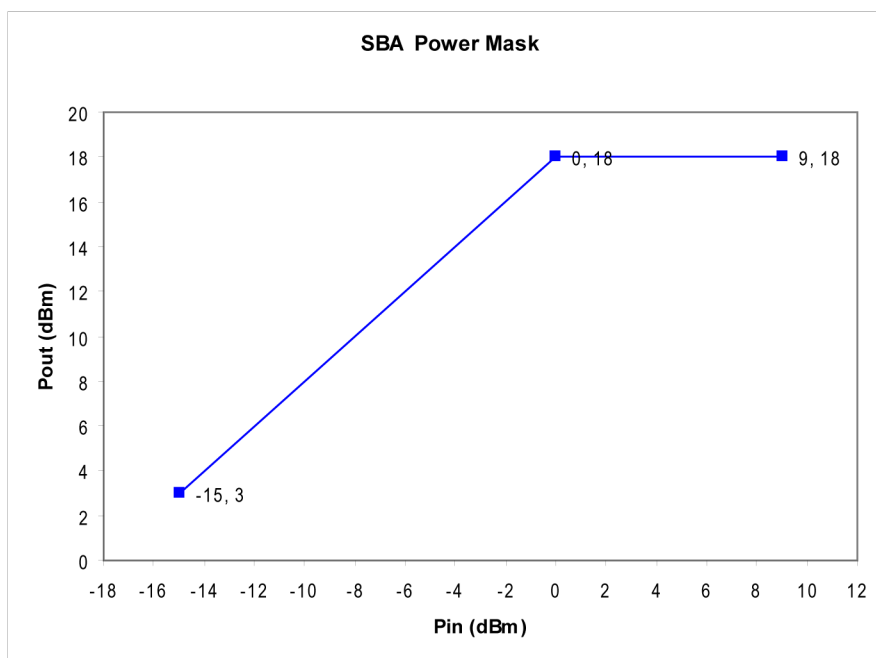
There are two modes of operation for the SBA:

- Constant gain mode
- Constant output power mode

Constant gain mode

Amplified Spontaneous Emission (ASE) correction for the SBA is calibrated across the C-band. When the SBA is used as a single-channel amplifier, the signal gain is accurate to ± 0.5 dB. The output power versus input power curve is shown in the following figure.

SBA power mask



Constant power mode

Constant power mode is supported only for single-channel operation. In this mode of operation, the total output power, including signal and ASE power, is controlled to the user-specified level. ASE correction is not applied.

Sub-band application

When the SBA is deployed as a banded amplifier in Bands 1 and 2, a default wavelength of 1550 nm is selected as the reference and the signal gain is accurate to ± 0.5 dB. Improved accuracy and gain flatness can be achieved by selecting a mid-band wavelength within the desired wavelength band as the reference channel.

This section covers the following topics:

- 13.2.1.1, “Single-channel/Sub-band Booster Amplifier general specifications”
- 13.2.1.2, “Single-channel/Sub-band Booster Amplifier single-channel application specifications”
- 13.2.1.3, “Single-channel/Sub-band Booster Amplifier sub-band application specifications”

13.2.1.1 Single-channel/Sub-band Booster Amplifier general specifications

Table 13-1 Single-Channel/Sub-band Booster Amplifier (SBA) BP1A05BB general specifications

Parameter	Value
Features	Constant Gain Constant Power (specified for single channel only)
Input/Output Ports	1 input (amplifier in) 2 output (amplifier out and monitor port)
Input/Output Connector	SC/PC, FC/PC, ST/PC
Power Monitor Port	1% monitor tap

13.2.1.2 Single-channel/Sub-band Booster Amplifier single-channel application specifications

Table 13-2 Single-Channel/Sub-band Booster Amplifier (SBA) BP1A05BB single-channel application specifications

Parameter	Minimum/Typical	Maximum	Units
Operating Wavelength	1528	1563	nm
Composite Input Level	-15/—	9	dBm
Output Signal Power	3/—	18	dBm
Note Output power reported by the photodetector includes signal and ASE power.			
Note Maximum output signal power may be greater than the specified value when an amplifier operates in its saturation region in constant gain mode.			
Monitor Port Insertion Loss Ratio	—	22 /1	dB
Input/Output Power Accuracy	—	±0.2	dBm
Note Refers to the accuracy of the amplifier's photodetector, which is calibrated against a standard power meter with a variation of ±0.2 dB.			
Polarization Mode Dispersion	—/0.4	0.5	ps
Polarization Dependent Gain	—	0.5	dB
Constant Gain			
Signal Gain	18		dB

Table 13-2 Single-Channel/Sub-band Booster Amplifier (SBA) BP1A05BB single-channel application specifications (Continued)

Parameter	Minimum/Typical	Maximum	Units
Note Gain reported is signal gain only.			
Average Gain Accuracy	—/±0.2	±0.5	dB
Gain Flatness (Up to 8 channels in either Band 1 or Band 2)	—	±0.5	dB
Gain Flatness (Up to 16 channels in Band 1 and Band 2)	—	±0.75	dB
Noise Figure (at minimum input power)	—/ <6	6.5	dB
Noise Figure (at maximum input power)	—	6.5	dB
Constant Power			
Output Power Accuracy	—	±0.5	dBm
Gain	—	26	dB

13.2.1.3 Single-channel/Sub-band Booster Amplifier sub-band application specifications

Table 13-3 Single-channel/Sub-band Booster Amplifier (SBA) BP1A05BB sub-band application specifications

Parameter	Minimum/Typical	Maximum	Units
Operating Wavelength	1546	1560	nm
Channel Capacity	Up to 16 ITU-T channels in 1554.13 to 1559.79 nm and/or 1546.12 to 1551.72 nm		
Input Level Per Channel (number of wavelengths >=2)	-18/—	—	dBm
Composite Input Level	-15/—	+9	dBm
Output Signal Power	3/—	18	dBm
Note Output power reported by the photodetector includes signal and ASE power.			
Note Maximum output signal power may be greater than the specified value when an amplifier operates in its saturation region in constant gain mode.			
Monitor Port Insertion Loss Ratio	—	22 /1	dB
Input/Output Power Accuracy	—	±0.2	dBm
Note Refers to the accuracy of the amplifier's photodetector, which is calibrated against a standard power meter with a variation of ±0.2 dB.			
Polarization Mode Dispersion	—/0.4	0.5	ps
Polarization Dependent Gain	—	0.5	dB
Constant Gain			
Signal Gain	18		dB

Table 13-3 Single-channel/Sub-band Booster Amplifier (SBA) BP1A05BB sub-band application specifications (Continued)

Parameter	Minimum/Typical	Maximum	Units
Note Gain reported is signal gain only.			
Average Gain Accuracy	—/±0.2	±0.5	dB
Gain Flatness (Up to 8 channels in either Band 1 or Band 2)	—	±0.5	dB
Gain Flatness (Up to 16 channels in Band 1 and Band 2)	—	±0.75	dB
Noise Figure (at minimum input power)	—/≤6	6.5	dB
Noise Figure (at maximum input power)	—	6.5	dB
Transient Performance			
Overshoot/Undershoot for Transient Rise/Fall time for 12 dB A/D			
Note Average control ripple is ±0.2 dB.			
1 ms	—	1.8	dB
100 ns	—	3	dB
Surviving Channel Gain Offset	—	1	dB
Gain Settling Time for Transient Rise/Fall time			
1 ms	—	5	ms
100 ns	—	3	ms

13.2.2 Single-channel/Sub-band Pre-Amplifier (SPA)

Amplifier features

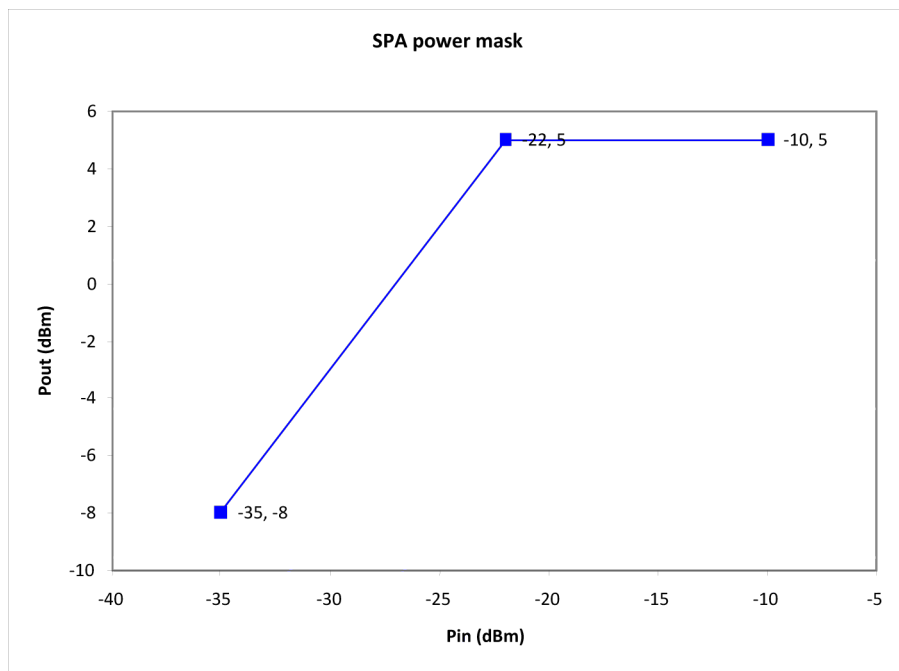
There are two modes of operation for the SPA:

- Constant gain mode
- Constant output power mode

Constant gain mode

ASE correction for the SPA is calibrated across the C-band. When the SPA is used as a single-channel amplifier, the signal gain is accurate to ±0.5 dB. The output power versus input power curve is shown in the following figure.

SPA Power Mask



Constant power mode

Constant power mode is supported only for single-channel SPA operation. In this mode of operation, the total output power, including signal and ASE power, is controlled to the user-specified level. ASE correction is not applied.

Sub-band application

When the SPA is deployed as a banded amplifier in Bands 1 and 2, a default wavelength of 1550 nm is selected as the reference and the signal gain is accurate to ± 0.5 dB. Improved accuracy and gain flatness can be achieved by selecting a mid-band wavelength within the desired wavelength band as the reference channel.

This section covers the following topics:

- [13.2.2.1, “Single-channel/Sub-band Pre-Amplifier general specifications”](#)
- [13.2.2.2, “Single-channel/Sub-band Pre-Amplifier single-channel application specifications”](#)
- [13.2.2.3, “Single-channel/Sub-band Pre-Amplifier sub-band application specifications”](#)

13.2.2.1 Single-channel/Sub-band Pre-Amplifier general specifications

Table 13-4 Single-Channel/Sub-band Pre-Amplifier (SPA) BP1A05PB general specifications

Parameter	Value
Features	Constant Gain
	Constant Power (specified for single channel only)
Input/Output Ports	1 input (amplifier in)

Table 13-4 Single-Channel/Sub-band Pre-Amplifier (SPA) BP1A05PB general specifications (Continued)

Parameter	Value
	2 output (amplifier out and monitor port)
Input/Output Connector	SC/PC, FC/PC, ST/PC
Power Monitor Port	1% monitor tap

13.2.2.2 Single-channel/Sub-band Pre-Amplifier single-channel application specifications

Table 13-5 Single-Channel/Sub-band Pre-Amplifier (SPA) BP1A05PB single-channel application specifications

Parameter	Minimum/Typical	Maximum	Units
Operating Wavelength	1528	1563	nm
Composite Input Level	-35/—	-10	dBm
Output Signal Power	-8/—	5	dBm
Note Maximum output signal power may be greater than the specified value when an amplifier operates in its saturation region in constant gain mode.			
Monitor Port Insertion Loss Ratio	—	22 /1	dB
Input/Output Power Accuracy	—	±0.2	dBm
Note Refers to the accuracy of the amplifier's photodetector, which is calibrated against a standard power meter with a variation of ±0.2 dB.			
Polarization Mode Dispersion	—/0.4	0.5	ps
Polarization Dependent Gain	—	0.5	dB
Constant Gain			
Signal Gain	27		dB
Note Gain reported is signal gain only.			
Average Gain Accuracy	—/±0.2	±0.5	dB
Gain Flatness (Up to 8 channels in either Band 1 or Band 2)	—	±0.5	dB
Gain Flatness (Up to 16 channels in Band 1 and Band 2)	—	±0.75	dB
Noise Figure (at minimum input power)	—/<6	5.5	dB
Noise Figure (at maximum input power)	—	5.5	dB
Constant Power			
Output Power Accuracy	—	±0.75	dBm
Gain	—	>27	dB

13.2.2.3 Single-channel/Sub-band Pre-Amplifier sub-band application specifications

Table 13-6 Single-Channel/Sub-band Pre-Amplifier (SPA) BP1A05PB sub-band application specifications

Parameter	Minimum/Typical	Maximum	Units
Operating Wavelength	1546	1560	nm
Channel Capacity	Up to 16 ITU-T channels in 1554.13 to 1559.79 nm and/or 1546.12 to 1551.72 nm		
Input Level Per Channel (number of wavelengths ≥ 2)	-38/—	—	dBm
Composite Input Level	-35/—	-10	dBm
Output Signal Power	-8/—	5	dBm
Note Output power reported by the photodetector includes signal and ASE power.	—	5	dBm
Note Maximum output signal power may be greater than the specified value when an amplifier operates in its saturation region in constant gain mode.			
Monitor Port Insertion Loss Ratio	—	22 /1	dB
Input/Output Power Accuracy	—	± 0.2	dBm
Note Refers to the accuracy of the amplifier's photodetector, which is calibrated against a standard power meter with a variation of ± 0.2 dB.	—/0.4	0.5	ps
Polarization Mode Dispersion			
Polarization Dependent Gain	—	0.5	dB
Constant Gain			
Signal Gain	27		dB
Note Gain reported is signal gain only.			
Average Gain Accuracy	$-\pm 0.2$	± 0.5	dB
Gain Flatness (Up to 8 channels in either Band 1 or Band 2)	—	± 0.5	dB
Gain Flatness (Up to 16 channels in Band 1 and Band 2)	—	± 0.75	dB
Noise Figure (at minimum input power)	$-\leq 6$	5.5	dB
Noise Figure (at maximum input power)	—	5.5	dB
Transient Performance			
Overshoot/Undershoot for Transient Rise/Fall time for 12 dB A/D			
Note Average control ripple is ± 0.2 dB.			
1 ms	—	1.8	dB
100 ns	—	3	dB
Surviving Channel Gain Offset	—	1	dB
Gain Settling Time for Transient Rise/Fall time			

**Table 13-6 Single-Channel/Sub-band Pre-Amplifier (SPA) BP1A05PB sub-band application specifications
(Continued)**

Parameter	Minimum/Typical	Maximum	Units
1 ms	—	5	ms
100 ns	—	3	ms

13.3 DWDM amplifier specifications

Tilt compensation

Tilt compensation is available for all line amplifiers running in constant gain mode, including the OLA and OLAM, LGA, MGA, and MGM amplifiers. Gain tilt results primarily from wavelength dependent losses in an optical link. Amplifiers operating in saturation can also result in gain tilt. Applying appropriate tilt compensation along an optical link can improve the flatness of the signal output profile at the end of the link, ensuring that the input power stays within the dynamic range of the receivers. When tilt compensation is applied, the gain per channel will increase or decrease depending on the channel power profile and whether a positive or negative tilt is applied. However, the average gain will remain the same.

Notes on optical specifications:

- 1 Constant gain mode is supported on all amplifiers. This is the default and recommended setting.
- 2 Constant power mode is supported for single-channel applications on the LGA, MGA, MGM, OBA, and OPA amplifiers. When these amplifiers are operating in constant power mode, the total output power, including signal and ASE power, is controlled to the user-specified level as long as the input power is within specifications. ASE correction is not applied.
- 3 When the input power falls below the minimum specified level, the signal is still amplified, but the accuracy of the input power, gain, and output power will not meet the specifications provided.
- 4 When the input power exceeds the maximum specified level, the signal is still amplified, but the accuracy of the input power, gain, and output power will not meet the specifications provided.
- 5 All specifications quoted are for worst-case temperature and aging scenarios.

This section covers the following topics:

- [13.3.1, “Optical Booster Amplifier”](#)
- [13.3.2, “Optical Line Amplifier”](#)
- [13.3.3, “Optical Line Amplifier with Mid-Stage Access”](#)
- [13.3.4, “DWDM C-Band Pre-Amplifier”](#)
- [13.3.5, “DWDM C-Band Low Gain Amplifier \(LGA\)”](#)
- [13.3.6, “DWDM C-Band Mid Gain Amplifier \(MGA\)”](#)
- [13.3.7, “DWDM C-Band Mid Gain Amplifier with Mid-stage access \(MGM\)”](#)

13.3.1 Optical Booster Amplifier

Amplifier features

There are two modes of operation for the booster amplifier:

- Constant gain mode — the output power is given by the input power plus gain.
- Constant power mode — the total output power (signal + ASE) is set to a user selected level.

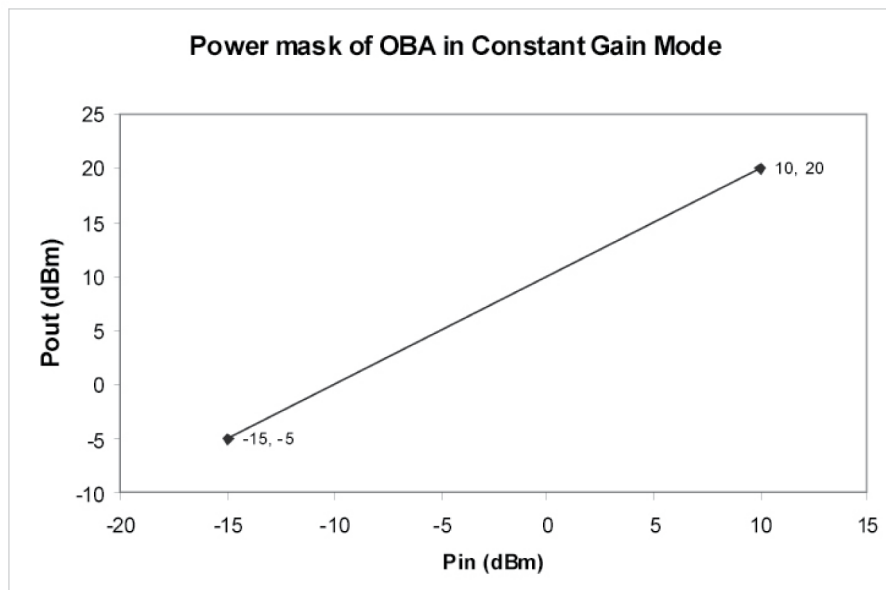
Constant gain mode

Note Constant gain mode is the recommended setting.

The Optical Booster Amplifier is typically deployed at the output of a mux at the head end of an optical link, but they can be used anywhere in an optical link where the input power to the amplifier is high and the required gain is low. For example, they may be used at mid-link at the end of a short optical span.

The power mask for the DWDM C-band Booster Amplifier in constant gain mode is shown in the following figure.

DWDM C-band Booster Amplifier constant gain mode



Constant power mode

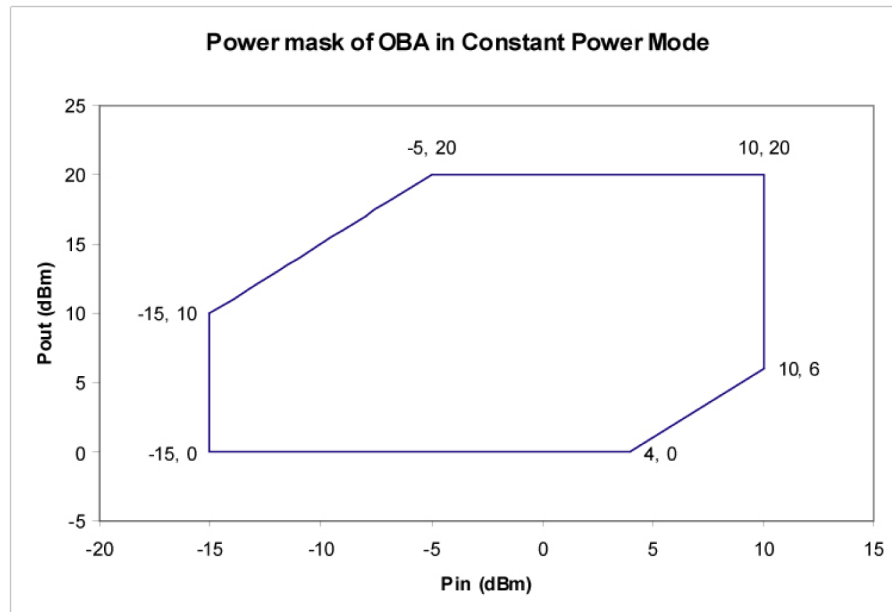
Note Constant power mode is supported for single-channel applications only.

When the amplifier is in constant power mode, the signal gain cannot exceed the maximum gain of the amplifier. When the output power selected is such that $P_{out} - P_{in} > \text{Design Flat Gain (DFG)}$ of 10 dB for the C-Band Booster Amplifier, the output spectrum will have a negative tilt across the operating wavelength range. The tilt is equal to $(P_{out} - P_{in}) - \text{DFG}$. When the output power

selected is such that $P_{out} - P_{in} < DFG$, the output spectrum will have a positive tilt across the operating wavelength range. The tilt is equal to $DFG - (P_{out} - P_{in})$ from 1528 to 1563 nm.

The following figure shows the power mask for the DWDM C-Band Booster Amplifier in constant power mode.

DWDM C-Band Booster Amplifier in constant power mode



13.3.1.1 DWDM C-Band Booster Amplifier with Power Monitor general specifications

Table 13-7 DWDM C-Band Booster Amplifier (OBA) BP1A02DA general specifications

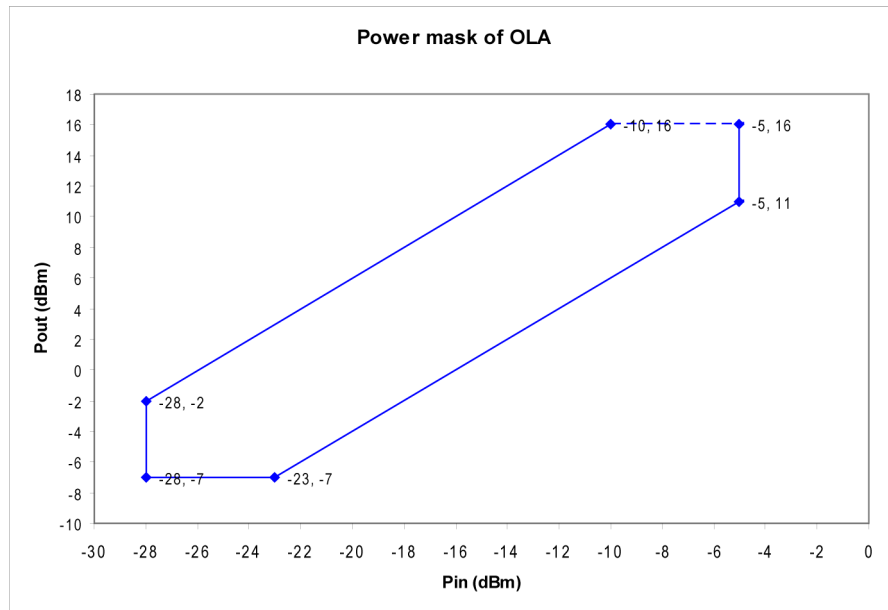
Parameter	Value
Features	Gain Flattening Filter (GFF) Constant Gain Constant Power (specified for single channel only)
Input/Output Ports	1 input (amplifier in) 2 output (amplifier out and monitor port)
Input/Output Connector	SC/PC, FC/PC, ST/PC
Power Monitor Port	1% monitor tap

13.3.2 Optical Line Amplifier

Amplifier features

The Optical Line Amplifier (OLA) operates in constant gain mode. The power mask of the OLA is shown in the following figure.

OLA Power Mask



When the OLA is operating in saturation (as shown by the dashed line in the power mask), the output spectrum may have a positive tilt across the spectrum. There is no tilt when the gain is set to the achievable gain constrained by $P_{out} - P_{in}$. If the specified gain exceeds the achievable gain, then the tilt is equal to the difference between the specified gain and the achievable gain across the operating wavelength range from 1528 to 1563 nm.

13.3.2.1 Optical Line Amplifier general specifications

Table 13-8 Optical Line Amplifier (OLA) BP1A03AA general specifications

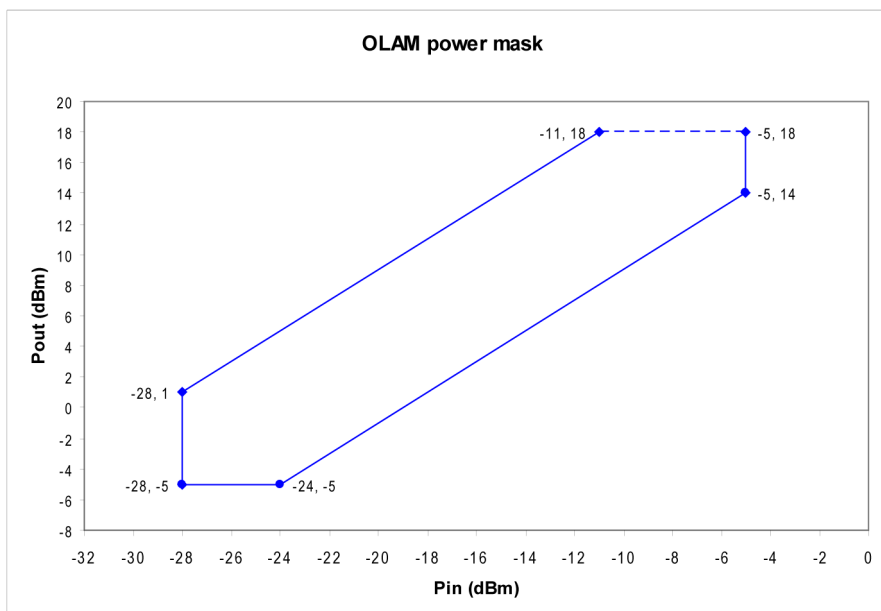
Parameter	Value
Features	Gain Flattening Filter (GFF) Adjustable Gain Constant Gain Tilt Compensation
Input/Output Ports	2 (input, output)
Input/Output Connector	SC/PC, FC/PC, ST/PC

13.3.3 Optical Line Amplifier with Mid-Stage Access

Amplifier features

The Optical Line Amplifier with Mid-Stage Access (OLAM) operates in constant gain mode. The power mask of the OLAM is shown in the following figure.

OLAM Power Mask



When the OLAM is operating in saturation (as shown by the dashed line in the power mask), the output spectrum may have a positive tilt across the spectrum. There is no tilt when the gain is set to the achievable gain constrained by $P_{out} - P_{in}$. If the specified gain exceeds the achievable gain, then the tilt is equal to the difference between the specified gain and the achievable gain across the operating wavelength range from 1528 to 1563 nm.

13.3.3.1 Optical Line Amplifier with Mid-Stage Access general specifications

Table 13-9 Optical Line Amplifier with 0 – 15 dB Mid-Stage Access (OLAM) BP1A04BA general specifications

Parameter	Value
Features	Gain Flattening Filter (GFF) Adjustable Gain Constant Gain Constant Power (specified for single channel only) Tilt Compensation
Input/Output Ports	2 (input, output)
Input/Output Connector	SC/PC, FC/PC, ST/PC
Mid-Stage Access Connector	Dual LC

13.3.4 DWDM C-Band Pre-Amplifier

Amplifier features

There are two modes of operation for the DWDM C-Band Pre-Amplifier (OPA):

- Constant gain mode — the output power is given by the input power plus gain.

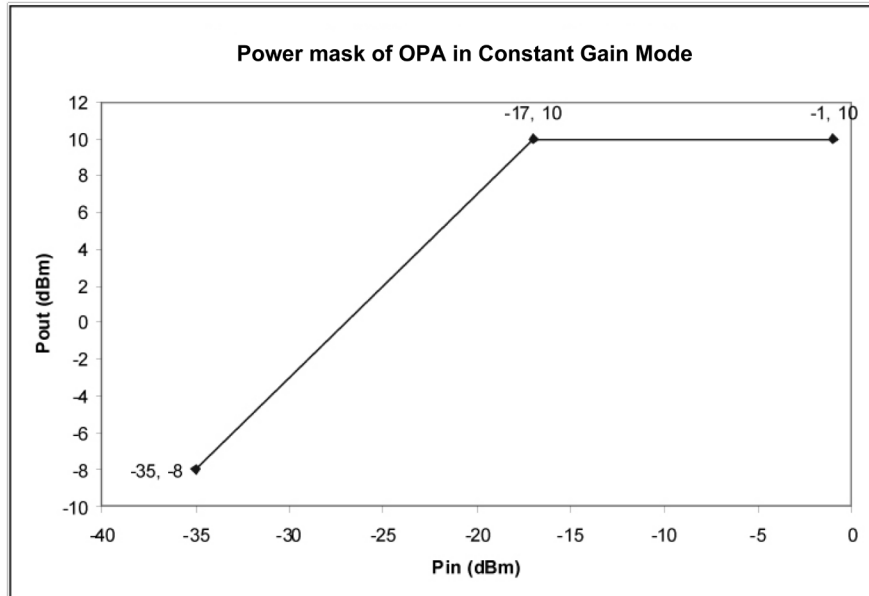
- Constant power mode — the total output power (signal + ASE) is set to a user selected level.

Constant gain mode

Note Constant gain mode is the recommended setting.

The power mask for the DWDM C-Band Pre-Amplifier in constant gain mode is shown in the following figure.

DWDM C-Band Pre-Amplifier power mask in constant gain mode



When the OPA is operating in saturation, the output spectrum will have a positive tilt across the operating wavelength range from 1528 to 1563 nm. The gain tilt is equal to $(P_{in} + \text{Gain} - P_{out})$.

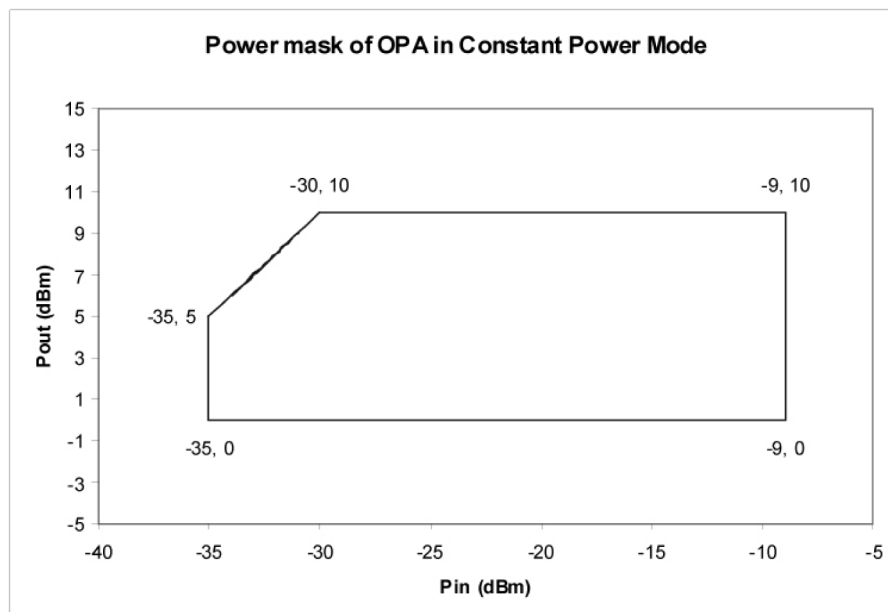
Constant power mode

Note Constant power mode is supported for single-channel applications only.

When the amplifier is in constant power mode, the signal gain cannot exceed the maximum gain of the amplifier. When the output power selected is such that $P_{out} - P_{in} > \text{Design Flat Gain (DFG)}$ of 27 dB for the OPA, the output spectrum will have a negative tilt across the operating wavelength range. The tilt is equal to $(P_{out} - P_{in}) - \text{DFG}$. When the output power selected is such that $P_{out} - P_{in} < \text{DFG}$, the output spectrum will have a positive tilt across the operating wavelength range. The tilt is equal to $\text{DFG} - (P_{out} - P_{in})$ from 1528 to 1563 nm.

The power mask for the OPA in constant power mode is shown in the following figure.

DWDM C-Band Pre-Amplifier in constant power mode



13.3.4.1 DWDM C-Band Pre-Amplifier general specifications

Table 13-10 DWDM C-Band Pre-Amplifier (OPA) with Power Monitor BP1A01DA general specifications

Parameter	Value
Features	Gain Flattening Filter (GFF) Constant Gain Constant Power (specified for single channel only)
Input/Output Ports	1 input (amplifier in) 2 output (amplifier out and monitor port)
Input/Output Connector	SC/PC, FC/PC, ST/PC
Power Monitor Port	1% monitor tap

13.3.5 DWDM C-Band Low Gain Amplifier (LGA)

Amplifier features

There are two modes of operation for the DWDM C-Band Low Gain Amplifier (LGA):

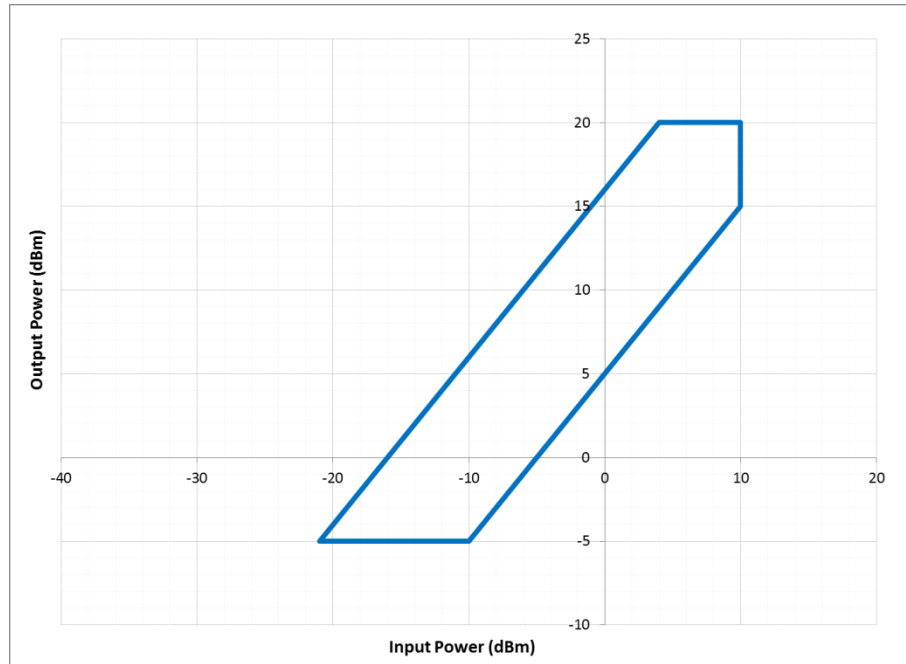
- Constant gain mode — the output power is determined by the input power plus gain.
- Constant power mode — the total output power (signal + ASE) is set to a user selected level.

Constant gain mode

Note Constant gain mode is the recommended setting.

The power mask for the LGA in constant gain mode is shown in the following figure.

LGA power mask in constant gain mode



When the amplifier is operating in saturation, the output spectrum will have a positive tilt across the operating wavelength range. The gain tilt is equal to $(P_{in} + \text{Gain} - P_{out})$.

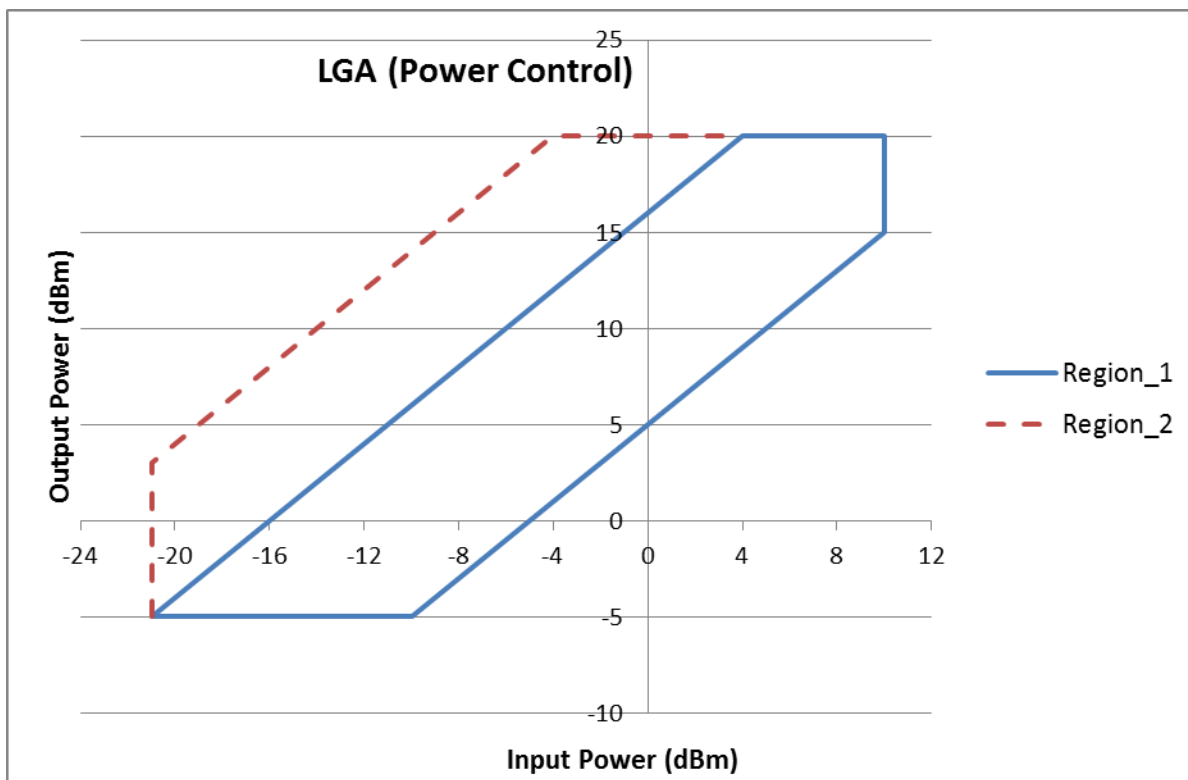
Constant power mode

Note Constant power mode is supported for single-channel applications only.

When the amplifier is in constant power mode, the signal gain cannot exceed the maximum gain of the amplifier. When the output power selected is such that $P_{out} - P_{in} > \text{Design Flat Gain (DFG)}$ for the amplifier, the output spectrum will have a negative tilt across the operating wavelength range. The tilt is equal to $(P_{out} - P_{in}) - \text{DFG}$. When the output power selected is such that $P_{out} - P_{in} < \text{DFG}$, the output spectrum will have a positive tilt across the operating wavelength range. The tilt is equal to $\text{DFG} - (P_{out} - P_{in})$ over the operating wavelength range.

The power mask for the LGA in constant power mode is shown in the following figure. Region_1 is the supported power mask. Region_2 extends the power mask to provide a greater range (but with a lower power control accuracy), and is supported on a best effort basis.

LGA power mask in constant power mode



13.3.5.1 DWDM C-Band Low Gain Amplifier (LGA) general specifications

Table 13-11 DWDM C-Band Low Gain Amplifier (LGA) BT7A02AA general specifications

Parameter	Value
Features	Variable Optical Attenuator (VOA) for flat gain and desired tilt Adjustable Gain Constant Gain Constant Power Tilt Compensation
Input/Output Ports	1 input (amplifier in) 2 output (amplifier out and monitor port)
Input/Output Connector	LC
Power Monitor Port	1% monitor tap

13.3.6 DWDM C-Band Mid Gain Amplifier (MGA)

Amplifier features

There are two modes of operation for the DWDM C-Band Mid Gain Amplifier (MGA):

- Constant gain mode — the output power is determined by the input power plus gain.

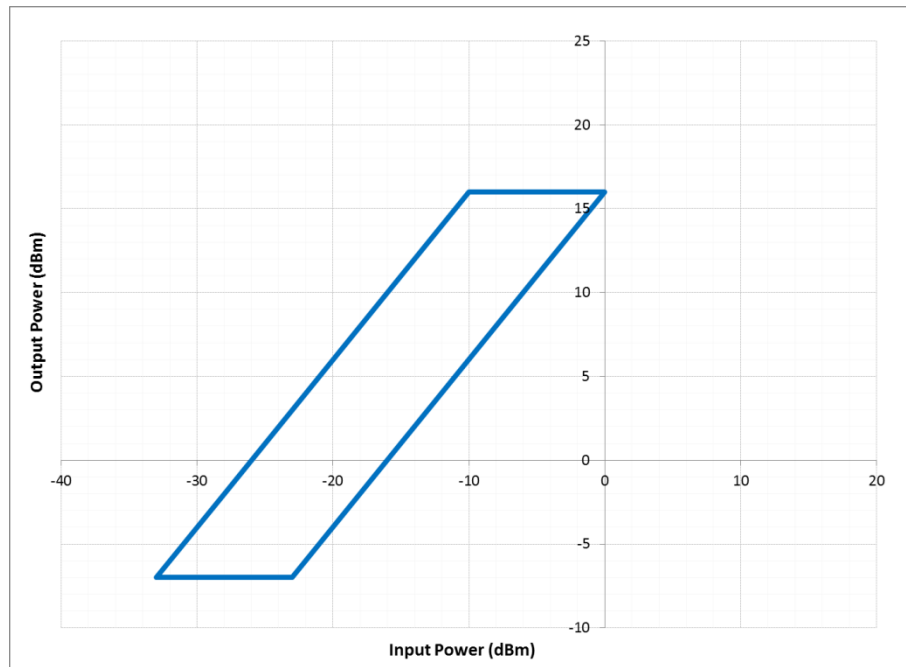
- Constant power mode — the total output power (signal + ASE) is set to a user selected level.

Constant gain mode

Note Constant gain mode is the recommended setting.

The power mask for the MGA in constant gain mode is shown in the following figure.

MGA power mask in constant gain mode



When the amplifier is operating in saturation, the output spectrum will have a positive tilt across the operating wavelength range. The gain tilt is equal to $(P_{in} + \text{Gain} - P_{out})$.

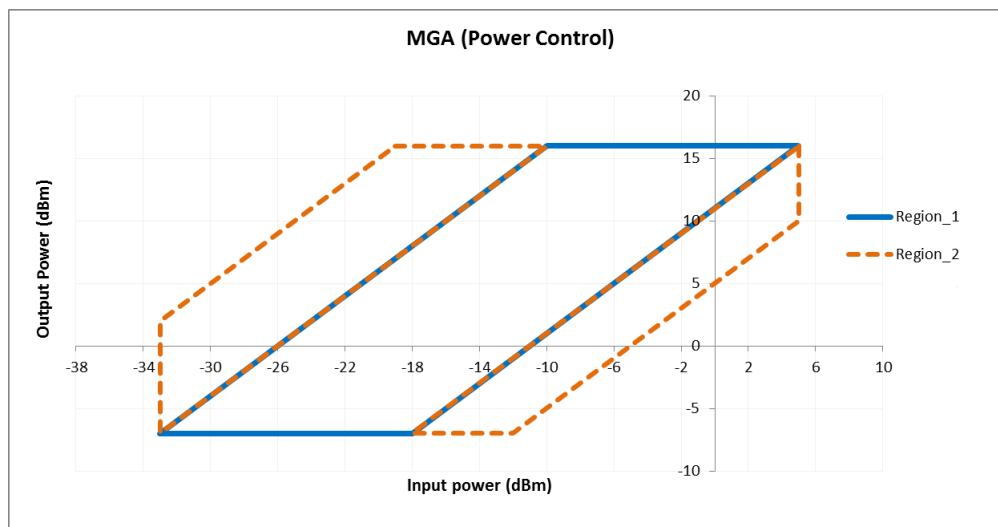
Constant power mode

Note Constant power mode is supported for single-channel applications only.

When the amplifier is in constant power mode, the signal gain cannot exceed the maximum gain of the amplifier. When the output power selected is such that $P_{out} - P_{in} > \text{Design Flat Gain (DFG)}$ for the amplifier, the output spectrum will have a negative tilt across the operating wavelength range. The tilt is equal to $(P_{out} - P_{in}) - \text{DFG}$. When the output power selected is such that $P_{out} - P_{in} < \text{DFG}$, the output spectrum will have a positive tilt across the operating wavelength range. The tilt is equal to $\text{DFG} - (P_{out} - P_{in})$ over the operating wavelength range.

The power mask for the MGA in constant power mode is shown in the following figure. Region_1 is the supported power mask. Region_2 extends the power mask to provide a greater range (but with a lower power control accuracy), and is supported on a best effort basis.

MGA power mask in constant power mode



13.3.6.1 DWDM C-Band Mid Gain Amplifier (MGA) general specifications

Table 13-12 DWDM C-Band Mid Gain Amplifier (MGA) BT7A03AA general specifications

Parameter	Value
Features	Variable Optical Attenuator (VOA) for flat gain and desired tilt Adjustable Gain Constant Gain Constant Power Tilt Compensation
Input/Output Ports	1 input (amplifier in) 2 output (amplifier out and monitor port)
Input/Output Connector	LC
Power Monitor Port	1% monitor tap

13.3.7 DWDM C-Band Mid Gain Amplifier with Mid-stage access (MGM)

Amplifier features

There are two modes of operation for the DWDM C-Band Mid Gain Amplifier with Mid-stage access (MGM):

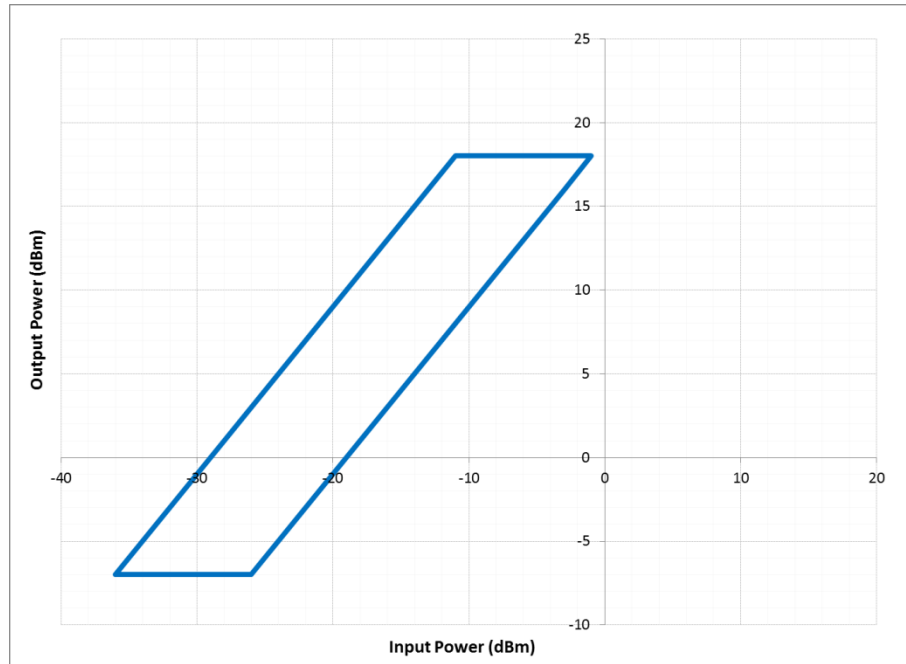
- Constant gain mode — the output power is determined by the input power plus gain.
- Constant power mode — the total output power (signal + ASE) is set to a user selected level.

Constant gain mode

Note Constant gain mode is the recommended setting.

The power mask for the MGM in constant gain mode is shown in the following figure.

MGM power mask in constant gain mode



When the amplifier is operating in saturation, the output spectrum will have a positive tilt across the operating wavelength range. The gain tilt is equal to $(P_{in} + \text{Gain} - P_{out})$.

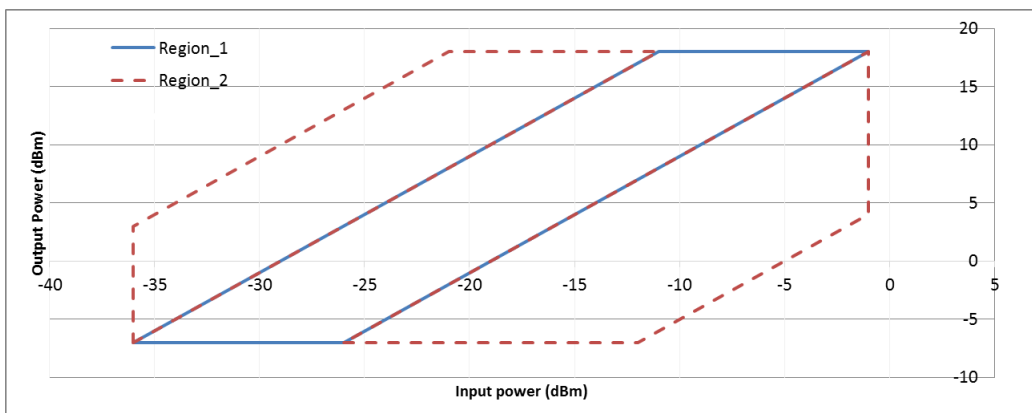
Constant power mode

Note Constant power mode is supported for single-channel applications only.

When the amplifier is in constant power mode, the signal gain cannot exceed the maximum gain of the amplifier. When the output power selected is such that $P_{out} - P_{in} > \text{Design Flat Gain (DFG)}$ for the amplifier, the output spectrum will have a negative tilt across the operating wavelength range. The tilt is equal to $(P_{out} - P_{in}) - \text{DFG}$. When the output power selected is such that $P_{out} - P_{in} < \text{DFG}$, the output spectrum will have a positive tilt across the operating wavelength range. The tilt is equal to $\text{DFG} - (P_{out} - P_{in})$ over the operating wavelength range.

The power mask for the MGA in constant power mode is shown in the following figure. Region_1 is the supported power mask. Region_2 extends the power mask to provide a greater range (but with a lower power control accuracy), and is supported on a best effort basis.

MGM power mask in constant power mode



13.3.7.1 DWDM C-Band Mid Gain Amplifier with Mid-stage access (MGM) general specifications

Table 13-13 DWDM C-Band Mid Gain Amplifier with Mid-stage access (MGM) BT7A04AA general specifications

Parameter	Value
Features	Variable Optical Attenuator (VOA) for flat gain and desired tilt Adjustable Gain Constant Gain Constant Power Tilt Compensation
Input/Output Ports	2 input (amplifier in, mid-stage in) 3 output (amplifier out, mid-stage out, and monitor port)
Input/Output/Mid-Stage Access Connectors	LC
Power Monitor Port	1% monitor tap

13.4 SFP specifications

Note Optical performance has been characterized for SM fiber. Networks can be deployed on other fiber types. Contact your BTI representative for information about supporting these designs.

This section covers the following topics:

- 13.4.1, “850 nm SFPs”
- 13.4.2, “1310 nm SFPs”
- 13.4.3, “Bidirectional 1310nm TX/1550nm RX SFP specifications”
- 13.4.4, “Bidirectional 1310nm/1490nm SR SFP specifications”
- 13.4.5, “Bidirectional 1310nm/1490nm IR SFP specifications”
- 13.4.6, “CWDM SFPs”
- 13.4.7, “DWDM SFPs”
- 13.4.8, “Copper SFPs”

For specifications on SFPs for multishelf or OSC use, see 13.6, “Optical Supervisory Channel integrated on the System Control Processor”.

13.4.1 850 nm SFPs

This section covers the following topics:

- 13.4.1.1, “Tri-rate 850 nm SX SFP optical specifications”
- 13.4.1.2, “Tri-rate 850 nm SX SFP cable and connector specifications”
- 13.4.1.3, “4 Gigabyte Quad-Rate 850 nm SX SFP optical specifications”
- 13.4.1.4, “4 Gigabyte Quad-Rate 850 nm SX SFP cable specifications”

13.4.1.1 Tri-rate 850 nm SX SFP optical specifications

Table 13-14 Tri-rate 850 nm SX SFP BP3AD1SS optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	—	1.0625	—	Gb/s
	—	1.25	—	Gb/s
	—	2.125	—	Gb/s
Transmitter				
Laser source	—			
Tx center wavelength	840	—	860	nm
Average operating power	-9.0	—	-1.5	dBm
Spectral width (-20 dB)	—	—	0.65	nm
Extinction ratio	9	—	—	dB

Table 13-14 Tri-rate 850 nm SX SFP BP3AD1SS optical specifications (Continued)

Parameter	Min	Typ	Max	Units
Receiver				
Rx operating wavelength	770	—	860	nm
Stressed Rx sensitivity (BER=1x10 ⁻¹²)				
50/125 µm cable specifications				
1.0625 Gb/s	-14.6	—	3	dBm
1.25 Gb/s	-13.6	—	3	dBm
2.125 Gb/s	-12.2	—	3	dBm
62.5/125 µm cable specifications				
1.0625 Gb/s	-13.7	—	3	dBm
1.25 Gb/s	-12.6	—	3	dBm
2.125 Gb/s	-11.6	—	3	dBm
Reflectance	—	—	-12	dB
Other				
Connector/Latch type	LC/Bail			
SFP MSA 8074 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

13.4.1.2 Tri-rate 850 nm SX SFP cable and connector specifications

Table 13-15 Tri-rate 850 nm SX SFP BP3AD1SS cable and connector specifications

Parameter	Min	Typ	Max	Units
50/125 µm Cable Specifications (multimode 850 nm)				
Bandwidth @ 850 nm	2000	—	—	MHz-km
Length - 2.125 Gb/s	0.5	—	500	m
Length - 1.0625 Gb/s	0.5	—	860	m
Length - 1.250 Gb/s	0.5	—	860	m
Bandwidth @ 850 nm	500	—	—	MHz-km
Length - 2.125 Gb/s	0.5	—	300	m
Length - 1.0625 Gb/s	0.5	—	550	m
Length - 1.250 Gb/s	0.5	—	550	m
Bandwidth @ 850 nm	400	—	—	MHz-km
Length - 2.125 Gb/s	0.5	—	260	m

Table 13-15 Tri-rate 850 nm SX SFP BP3AD1SS cable and connector specifications (Continued)

Parameter	Min	Typ	Max	Units
Length - 1.0625 Gb/s	0.5	—	500	m
Length - 1.250 Gb/s	0.5	—	500	m
62.5/125 μm Cable Specifications (multimode 850 nm)				
Bandwidth @ 850 nm	200	—	—	MHz-km
Length - 2.125 Gb/s	0.5	—	150	m
Length - 1.0625 Gb/s	0.5	—	300	m
Length - 1.250 Gb/s	0.5	—	275	m
Bandwidth @ 850 nm	160	—	—	MHz-km
Length - 2.125 Gb/s	0.5	—	120	m
Length - 1.0625 Gb/s	0.5	—	250	m
Length - 1.250 Gb/s	0.5	—	220	m
LC Optical Connector Specifications (multimode)				
Nominal Attenuation	—	0.25	0.4	dB
Attenuation Standard Deviation	—	0.15	—	dB
Connects/Disconnects	—	—	250	cycles

13.4.1.3 4 Gigabyte Quad-Rate 850 nm SX SFP optical specifications

Table 13-16 4 Gigabyte Quad-Rate 850 nm SFP BP3AD2SS optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	—	1.0625	—	Gb/s
	—	1.25	—	Gb/s
	—	2.125	—	Gb/s
	—	4.25	—	Gb/s
Transmitter				
Laser source	—			
Tx center wavelength	830	—	860	nm
Average operating power	-9.0	—	-2.5	dBm
Spectral width (-20 dB)	—	—	0.85	nm
Extinction ratio	9	—	—	dB
Receiver				
Rx operating wavelength	770	—	860	nm
Stressed Rx sensitivity (BER=1x10⁻¹²)				
1.0625 Gb/s	-14.5	—	0	dBm
1.25 Gb/s	-13.5	—	0	dBm
2.125 Gb/s	-12.0	—	0	dBm
4.25 Gb/s	-10.5	—	0	dBm

Table 13-16 4 Gigabyte Quad-Rate 850 nm SFP BP3AD2SS optical specifications (Continued)

Parameter	Min	Typ	Max	Units
Reflectance	—	—	-12	dB
Other				
Connector type	LC			
Latch type	Bail			
SFP MSA 8074 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

13.4.1.4 4 Gigabyte Quad-Rate 850 nm SX SFP cable specifications

Table 13-17 4 Gigabyte Quad-Rate 850 nm SFP BP3AD2SS cable specifications

Parameter	Min	Typ	Max	Units
50/125 μm Cable Specifications (multimode 850 nm)				
Bandwidth @ 850 nm	2000	—	—	MHz-km
Length - 4.250 Gbps	2	—	270	m
Length - 2.125 Gbps	2	—	500	m
Length - 1.250 Gbps	0.5	—	860	m
Length - 1.0625 Gbps	2	—	860	m
Bandwidth @ 850 nm	1500	—	—	MHz-km
Length - 4.250 Gbps	2	—	215	m
Length - 2.125 Gbps	2	—	430	m
Length - 1.250 Gbps	0.5	—	740	m
Length - 1.0625 Gbps	2	—	755	m
Bandwidth @ 850 nm	900	—	—	MHz-km
Length - 4.250 Gbps	2	—	175	m
Length - 2.125 Gbps	2	—	350	m
Length - 1.250 Gbps	0.5	—	595	m
Length - 1.0625 Gbps	2	—	630	m
Bandwidth @ 850 nm	500	—	—	MHz-km
Length - 4.250 Gbps	2	—	150	m
Length - 2.125 Gbps	2	—	300	m
Length - 1.250 Gbps	0.5	—	550	m
Length - 1.0625 Gbps	2	—	500	m
62.5/125 μm Cable Specifications (multimode 850 nm)				

Table 13-17 4 Gigabyte Quad-Rate 850 nm SFP BP3AD2SS cable specifications (Continued)

Parameter	Min	Typ	Max	Units
Bandwidth @ 850 nm	200	—	—	MHz-km
Length - 4.250 Gbps	2	—	70	m
Length - 2.125 Gbps	2	—	150	m
Length - 1.250 Gbps	0.5	—	275	m
Length - 1.0625 Gbps	2	—	300	m

Note Optical performance has been characterized for SM fiber. Networks can be deployed on other fiber types. Please contact your BTI representative for information about supporting these designs.

13.4.2 1310 nm SFPs

This section covers the following topics:

- [13.4.2.1, “1310 nm SR SFP optical specifications”](#)
- [13.4.2.2, “1310 nm IR SFP optical specifications ”](#)
- [13.4.2.3, “4 Gigabyte Quad-Rate 1310 nm SFP optical specifications”](#)

13.4.2.1 1310 nm SR SFP optical specifications

Table 13-18 1310 nm SR SFP BP3AM1MS optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	125	—	2.67	Gb/s
Transmitter				
Laser source	single-mode			
Tx operating wavelength	1266	1310	1360	nm
Average operating power	-10	—	-3	dBm
Spectral width (rms)	—	—	4	nm
Extinction ratio	8.2	—	—	dB
Receiver				
Rx operating wavelength	1266	—	1620	nm
Rx sensitivity (BER=1x10 ⁻¹⁰)	-18	—	—	dBm
Rx sensitivity (BER=1x10 ⁻¹²)	-17	—	—	dBm
Rx overload	-3	—	—	dBm
Optical path penalty	—	—	1	dB
Dispersion	—	—	12	ps/nm
Reach	—	—	2	km
Reflectance	—	—	-27	dB
Other				

Table 13-18 1310 nm SR SFP BP3AM1MS optical specifications (Continued)

Parameter	Min	Typ	Max	Units
Connector/Latch type	LC/Bail			
GR 253, ITU-T G.957 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

13.4.2.2 1310 nm IR SFP optical specifications

Table 13-19 1310 nm IR SFP BP3AM1MI optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	125	—	2.67	Gb/s
Transmitter				
Laser source	single-mode			
Tx operating wavelength	1260	1310	1360	nm
Average operating power	-5	—	0	dBm
Spectral width (-20 dB)	—	—	1	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx operating wavelength	1260	—	1620	nm
Rx sensitivity (BER=1x10 ⁻¹⁰)	-18	—	—	dBm
Rx sensitivity (BER=1x10 ⁻¹²)	-17	—	—	dBm
Rx overload	0	—	—	dBm
Optical path penalty	—	—	1	dB
Reach	—	—	15	km
Reflectance	—	—	-24	dB
Other				
Connector/Latch type	LC/Bail			
GR 253, ITU-T G.957 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			

Table 13-19 1310 nm IR SFP BP3AM1MI optical specifications (Continued)

Parameter	Min	Typ	Max	Units
Rx power accuracy	± 3 dB			

13.4.2.3 4 Gigabyte Quad-Rate 1310 nm SFP optical specifications

Table 13-20 4 Gigabyte Quad-Rate 1310 nm SFP BP3AD2MS optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	—	1.0625	—	Gb/s
	—	1.25	—	Gb/s
	—	2.125	—	Gb/s
	—	4.25	—	Gb/s
Transmitter				
Laser source	—			
Tx center wavelength	1285	—	1350	nm
Average operating power	-8.4	—	-1.0	dBm
Spectral width (rms)	—	—	2.0	nm
Extinction ratio	—	6	—	dB
Receiver				
Rx operating wavelength	1270	—	1365	nm
Reach				
4G FC	—	—	4	km
1G/2G FC, GE	—	—	10	km
Stressed Rx sensitivity (BER=1x10 ⁻¹²)				
1.0625 Gb/s	-20	—	1	dBm
1.25 Gb/s	-20	—	1	dBm
2.125 Gb/s	-20	—	1	dBm
4.25 Gb/s	-17	—	1	dBm
Reflectance	—	—	-12	dB
Other				
Connector type	LC			
Latch type	Bail			
SFP MSA 8074 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 2 dB			
Rx power accuracy	± 2 dB			

13.4.3 Bidirectional 1310nm TX/1550nm RX SFP specifications

Note This SFP is used for single fiber interconnection. On a single fiber, a matched pair of SFPs must be used; that is, a 1310nm TX/1550nm RX (BP3AM5MB) can only communicate with a 1550nm TX/1310nm RX (BP3AM5LB).

Table 13-21 Optical specifications for bidirectional SFPs: 1310nm TX/1550nm RX (BP3AM5MB) and 1550nm TX/1310nm RX (BP3AM5LB)

Parameter	Min	Typ	Max	Units
Bit rate	125	—	1250	Mb/s
Transmitter				
Tx operating wavelength: 1310	1270	1310	1360	nm
Tx operating wavelength: 1550	1530	1550	1570	nm
Average operating power	-9.5	—	-3	dBm
Spectral width (rms) - 1310 nm	—	—	5.5	nm
Spectral width (-20 dB) - 1550 nm	—	—	1	nm
Side Mode Suppression Ratio @ 1550 nm	30	—	—	dB
Extinction ratio	9	—	—	dB
Receiver				
Rx operating wavelength: 1310	1260	—	1360	nm
Rx operating wavelength: 1550	1480	—	1620	nm
Rx sensitivity (BER=1x10 ⁻¹²)	-20	—	—	dBm
Rx overload	-3	—	—	dBm
Reach	—	—	10	km
Reflectance	—	—	-12	dB
Other				
Connector/Latch type	LC/Bail			
IEEE 802.3, SFP MSA compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

13.4.4 Bidirectional 1310nm/1490nm SR SFP specifications

Note This SFP is used for single fiber interconnection. On a single fiber, a matched pair of SFPs must be used; that is, a 1310nm TX/1490nm RX GE, SR (BP3AM5PB) can only communicate with a 1490nm TX/1310nm RX GE, SR (BP3AM5QB).

Table 13-22 Optical specifications for bidirectional SFPs: 1310nm /1490nm SR (BP3AM5PB) and 1490nm/1310nm SR (BP3AM5QB)

Parameter	Min	Typ	Max	Units
Bit rate	125	—	1250	Mb/s
Transmitter				
Tx operating wavelength: 1310	1260	1310	1360	nm
Tx operating wavelength: 1490	1480	1490	1500	nm
Average operating power	-5.0	—	0	dBm
Extinction ratio	6	—	—	dB
Receiver				
Rx operating wavelength: 1310	1260	1310	1360	nm
Rx operating wavelength: 1490	1480	1490	1500	nm
Rx sensitivity (BER=1x10 ⁻¹²)	-20	—	—	dBm
Rx overload	—	—	-3	dBm
Reach	—	—	20	km
Other				
Connector/Latch type	LC/Bail			
IEEE 802.3, SFP MSA compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

13.4.5 Bidirectional 1310nm/1490nm IR SFP specifications

Note This SFP is used for single fiber interconnection. On a single fiber, a matched pair of SFPs must be used; that is, a 1310nm TX/1490nm RX GE, IR (BP3AM5PI) can only communicate with a 1490nm TX/1310nm RX GE, IR (BP3AM5QI).

Table 13-23 Optical specifications for bidirectional SFPs: 1310nm/1490nm IR (BP3AM5PI) and 1490nm/1310nm IR (BP3AM5QI)

Parameter	Min	Typ	Max	Units
Bit rate	125	—	1250	Mb/s
Transmitter				
Tx operating wavelength: 1310	1260	1310	1360	nm
Tx operating wavelength: 1490	1480	1490	1500	nm
Average operating power	-2	—	+3	dBm
Extinction ratio	6	—	—	dB

Table 13-23 Optical specifications for bidirectional SFPs: 1310nm/1490nm IR (BP3AM5PI) and 1490nm/1310nm IR (BP3AM5QI) (Continued)

Parameter	Min	Typ	Max	Units
Receiver				
Rx operating wavelength: 1310	1260	1310	1360	nm
Rx operating wavelength: 1490	1480	1490	1500	nm
Rx sensitivity (BER=1x10 ⁻¹²)	-24	—	—	dBm
Rx overload	—	—	-3	dBm
Reach	—	—	40	km
Other				
Connector/Latch type	LC/Bail			
IEEE 802.3, SFP MSA compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

13.4.6 CWDM SFPs

This section covers the following topics:

- [13.4.6.2, “CWDM LR SFP optical specifications ”](#)

13.4.6.1 CWDM 23 dB SFP optical specifications

Table 13-24 CWDM 23 dB SFP BP3AM1CJ optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	155	—	2670	Mb/s
Transmitter				
Laser source	single mode			
Tx center wavelength	1271	—	1611	nm
Tx center wavelength accuracy	-6.5	—	+6.5	nm
Average operating power	-2	—	3	dBm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx operating wavelength	1260	—	1620	nm
Rx sensitivity (BER=1x10 ⁻¹⁰)	-25	—	—	dBm
Rx sensitivity (BER=1x10 ⁻¹²)	-24	—	—	dBm

Table 13-24 CWDM 23 dB SFP BP3AM1CJ optical specifications (Continued)

Parameter	Min	Typ	Max	Units
Rx overload	-8	—	—	dBm
Dispersion	—	—	1680	ps/nm
Optical path penalty	—	—	2	dB
Reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Bail			
GR 253, ITU-T G.957 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

13.4.6.2 CWDM LR SFP optical specifications

Table 13-25 CWDM LR SFP BP3AM1CL optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	125	—	2.67	Gb/s
Transmitter				
Laser source	single-mode			
Tx center wavelength	1271	—	1611	nm
Tx center wavelength accuracy	-6.5	—	+6.5	nm
Average operating power	0	—	4	dBm
Spectral width (-20 dB)	—	—	1	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx sensitivity (BER=1x10 ⁻¹⁰)	-28	—	—	dBm
Rx sensitivity (BER=1x10 ⁻¹²)	-27	—	—	dBm
Rx overload	-8	—	—	dBm
Dispersion	—	—	1600	ps/nm
Optical path penalty	—	—	2.5	dB
Reflectance	—	—	-24	dB
Other				
Connector/Latch type	LC/Bail			
SFP MSA 8074, GR 253, ITU-T G.957 compliant				

Table 13-25 CWDM LR SFP BP3AM1CL optical specifications (Continued)

Parameter	Min	Typ	Max	Units
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy		± 3 C		
Supply Voltage accuracy		± 0.1 V		
Tx Bias Current accuracy		± 5 mA		
Tx power accuracy		± 3 dB		
Rx power accuracy		± 3 dB		

13.4.6.3 4G CWDM SFP specifications

Table 13-26 4G CWDM SFP BP3AM2CL optical specifications

Parameter	Min	Typ	Max	Units
Bit rate				
GbE	—	1.25	—	Gb/s
OC48	—	2.48832	—	Gb/s
1XFC	—	1.062	—	Gb/s
2XFC	—	2.12	—	Gb/s
4XFC	—	4.24	—	Gb/s
Transmitter				
Tx center wavelength	1471	—	1611	nm
Tx center wavelength accuracy	-6.5	—	6.5	nm
Channel Spacing	See 13.7.1, "CWDM wavelength plan" .			GHz
Average operating power	0	—	4	dBm
Spectral width (-20 dB)	—	—	0.3	nm
Side mode suppression ratio	40	—	—	dB
Extinction ratio				
GbE, OC48, 1XFC, 2XFC	—	—	8.2	dB
4XFC	—	—	6	dB
Receiver				
Rx operating wavelength	1461	—	1617.5	nm
Rx overload				
GbE, OC48, 1XFC, 2XFC	-7	—	—	dBm
4XFC	-9	—	—	dBm
Dispersion (all rates)	0	—	1600	ps/nm
Reflectance	—	—	-27	dB
Rx characteristics for OSNR ≥ 30 dB @ 1e-12				
GbE, OC48, 1XFC, 2XFC				
0 ps/nm	-28	—	—	dBm
1600 ps/nm	-26	—	—	dBm

Table 13-26 4G CWDM SFP BP3AM2CL optical specifications (Continued)

Parameter	Min	Typ	Max	Units
4XFC				
0 ps/nm	-24	—	—	dBm
1600 ps/nm	-21	—	—	dBm

13.4.7 DWDM SFPs

This section covers the following topics:

- [13.4.7.1, “Multirate DWDM ER SFP optical specifications”](#)

13.4.7.1 Multirate DWDM ER SFP optical specifications

Table 13-27 Multirate DWDM ER SFP BP3AM1DE optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	125	—	2.67	Mb/s
Transmitter				
Laser source	single-mode			
Tx center wavelength	1529.55	—	1560.61	nm
Tx center wavelength accuracy	-0.1	—	+0.1	nm
Average operating power	0	—	4	dBm
Spectral width (-20 dB)	—	—	0.3	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx operating wavelength	1260	—	1580	nm
Rx overload	-8	—	—	dBm
Dispersion	—	—	2100	ps/nm
Receiver characteristics for OSNR ≥ 30 dB¹				
Rx sensitivity (BER=1x10 ⁻¹²)	-28	—	-9	dBm
Optical path penalty	—	—	2	dB
Receiver characteristics for OSNR ≥ 20 dB				
Rx sensitivity (BER=1x10 ⁻¹²)	-24	—	-12	dBm
Optical path penalty	—	—	2	dB
Receiver characteristics for OSNR ≥ 18 dB				
Rx sensitivity (BER=1x10 ⁻¹²)	-22	—	-12	dBm
Optical path penalty	—	—	2	dB
Reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Bail			

Table 13-27 Multirate DWDM ER SFP BP3AM1DE optical specifications (Continued)

Parameter	Min	Typ	Max	Units
DWDM SFP MSA, GR 253 and SFF 8472 compliant				
¹ Optical Path Penalty needs to be applied to Rx Sensitivity only.				

13.4.7.2 Multirate DWDM 200 KM SFP optical specifications

Table 13-28 Multirate DWDM 200 KM SFP BP3AM1DX optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	100	—	2700	Mb/s
Transmitter				
Laser source	single-mode			
Tx center wavelength	1529.55	—	1560.61	nm
Tx center wavelength accuracy	-0.1	—	+0.1	nm
Channel spacing	—	100	—	GHz
Average operating power	3	—	7	dBm
Spectral width (-20 dB)	—	—	0.5	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx operating wavelength	1260	—	1565	nm
Rx overload	-8	—	—	dBm
Dispersion	—	—	3600	ps/nm
Receiver characteristics for OSNR ≥ 21 dB @1e-12				
Back-to-Back	-28	—	-8	dBm
4000 ps/nm	-25	—	-8	dBm
Receiver characteristics for OSNR ≥ 19 dB @ 1e-12				
4000 ps/nm	-22	—	-9	dBm
Reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Bail			
DWDM SFP MSA, GR 253 and SFF 8472 compliant				

13.4.7.3 4G DWDM SFP specifications

Table 13-29 4G DWDM SFP BP3AM2DL optical specifications

Parameter	Min	Typ	Max	Units
Bit rate				
GbE	—	1.25	—	Gb/s

Table 13-29 4G DWDM SFP BP3AM2DL optical specifications (Continued)

Parameter	Min	Typ	Max	Units
OC48	—	2.48832	—	Gb/s
1XFC	—	1.062	—	Gb/s
2XFC	—	2.12	—	Gb/s
4XFC	—	4.24	—	Gb/s
Transmitter				
Tx center wavelength	1530.33	—	1559.79	nm
Tx center wavelength accuracy	-0.1	—	0.1	nm
Channel Spacing	—	100	—	GHz
Average operating power	0	—	4	dBm
Spectral width (-20 dB)	—	—	0.3	nm
Side mode suppression ratio	40	—	—	dB
Extinction ratio				
GbE, OC48, 1XFC, 2XFC	—	—	8.2	dB
4XFC	—	—	6	dB
Receiver				
Rx operating wavelength	1520	—	1570	nm
Rx overload				
GbE, OC48, 1XFC, 2XFC	-7	—	—	dBm
4XFC	-9	—	—	dBm
Dispersion				
GbE, OC48, 1XFC, 2XFC	0	—	4000	ps/nm
4XFC	0	—	1600	ps/nm
Reflectance	—	—	-27	dB
Rx characteristics for OSNR ≥ 30 dB @ 1e-12				
GbE, OC48, 1XFC, 2XFC				
0 ps/nm	-28	—	—	dBm
2100 ps/nm	-26	—	—	dBm
4XFC				
0 ps/nm	-25	—	—	dBm
1600 ps/nm	-22	—	—	dBm
Rx characteristics for OSNR ≥ 25 dB @ 1e-12				
4XFC, 1600 ps/nm	-22	—	—	dBm
Rx characteristics for OSNR ≥ 20 dB @ 1e-12				
GbE, OC48, 1XFC, 2XFC, 2100 ps/nm	-24	—	—	dBm
Rx characteristics for OSNR ≥ 18 dB @ 1e-12				
GbE, OC48, 1XFC, 2XFC, 2100 ps/nm	-22	—	—	dBm

13.4.8 Copper SFPs

This section covers the following topics:

- [13.4.8.1, “Copper SFP BP3AD3ES specifications”](#)
- [13.4.8.2, “Copper SFP BP3AE2ES specifications”](#)

13.4.8.1 Copper SFP BP3AD3ES specifications

Table 13-30 Copper SFP BP3AD3ES specifications

Parameter	Min	Typ	Max	Units
Data rate (10/100/1000Base-T)	0.0125	—	1.25	Gbps
Reach (CAT 5 cable)	100	—	—	m
Clock Tolerance	-50	—	50	ppm
Rise/fall time (20%-80%)	—	175	—	ps
Power dissipation	—	—	1.3	W
Latency	—	—	1	μs
Regulatory compliance	Class A EMI GR1089 lightning protection: Type 2 (intra-building) from NEBS-3, unshielded cable IEEE 802.3			

13.4.8.2 Copper SFP BP3AE2ES specifications

Table 13-31 Copper SFP BP3AE2ES specifications

Parameter	Min.	Typical	Max.	Units
Data rate (1000Base-T)	—	1.25	—	Gb/s
Reach (CAT 5 cable)	100	—	—	m
Clock Tolerance	-50	—	50	ppm
Rise/fall time (20%-80%)	—	175	—	ps
Power dissipation	—	—	1.3	W
Latency	—	—	1	μs
Regulatory compliance	Class A EMI; GR1089 lightning protection: Type 2 (intra-building) from NEBS-3, unshielded cable; IEEE 802.3			

13.5 XFP specifications

Note Optical performance has been characterized for SM fiber.

13.5.1 850 nm XFP specifications

Table 13-32 850 nm XFP BP3AM4SS optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	9.953	—	10.7	Gb/s
Transmitter				
Tx operating wavelength	840	850	860	nm
Average operating power	-4.4	—	-1.1	dBm
Spectral width (rms)	—	—	0.45	nm
Extinction ratio	3	—	—	dB
Optical Return Loss Tolerance	—	—	12	dB
Receiver				
Rx operating wavelength	840	850	860	nm
Stressed Rx sensitivity (BER = 1e-12)	-7.5	—	—	dBm
Rx overload	—	—	-1.0	dBm
Optical Path Penalty	—	—	3.9	dB
Reflectance	—	—	-12	dB
50/125 μm Cable Specifications (multimode 850 nm)				
Length @ 2000 MHz-km	2	—	300	m
Length @ 500 MHz-km	2	—	82	m
62.5/125 μm Cable Specifications (multimode 850 nm)				
Length @ 200 MHz-km	2	—	33	m
Other				
Connector/Latch type	LC/Lever			
IEEE 802.3 ae and XFP MSA compliant				

13.5.2 1310 nm SR XFP optical specifications

Table 13-33 1310 nm SR XFP BP3AM4MS optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	9.953	—	10.7	Gb/s
Transmitter				
Tx operating wavelength	1290	1310	1330	nm
Average operating power	-6	—	-1	dBm
Spectral width (-20dB)	—	—	1	nm

Table 13-33 1310 nm SR XFP BP3AM4MS optical specifications (Continued)

Parameter	Min	Typ	Max	Units
Side mode suppression ratio	30	—	—	dB
Extinction ratio	6	7	—	dB
Optical Return Loss Tolerance	—	—	12	dB
Receiver				
Rx operating wavelength	1260	—	1355	nm
Stressed Rx sensitivity (BER = 1e-12)	-10.3	—	—	dBm
Rx overload	—	—	+0.5	dBm
Optical path penalty (@ 6.6 ps/nm)	—	—	1.2	dB
Reflectance	—	—	-14	dB
Reach				
SONET	—	—	7	km
Ethernet/FC	—	—	10	km
Other				
Connector/Latch type	LC/Lever			
GR 253, ITU-T G.957, IEEE 802.3 ae and XFP MSA compliant				

13.5.3 1550 nm IR XFP optical specifications

Table 13-34 1550 nm IR XFP BP3AM4LI optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	9.953	—	10.7	Gb/s
Transmitter				
Tx operating wavelength	1530	—	1565	nm
Average operating power	-1	—	+2	dBm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx operating wavelength	1270	—	1600	nm
Stressed Rx sensitivity (BER = 1e-12)	-11.3	—	—	dBm
Rx overload	—	—	-1	dBm
Optical path penalty (at 800 ps/nm)	—	—	2	dB
Reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Lever			
GR 253, ITU-T G.957, IEEE 802.3 ae and XFP MSA compliant				

13.5.4 CWDM XFP BP3AM4CL optical specifications

Table 13-35 CWDM XFP BP3AM4CL optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	9.953	—	10.7	Gb/s
Transmitter				
Tx center wavelength	1471	—	1611	nm
Tx center wavelength accuracy	-6.5	—	+6.5	nm
Average operating power	0	—	4	dBm
Spectral width (-20dB)	—	—	1	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	9	—	—	dB
Receiver				
Rx operating wavelength	1460	—	1620	nm
Rx reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Lever			
Compliant to XFP MSA and GR 253				

Table 13-36 CWDM XFP Rx Optical Performance Specifications

Bit Rate (Gb/s)	Dispersion (ps/nm)	Receiver Sensitivity (dBm)	BER
9.953/10.312/10.5	0	-21 to -9	1e-12
	1400	-20.5 to -9	
10.7 with FEC	0	-25 to -9	1e-4
	1400	-24.5 to -9	
10.7 with EFEC	0	-26 to -9	1e-3
	1400	-25.5 to -9	

13.5.5 DWDM XFP optical specifications

Table 13-37 DWDM XFP BP3AM4DL optical specifications

Parameter	Min	Typ	Max	Units
Bit Rate	9.953	—	10.7	Gb/s
Transmitter				
Tx operating wavelength	1529.55	—	1560.61	nm
Average operating power	-1	—	+3	dBm
Spectral width (-20dB)	—	—	0.3	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB

Table 13-37 DWDM XFP BP3AM4DL optical specifications (Continued)

Parameter	Min	Typ	Max	Units
Receiver				
Rx operating wavelength	1528	—	1565	nm
Reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Lever			
Compliant to XFP MSA				

Table 13-38 DWDM XFP Rx Optical Performance Specifications

Bit Rate (Gb/s)	Dispersion (ps/nm)	OSNR (dB)	Receiver Sensitivity (dBm)	BER
9.95/10.3	0	≥30	-24 to -7	1e-12
		≥25	-18 to -7	
	1200	≥30	-23 to -7	
		≥27	-18 to -7	
	1600	≥30	-22 to -7	
		≥28	-18 to -7	
10.5	0	≥30	-23 to -7	1e-12
		≥26	-18 to -7	
	1200	≥30	-22 to -7	
		≥28	-18 to -7	
	1600	≥30	-18 to -7	
10.7/ with FEC	0	≥30	-26 to -7	1e-4
		≥18	-18 to -7	
	1200	≥30	-25 to -7	
		≥18	-18 to -7	
	1600	≥30	-24 to -7	
		≥19	-18 to -7	
10.7/ with EFEC	0	≥30	-27 to -7	1e-3
		≥16	-18 to -7	
	1200	≥30	-26 to -7	
		≥16	-18 to -7	
	1600	≥30	-25 to -7	
		≥17	-18 to -7	

13.5.6 Tunable DWDM LR XFP optical specifications

Table 13-39 Tunable DWDM LR XFP BP3AM4TL, BP3AM4TF, BP3AM4TB-Bnn, BP3AM4TC-Bnn optical specifications

Parameter	Min	Max	Units
Bit Rate	9.953	10.7	Gb/s
Transmitter			
Tx operating wavelength:			
BP3AM4TL ¹	1529.55	1560.61	nm
BP3AM4TF	1528.77	1566.72	nm
BP3AM4TB-Bnn	See Table 13-40 .		
BP3AM4TC-Bnn	See Table 13-41 .		
Average operating power	-1	+3	dBm
Spectral width (-20dB)	—	0.3	nm
Side mode suppression ratio	30	—	dB
Extinction ratio	8.2	—	dB
Receiver			
Rx operating wavelength	1528.77	1566.72	nm
Reflectance	—	-27	dB
Other			
Connector/Latch type	LC/Lever		
Compliant to XFP MSA			

¹This transceiver is manufacture discontinued. Use BP3AM4TF instead.

Note The BP3AM4TC-Bnn is intended for 50 GHz spacing applications only.

Table 13-40 100 GHz sub-band tunable (BP3AM4TB-Bnn) transmit frequencies

Part Number	Sub-band	Min	Max	Units
BP3AM4TB-B01	1	192.10	193.00	THz
BP3AM4TB-B02	2	193.10	194.00	THz
BP3AM4TB-B03	3	194.10	195.00	THz
BP3AM4TB-B04	4	195.10	196.00	THz

Table 13-41 50 GHz sub-band tunable (BP3AM4TC-Bnn) transmit frequencies

Part Number	Sub-band	Min	Max	Units
BP3AM4TC-B01	1	191.35	191.80	THz
BP3AM4TC-B02	2	191.85	192.30	THz
BP3AM4TC-B03	3	192.35	192.80	THz
BP3AM4TC-B04	4	192.85	193.30	THz
BP3AM4TC-B05	5	193.35	193.80	THz

Table 13-41 50 GHz sub-band tunable (BP3AM4TC-Bnn) transmit frequencies (Continued)

Part Number	Sub-band	Min	Max	Units
BP3AM4TC-B06	6	193.85	194.30	THz
BP3AM4TC-B07	7	194.35	194.80	THz
BP3AM4TC-B08	8	194.85	195.30	THz
BP3AM4TC-B09	9	195.35	195.80	THz
BP3AM4TC-B10	10	195.85	196.10	THz

Table 13-42 Tunable XFP Rx Optical Performance Specifications

Bit Rate (Gb/s)	Dispersion (ps/nm)	OSNR (dB)	Receiver Sensitivity (dBm)	BER
9.95/10.3	0	≥ 30	-24 to -7	1e-12
		≥ 25	-18 to -7	
	1200	≥ 30	-23 to -7	
		≥ 27	-18 to -7	
	1600	≥ 30	-22 to -7	
		≥ 28	-18 to -7	
10.5	0	≥ 30	-23 to -7	1e-12
		≥ 26	-18 to -7	
	1200	≥ 30	-22 to -7	
		≥ 28	-18 to -7	
	1600	≥ 30	-18 to -7	
10.7/ with FEC	0	≥ 30	-26 to -7	1e-4
		≥ 18	-18 to -7	
	1200	≥ 30	-25 to -7	
		≥ 18	-18 to -7	
	1600	≥ 30	-24 to -7	
10.7/ with EFEC	0	≥ 30	-27 to -7	1e-3
		≥ 16	-18 to -7	
	1200	≥ 30	-26 to -7	
		≥ 16	-18 to -7	
	1600	≥ 30	-25 to -7	
		≥ 17	-18 to -7	

13.5.7 Wavelengths supported on Tunable XFP BP3AM4TL

Note This transceiver is manufacture discontinued. Use BP3AM4TF instead.

Table 13-43 DWDM Wavelength Plan

Wavelength (nm)	BTI Channel Numbers	Wavelength (nm)	BTI Channel Numbers
1529.55	E8	1545.32	E4
1530.33	32	1546.12	16
1531.12	31	1546.92	15
1531.90	30	1547.72	14
1532.68	29	1548.51	13
1533.47	28	1549.32	12
1534.25	27	1550.12	11
1535.04	26	1550.92	10
1535.82	25	1551.72	9
1536.61	E7	1552.52	E3
1537.40	E6	1553.33	E2
1538.19	24	1554.13	8
1538.98	23	1554.94	7
1539.77	22	1555.75	6
1540.56	21	1556.55	5
1541.35	20	1557.36	4
1542.14	19	1558.17	3
1542.94	18	1558.98	2
1543.73	17	1559.79	1
1544.53	E5	1560.61	E1

13.5.8 Wavelengths supported on Tunable XFP BP3AM4TF

Table 13-44 96-channel DWDM Wavelength Plan

DOLChannel Numbers	Frequency (THz)	Wavelength (nm)
610	196.10	1528.77
605	196.05	1529.16
600	196.00	1529.55
595	195.95	1529.94
590	195.90	1530.33
585	195.85	1530.72
580	195.80	1531.12
575	195.75	1531.51
570	195.70	1531.90
565	195.65	1532.29
560	195.60	1532.68
555	195.55	1533.07

Table 13-44 96-channel DWDM Wavelength Plan (Continued)

DOLChannel Numbers	Frequency (THz)	Wavelength (nm)
550	195.50	1533.47
545	195.45	1533.86
540	195.40	1534.25
535	195.35	1534.64
530	195.30	1535.04
525	195.25	1535.43
520	195.20	1535.82
515	195.15	1536.22
510	195.10	1536.61
505	195.05	1537.00
500	195.00	1537.40
495	194.95	1537.79
490	194.90	1538.19
485	194.85	1538.58
480	194.80	1538.98
475	194.75	1539.37
470	194.70	1539.77
465	194.65	1540.16
460	194.60	1540.56
455	194.55	1540.95
450	194.50	1541.35
445	194.45	1541.75
440	194.40	1542.14
435	194.35	1542.54
430	194.30	1542.94
425	194.25	1543.33
420	194.20	1543.73
415	194.15	1544.13
410	194.10	1544.53
405	194.05	1544.92
400	194.00	1545.32
395	193.95	1545.72
390	193.90	1546.12
385	193.85	1546.52
380	193.80	1546.92
375	193.75	1547.32
370	193.70	1547.72
365	193.65	1548.11

Table 13-44 96-channel DWDM Wavelength Plan (Continued)

DOLChannel Numbers	Frequency (THz)	Wavelength (nm)
360	193.60	1548.51
355	193.55	1548.91
350	193.50	1549.32
345	193.45	1549.72
340	193.40	1550.12
335	193.35	1550.52
330	193.30	1550.92
325	193.25	1551.32
320	193.20	1551.72
315	193.15	1552.12
310	193.10	1552.52
305	193.05	1552.93
300	193.00	1553.33
295	192.95	1553.73
290	192.90	1554.13
285	192.85	1554.54
280	192.80	1554.94
275	192.75	1555.34
270	192.70	1555.75
265	192.65	1556.15
260	192.60	1556.55
255	192.55	1556.96
250	192.50	1557.36
245	192.45	1557.77
240	192.40	1558.17
235	192.35	1558.58
230	192.30	1558.98
225	192.25	1559.39
220	192.20	1559.79
215	192.15	1560.20
210	192.10	1560.61
205	192.05	1561.01
200	192.00	1561.42
195	191.95	1561.83
190	191.90	1562.23
185	191.85	1562.64
180	191.80	1563.05
175	191.75	1563.45

Table 13-44 96-channel DWDM Wavelength Plan (Continued)

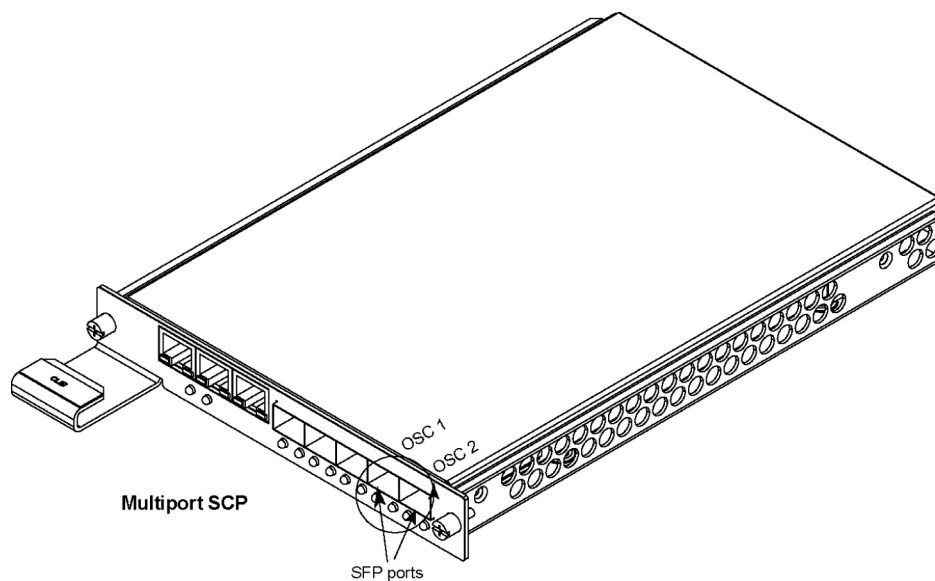
DOLChannel Numbers	Frequency (THz)	Wavelength (nm)
170	191.70	1563.86
165	191.65	1564.27
160	191.60	1564.68
155	191.55	1565.09
150	191.50	1565.50
145	191.45	1565.91
140	191.40	1566.31
135	191.35	1566.72

13.6 Optical Supervisory Channel integrated on the System Control Processor

The System Control Processor (SCP) provides Optical Supervisory Channel (OSC) functionality for remote management of a BTI 7000 Series shelf. The SCP has two SFP-based OSC ports supporting 1511 channels. The OSC integrated on the SCP must be combined with a separate Coupler/Splitter module for full functionality.

Note For OSC applications using the 1511 SFP, use the 1-Channel or Double 1-Channel CWDM OADM/OSC Coupler Splitter, Channel 6 (1511 nm) Optical Coupler / Splitter Single Direction or Optical Coupler / Splitter Dual Direction module.

The following figure shows the OSC ports on the SCP.



13.6.1 1510 XR SFP (for OSC) specifications

The following table provides specifications for the 1510 XR SFP (for OSC) supported for use in the OSC ports on the SCP.

Table 13-45 1510 XR SFP (for OSC) BP3AE1CX specifications

Parameter	Min	Typ	Max	Units
Bit rate ¹	—	156	—	Mb/s
Transmitter				
Laser source	single-mode			
Tx center wavelength	1500	1511	1520	nm
Average operating power	1	—	5	dBm
Spectral width (-20 dB)	—	—	1	nm

Table 13-45 1510 XR SFP (for OSC) BP3AE1CX specifications (Continued)

Parameter	Min	Typ	Max	Units
Side mode suppression ratio	30	—	—	dB
Extinction ratio	10	—	—	dB
Receiver				
Rx operating wavelength	1100	—	1600	nm
Max Input (BER=1x10 ⁻¹⁰)	-7	—	—	dBm
Rx sensitivity (BER=1x10 ⁻¹⁰)	-43	—	—	dBm
Optical Return Loss	25	—	—	dB
Other				
Connector/Latch type	LC/Bail			
¹Data rate ranges from 50 Mb/s to 266 Mb/s. However, device performance is not guaranteed.				

13.6.2 CWDM ER SFP (for OSC) specifications

The following table provides specifications for the CWDM ER SFP (for OSC) supported for use in the OSC ports on the Multiport SCP.

Table 13-46 CWDM ER SFP (for OSC) BP3AE1CE specifications

Parameter	Min	Typ	Max	Units
Bit rate	50	156	266	Mb/s
Transmitter				
Laser source	single-mode			
Tx center wavelength	1511	—	1611	nm
Tx center wavelength accuracy	-6.5	—	6.5	nm
Average operating power	0	—	5	dBm
Spectral width (-20 dB)	—	—	1	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	10	—	—	dB
Receiver				
Rx operating wavelength	1100	—	1620	nm
Max Input (BER=1x10 ⁻¹⁰)	-7	—	—	dBm
Rx sensitivity (BER=1x10 ⁻¹⁰)	-34	-37	—	dBm
Optical Return Loss	25	—	—	dB
Other				
Connector/Latch type	LC/Bail			

13.6.3 Multimode 1310 SR SFP optical specifications

The following table provides specifications for the Multimode 1310 SR SFP supported for multishelf use.

Table 13-47 Multimode 1310 SR SFP BP3AE1MM optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	—	125	—	Mb/s
Transmitter				
Laser source	multimode			
Tx operating wavelength	1270	—	1380	nm
Average operating power	-20	—	-14	dBm
Spectral width (-20 dB)	—	—	200	nm
Extinction ratio	10	—	—	dB
Receiver				
Rx operating wavelength	1100	—	1600	nm
Max input (BER=2.5x10 ⁻¹⁰)	-14	—	—	dBm
Rx sensitivity (BER=1x10 ⁻¹⁰)	-30	—	—	dBm
Rx sensitivity (BER=1x10 ⁻¹²)	-29	—	—	dBm
Other				
Connector/Latch type	LC/Bail			

13.7 CWDM Multiplexer specifications

The CWDM multiplexers provide optical multiplexing in CWDM network architectures. A low-cost alternative to DWDM network architectures, a CWDM solution is ideal for low-channel-count networks.

This section covers the following topics:

- [13.7.1, “CWDM wavelength plan”](#)
- [13.7.2, “Double 1-Channel CWDM OADM/Double OSC Coupler Splitter ”](#)
- [13.7.3, “4-Channel CWDM Mux/Demux Modules 1 to 4 specifications”](#)

13.7.1 CWDM wavelength plan

The 4-channel CWDM multiplexer/demultiplexer modules support 4 channels in each module. The 16 wavelengths supported by the modules combined are listed in the following table.

Note Channels 1391 nm and 1441 nm are not supported as a result of high fiber attenuation at those wavelengths.

Table 13-48 CWDM Wavelength Plan

Available Wavelengths (nm)	Mux/Demux Modules	BTI Channel Numbers
1271	4	16
1291	4	15
1311	4	14
1331	4	13
1351	3	12
1371	3	11
1431	3	10
1451	3	9
1471	2	8
1491	2	7
1511	2	6
1531	2	5
1551	1	4
1571	1	3
1591	1	2
1611	1	1

13.7.2 Double 1-Channel CWDM OADM/Double OSC Coupler Splitter

Note Channels 9 to 16 (1451 nm to 1271 nm) are manufacture discontinued (MD) and are no longer orderable.

Table 13-49 Double 1-Channel CWDM OADM/Double OSC Coupler Splitter (BP1A32CA) specifications

Parameter	Standard	Hardened	Units
Center Wavelength	1271 to 1611		nm
Center Wavelength Accuracy	±0.5		nm
Channel Spacing	See 13.7.1, “CWDM wavelength plan”.		nm
Channel Pass Band	±6.5		nm
Channel Ripple			
Passband	≤0.5	≤0.5	dB
Express Channel	≤0.5	≤0.5	dB
Insertion Loss			
Add/Drop Channel	≤1.3	≤1.5	dB
Express Channel	≤1.0	≤1.2	dB
Isolation			
Adjacent Channel	NA/≥30		dB
Non-Adjacent Channel	NA/≥40		dB
Express Channel	NA/≥15		dB
Directivity	≥50		dB
Return Loss	≥45		dB
Polarization Dependent Loss	≤0.1		dB
Polarization Mode Dispersion	≤0.1		pS

13.7.3 4-Channel CWDM Mux/Demux Modules 1 to 4 specifications

Table 13-50 4 -Channel CWDM Mux/Demux BP1A33BA/BB/BC/BD specifications

Parameter	Standard	Hardened	Units
Wavelength Range			
Module 1	1551 to 1611		nm
Module 2	1471 to 1531		nm
Module 3	1351 to 1451		nm
Module 4	1271 to 1331		nm
Channel Wavelength Accuracy	±0.5		nm
Channel Spacing	See 13.7.1, "CWDM wavelength plan".		nm
Channel Pass Band	±6.5		nm
Channel Ripple	≤0.5	≤0.5	dB
Express Band Ripple	≤0.8	≤0.8	dB

Table 13-50 4 -Channel CWDM Mux/Demux BP1A33BA/BB/BC/BD specifications (Continued)

Parameter	Standard	Hardened	Units
Insertion Loss			
In to Drop 1, Add 4 to Out	≤1.3	≤1.5	dB
In to Drop 2, Add 3 to Out	≤1.6	≤2.0	dB
In to Drop 3, Add 2 to Out	≤2.0	≤2.2	dB
In to Drop 4, Add 1 to Out	≤2.3	≤2.5	dB
Expansion Port Loss	≤2.0	≤2.2	dB
Insertion Loss Uniformity			
Module	≤1.6	≤1.8	dB
Pair	≤1.5	≤1.5	dB
Isolation			
Adjacent Channel	NA/≥30		dB
Non-Adjacent Channel	NA/≥40		dB
Express Channel	NA/≥15		dB
Directivity	≥50		dB
Return Loss	≥45		dB
Polarization Dependent Loss	≤0.2		dB
Polarization Mode Dispersion	≤0.2		ps

13.7.4 1310nm + CWDM Optical Add/Drop Multiplexer specifications

Table 13-51 1310 CWDM Optical Add/Drop (BT7A32DA) Multiplexer specifications

1310 CWDM Optical Add/Drop Multiplexer			
Parameter	Standard	Hardened	Units
Center Wavelength – CWDM Add/Drop	1471 to 1611		nm
Operating Wavelength Range			
1310 Add/Drop	1260 to 1360		nm
1310 Thru	1460	1620	nm
Channel Spacing	see 13.7.1, “CWDM wavelength plan”		nm
Channel Pass Band (CWDM)	±6.5		nm
Channel Ripple			
CWDM Pass band	≤0.3		dB
1310 Pass band	≤0.35		dB
Insertion Loss			
Line In to 1310 Drop	1.2	1.4	dB
Line In to CWDM Drop	2.2	2.4	dB
Line In to Line Out	3.4	3.8	dB
CWDM Add to Line Out	2.2	2.4	dB

Table 13-51 1310 CWDM Optical Add/Drop (BT7A32DA) Multiplexer specifications (Continued)

1310 CWDM Optical Add/Drop Multiplexer			
1310 Add to Line Out	1.2	1.4	dB
Express CWDM Channel Uniformity - max loss variation within Passband from Line In to Line Out	≤0.7		dB
CWDM/1310 Isolation			
CWDM In 1310 Drop	≥25		dB
1310 In CWDM Drop	≥45		dB
CWDM Channel Isolation			
CWDM Add/Drop Channel Line In to Line Out	≥30		dB
CWDM Adjacent Channel In CWDM Drop	≥30		dB
CWDM Non-adjacent Channel In CWDM Drop	≥40		dB
Directivity	≥50		dB
Return Loss	≥45		dB
Polarization Dependent Loss	≤0.1		dB
Polarization Mode Dispersion	≤0.1		dB

13.8 DWDM Multiplexer specifications

This section contains specifications and additional information about DWDM Multiplexer modules and covers the following topics:

- [13.8.1, “40-channel DWDM wavelength plan”](#)
- [13.8.2, “96-channel DWDM wavelength plan”](#)
- [13.8.3, “DWDM Mux/Demux specifications”](#)
- [13.8.4, “DWDM OADM specifications”](#)
- [13.8.5, “40-Channel DWDM Mux/Demux specifications”](#)
- [13.8.6, “96-Channel DWDM Mux/Demux specifications”](#)
- [13.8.7, “96-Channel Fixed Mux/Demux Specifications”](#)

13.8.1 40-channel DWDM wavelength plan

Table 13-52 DWDM Wavelength Plan

Wavelength (nm)	BTI Channel Numbers	Wavelength (nm)	BTI Channel Numbers
1529.55	E8	1545.32	E4
1530.33	32	1546.12	16
1531.12	31	1546.92	15
1531.90	30	1547.72	14
1532.68	29	1548.51	13
1533.47	28	1549.32	12
1534.25	27	1550.12	11
1535.04	26	1550.92	10
1535.82	25	1551.72	9
1536.61	E7	1552.52	E3
1537.40	E6	1553.33	E2
1538.19	24	1554.13	8
1538.98	23	1554.94	7
1539.77	22	1555.75	6
1540.56	21	1556.55	5
1541.35	20	1557.36	4
1542.14	19	1558.17	3
1542.94	18	1558.98	2
1543.73	17	1559.79	1
1544.53	E5	1560.61	E1

13.8.2 96-channel DWDM wavelength plan

The following table lists the DWDM wavelength plan for the BTI 7000 Series 96-channel Mux/Demux passive shelf:

Table 13-53 96-channel DWDM Wavelength Plan

DOLChannel Numbers	Frequency (THz)	Wavelength (nm)
610	196.10	1528.77
605	196.05	1529.16
600	196.00	1529.55
595	195.95	1529.94
590	195.90	1530.33
585	195.85	1530.72
580	195.80	1531.12
575	195.75	1531.51
570	195.70	1531.90
565	195.65	1532.29
560	195.60	1532.68
555	195.55	1533.07
550	195.50	1533.47
545	195.45	1533.86
540	195.40	1534.25
535	195.35	1534.64
530	195.30	1535.04
525	195.25	1535.43
520	195.20	1535.82
515	195.15	1536.22
510	195.10	1536.61
505	195.05	1537.00
500	195.00	1537.40
495	194.95	1537.79
490	194.90	1538.19
485	194.85	1538.58
480	194.80	1538.98
475	194.75	1539.37
470	194.70	1539.77
465	194.65	1540.16
460	194.60	1540.56
455	194.55	1540.95
450	194.50	1541.35

Table 13-53 96-channel DWDM Wavelength Plan (Continued)

DOLChannel Numbers	Frequency (THz)	Wavelength (nm)
445	194.45	1541.75
440	194.40	1542.14
435	194.35	1542.54
430	194.30	1542.94
425	194.25	1543.33
420	194.20	1543.73
415	194.15	1544.13
410	194.10	1544.53
405	194.05	1544.92
400	194.00	1545.32
395	193.95	1545.72
390	193.90	1546.12
385	193.85	1546.52
380	193.80	1546.92
375	193.75	1547.32
370	193.70	1547.72
365	193.65	1548.11
360	193.60	1548.51
355	193.55	1548.91
350	193.50	1549.32
345	193.45	1549.72
340	193.40	1550.12
335	193.35	1550.52
330	193.30	1550.92
325	193.25	1551.32
320	193.20	1551.72
315	193.15	1552.12
310	193.10	1552.52
305	193.05	1552.93
300	193.00	1553.33
295	192.95	1553.73
290	192.90	1554.13
285	192.85	1554.54
280	192.80	1554.94
275	192.75	1555.34
270	192.70	1555.75
265	192.65	1556.15
260	192.60	1556.55

Table 13-53 96-channel DWDM Wavelength Plan (Continued)

DOLChannel Numbers	Frequency (THz)	Wavelength (nm)
255	192.55	1556.96
250	192.50	1557.36
245	192.45	1557.77
240	192.40	1558.17
235	192.35	1558.58
230	192.30	1558.98
225	192.25	1559.39
220	192.20	1559.79
215	192.15	1560.20
210	192.10	1560.61
205	192.05	1561.01
200	192.00	1561.42
195	191.95	1561.83
190	191.90	1562.23
185	191.85	1562.64
180	191.80	1563.05
175	191.75	1563.45
170	191.70	1563.86
165	191.65	1564.27
160	191.60	1564.68
155	191.55	1565.09
150	191.50	1565.50
145	191.45	1565.91
140	191.40	1566.31
135	191.35	1566.72

13.8.3 DWDM Mux/Demux specifications

Multiplexers include the 32-Channel DWDM Mux/Demux modules, which are available as the following 8-channel modules:

- 32-Channel DWDM Mux/Demux Module 1
- 32-Channel DWDM Mux/Demux Module 2
- 32-Channel DWDM Mux/Demux Module 3
- 32-Channel DWDM Mux/Demux Module 4

The following 32-Channel Bidirectional DWDM Mux/Demux modules are also available:

- 32-Channel DWDM Bidirectional Mux/Demux (Mux Band 1, Demux Band 2)

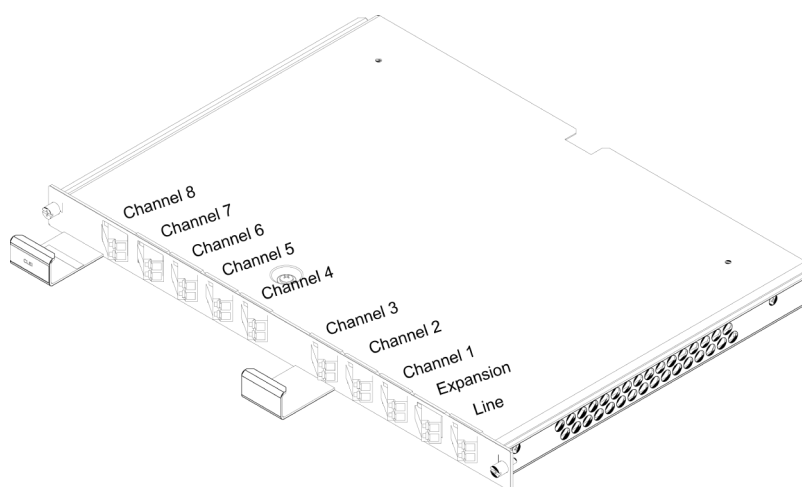
- 32-Channel DWDM Bidirectional Mux/Demux (Mux Band 2, Demux Band 1)
- 32-Channel DWDM Bidirectional Mux/Demux (Mux Band 2, Demux Band 4)
- 32-Channel DWDM Bidirectional Mux/Demux (Mux Band 4, Demux Band 2)

The following band combinations are available:

- Band 1/Band 2
- Band 2/Band 4

The following figure shows the key physical features of the 32-Channel DWDM Mux/Demux modules.

8-channel module for 32-Channel DWDM Mux/Demux



This section covers the following topic:

- [13.8.3.1, “32-Channel DWDM Mux/Demux specifications”](#)

13.8.3.1 32-Channel DWDM Mux/Demux specifications

Table 13-54 32-Channel DWDM Mux/Demux BP1A35AA/AB/AC/AD/DA-12/DA-21/DA-24/DA-42 specifications

Parameter	Standard	Hardened	Units
Wavelength Range			
Module 1	1554.13 to 1559.79		nm
Module 2	1546.12 to 1551.72		nm
Module 3	1538.19 to 1543.73		nm
Module 4	1530.33 to 1535.82		nm
Channel Wavelength	ITU 100 GHz Grid		
Channel Wavelength Accuracy	±0.1		nm
Channel Spacing	100		GHz
Channel Pass Band	±12.5		GHz
Channel Ripple	≤0.5		dB

Table 13-54 32-Channel DWDM Mux/Demux BP1A35AA/AB/AC/AD/DA-12/DA-21/DA-24/DA-42 specifications (Continued)

Parameter	Standard	Hardened	Units
Insertion Loss	$0.5 \leq IL \leq 3.8$	$0.5 \leq IL \leq 4.3$	dB
Insertion Loss Uniformity	≤ 2.5		dB
Insertion Loss for Mux/Demux pair	$3 \leq IL \leq 6.0$	$3 \leq IL \leq 6.5$	dB
Insertion Loss Uniformity for Mux/Demux pair	≤ 1.5		dB
Expansion Port Loss	≤ 0.8	≤ 1.0	dB
Note Upgrade port insertion loss includes a 0.3 dB channel ripple.			
Chromatic Dispersion for Mux/Demux pair	Min = -85 Max = +65		ps/nm
Note Chromatic dispersion is specified over a ± 15 GHz bandwidth.			
Adjacent Channel Isolation (Mux/Demux)	NA/ ≥ 25		dB
Non-Adjacent Channel Isolation (Mux/Demux)	NA/ ≥ 40		dB
Drop channel residual @ Expansion Port Out	≥ 15		dB
Directivity	≥ 50		dB
Return Loss	≥ 45		dB
Polarization Dependent Loss	≤ 0.2	≤ 0.25	dB
Polarization Mode Dispersion	≤ 0.2		ps
Latency	≤ 10		ns

Note Total insertion losses for networks with cascaded filters are dependent on the connection order of the expansion ports.

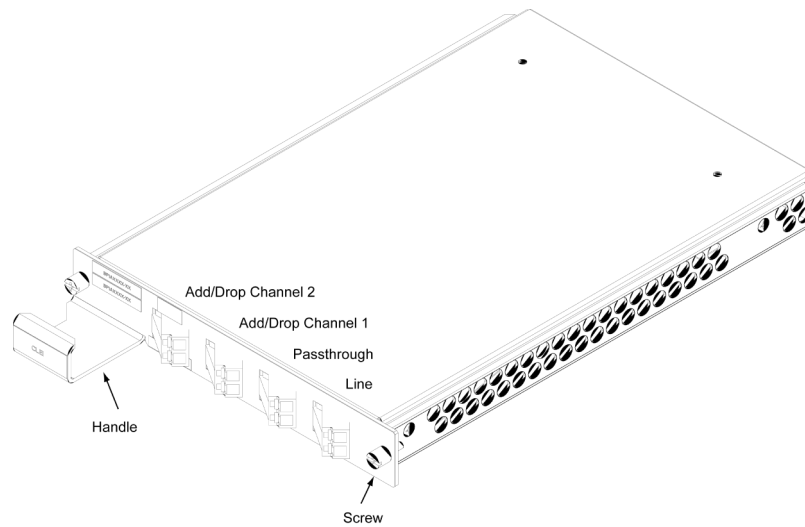
Note All Insertion Loss values include connector loss.

13.8.4 DWDM OADM specifications

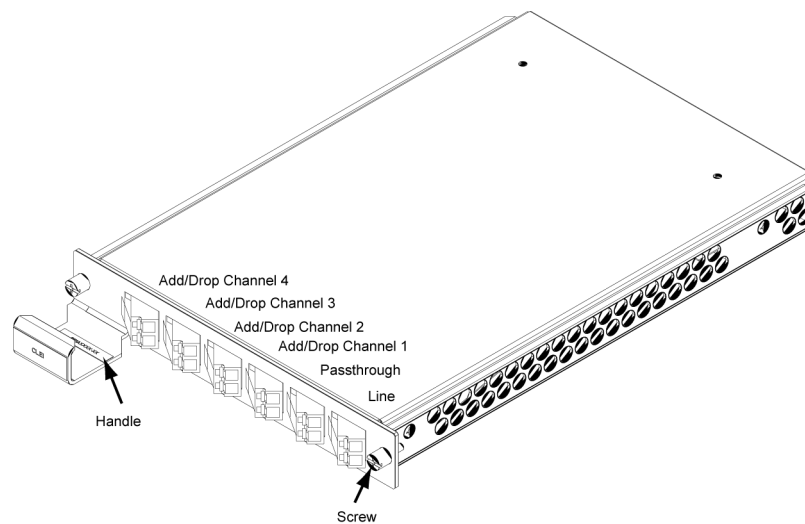
The DWDM OADM modules complement the passive 32-Channel DWDM Mux/Demux modules, enabling customers to expand capacity when required.

The following figures show the key physical features of the 2-Channel, and 4-Channel DWDM Optical Add/Drop modules.

2-Channel OADM



4 -Channel OADM



13.8.4.1 2-Channel DWDM Optical Add/Drop Module specifications

Table 13-55 2-Channel DWDM OADM BP1A36AB specifications

Parameter	Add/Drop	Units
Wavelength Range	See 13.8.1, “40-channel DWDM wavelength plan” .	nm
Channel Wavelength	ITU 100 GHz Grid	
Channel Wavelength Accuracy	±0.1	nm
Channel Spacing	100	GHz
Channel Pass Band	±12.5	GHz

Table 13-55 2-Channel DWDM OADM BP1A36AB specifications (Continued)

Parameter	Add/Drop	Units
Insertion Loss (In to Drop 1, Add 2 to Out)	≤ 1.5 ≤ 1.7 (Hardened)	dB
Insertion Loss (In to Drop 2, Add 1 to Out)	≤ 1.9 ≤ 2.1 (Hardened)	dB
Insertion Loss (Pass Through channels)	≤ 1.8 ≤ 2.0 (Hardened)	dB
A/D Channel Ripple	≤ 0.5	dB
Isolation @ A/D channel (Adjacent)	NA ≥ 25	dB
Isolation @ A/D channel (Non-adjacent)	NA ≥ 50	dB
Add/Drop Filter Isolation		
Drop channel residual @ Pass Through Out	≥ 15	dB
Drop channel residual from Pass Through In to Line Out	≥ 15	dB
Drop channel residual @ Line Out as Pass Through Out connected to Pass Through In directly (looped)	≥ 30	dB
Directivity	≥ 50	dB
Return Loss	≥ 45	dB
Polarization Dependent Loss	≤ 0.2	dB
Polarization Mode Dispersion	≤ 0.15	ps

Note All insertion loss values include connector losses.

Available channel combinations

For adjacent channel modules, the combinations are:

- xx, xx+1
- xx=01, 03, 05, 07, 09, 11, 13, 15... 31

where xx, for channels 1 and 2, is 01, as in BP1A36AB-01.

13.8.4.2 4-Channel DWDM Optical Add/Drop Module specifications

Table 13-56 4-Channel DWDM Optical Add-Drop Module BP1A36AC/BC specifications

Parameter	Add/Drop	Units
Wavelength Range	See 13.8.1, "40-channel DWDM wavelength plan" .	nm
Channel Wavelength	ITU 100 GHz Grid	
Channel Wavelength Accuracy	± 0.1	nm

Table 13-56 4-Channel DWDM Optical Add-Drop Module BP1A36AC/BC specifications (Continued)

Parameter	Add/Drop	Units
Channel Spacing	100	GHz
Channel Pass Band	± 12.5	GHz
Insertion Loss (A/D channel)		
In to Drop 1, Add 4 to Out	≤ 1.5 ≤ 1.7 (Hardened)	dB
In to Drop 2, Add 3 to Out	≤ 1.8 ≤ 2.0 (Hardened)	dB
In to Drop 3, Add 2 to Out	≤ 2.1 ≤ 2.3 (Hardened)	dB
In to Drop 4, Add 1 to Out	≤ 2.4 ≤ 2.5 (Hardened)	dB
Insertion Loss (Pass Through channels)	≤ 3.0	dB
A/D Channel Ripple	≤ 0.5	dB
Isolation @ A/D channel (Adjacent)	NA ≥ 25	dB
Isolation @ A/D channel (Non-adjacent)	NA ≥ 50	dB
Add/Drop Filter Isolation		
Drop channel residual @ Pass Through Out	≥ 15	dB
Drop channel residual from Pass Through In to Line Out	≥ 15	dB
Drop channel residual @ Line Out as Pass Through Out connected to Pass Through In directly (looped)	≥ 30	dB
Directivity	≥ 50	dB
Return Loss	≥ 45	dB
Polarization Dependent Loss	≤ 0.2	dB
Polarization Mode Dispersion	≤ 0.15	ps

Note All insertion loss values include connector losses.

Available channel combinations

For adjacent channel modules, the combinations are:

- xx, xx+1, xx+2, xx+3
- xx=01, 05, 09, 13... 29

where xx, for channels 1, 2, 3 and 4 is 01, as in BP1A36AC-01.

In addition to the 4-Channel DWDM OADM module (BP1A36AC), which supports channels 1 to 32, the 4-Channel DWDM OADM (BP1A36BC) supports channels 53, 55, 57, and 59 (1560.

61 nm, 1552.52 nm, 1544.53 nm and 1536.61 nm). Channels 53, 55, 57, and 59 correspond to channels 1, 2, 3 and 4 on the OADM module.

Note The four channels must be adjacent to each other.

13.8.5 40-Channel DWDM Mux/Demux specifications

The 40-Channel DWDM Mux/Demux supports the multiplexing of 40 ITU DWDM wavelengths onto a single fiber. This module integrates a line in and line out monitor port, an optical isolator, and a 40-channel DWDM Mux/Demux filter.

Table 13-57 40-Channel DWDM Mux/Demux (BT7A37AA/CA) specifications

Parameter	Mux	Demux	Units
Wavelength Range	1529.55 to 1560.61		nm
Channel Wavelength	ITU 100 GHz Grid		
Channel Wavelength Accuracy	±0.06		nm
Channel Spacing	100		GHz
Channel Pass Band	±12.5		GHz
Channel Ripple	≤0.6		dB
Insertion Loss (IL)	$3.1 \leq IL \leq 6.5$	$3.4 \leq IL \leq 7.0$	dB
Insertion Loss Uniformity	≤1.5		dB
Chromatic Dispersion (CD)	$-20 \leq CD \leq 20$		ps/nm
Adjacent Channel Isolation	–	≥25	dB
Non-Adjacent Channel Isolation	–	≥30	dB
Directivity	≥45		dB
Return Loss	≥45	≥40	dB
Polarization Dependent Loss	≤0.6		dB
Polarization Mode Dispersion	≤0.6		dB
Latency	≤15		ns

Note All insertion loss values include connector losses.

13.8.6 96-Channel DWDM Mux/Demux specifications

The 96-Channel DWDM Mux/Demux supports the multiplexing of 96 ITU DWDM wavelengths onto a single fiber. This module can support 1610 nm OSC add/drop management through a passthrough port to which you can connect a pre-amplifier and booster-amplifier; this eliminates the need for a separate 1610 nm filter.

Table 13-58 96-Channel DWDM Mux/Demux (BT8A96MD01-I02/MD02-I02) specifications

Parameter		Mux		Demux		Units
Wavelength Range		1566.72 to 1528.77				nm
Channel Wavelength		ITU 50 GHz Grid				
Channel Frequency		196.10 to 191.35				THz
Channel Spacing		50				GHz
ITU Band		±6.25				GHz
Channel Ripple		≤0.5				dB
OSC Wavelength		1600 to 1640				nm
Insertion Loss (IL) - Mux	C-Band	CH _{ADD} to Line _{OUT}	3.0 ≤ IL ≤ 6.2			dB
	C-Band	PT _{IN} to Line + 1610 _{OUT}	0.6 typical 0.8 maximum			dB
	C-Band	MON _{OUT} to Line _{OUT}	18.0 ≤ IL ≤ 22.0			dB
	1600-1640nm	OSC _{IN} to Line + OSC _{OUT}	≤1.0			dB
Insertion Loss (IL) - Demux	C-Band			Line _{IN} to CH _{DROP}	3.0 ≤ IL ≤ 6.8	dB
	C-Band			Line + 1610 _{IN} to PT _{OUT}	0.6 typical 0.9 maximum	dB
	C-Band			Line _{IN} to MON _{IN}	18.0 ≤ IL ≤ 22.0	dB
	1600-1640nm			Line + 1610 _{IN} to OSC _{OUT}	≤1.3	dB
Insertion Loss Uniformity		≤1.5				dB
Chromatic Dispersion (CD)		-42 ≤ CD ≤+42				ps/nm
Adjacent Channel Isolation		≥23		≥23		dB
Non-Adjacent Channel Isolation		≥30		≥30		dB
Directivity		≥40				dB
Return Loss		≥40		≥40		dB
Polarization Dependent Loss		≤0.65				dB

Table 13-58 96-Channel DWDM Mux/Demux (BT8A96MD01-I02/MD02-I02) specifications (Continued)

Parameter		Mux	Demux	Units
Polarization Mode Dispersion		≤0.85	≤0.9	ps
Passband	0.5 dB down	20.0		GHz
	1.0 dB down	24.5		GHz
	3.0 dB down	35.0		GHz

Note All insertion loss values include connector losses.

13.8.7 96-Channel Fixed Mux/Demux Specifications

Table 13-59 FMD96 (BT8A78MD03) Specifications

Parameters	Range		
Physical			
Width	438 mm		
Height	88 mm		
Depth	280 mm		
Weight			
Environmental			
Power Consumption	Not applicable, passive		
Optical	Minimum	Typical	Maximum
Central Wavelengths (C-Band)	1528.77 nm		1566.72 nm
Number of channels (50GHz spacing)			96 channels
Insertion Loss (client in to line out)	4.0 dB		6.5 dB
Insertion Loss (line in to client out)	4.0 dB		6.5 dB
Monitor In Port Loss ¹	19.6 dB		22.3 dB
Monitor Out Port Loss ²	17.9 dB		21.2 dB
L1 Composite Input Signal Power			23 dBm
Client Input Signal Power			5 dBm/port ³
Wavelength (OSC, Line Port) ⁴	1266 nm	1310nm	1360 nm
Fiber Type	SMF-28 or equivalent		
Connector	LC/UPC		

¹ Relative to L1 In.

² Relative to L1 Out.

³ The input power per client port must not exceed this limit to ensure that the optical safety on line output is within Class 1M requirements.

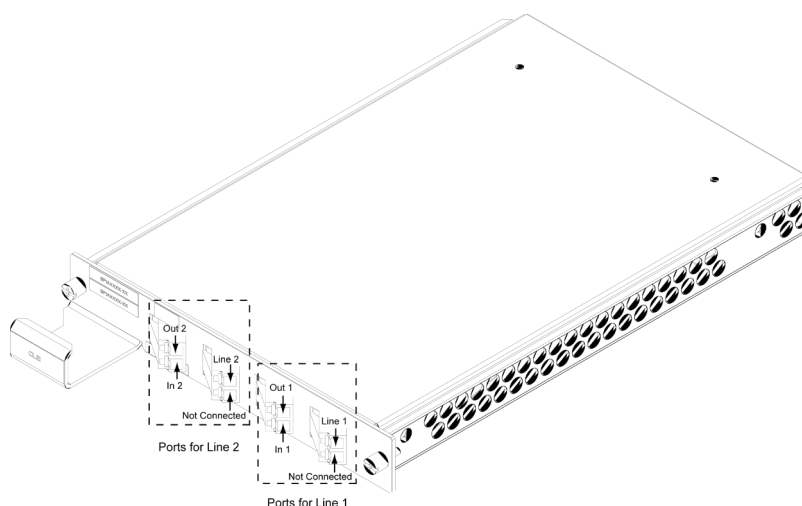
⁴ For connection to ROADM client ports.

13.9 Double DWDM Bidirectional Coupler/Splitter specifications

The six-port Double Bidirectional Coupler/Splitter is a key device in a single-fiber bidirectional transmission solution. Used in conjunction with passive 32-Channel Bidirectional DWDM Mux/Demux modules, the DWDM Bidirectional Coupler/Splitter separates the two counter-propagating signals on a single fiber according to their direction of transmission, enabling a separate transmit channel in one direction and the receive channel in the other direction.

The following figure shows the key physical features of the Double Bidirectional Coupler/Splitter module.

Double Bidirectional Coupler/Splitter module



This section covers the following topic:

- [13.9.1, “Double Bidirectional Coupler/Splitter specifications”](#)

13.9.1 Double Bidirectional Coupler/Splitter specifications

Table 13-60 Double Bidirectional Coupler/Splitter BP1A39CA specifications

Parameter		Value	Units
Wavelength Range		1528 to 1565	nm
Insertion Loss	In → Line	≤1.5	dB
	Line → Out	≤1.5	dB
Isolation	Line → In	≥35	dB
	Out → Line	≥35	dB
Directivity	In → Out	≥45	dB
Polarization Dependent Loss		≤0.1	dB
Polarization Mode Dispersion		≤0.05	ps
Return Loss		≥50	dB

13.10 Dispersion management

The BTI 7000 Series platform supports the following categories of dispersion management modules:

- ITU-T C-Band Channelized DCMs for DWDM applications
- Dispersion Compensating Fiber Modules (DCMs) for DWDM applications

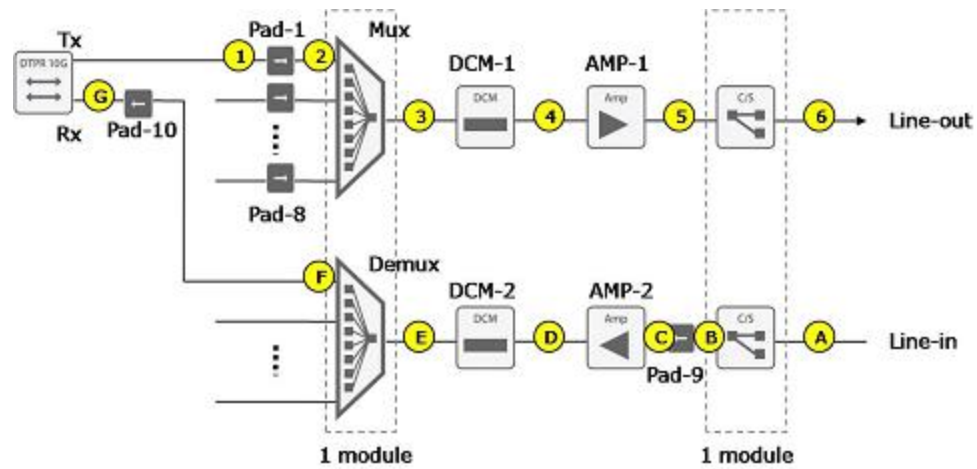
Note Specifications for other fiber types and lengths are available on request.

14.0 Measuring optical power and OSNR

This section discusses how to measure optical power on a fiber link using a power meter, along with measuring Optical Signal to Noise Ratio (OSNR) of a channel in an amplified link using Optical Spectrum Analyzer (OSA). OSNR value plays a role in an amplified link and affects the signal quality (BER) and reach on a link. Based on the network design and use of number of amplifiers along a link, a measured OSNR value should meet the link design provided prior to the start of the installation. Also, based on the OSNR value, the input power to the transceiver will be higher than in a situation where there is no amplifier used on a link. OSNR directly affects the BER of a channel and thus input power to the transceiver must meet the specification of the transceiver for types of transceivers and OSNR specification for that specific transceiver.

Note	Only DWDM channels can be amplified and thus OSNR only affects a DWDM channels in a link. A network that is built on CWDM cannot be amplified and does not require an OSA to measure the OSNR value of the link.
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An example of a typical network is shown in the following illustration, and demonstrates the points along the fiber of an NE and its components where optical power should be measured using a power meter, and where OSNR should be measured using an Optical Spectrum Analyzer (OSA). Your installation and fiber of the NE may or may not use all of the components shown in the example network. Therefore, skip points that do not apply to your installation.



- 14.1, “Measuring optical power using an optical power meter”
- 14.2, “Measuring OSNR using an OSA”

14.1 Measuring optical power using an optical power meter

Use this procedure to measure the optical power on a port or a fiber using an optical power meter.

Prerequisites

The ports on the service module must be provisioned and must be in service and transmitting light.

What you need

- optical power meter
- ESD wrist strap
- isopropyl alcohol and lint-free pads



Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

Step 1 Set up the power meter.

- a) Adjust the wavelength on the power meter to the type of transceiver/fiber being measured (850nm, 1310nm, 1510nm, 1550nm (for CWDM and DWDM) wavelengths).
- b) Adjust power setting on the power meter. Set the power meter to dBm for individual channel measurements and to dB for total power measurements.

Step 2 Ensure that the power meter optical connector type matches the optical fiber connector on the fiber.

Step 3 Clean the tip of the optical fiber connector, or attenuator if applicable, using Isopropyl alcohol and link-free pads.

Step 4 Gently push the male optical connector into the power meter until a distinctive click is heard. Then continue exerting pressure on the connector to ensure that a good connection is achieved.

Step 5 Measure and record the optical power value.

Compare the measured optical power value on the power meter to what is displayed in the proNX 900. If the power value is not what is expected, refer to the *Alarm and Troubleshooting Guide* to resolve this issue. In the Navigation pane of the proNX 900, right-click a port on a service module, and select View Port PM.

Note For SFP transceivers, reported power measurements for OPR and OPT are accurate to +/- 3.0dB.

Note For XFP transceivers, reported power measurements for OPR and OPT are accurate to +/- 2.0dB.

Note The measured transmit power of a transceiver may vary depending on the type of transceiver in the service module.

You have successfully completed this procedure.

14.2 Measuring OSNR using an OSA

Use this procedure to measure the optical signal-to-noise ratio (OSNR) on an Output or Monitor port of an Amplifier module using an optical spectrum analyser (OSA).

Prerequisites

The ports on the amplifier module must be provisioned and must be in service and transmitting light.

The Input port of the Amplifier must be connected to a source and have at least one DWDM wavelength carried on the fiber.

The amplifier must be alarm free.

What you need

- optical spectrum analyzer
- ESD wrist strap
- isopropyl alcohol and lint-free pads



Caution

Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

OSA settings

Optical signal-to-noise ratio is the ratio of the signal power at the peak of a channel to the noise power at the position of the peak. OSA characteristics that are required to perform adequate OSNR measurement are:

- The wavelength measurement range of the OSA must be wide enough to encompass all channels.
- The sensitivity, defined as the lowest level at which spectral power can be measured with a specific accuracy.
- The resolution bandwidth must be wide enough to encompass the entire signal power spectrum of each modulated channel.

The most important and common settings on any OSAs to capture OSNR values are:

- Wavelength range
- Sensitivity
- Resolution bandwidth
- dB per division

Based on the type of OSA used, some or all of the following parameters must be set appropriately to measure OSNR:

- start wavelength
- stop wavelength
- sensitivity auto/manual
- auto range enable/disable
- sensitivity
- video bandwidth auto/manual
- resolution bandwidth
- video bandwidth
- gated sweep enable/disable
- sweep continuous/single
- sweep time auto/manual
- sweep time
- sweep trace length
- reference level
- dB per division
- reference level position
- Y scale linear/log mode
- amplitude correction enable/disable
- current active ampcorr correction set
- ampcor interpolation method
- vacuum or air
- wavelength offset
- number of averages for trace averaging

Step 1 Set up the OSA.

Step 2 Ensure that the OSA optical connector type matches the optical fiber connector on the fiber jumper used between the output or monitor port of the Amplifier to the OSA port.

Step 3 Clean the tip of the optical fiber connector, or attenuator if applicable, using Isopropyl alcohol and link-free pads.

Step 4 Gently push the male optical connector into the OSA until a good connection is achieved.

Step 5 Measure and record the OSNR values, in particular the WDM measured waveform and the WDM measurement results.

Compare the measured OSNR value on the OSA to what is displayed in the proNX 900. If the power value is not what is expected, refer to the *Alarm and Troubleshooting Guide* to resolve this issue. In the Navigation pane of the proNX 900, right-click a port on a service module, and select View Port PM.

You have successfully completed this procedure.



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