



PRODUCT DOCUMENTATION

BTI 7000 Series Muxponder Solutions 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 technicians and network operation center (NOC) staff.

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 7060 Filler Panel Kit	BT7A55EA

BTI 7000 Series common equipment (Continued)

Equipment	PEC
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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1.0 Muxponder portfolio

This section identifies the Muxponder modules that the BTI 7000 Series supports, and provides information about software release compatibility.

- 1.1, “Muxponder modules”
- 1.2, “Muxponder comparison”
- 1.3, “Overview of Muxponder supported protocols”

1.1 Muxponder modules

Table 1-1 Muxponders

Modules	PEC	System software introduced
2-Port GbE Muxponders		
2-Port GbE Muxponder – SONET	BP1A46AA	7.1.0
2-Port GbE Muxponder SDH	BP1A46BA	7.1.0
8-Port Multiprotocol Muxponders		
8-Port Multiprotocol Muxponder – SONET	BT7A47JA	7.2.0
8-Port Multiprotocol Muxponder – SDH	BT7A47KA	7.2.0
8-Port Multiprotocol Muxponder – SDH CCAT	BT7A47MA	
10-Port Multiprotocol Muxponders		
10-Port Multiprotocol Muxponder – SONET	BT7A48AA	7.1.1
	BT7A48AA-I02	13.1
10-Port Multiprotocol Muxponder – SDH	BT7A48BA	7.1.1
10-Port Multiprotocol Muxponder – SDH CCAT	BT7A48BA-I02	13.1
	BT7A48DA	7.1.1

1.2 Muxponder comparison

Table 1-2 Comparison of Muxponder module features

Feature	2-Port GbE Muxponder	8-Port Multiprotocol Muxponder	10-Port Multiprotocol Muxponder
Client ports	2 SFPs 2 RJ-45	8 SFPs	10 SFPs
Client interfaces	Fast Ethernet (FE) Gigabit Ethernet (GE)	Gigabit Ethernet (GE) OC3 or STM1 OC12 or STM4 Fibre Channel 1G/FICON 1G Fibre Channel 2G/FICON 2G 100FX (First Office Application only) SD-SDI HD-SDI HD-SDI 1.001 DVB-ASI (First Office Application only)	Gigabit Ethernet (GE) OC3 or STM1 OC12 or STM4 OC48 or STM16 Fibre Channel 1G/FICON 1G Fibre Channel 2G/FICON 2G Fibre Channel 4G/FICON 4G
Line ports	2 SFPs	2 SFPs	2 XFPs
Supported line protocols	STM16 or OC48	STM16 or OC48	OC192 or STM64
Line mapping	None (SONET or SDH rate)	None (SONET or SDH rate) OTU1 (SONET or SDH rate wrapped in OTU1) SUBODU1-OTU1 (SONET or SDH rate wrapped in SUBODU1-OTU1)	None (SONET or SDH rate) OTU2 (SONET or SDH rate wrapped in OTU2) ODU1-OTU2 (SONET or SDH rate wrapped in ODU1-OTU2)
Data client concatenation	VCAT supported on all destination client ports	VCAT/CCAT supported on all destination client ports	VCAT/CCAT supported on all destination client ports
Line protection	SONET/SDH	SONET/SDH (Line mapping = None) 1+1 OTU1 (Line mapping = OTU1 or SUBODU1-OTU2)	SONET/SDH (Line mapping = None) 1+1 OTU2 (Line mapping = OTU2 or ODU1-OTU2)
Path protection	UPSR/SNCP	UPSR/SNCP (Line mapping = None or OTU1)	UPSR/SNCP (Line mapping = None or OTU2)
In-band management	FE port connected to NMS port	GCC0	GCC0
GE GFP mapping	GFP-F	GFP-F GFP-T	GFP-F GFP-T
FC GFP mapping	Not supported	GFP-T	GFP-T

Table 1-2 Comparison of Muxponder module features (Continued)

Feature	2-Port GbE Muxponder	8-Port Multiprotocol Muxponder	10-Port Multiprotocol Muxponder
Total protected line capacity	2.5G	2.5G	10G
Total unprotected line capacity	2.5G	5G	10G
Performance monitoring	Physical GE Layer 1, Layer 2 SONET Section/Line SONET Path SDH Regenerator Section/ Multiplex Section SDH Higher Order Path	Physical GE Layer 1 GE Layer 2 FC Layer 1 SONET Section/Line SONET Path SDH Regenerator Section/ Multiplex Section SDH Higher Order Path OTN	Physical GE Layer 1 GE Layer 2 FC Layer 1 SONET Section/Line SONET Path SDH Regenerator Section/ Multiplex Section SDH Higher Order Path OTN
GE flow control	Full-rate GE	Full-rate and sub-rate GE	Full-rate and sub-rate GE
Operating temperature	Long term: 0°C to 40°C or -20°C to +65°C Short term: -5°C to 50°C	Long term: 0°C to 40°C Short term: -5°C to 50°C	Long term: 0°C to 40°C Short term: -5°C to 50°C

1.3 Overview of Muxponder supported protocols

Table 1-3 Muxponder portfolio supported protocols

Protocol	2-Port GbE Muxponder	8-Port Multiprotocol Muxponder	10-Port Multiprotocol Muxponder
OC3/12	Not supported	Supported (SONET module only)	Supported (SONET module only)
OC48	Supported (SONET module line port only)	Supported (SONET module line ports only)	Supported (SONET module client ports only)
OC192	Not supported	Not supported	Supported (SONET module line ports only)
STM1/4	Not supported	Supported (SDH module client ports only)	Supported (SDH module client ports only)
STM16	Supported (SDH module line port only)	Supported (SDH module line ports only)	Supported (SDH modules client ports only)
STM64	Not supported	Not supported	Supported (SDH modules line ports only)
OTU1	Not supported	Supported	Not supported
OTU2	Not supported	Not supported	Supported
Gigabit Ethernet (GE)	Supported	Supported	Supported
Fast Ethernet (FE)	Supported	Not supported	Not supported
Fibre Channel 1G/ FICON 1G	Not supported	Supported	Supported
Fibre Channel 2G/ FICON 2G	Not supported	Supported	Supported
Fibre Channel 4G/ FICON 4G	Not supported	Not supported	Supported
OC3	Not supported	Supported	Supported
OC12	Not supported	Supported	Supported
STM1	Not supported	Supported	Supported
STM4	Not supported	Supported	Supported
100FX (First Office Application only)	Not supported	Supported	Not supported
SD-SDI	Not supported	Supported	Not supported
HD-SDI	Not supported	Supported	Not supported
HD-SDI 1.001	Not supported	Supported	Not supported
DVB-ASI (First Office Application only)	Not supported	Supported	Not supported

2.0 Muxponder features and supported protocols

This section describes the features of the Muxponder portfolio and the protocols each module supports.

- [2.1, “2-Port GbE Muxponder features”](#)
- [2.2, “2-Port GbE Muxponder supported protocols”](#)
- [2.3, “8-Port Multiprotocol Muxponder features”](#)
- [2.4, “8-Port Multiprotocol Muxponder supported protocols”](#)
- [2.5, “10-Port Multiprotocol Muxponder features”](#)
- [2.6, “10-Port Multiprotocol Muxponder supported protocols”](#)

2.1 2-Port GbE Muxponder features

The 2-Port GbE Muxponder portfolio offers the following modules:

Module	PEC
2-Port GbE Muxponder – SONET	BP1A46AA
2-Port GbE Muxponder – SDH	BP1A46BA

Features

- Module size: Single slot
- Supported platforms: BTI 7000 Series running system software version 7.1.0 or later
- Interfaces: 2 x SFP-based line ports; 2 x SFP-based client ports, 2 x 100BaseT (RJ45) client ports (intended only for management traffic¹)
- Copper SFPs are supported on client ports, at GE rate only
- Supported line rates: OC48/STM16
- Supported client protocols:
 - Gigabit Ethernet (GE) - full rate
 - Fast Ethernet (FE) - RJ45 ports only
- Data client encapsulation: GFP-F
- Data client concatenation: VCAT
- UPSR/SNCP support
- Facility and terminal loopback on client ports; facility loopback on line ports¹
- Extensive, integrated performance monitoring (15-minute and 24-hour): Physical layer, SONET/SDH, Gigabit Ethernet¹

2-Port GbE Muxponder



¹ Alarming, provisioning, and performance monitoring are not supported for the Fast Ethernet equipment/facilities on RJ-45 client ports because these ports are intended for management traffic only.

2.2 2-Port GbE Muxponder supported protocols

Table 2-1 2-Port GbE Muxponder supported protocols and bit rates

Protocol	Bit rate	Port
OC48 (2-Port GbE Muxponder – SONET only)	2.488 Gbps	Lines 1 and 2
STM16 (2-Port GbE Muxponder – SDH only)	2.488 Gbps	Lines 1 and 2
Gigabit Ethernet	1 Gbps	Clients 1 and 2
Fast Ethernet	100 Mbps	Clients 3 and 4

2.3 8-Port Multiprotocol Muxponder features

Module	PEC
8-Port Multiprotocol Muxponder – SONET	BT7A47JA
8-Port Multiprotocol Muxponder – SDH	BT7A47KA
	BT7A47MA

Features

- Module size: Double-width slot
- Supported platforms: BTI 7000 Series running system software version 7.2 or later.
- Interfaces: 2 SFP-based line ports; 8 SFP-based client ports
- Copper SFP support on client ports, at Gigabit Ethernet rate only
- Supported line rates: OC48/STM16, OTU1
- Supported client protocols:
 - OC3/STM1
 - OC12/STM4
 - Gigabit Ethernet, full-rate and sub-rate
 - Fibre Channel 1G/FICON 1G, Fibre Channel 2G/FICON 2G
 - 100FX (First Office Application only)
 - SD-SDI
 - HD-SDI
 - HD-SDI 1.001
 - DVB-ASI (First Office Application only)
- Data client encapsulation:
 - Gigabit Ethernet: GFP-F and GFP-T
 - Fibre Channel: GFP-T
- Data client concatenation: VCAT and CCAT; subrate VCAT CCAT support on GFP-P mapped Gigabit Ethernet clients only, as follows:
 - STS1-nv where n = 1..21
 - STS-3c-nv where n = 1..7
 - VC-4-nv where n = 1..7
- Line mapping:
 - OC48/STM16

- OC48/STM16 » OTU1
- 4 x SubODU1 » OTU1
- TOH Transparency support on asynchronous clients
- SDCC Transparency support on OC12/STM4 clients
- Support for basic Synchronization Status Messaging (SSM)
- UPSR/SNCP
- 1+1 line protection
- 5G of aggregate line capacity (unprotected)
- Facility and terminal loopback on client ports; facility loopback on line ports
- Extensive, integrated performance monitoring (15-minute and 24-hour): Physical layer, Gigabit Ethernet, Fibre Channel, SONET, SDH, OTN
- Inband management: GCC

8-Port Multiprotocol Muxponder



2.4 8-Port Multiprotocol Muxponder supported protocols

Table 2-2 8-Port Multiprotocol Muxponder supported protocols and bit rates

Protocol	Bit rate	Port
OC48/STM16	2.488 Mbps	Lines 1 and 2
OTU1	2.666 Mbps	Lines 1 and 2
OC3/STM1	155.52 Mbps	Clients 1 to 4
OC12/STM4	622.08 Mbps	Clients 1 to 4
Gigabit Ethernet	1 Gbps	Clients 3 to 8
Fibre Channel 1G/FICON 1G	1.062 Gbps	Clients 3 to 8
Fibre Channel 2G/FICON 2G	2.125 Gbps	Clients 3 to 8
100FX (First Office Application only)	125 Mbps	Clients 1 to 4
SD-SDI	270 Mbps	Clients 1 to 4
HD-SDI	1485 Mbps	Clients 1 to 4
HD-SDI 1.001	1483.5165 Mbps	Clients 1 to 4
DVB-ASI (First Office Application only)	270 Mbps	Clients 1 to 4

2.5 10-Port Multiprotocol Muxponder features

The 10-Port Multiprotocol Muxponder portfolio offers the following full-featured modules:

Module	PEC
10-Port Multiprotocol Muxponder – SONET	BT7A48AA, BT7A48AA-I02
10-Port Multiprotocol Muxponder – SDH	BT7A48BA, BT7A48BA-I02 BT7A48DA

Features of BT7A48AA and BT7A48BA

- Module size: Double-width slot
- Supported platforms: BTI 7000 Series running system software version 7.1.1 or later
- Interfaces: 2 XFP-based line ports; 10 SFP-based client ports
- Tunable XFP support on line ports
- Copper SFP support on client ports, at Gigabit Ethernet rate only
- Supported line rates: OC192/STM64, OTU2
- Supported client protocols:
 - Fibre Channel 1G/FICON 1G, Fibre Channel 2G/FICON 2G
 - Fibre Channel 4G/FICON 4G
 - Gigabit Ethernet, full-rate and sub-rate
 - OC3/STM1
 - OC12/STM4
 - OC48/STM16
- Data client encapsulation: GFP-F and GFP-T
- Data client concatenation: VCAT and CCAT; subrate CCAT and VCAT support on GFP-F mapped Gigabit Ethernet clients only, as follows:
 - STS1-nv where n = 1..21
 - STS-3c-nv where n = 1..7
 - VC-4-nv where n = 1..7
- Line mapping:
 - STM64/OC192
 - STM64/OC192 » OTU2
 - 4 x ODU1 » OTU2
- TOH Transparency support on asynchronous clients

- SDCC Transparency support on OC12/STM4 and OC48/STM16 clients
- Support for basic Synchronization Status Messaging (SSM)
- UPSR/SNCP
- 1+1 OTN Facility Protection
- 10G of aggregate line capacity (protected or unprotected)
- Facility and terminal loopback on client ports; facility loopback on line ports
- Extensive, integrated performance monitoring (15-minute and 24-hour): Physical layer, Gigabit Ethernet, SONET/SDH, Fibre Channel, OTN
- In-band management: GCC

Features of BT7A48AA-I02 and BT7A48BA-I02

This version of the modules includes all features listed above plus the following Alarm and Performance Monitoring (PM) features. For more information about temperature and voltage monitoring refer to [2.5.1, “Module temperature monitoring ”](#) and [2.5.2, “Module voltage and fuse monitoring ”](#).

- Module temperature monitoring including automatic shutdown if critical temperature is reached
- Module voltage rail and feed rail monitoring
- PM collection of historical module temperature levels.

Note • The above features are supported on Release 13.1 and above. When you insert a BT7A48AA-I02 or BT7A48BA-I02 into a shelf running 10.3 to 12.2 software, the new module behaves in the same manner as the existing BT7A48AA or BT7A48AB modules and do not support the temperature or voltage monitoring features. You cannot insert BT7A48AA-I02 or BT7A48AB-I02 modules into a shelf running software older than release 10.3.

10-Port Multiprotocol Muxponder



For a list of all the alarms supported on the Dual 10G Multiprotocol Transponder modules refer to [9.1, “Alarms and events on Muxponder modules”](#). For detailed information and clearing procedures for these alarms refer to the *BTI 7000 Series Alarm and Troubleshooting Guide*.

2.5.1 Module temperature monitoring

This section describes module-specific temperature monitoring.

Module temperature monitoring is supported on the following Muxponder modules:

- 10 Port Multiprotocol Muxponder (BT7A48AA-I02)

- 10 Port Multiprotocol Muxponder (BT7A48AB-I02)

Note	Temperature monitoring for modules is not the same as monitoring the temperature of individual pluggable SFPs and XFPs. Temperature monitoring for SFPs and XFPs is part of a port's physical performance metrics (PM).
-------------	---

Temperature thresholds

Temperature monitoring threshold crossing alarms have two levels. The first, high threshold, alerts you to rising temperatures so that you may take action to prevent traffic interruption. The second, shutdown threshold, indicates that module damage may occur. The shutdown temperature is likely to be reached only in case of total cooling unit failure.

For the BT7A48AA-I02 and BT7A48BA-I02 modules, the high and shutdown thresholds are 75 and 80°C.

The threshold values can be viewed in the module inventory. They cannot be changed.

Automatic shutdown

If automatic shutdown is enabled (through the use of the system setting HTAS), then if the shutdown threshold is exceeded, the module is shut down to avoid damage.

The HTAS setting is off by default.

When a module has been shut down due to temperature, the REPLUNITHATS alarm is raised.

Temperature is not monitored while a module is shut down. You can start up a module that has been shut down due to temperature by using the `TL1 INIT-SYS` command with the phase 2 power-on option. Alternatively, the module can be re-seated.

Temperature PMs

The module temperature can be viewed under equipment PMs (`rtrv-pm-eqpt`).

Temperature PMs provide the current and historical temperature readings.

To view PMs, the module must be provisioned.

High temperature automatic shutdown unsupported (HTASUNS) alarm

The high temperature automatic shutdown (HTAS) feature is not supported by all versions of the MSI. In the case of an incompatible MSI, the HTASUNS alarm is raised. To clear the alarm, you can either disable the HTAS feature, or you can replace the MSI with a compatible version. To obtain a compatible MSI, contact your BTI representative.

Temperature monitoring alarms

The following table lists the alarms associated with monitoring the module temperature. For more information about these alarms and alarm clearing procedures, refer to the *BTI 7000 Series Alarm and Troubleshooting Guide*:

Alarm Code	Alarm Name	Problem Description
HTASUNS	High Temperature Automatic Shutdown Unsupported	The HTAS option has been enabled, but the system is not able to support the feature.
REPLUNITHTAS	Circuit Pack High Temperature Automatic Shutdown	The module has exceeded the shutdown temperature threshold and has been shut down because the HTAS feature is enabled.
T-REPLUNIT-HT	Circuit pack exceeded the high temperature threshold.	The module has exceeded the high temperature threshold.
T-REPLUNIT-HTS	Circuit pack exceeded the shutdown temperature threshold.	The module has exceeded the shutdown temperature threshold.

Commands used for module temperature monitoring

This section lists the TL1 commands used for monitoring module temperature. For more information about these commands, refer to the *BTI 7000 Series TL1 Reference Guide*.

Command type	Command	Description
TL1	ED-SYS: BTI7000:: [CTAG]:HTAS=[ON OFF]	Turns the HTAS feature on or off. The default is OFF.
TL1	RTRV-INV: [TID]:[<aid>]:[CTAG]::;	Displays the module high temperature threshold (TEMPHT) and the module high shutdown temperature threshold (TEMPHTS) in degrees Celcius.
TL1	INIT-SYS: [TID]:[<aid>]:[CTAG]::[<2>]:	Restarts the module following a temperature shutdown. The value of the phase parameter is 2.
TL1	RTRV-ALM-ALL: [TID]:[<aid>]:[CTAG]:: [<ntfncn>], [<condtype>], [<srveff>], [<locn>], [<dirn>], [<tmper>];	Displays all alarms, including the module temperature alarms and severity for the specified condition type (HTASUNS, REPLUNITHTAS, T-REPLUNIT-HT, T-REPLUNIT-HTS).

2.5.2 Module voltage and fuse monitoring

This section describes module-specific voltage and fuse monitoring.

Module voltage and fuse monitoring is supported on the following Muxponder modules:

- 10 Port Multiprotocol Muxponder (BT7A48AA-I02)
- 10 Port Multiprotocol Muxponder (BT7A48AB-I02)

Voltage monitoring

All supply voltage rails on the module are monitored. If any rail falls below nominal voltage by a preset amount, the module is shut down.

When the module is shut down due to a voltage rail failure, the REPLUNITPWR alarm is raised.

Fuse monitoring

The two 48V feed fuses on the module are monitored. If either of the fuses fails, a feed fuse alarm is raised.

Module operation is not affected if only one fuse fails, unless the system feed for the other side also fails.

A feed fuse alarm indicates that the module should be replaced as soon as possible.

Voltage and fuse monitoring alarms

The following table lists the alarms associated with monitoring the module voltage and fuses. For more information about these alarms and alarm clearing procedures, refer to the *BTI 7000 Series Alarm and Troubleshooting Guide*:

Alarm Code	Alarm Name	Problem Description
FEEDAFUSEFAIL	Circuit pack feed A fuse failure.	The module's fuse for the 48V feed A has failed.
FEEDBFUSEFAIL	Circuit pack feed B fuse failure.	The module's fuse for the 48V feed B has failed.
REPLUNITPWR	Circuit pack power failure.	A voltage rail failure was detected on the module.

Commands used for module voltage monitoring

This section lists the TL1 commands used for monitoring module voltage and fuses. For more information about these commands, refer to the *BTI 7000 Series TL1 Reference Guide*.

Command type	Command	Description
TL1	RTRV-ALM-EQPT : [TID] : [<aid>] : [CTAG] :: [FEEDAFUSEFAIL FEEDBFUSEFAIL REPLUNITPWR]	Displays the module voltage alarms and severity for the specified condition type.

2.6 10-Port Multiprotocol Muxponder supported protocols

Table 2-3 10-Port Multiprotocol Muxponder supported protocols and bit rates

Protocol	Bit rate	Port
OC192/STM64	9.953 Mbps	Lines 1 and 2
OTU2	10.7 Gbps	Lines 1 and 2
Fibre Channel 1G/FICON 1G	1.062 Gbps	Clients 1 to 10
Fibre Channel 2G/FICON 2G	2.125 Gbps	Clients 1 to 10
Fibre Channel 4G/FICON 4G	4 Gbps	Clients 1 and 2
Gigabit Ethernet	1 Gbps	Clients 1 to 10
OC3/STM1	155.52 Mbps	Clients 1 to 4
OC12/STM4	622.08 Mbps	Clients 1 to 4
OC48/STM16	2.488 Gbps	Clients 1 to 4

3.0 Muxponder applications

This section provides information about the applications that Muxponder modules support.

- [3.1, “Wireless backhaul ”](#)
- [3.2, “Business services”](#)
- [3.3, “Enterprise networks”](#)
- [3.4, “SONET/SDH aggregation and interconnect ”](#)
- [3.5, “Data center interconnect”](#)
- [3.6, “Transparent network interconnect”](#)

3.1 Wireless backhaul

Muxponder modules can be used to provide protected backhaul from new broadband access devices, such as WiMAX base stations. The 2-Port GbE Muxponder client ports connect to the two optical GbE ports on the access device at any wavelength. The Muxponder maps the two GbE ports into an OC48 or STM16. The OC48 or STM16 is output on redundant line-side ports that can be routed East and West on a UPSR- or SNCP-protected ring for backhaul to the aggregation site or central office.

Figure 3-1 2-Port GbE Muxponders or 8-Port Multiprotocol Muxponders deployed for 4G/LTE/WiMAX

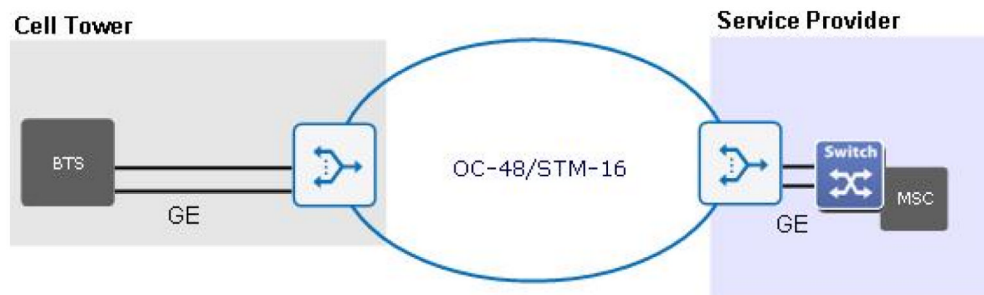
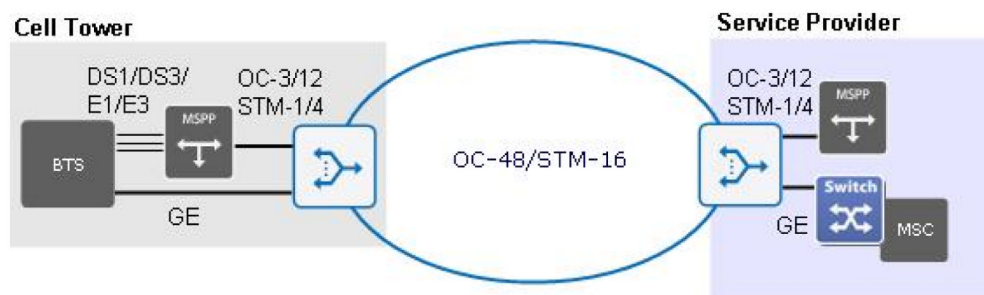


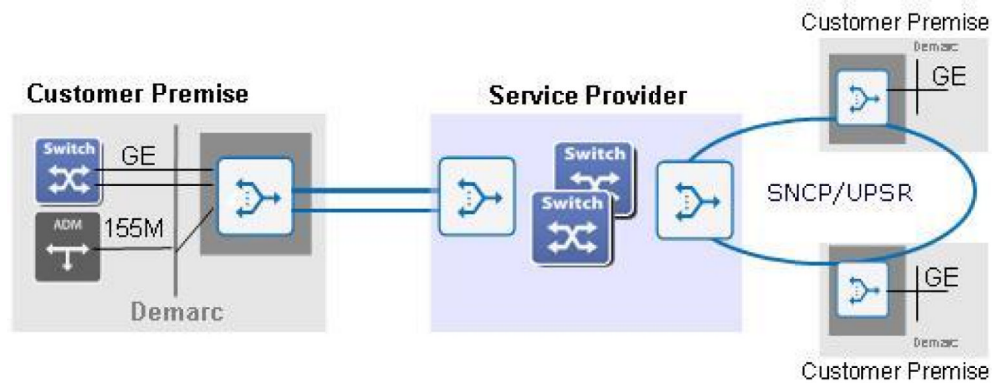
Figure 3-2 8-Port Multiprotocol Muxponders deployed for 3G/4G wireless backhaul



3.2 Business services

Muxponder modules provide delivery of wholesale and enterprise, full-bandwidth GbE Private Line services and SONET/SDH Private Line services over a service provider's network infrastructure. The service interface can be GbE or SONET/SDH at any wavelength. A full suite of GbE alarms and performance monitoring provides service demarcation, with measurement to Service Level Agreements (SLAs) and simplified billing. UPSR and SNCP protection at sub-50ms provides premium-quality service.

Figure 3-3 Muxponder modules deployed in a service provider's network infrastructure



3.3 Enterprise networks

Muxponder modules can be used in private or carrier networks for the transport of GbE signals between Ethernet switches and routers. GbE signals are mapped into OC48/STM16 or OC192/STM64 line ports to enable transport over existing or new SONET or SDH networks.

Figure 3-4 8-Port or 10-Port Multiprotocol Muxponders deployed in an enterprise network

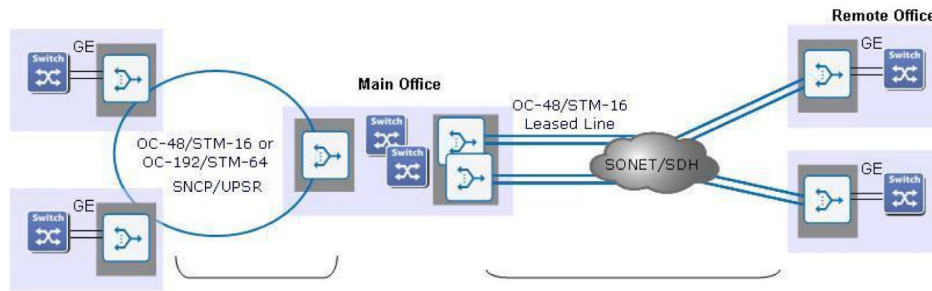
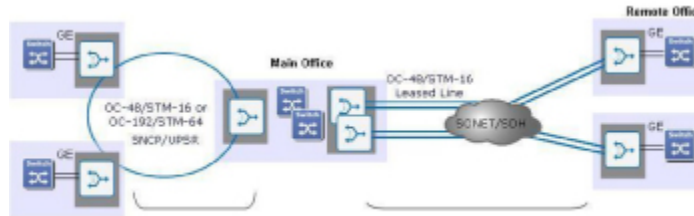


Figure 3-5 8-Port or 10-Port Multiprotocol Muxponders deployed in an enterprise network

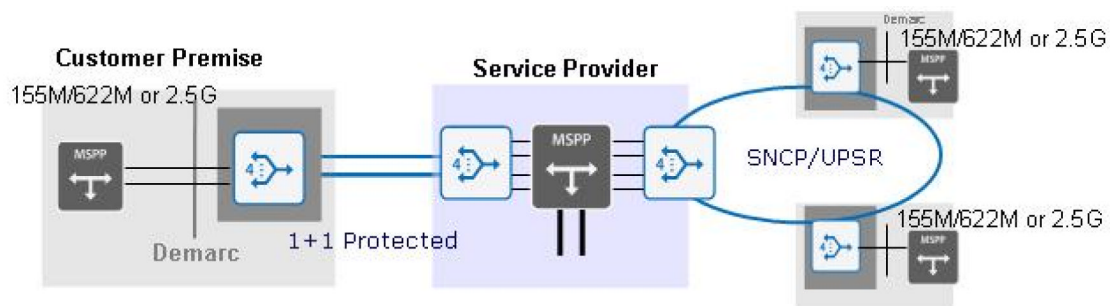


3.4 SONET/SDH aggregation and interconnect

The 8-Port Multiprotocol Muxponder modules enable up to four SONET/SDH carriers to be converged onto a single protected 2.5G wavelength, or two unprotected 2.5G wavelengths, for aggregation of wholesale and service-oriented OC3/STM1 or OC12/STM4 private line and ring services.

The 10-Port Multiprotocol Muxponder modules enable up to four SONET/SDH carriers to be converged onto a single 10G wavelength, with optional line protection, for aggregation of wholesale and service-oriented OC48/STM16 private line and ring services.

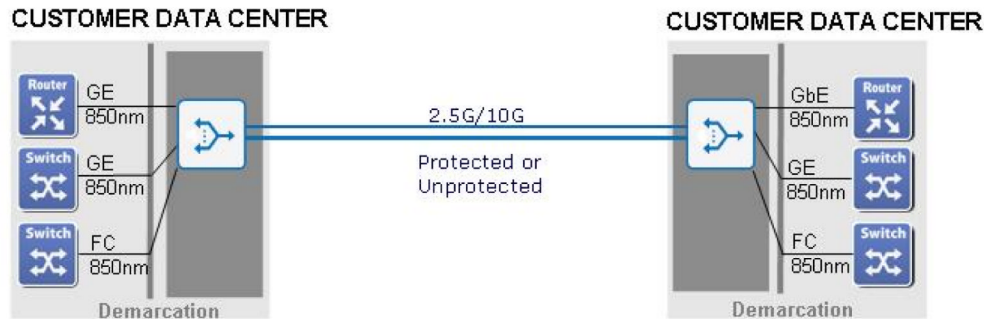
Figure 3-6 8-Port or 10-Port Multiprotocol Muxponder modules deployed for SONET/SDH aggregation



3.5 Data center interconnect

The 8-Port and 10-Port Multiprotocol Muxponders provide high-density fan-in of client ports to support Fibre Channel and Gigabit Ethernet for key data center applications, including Storage Area Network (SAN) extension and Business Continuity/Disaster Recovery plus Network Attached Storage (NAS) interconnect.

Figure 3-7 8-Port or 10-Port Multiprotocol Muxponders deployed to interconnect data centers

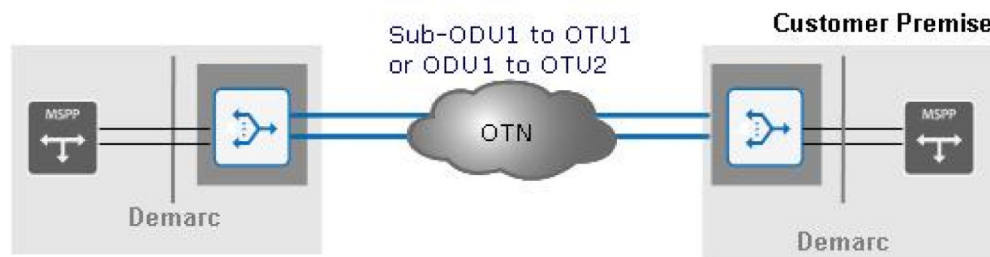


3.6 Transparent network interconnect

The 8-Port and 10-Port Multiprotocol Muxponders with transparent mapping provide aggregation and transport of SONET/SDH traffic transparently across the network while retaining individual timing information.

The 8-Port Multiprotocol Muxponder modules support transparent transport for OC3/STM1 or OC12/STM4 clients. 10-Port Multiprotocol Muxponder modules support transparent transport for OC48/STM16 clients.

Figure 3-8 8-Port or 10-Port Multiprotocol Muxponders deployed in a network



4.0 Installing Muxponder modules and transceivers

This section provides instructions for installing Muxponder modules in supported shelves, and installing transceivers in Muxponder modules.

- [4.1, “Installing 2-Port GbE Muxponder modules”](#)
- [4.2, “Installing 8-Port and 10-Port Multiprotocol Muxponder modules”](#)
- [4.3, “Installing optical transceivers”](#)
- [4.4, “Installing copper transceivers”](#)

4.1 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

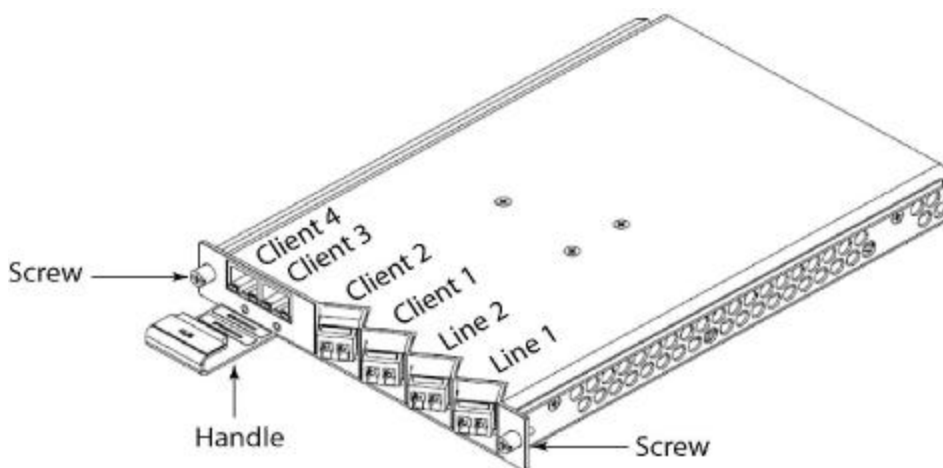


Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

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 [4.3, “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.

4.2 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.

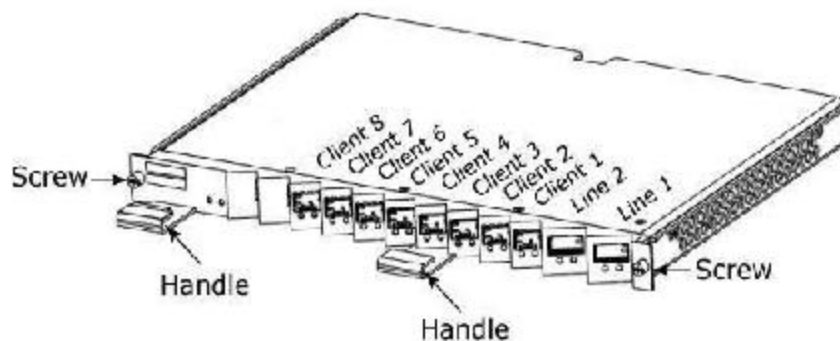


Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

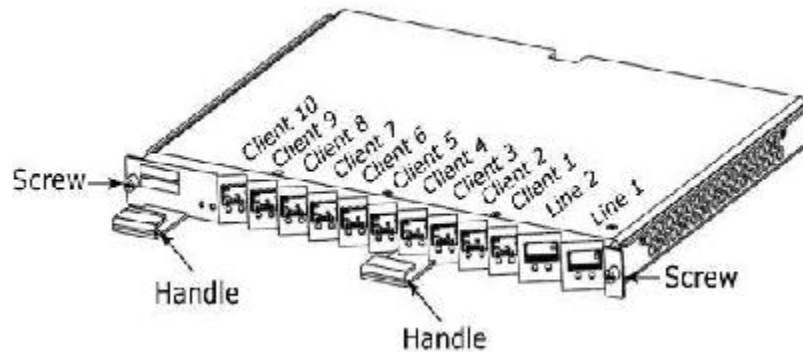
Key installation features

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

Figure 4-2 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 4.3, “[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.

4.3 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).



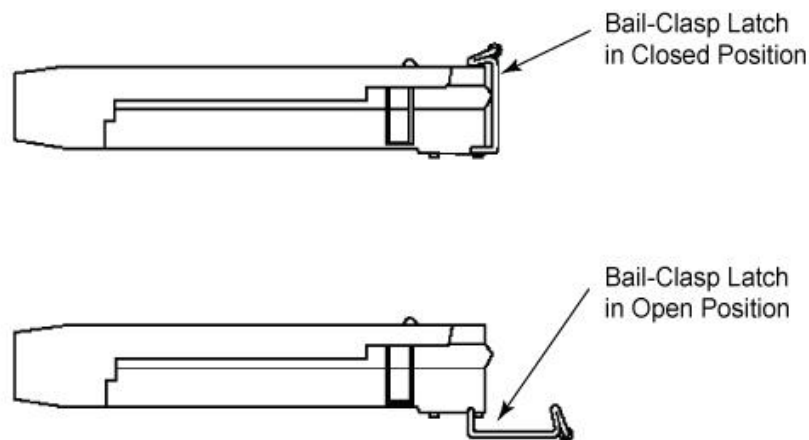
Laser

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

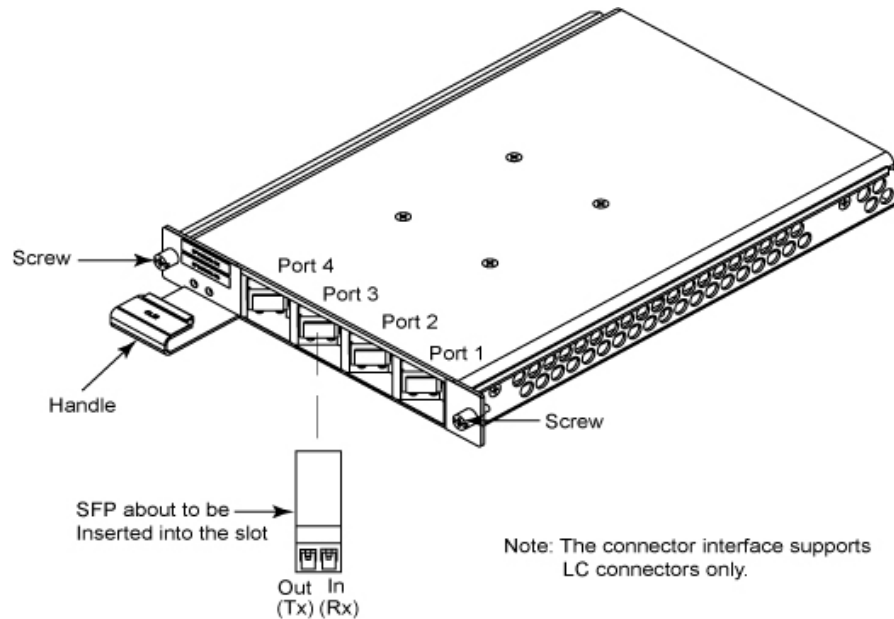
The following figure shows a typical SFP transceiver with a bail-clasp latch.

Figure 4-4 SFP transceiver with a bail-clasp latch



The following figure shows a transceiver about to be inserted into its slot.

Figure 4-5 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.

4.4 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.



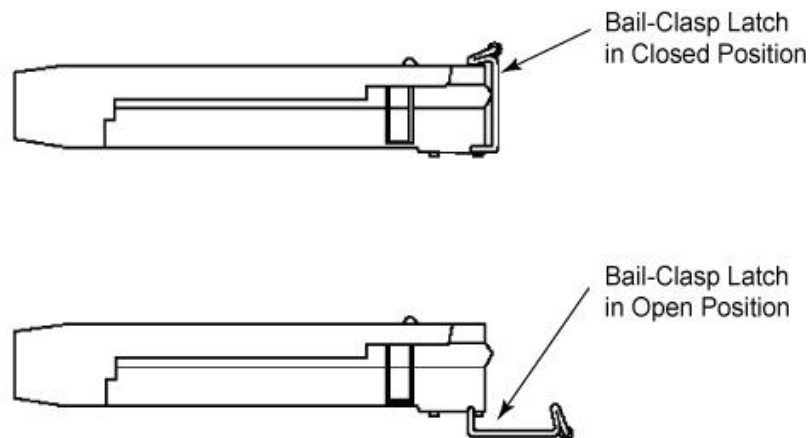
Caution

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).

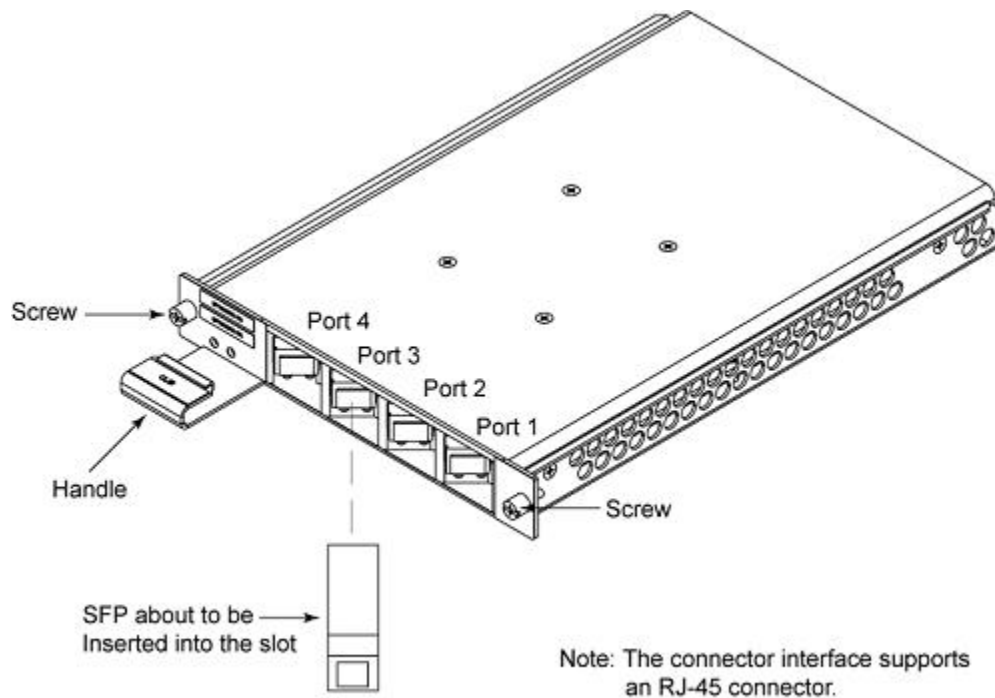
Transceiver key features

The following figure shows a typical SFP transceiver with a bail-clasp latch.

Figure 4-6 SFP transceiver with a bail-clasp latch



The following figure shows a transceiver about to be inserted into its slot.

Figure 4-7 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.

5.0 Management interfaces

This section provides a brief overview about each management interface you can use to provision, monitor, and administer Muxponder modules.

- [5.1, “proNX 900 Node Controller, CLI, TL1, SNMP, and proNX Service Manager”](#)

5.1 proNX 900 Node Controller, CLI, TL1, SNMP, and proNX Service Manager

proNX 900 Node Controller

proNX 900 Node Controller (proNX 900) provides a graphical user interface you can use to provision, operate, monitor, and troubleshoot all BTI 7000 Series modules. This interface provides a representational view of the physical configuration of each shelf in the network, and the modules in each shelf. For information about using the proNX 900 Node Controller, see the *proNX 900 Node Controller Online Help*.

CLI

The CLI is used to configure, monitor, and maintain packetVX and other modules. The CLI does not support all BTI 7000 Series modules. For information about using CLI commands, see the *CLI Reference Guide*.

TL1

The BTI 7000 Series supports a comprehensive and interactive Transaction Language One (TL1) interface, based on Telcordia standards, including GR-831, GR-199-CORE, and GR-833-Core. For information about using TL1 commands to provision, monitor, and administer BTI 7000 Series modules, see the *TL1 Reference Guide*.

SNMP

The BTI SNMP implementation supports SNMP Version 1 (SNMPv1) as defined in RFCs 1155, 1157, 1212, 1213, and 1215. The SNMP implementation also supports SNMPv2c as defined in RFCs 1901 through 1907. For information about the BTI SNMP implementation, see the *SNMP Overview Guide*.

proNX Service Manager

The proNX Service Manager provides proactive, service-centric management of network resources using tools closely aligned with service providers' own business processes. It is designed to simplify network operations from visualization and activation of services to troubleshooting and supporting end customers. For more information, see the *proNX Service Manager User Guide*.

6.0 Provisioning Muxponder modules and ports

This section provides information about provisioning Muxponder modules and ports.

- [6.1, “Autoprovisioning support on Muxponder modules”](#)
- [6.2, “Provisioning Muxponder modules”](#)
- [6.3, “Provisioning ports on Muxponder modules”](#)
- [6.4, “Provisioning synchronization on Muxponder modules”](#)
- [6.5, “General Communications Channel”](#)

6.1 Autoprovisioning support on Muxponder modules

Muxponder modules support autoprovisioning. This function is a system-wide parameter that can be enabled or disabled. For detailed information about autoprovisioning, see the *Operations Solutions Guide*.

Autoprovisioning support

When a 2-Port GbE Muxponder 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. All client-side ports (GE and FE) and line-side ports (OC48 or STM16) will be autoprovisioned as the module itself is autoprovisioned. Alternatively, the GE client-side ports and the OC48 or STM16 line-side ports can be autoprovisioned when SFP transceivers are inserted.

When an 8-Port or 10-Port Multiprotocol Muxponder 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 following table provides information about autoprovisioning behavior when a qualified transceiver is inserted into a port on an 8-Port or 10-Port Multiprotocol Muxponder module.

Table 6-1 Autoprovisioning behavior upon insertion of a qualified transceiver

Module	Port	SONET	SDH
8-Port Multiprotocol Muxponder	Client	Port 1 or 2 is autoprovisioned as OC3.	Port 1 or 2 is autoprovisioned as STM1.
		Port 3, 4, 5, 6, 7, or 8 is autoprovisioned as GE.	
	Line	Port is autoprovisioned as OC48 with the digital wrapper (OTU1) enabled.	Port is autoprovisioned as STM16 with the digital wrapper (OTU1) enabled.
10-Port Multiprotocol Muxponder	Client	Port is autoprovisioned as GE.	
	Line	Port is autoprovisioned as OC192 with the digital wrapper (OTU2) enabled.	Port is autoprovisioned as STM64 with the digital wrapper (OTU2) enabled.

For information about provisioned port parameters, see [6.3, “Provisioning ports on Muxponder modules”](#).

Note When a SONET or SDH line port on a Muxponder module is autoprovisioned, default VCGs are automatically created. For more information, see [7.3, “Virtual Concatenation groups”](#).

Note Autoprovisioning is not supported on Tunable XFPs.

Note Cross-connections between ports on any Muxponder module are not autoprovisioned.

6.2 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:

- [6.2.1, “Provision Muxponder module settings”](#)
- [6.2.3, “Display Muxponder module information”](#)
- [6.2.4, “Remove a Muxponder module from service”](#)
- [6.2.5, “Restore a Muxponder module to service”](#)

- [6.2.6, “Restart a Muxponder module”](#)
- [6.2.7, “Delete a Muxponder module”](#)

6.2.1 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** Select the PEC for the module type from the **PEC/CLEI** list.
- Step 5** Optionally, enter information (up to 20 alphanumeric characters) about the module in the **ID** field.
- Step 6** 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 7** Click **Apply**.

You have successfully completed this procedure.

6.2.2 Bulk module provisioning

Systems that contain many modules of the same type can be provisioned quickly using bulk module provisioning.



Prerequisites

- Expansion shelves must be provisioned.

Note Modules that were provisioned via bulk provisioning must be deleted individually. There is no bulk de-provisioning.

The following table provides information about the bulk module provisioning parameters:

Parameter	Description	Configurable
Product Model	List of all the available products/Short name of module installed. For example, SBA for the Sub-Band Booster Amplifier.	Yes
PEC/CLEI Code	Lists all the Product Equipment Codes (PECs) available for the selected module type. For example, if TPR is selected, the list contains the PEC codes for all the supported TPR modules.	Yes
Initial State	List of initial states for the cards to be provisioned. Values are: <ul style="list-style-type: none"> OOS (Out of Service) IS (In Service) - Default 	Yes
Available Slots	Lists the slots within the system that are not provisioned	Yes
Selected Slots	Lists the slots selected to be provisioned with the same attributes as the selected PEC module.	Yes

Use this procedure to bulk provision modules.

Step 1 On the Tools menu, select **Bulk Tools > Bulk Module Provisioning**.

Step 2 In the **Bulk Module Provisioning** dialog, select a module type from the **Product Model** drop-down box.

Step 3 From the **PEC/CLEI Code** drop-down box, select a code for the selected product model.

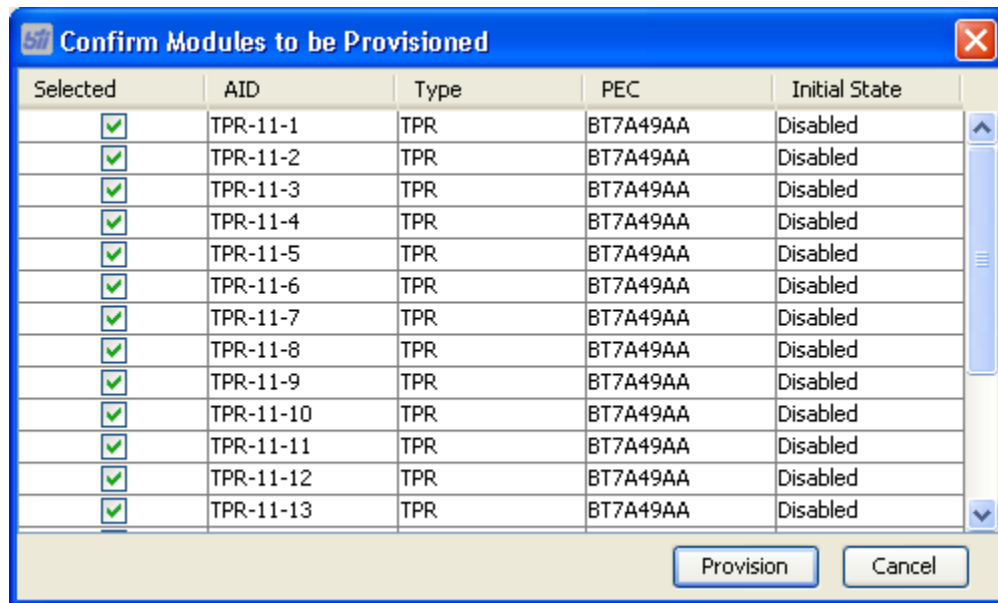
Step 4 From the **Initial State** drop-down box, select an initial state for the selected PEC.

Step 5 In the **Available Slots** list, shift-click to select the slots that are to be provisioned with the PEC attributes selected in step 2.

Step 6 Click the > arrow between the **Available Slots** and the **Selected Slots** lists.
The selected slots are moved to the **Selected Slots** list.

Step 7 Click **Apply**.

A confirmation dialog displays with a list of the objects that will be created. If required, you can remove individual items from the list. The modules are provisioned with the selected attributes.



Step 8 Click **Provision**.

A progress bar displays. When complete, if any provisioning errors occur, an error status window displays.

6.2.3 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 6-2](#).

Step 3 Click **Close**.

You have successfully completed this procedure.

Table 6-2 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

6.2.4 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.

6.2.5 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.

6.2.6 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*.

6.2.7 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.

6.3 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:

- [6.3.1, “Provision port settings on a 2-Port GbE Muxponder module”](#)
- [6.3.2, “Provision port settings on an 8-Port Multiprotocol Muxponder module”](#)
- [6.3.3, “Provision port settings on a 10-Port Multiprotocol Muxponder module”](#)
- [6.3.4, “Bulk port provisioning”](#)
- [6.3.5, “Display transceiver information ”](#)
- [6.3.6, “Display port information for a Muxponder module”](#)
- [6.3.7, “Modify port settings on a Muxponder module”](#)
- [6.3.8, “Remove a port from service on a Muxponder module”](#)
- [6.3.9, “Restore a port to service on a Muxponder module”](#)
- [6.3.10, “Delete a port on a Muxponder module”](#)

6.3.1 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 [7.3, “Virtual Concatenation groups”](#).

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 6-3](#).

Note The **Protocol** parameter is set by default and cannot be modified.

Step 4 Click **Apply**.

You have successfully completed this procedure.

Table 6-3 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 6.3.6.5, “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 6.3.6.4, “Fault Propagation	Client 1, Client 2

Table 6-3 2-Port GbE Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports
	Note When Wavelength = 0, FPSD cannot be Enabled .	Shutdown and laser status".	
	Note Fault Propagation Shutdown must be set to Disabled if Laser Control is set to Manual On or Manual Off .		
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
Media Rate	Auto (default) 1000FD	The Ethernet speed and duplex rate in Mbps	Client 1, Client 2

Table 6-3 2-Port GbE Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports
	Note When Wavelength = 0, Media Rate cannot be set to Auto.		
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

6.3.2 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 [7.3, “Virtual Concatenation groups”](#).

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 6-4](#).

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 6-4 8-Port Multiprotocol Muxponder port provisioning parameters

Parameter	Range of Values	Description	Applicable Ports and Protocols
Protocol	See 2.4, “8-Port Multiprotocol Muxponder supported protocols” .	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 6.3.6.5, “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 6.3.6.4, “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

Table 6-4 8-Port Multiprotocol Muxponder port provisioning parameters (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 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 GFP-T when Flow Control =

Table 6-4 8-Port Multiprotocol Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
			Local or when Media Rate = Auto.
TOH Transparency	No (default) Yes Note For more information about TOH Transparency, see 6.3.6.7, "TOH Transparency on 8-Port and 10-Port Multiprotocol Muxponder modules" .	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 6.3.6.8, "SDCC transparency on 8-Port and 10-Port Multiprotocol Muxponder modules" .
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 6.3.6.9, "Flow control on 8-Port and 10-Port Multiprotocol Muxponder modules" .

Table 6-4 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 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 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

6.3.3 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 [7.3, “Virtual Concatenation groups”](#).

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 6-5](#).

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 6-5 10-Port Multiprotocol Muxponder port provisioning parameters

Parameter	Range of Values	Description	Applicable Ports and Protocols
Protocol	See 2.6, “10-Port Multiprotocol Muxponder supported protocols” .	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 6.3.3.1, “Wavelengths”	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 6-5 10-Port Multiprotocol Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
	supported on Tunable XFP BP3AM4TL".		
	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 6.3.6.5, "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 6.3.6.4, "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 6-5 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 6-5 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 6.3.6.7, "TOH Transparency on 8-Port and 10-Port Multiprotocol Muxponder modules".</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 6.3.6.8, "SDCC transparency on 8-Port and 10-Port Multiprotocol Muxponder modules".</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 6.3.6.9, "Flow control on 8-Port and 10-Port Multiprotocol Muxponder modules".</p>
Vendor Part Number 1, 2, 3	Up to 20 characters	The part numbers provided by the transceiver manufacturer	All ports and protocols

Table 6-5 10-Port Multiprotocol Muxponder port provisioning parameters (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
		Note 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.	
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

6.3.3.1 Wavelengths supported on Tunable XFP BP3AM4TL

Note This transceiver is manufacture discontinued. Use BP3AM4TF instead.

Table 6-6 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

6.3.4 Bulk port provisioning

Systems that contain many Muxponder 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

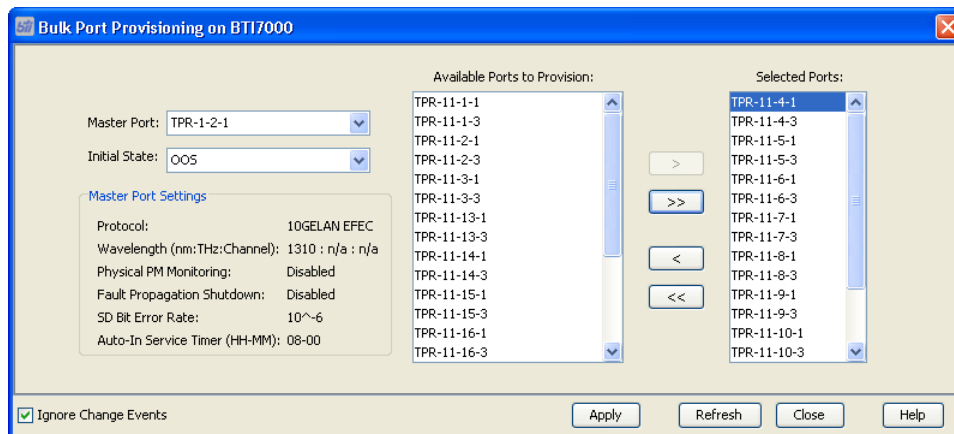
Parameter	Description	Configurable
Initial State	List of initial states for the ports to be cloned. Values are: <ul style="list-style-type: none"> • OOS (Out of Service) • IS (In Service) • AINS (Auto-In-Service) 	Yes
Master Port Settings	Contains some of the provisioned parameters of the selected master 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. <p>On Muxponder Modules:</p> <ul style="list-style-type: none"> • If the selected master port is a line port, line ports L1 and L2 line ports display. • If the selected master port is a client port that supports the protocol, client ports C1 and C10 client ports display. 	Yes
Selected ports	Lists the ports to which you want to apply master port provisioning. <p>When a port is added to this list, it is removed from the Available Ports list.</p>	Yes
Ignore Change Events	Parameter is available only during the provisioning phase. <p>When checked, blocks messages about change notifications such as:</p> <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 Muxponder 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**.

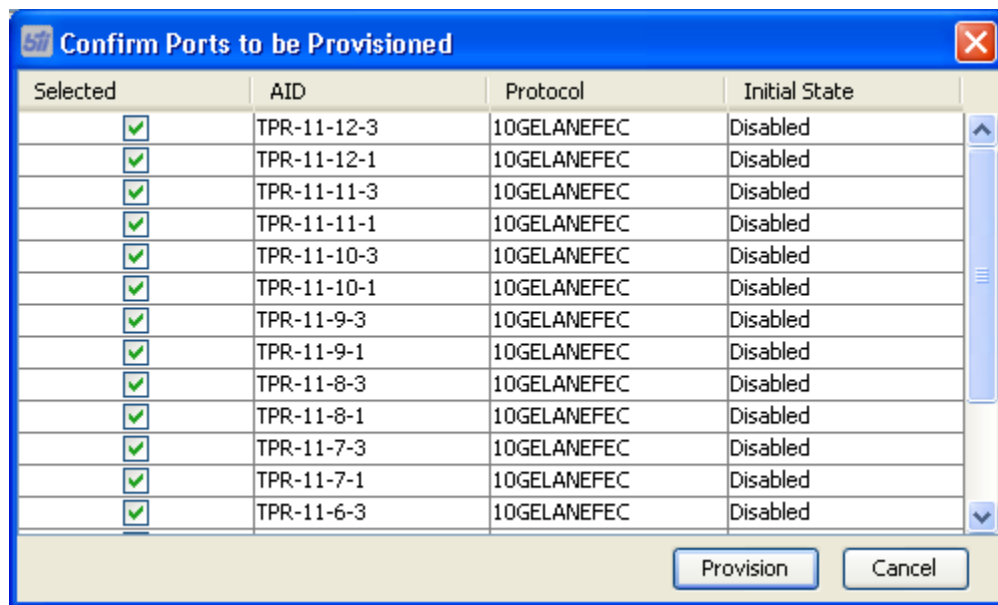
You can also right-click on the System or Shelf in the Navigation tree and choose **Bulk Port Provisioning**. When you access bulk port provisioning from the Navigation tree, only the ports specific to the shelf are available.

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**.

6.3.5 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.



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 6-7](#).

Step 2 Click **Close**.

You have successfully completed this procedure.

Table 6-7 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	<p>The wavelength of the transceiver in nm.</p> <p>Note</p> <p>Some transceivers have a wavelength value that is specified only to the nearest nm, whereas others specify wavelength to the nearest 0.01 nm.</p> <p>Note</p> <p>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.</p>
Minimum Wavelength Note This parameter is supported by a tunable XFP only.	Numeric	The minimum wavelength supported, represented in nm with 0.01 nm resolution.
Maximum Wavelength Note This parameter is supported by a tunable XFP only.	Numeric	The maximum wavelength supported, represented in nm with 0.01 nm resolution.
Wavelength Spacing Note This parameter is supported by a tunable XFP only.	Numeric	The grid spacing in GHz (100GHz, 50GHz)
Reach	Numeric	<p>The maximum transmit distance of the transceiver in kilometers using 9 micron SM fiber.</p> <p>Note</p> <p>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</p>
Connector Type	LC	The listed transceiver connector type

Table 6-7 SFP or XFP transceiver inventory information (Continued)

Parameter	Range of Values	Description
Digital Diagnostics Implemented	Yes No	<p>The digital diagnostic implementation parameter. When set to Yes, this parameter enables the recording of performance data in historical bins.</p> <p>Note</p> <p>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.</p>
Tx Fault Implemented	Yes No	<p>The transceiver fault implemented parameter on the transceiver</p> <p>Note</p> <p>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.</p>
Signal Encoding	8B10B 4B5B NRZ MANCHESTER SONET_SCRAMBLER	<p>The encoding scheme for the transceiver</p> <p>Note</p> <p>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.</p>
Minimum bit rate	Integer	<p>The minimum bit rate supported by the transceiver</p> <p>Note</p> <p>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.</p>
Maximum bit rate	Integer	<p>The maximum bit rate supported by the transceiver</p> <p>Note</p> <p>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.</p>
Nominal bit rate	Integer	<p>The nominal bit rate supported by the transceiver</p> <p>Note</p> <p>If a transceiver inserted in a module port does not have a nominal baud rate value specified in its memory, the system raises</p>

Table 6-7 SFP or XFP transceiver inventory information (Continued)

Parameter	Range of Values	Description
		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
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

6.3.6 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.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

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:

- [6.3.6.1, “Port information for 2-Port GbE Muxponder modules”](#)
- [6.3.6.2, “Port information for 8-Port Multiprotocol Muxponder modules”](#)
- [6.3.6.3, “Port information for 10-Port Multiprotocol Muxponder modules”](#)

Step 2 Click **Close**.

You have successfully completed this procedure.

6.3.6.1 Port information for 2-Port GbE Muxponder modules

Table 6-8 Port information for 2-Port GbE Muxponder modules

Parameter	Range of Values	Description	Applicable Ports
Protocol	See 2.2, “2-Port GbE Muxponder supported protocols” .	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 6.3.6.5, “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 6.3.6.4, “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

Table 6-8 Port information for 2-Port GbE Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable Ports
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
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

6.3.6.2 Port information for 8-Port Multiprotocol Muxponder modules

Table 6-9 Port information for 8-Port Multiprotocol Muxponder modules

Parameter	Range of Values	Description	Applicable Ports and Protocols
Protocol	See 2.4, “8-Port Multiprotocol Muxponder supported protocols” .	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
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 6.3.6.5, “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 6.3.6.4, “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

Table 6-9 Port information for 8-Port Multiprotocol Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
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 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 6.3.6.7, "TOH Transparency on 8-Port and 10-Port Multiprotocol Muxponder modules" .
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 6.3.6.8, "SDCC transparency on 8-Port and 10-Port Multiprotocol Muxponder modules" .	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 6.3.6.9, "Flow control on 8-Port and 10-Port Multiprotocol Muxponder modules" .
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

Table 6-9 Port information for 8-Port Multiprotocol Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable 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

6.3.6.3 Port information for 10-Port Multiprotocol Muxponder modules

Table 6-10 Port information for 10-Port Multiprotocol Muxponder modules

Parameter	Range of Values	Description	Applicable Ports and Protocols
Protocol	See 2.6, “10-Port Multiprotocol Muxponder supported protocols” .	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 6.3.6.5, “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 6.3.6.4, “Fault Propagation	Clients 1 to 10; only when Protocol = GE, FC1, FC2, or FC4

Table 6-10 Port information for 10-Port Multiprotocol Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
		Shutdown and laser status ".	
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	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 6.3.6.7, "TOH Transparency on 8-Port and 10-Port Multiprotocol Muxponder modules" .

Table 6-10 Port information for 10-Port Multiprotocol Muxponder modules (Continued)

Parameter	Range of Values	Description	Applicable Ports and Protocols
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 6.3.6.8, “SDCC transparency on 8-Port and 10-Port Multiprotocol Muxponder modules” .
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 6.3.6.9, “Flow control on 8-Port and 10-Port Multiprotocol Muxponder modules” .
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

6.3.6.4 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.
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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

6.3.6.5 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 [8.2, “Monitoring threshold crossing alerts”](#).

Table 6-11 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 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.

6.3.6.6 Line mapping on 8-Port and 10-Port Multiprotocol Muxponder modules

The following table provides information about line-mapping options available on 8-Port and 10-Port Multiprotocol Muxponder modules.

Muxponder	Line Mapping	Description
8-Port Multiprotocol Muxponder	None	Clients are cross-connected into line ports that are not OTN wrapped Lines provide GCC management; ADM/Pass-through capability enables ring configurations
	OTU1	Clients are cross-connected into line ports that are wrapped into OTU1 OTU1 lines provide GCC management; ADM/Pass-through capability enables ring configurations
	SubODU1 – OTU1	Clients are mapped into SubODU1 containers, which are then multiplexed into OTU1 lines Provides transparent transport for SONET/SDH clients connected asynchronously into the subODU1 quadrants, including all overhead bytes and timing reference transparency
10-Port Multiprotocol Muxponder	None	Clients are cross-connected into line ports that are not OTN wrapped

Muxponder	Line Mapping	Description
		Interface into SONET/SDH devices that are not OTN capable
	OTU2	<p>Clients are cross-connected into line ports that are wrapped into OTU2</p> <p>Provides FEC for added link performance and GCC management; ADM/Pass-through capability enables ring configurations</p>
	ODU1-OTU2	<p>Clients are mapped into ODU1 containers, which are then multiplexed into OTU2 lines</p> <p>Provides transparent transport for OC48/STM16 clients, including all overhead bytes and timing reference transparency</p>

The following images illustrate available line-mapping options.

Figure 6-1 8-Port and 10-Port Multiprotocol Muxponder Line Mapping: NONE and OTU1

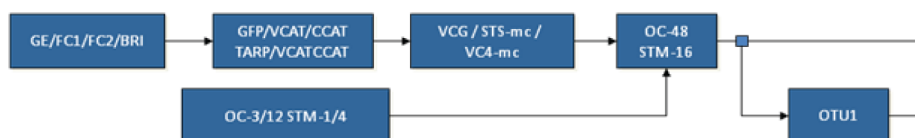


Figure 6-2 8-Port and 10-Port Multiprotocol Muxponder Line Mapping: SubODU1-OTU1

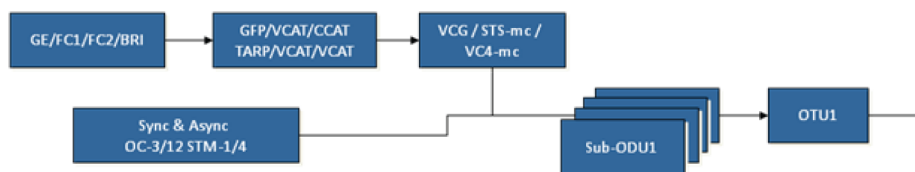


Figure 6-3 10-Port Multiprotocol Muxponder Line Mapping: NONE and OTU2

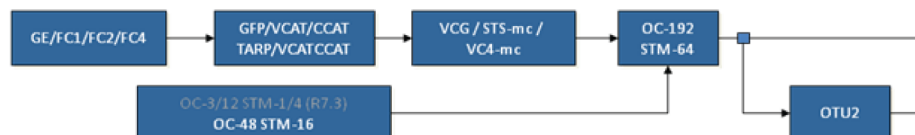
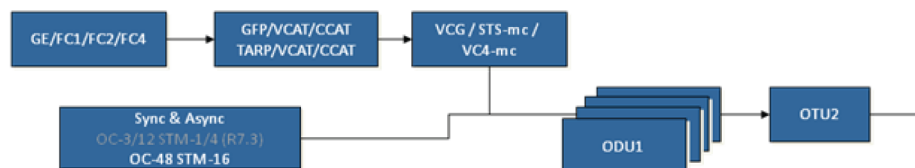


Figure 6-4 10-Port Multiprotocol Muxponder Line Mapping: ODU1-OTU2



6.3.6.7 TOH Transparency on 8-Port and 10-Port Multiprotocol Muxponder modules

By default, when line mapping is set to SubODU1 – OTU1 on an 8-Port Multiprotocol Muxponder, or to ODU1 – ODU2 on a 10-Port Multiprotocol Muxponder, an asynchronous SONET/SDH client regenerates the A1, A2, and B1 bytes in the section overhead. When TOH Transparency is enabled, these bytes are not regenerated but are transported transparently through the Muxponder module with the rest of the section and line overhead.

Note When TOH is enabled, only asynchronous connections can be provisioned. An asynchronous SONET/SDH client is a SONET/SDH client cross-connected asynchronously into a SubODU1 or ODU1 quadrant.

6.3.6.8 SDCC transparency on 8-Port and 10-Port Multiprotocol Muxponder modules

A synchronous SONET/SDH client can have the Section DCC (SDCC), specifically the D1, D2, and D3 bytes, transparently transported through the module. The default is to not transport the SDCC transparently.

The 8-Port Multiprotocol Muxponder module supports SDCC transparency for OC12/STM4 clients. The 10-Port Multiprotocol Muxponder module supports SDCC transparency for OC12/STM4 and OC48/STM16 clients.

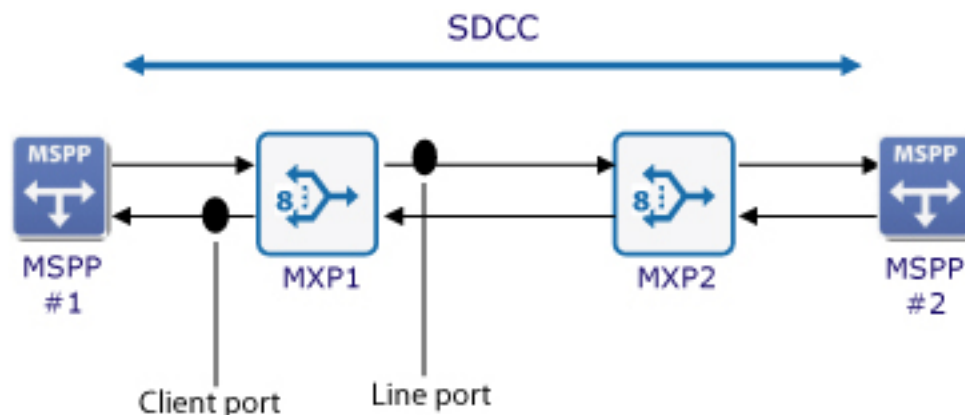
When SDCC Transparency is enabled, it is transported on the client channel specified by the Transparency Channel parameter provided that the specified channel is cross-connected. The Transparency Channel range is from 1 to 48 for SONET and 1 to 16 for SDH.

The following rules apply to SDCC transparency, which is a subset of TOH transparency:

- SDCC transparency is automatically enabled when TOH transparency is enabled.
- SDCC transparency cannot be disabled if TOH transparency is enabled.
- SDCC transparency cannot be changed if the client is connected.
- SDCC transparency cannot be changed if the client is not in a maintenance state (OOS-MA).

Note SDCC transparency is supported between two 8-Port Multiprotocol Muxponder modules and between two 10-Port Multiprotocol Muxponder modules. It is also supported between two 8-Port Multiprotocol Muxponder modules whose lines are carried asynchronously by 10-Port Multiprotocol Muxponder modules. Conversely, SDCC transparency information is lost when an 8-Port Multiprotocol Muxponder line is connected to a synchronously cross-connected 2.5G client on a 10-Port Multiprotocol Muxponder module.

The following illustration and table together list the SDCC transparency behavior.

Figure 6-5 SDCC Transparency**Table 6-12 SDCC transparency behavior**

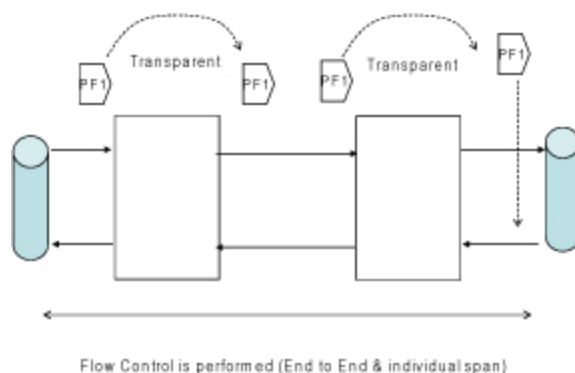
Client port status	Client conditioning	Line conditioning	MSPP #1 Rx SDCC	MSPP #2 Rx SDCC
In service	None	None	MSPP #2 Tx SDCC	MSPP #1 Tx SDCC
Out of service	AIS-L	AIS-P	All 0s pattern	All 0s pattern
Client facility loopback	None	AIS-P	MSPP #1 Tx SDCC	All 0s pattern
Client terminal loopback	AIS-L	None	All 0s pattern	All 0s pattern
IS/Client fault	None	AIS-P	MSPP #2 Tx SDCC	All 1s pattern*
IS/Client fault/Line fault	AIS-P	AIS-P	All 1s pattern*	All 1s pattern*
IS/line fault	AIS-P	None	All 1s pattern*	MSPP #1 Tx SDCC
IS/Path (line-side) fault	AIS-P	None	All 1s pattern*	MSPP #1 Tx SDCC

* Depending on the fault, SDCC may be received.

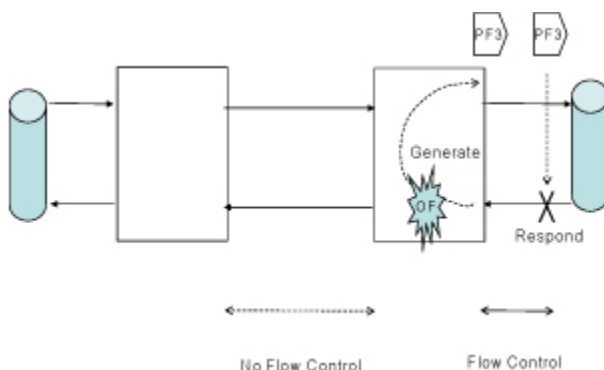
6.3.6.9 Flow control on 8-Port and 10-Port Multiprotocol Muxponder modules

Gigabit Ethernet (GE) client ports on 8-Port and 10-Port Multiprotocol Muxponder modules support two variations of flow control: Transparent and Local.

Transparent flow control is performed between the connected LAN devices; consequently, all pause frames are passed through the Muxponder.



Local flow control is performed between the connected LAN device and the Muxponder. To support subrate connections, the Muxponder generates pause frames when the input buffer reaches a specific level. All pause frames received are passed through the Muxponder. Local flow control can be enabled on GE ports only when GFP Mode is set to GFP-F.



6.3.7 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:
 - [6.3.1, “Provision port settings on a 2-Port GbE Muxponder module”](#)

- [6.3.2, “Provision port settings on an 8-Port Multiprotocol Muxponder module”](#)
- [6.3.3, “Provision port settings on a 10-Port Multiprotocol Muxponder module”](#)

Step 3 Click **Apply**.

You have successfully completed this procedure.

6.3.8 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.

6.3.9 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.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

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.

6.3.10 Delete a port on a Muxponder module

Use this procedure to delete a port on a BTI 7000 Series Muxponder module.



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.

6.4 Provisioning synchronization on Muxponder modules

Muxponder modules are designed to multiplex traffic coming from their client-side ports. Because SONET/SDH networks are synchronous in nature, new TDM traffic coming over client ports must be properly synchronized so that the entire network remains synchronous.

Muxponder modules support the following timing modes:

- Internal, which has a maximum clock accuracy of ± 20 ppm
- Line, which supports a primary timing reference and a secondary timing reference

Also, all 8-Port and 10-Port Multiprotocol Muxponder modules support basic Synchronization Status Messaging (SSM), which can be enabled or disabled on each timing reference. For more information, see [6.4.1, “Basic Synchronization Status Messaging support on 8-Port and 10-Port Multiprotocol Muxponders”](#).

Free Run state

Synchronization is in Free Run state immediately after a Muxponder module is reset or if the PLL has never been synchronized to a reference input. In Free Run state, the frequency accuracy of the output clock is 2.5 ppm.

Lock Acquisition state

In Lock Acquisition state, the input reference (that is, the internal clock or the primary reference) is continuously monitored for frequency accuracy and phase regularity. Upon finding such a timing reference, the Muxponder module transitions to the Locked state.

Locked state

In Locked state, which is the normal operating state, the Muxponder module locks to a reference points and generates output clocks and frame pulses with the frequency accuracy equal to the frequency accuracy of the input reference it is locked to.

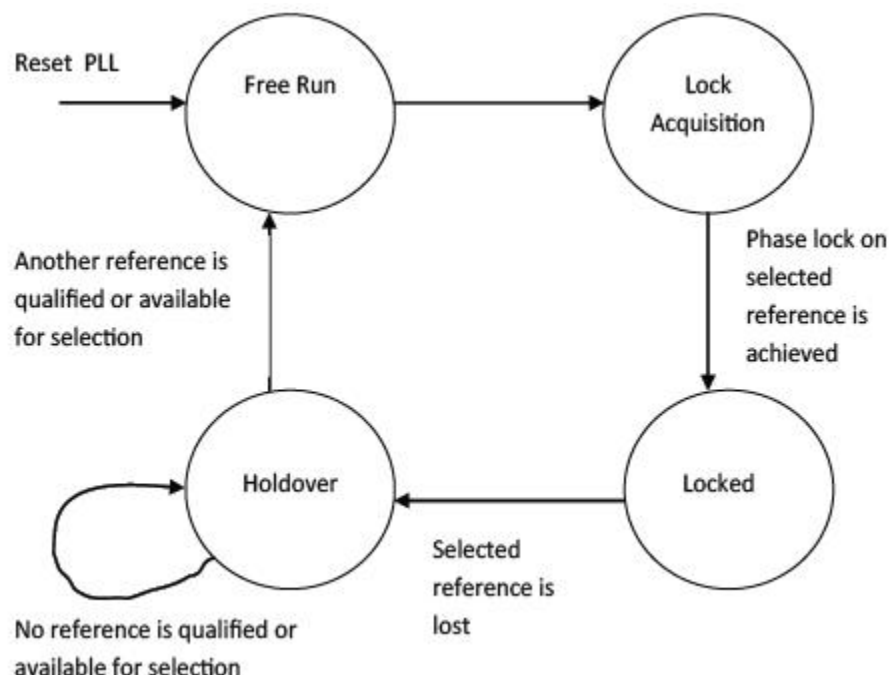
Holdover mode

If during Locked state, the Muxponder module loses the reference input that it locked on to, the Muxponder module transitions to Holdover mode. In this mode, the Muxponder module continues to provide an output clock based on the historical frequency data collected while it was synchronized. This transition is controlled by the PLL to guarantee that its initial frequency offset is better than 100 ppb (parts per billion). The frequency drift in this state depends on the frequency drift of the module's internal clock.

Note	The frequency drift on a Muxponder module in Holdover mode is very rapid and does not conform to the Telcordia standard.
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The following figure explains the synchronization-related triggers and the corresponding state transitions.

Synchronization Finite State Machine



To provision synchronization on a Muxponder module, you must provision the timing mode for the module, and then specify a timing reference and basic SSM setting if applicable. Once this information is provisioned, you can view it at any time.

This section covers the following topics:

- 6.4.1, “Basic Synchronization Status Messaging support on 8-Port and 10-Port Multiprotocol Muxponders”
- 6.4.2, “Provision Muxponder synchronization settings”
- 6.4.3, “Display Muxponder synchronization information”

6.4.1 Basic Synchronization Status Messaging support on 8-Port and 10-Port Multiprotocol Muxponders

8-Port and 10-Port Multiprotocol Muxponder modules support a basic form of Synchronization Status Messaging (SSM). For more information, see [6.4, “Provisioning synchronization on Muxponder modules”](#).

Basic SSM support allows for only two synchronization status messages, or values: '0000' STU (Synchronized-Traceability Unknown) or '1111' DUS (Do Not Use for Timing Synchronization). These messages can be transmitted in the S1 Byte b5-b8 for all SONET and SDH client and line ports.

Basic SSM support can be enabled or disabled on each primary and secondary timing reference specified when synchronization is provisioned and the timing mode is set to Line, as described in the following table.

Line mapping	Client traffic	Timing options	SSM options
None	With SONET/SDH client traffic	Line	Enabled Disable
	Without SONET/SDH client traffic	Line Internal	Enabled Disable
OTU1/OTU2	With SONET/SDH client traffic	Line	Enabled Disable
	Without SONET/SDH client traffic	Line Internal	Enabled Disable
SubODU1-OTU1/ODU1-OTU2	With SONET/SDH client traffic	Internal	Not applicable (with Internal)
	Without SONET/SDH client traffic	Internal	Not applicable (with Internal)

When enabled, Basic SSM prevents timing loops from occurring as a result of failures on the network or incorrect configuration.

When Basic SSM is either enabled or disabled, the following apply:

- STU is transmitted on any port that cannot be provisioned as a timing reference.
- STU is transmitted on any port provisioned as a timing reference that is not the active timing reference.
- DUS is transmitted on any port provisioned as a timing reference that is the active timing reference.

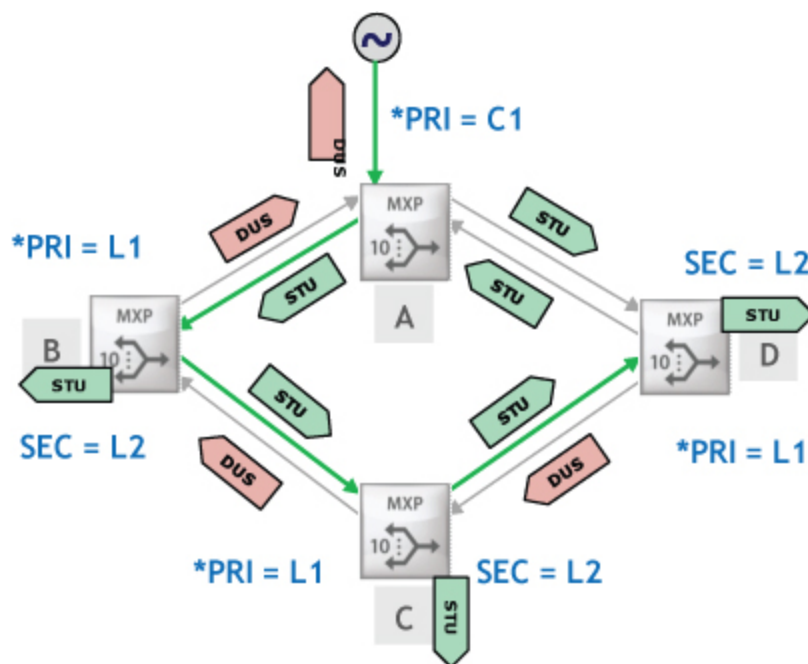
When Basic SSM is enabled, the following apply:

- A timing reference will not be used as the active reference if it is actively receiving a DUS message.
- A timing reference is invalid and cannot be used as the active timing reference if and only if LOS, LOF, AISL, or RX DUS is present.

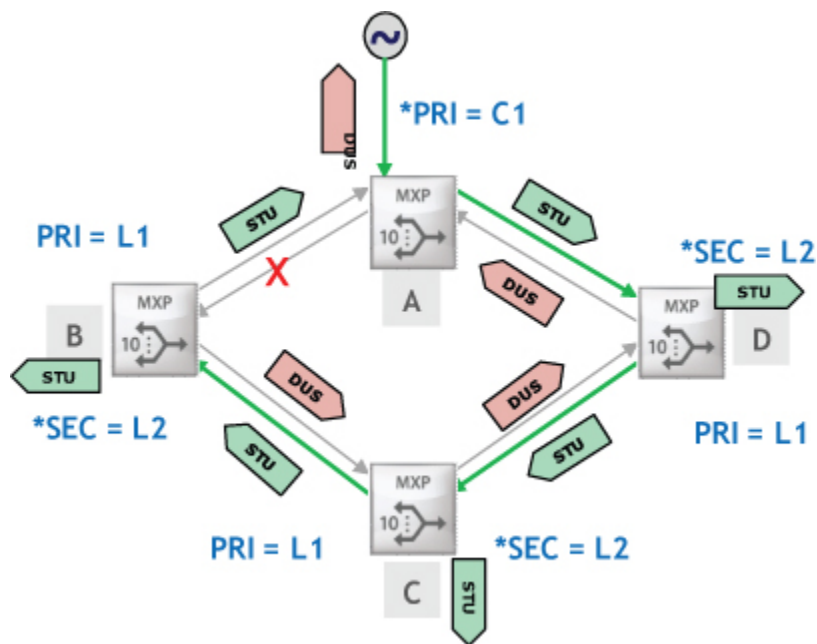
When Basic SSM is disabled, the following apply:

- A timing reference can be used as the active reference if it is actively receiving a DUS message.
- A timing reference is invalid and cannot be used as the active timing reference if and only if LOS, LOF, or AISL is present.
- A timing reference will keep transmitting STU and will keep receiving SSM signals, but it will not react to the signaling.
- A timing reference switch will occur only when LOS, LOF, or AISL is present on an active reference.

The following figure illustrates how SSM works in a steady-state synchronous network.



The following figure illustrates how SSM works when a failure occurs in a synchronous network. Active references appear in green, while references in stand-by mode appear in red.



6.4.2 Provision Muxponder synchronization settings

Use this procedure to provision synchronization on a BTI 7000 Series Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Line-side ports must be provisioned.

Rules for primary and secondary timing references

- Primary and secondary timing references can be provisioned only if the **Timing Mode** parameter is set to **Line**.
- A provisioned line-side port can be provisioned as a primary or secondary timing reference.
- On an 8-Port or 10-Port Multiprotocol Muxponder module, line-side ports and client-side ports C1 or C2 can be provisioned as a primary or secondary timing reference, and only if provisioned as SONET/SDH.
- A client- or line-side port involved in a timing reference cannot be deleted; however, it can be removed from service.
- If the primary timing reference is lost, the Muxponder module switches to the secondary timing reference, provided that the secondary timing reference has been provisioned. If the secondary timing reference has not been provisioned, the module goes into Holdover mode. In this mode, clock accuracy is 100 parts per billion and is relative to the last available clock (that is, either the primary timing reference or the system's internal clock).
- If both the primary and secondary timing references are lost, the Muxponder module goes into Holdover mode.
- A port that is provisioned as the primary timing reference cannot be provisioned as the secondary timing reference.
- Once provisioned, the timing mode cannot be directly changed from one mode to the other. The timing reference must be provisioned to None before it can be changed.

Note	Other modules can use client ports C3 and C4 as their timing reference if they are connected to client or line ports that are allowed to be timing references, provided that client ports C3 and C4 are provisioned to use a SONET/SDH protocol.
-------------	--

Provisioning synchronization

Follow these steps to provision synchronization for a Muxponder module:

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

Step 2 In the **Provision Synchronization** dialog, do one of the following:

a) In the **Timing Mode** area, enable the **Internal** option, and then proceed to step 5.

Note	When line mapping is set to SUBODU1 – OTU1 on the 8-Port Multiprotocol Muxponder or to ODU1 – OTU2 on the 10-Port Multiprotocol Muxponder and asynchronous clients are provisioned, the timing mode can set to Internal .
-------------	--

b) In the **Timing Mode** area, enable the **Line** option, and then proceed to step 3.

Step 3 In the **Timing Reference** area, choose a port in the **Primary** or **Secondary** list.

The status (**Working** or **Standby**) of each port you selected appears in the corresponding **Status** field.

Step 4 Choose **Yes** or **No** from the **Primary SSM** and **Secondary SSM** lists.

Step 5 Click **Apply**.

You have successfully completed this procedure.

6.4.3 Display Muxponder synchronization information

Use this procedure to view synchronization settings for a BTI 7000 Series Muxponder module.



Prerequisites

- The module must be provisioned.

Displaying synchronization information

Follow these steps to view synchronization information for a Muxponder module:

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

The **Provision Synchronization** dialog displays the **Timing Mode** and, if applicable, **Timing Reference** information for the Muxponder module.

Step 2 Click **Close**.

You have successfully completed this procedure.

6.5 General Communications Channel

The BTI 7000 Series uses the general communications channel (defined in ITU-T standard G.709-2003) to form an IP-based network for management communications. Service Providers can use the GCC to manage their networks without impacting customer bandwidth, or using another wavelength on their fibers. BTI uses the GCC0 bytes defined in the OTU2 overhead to form a 1.3 Mb/s channel for management traffic.

GCC0 functionality requires that OSPF be enabled and that the GCC0 exist before the GCC0 itself is enabled on a GCC-capable port of a supporting module. Once the GCC0 is enabled, it can be removed from service when necessary and then restored to service, and it can be disabled. For detailed information about the GCC0, the modules on which it is supported, the applications and configurations it supports, and enabling OSPF, see the *BTI 7000 Series Management Communication Channels Solutions Guide*.

6.5.1 Enable the General Communications Channel

Use this procedure to enable the General Communications Channel on a GCC-capable port on any of the following modules:

- 8-Port Multiprotocol Muxponder
- 10-Port Multiprotocol Muxponder
- packetVX Integrated Packet Services Module - 24/2



Prerequisites

- The GCC0 must exist and the OSPF must be enabled. See the *Management Communications Channel Solutions Guide* for detailed information.
- The module port must be provisioned to use an OTN protocol.
- The port laser control parameter must be configured to allow software to automatically control the laser status.

Enabling the GCC0

Follow these steps to enable the GCC0:

- Step 1** In the toolbar, click the System Configuration icon. The System Configuration view of the shelf displays in the Navigation pane.
- Step 2** In the Navigation pane, right-click a GCC-capable module, and click **Provision GCC0**. The **Provision <module>** dialog appears.
- Step 3** In the **Provision Port<module>** dialog, click the **GCC0** tab.

Step 4 In the **Settings** area, select one of the following modes. By default, the mode is set at Disabled:

- **Full Rate** — to use the full available bandwidth of 1.3 Mb/s
- **Low Rate** — to limit channel traffic to 192/Kbs

Step 5 Click **Apply**.

You have successfully completed this procedure.

6.5.2 Remove the General Communications Channel from service

Use this procedure to remove the General Communications Channel from service.



Prerequisites

- The GCC0 must be enabled.

Removing the GCC0 from service

Follow these steps to remove the GCC0 from service:

Step 1 In the Navigation pane, right-click a GCC-capable port, and click **Provision GCC0**.

Step 2 In the **Provision<module type> <shelf-slot-port>** dialog, click the **GCC0** tab.

Step 3 In the **State Management** area, click **Remove**.

Step 4 Click **Apply**.

You have successfully completed this procedure.

6.5.3 Restore the General Communications Channel to service

Use this procedure to restore the General Communications Channel to service.



Prerequisites

- The GCC0 must be enabled and removed from service.

Restoring the GCC0 to service

Follow these steps to restore the GCC0 to service:

Step 1 In the Navigation pane, right-click a GCC-capable port on a module, and click **Provision GCC0**.

Step 2 In the **Provision**<module type> <shelf-slot-port> dialogue, click the **GCC0** tab.

Step 3 In the **State Management** area, click **Restore**.

Step 4 Click **Apply**.

You have successfully completed this procedure.

6.5.4 Disable the General Communications Channel

Use this procedure to disable the General Communications Channel.



Prerequisites

- The GCC0 must be enabled.

Disabling the GCC0

Follow these steps to disable the GCC0:

Step 1 In the Navigation pane, right-click a GCC-capable port on a module, and then click **Provision Port**.

Step 2 In the **Provision Port** dialog, click the **GCC0** tab.

Step 3 On the **GCC0** tab, choose **Disabled** from the **GCC0 Mode** list.

Step 4 Click **Apply**.

You have successfully completed this procedure.

7.0 Muxponder cross-connections

This section provides information about provisioning cross-connections on Muxponder modules.

- [7.1, “Provisioning cross-connections on Muxponder modules”](#)
- [7.2, “VCAT and CCAT connections on Muxponder modules”](#)
- [7.3, “Virtual Concatenation groups”](#)
- [7.4, “Synchronous CCAT client connections supported on Muxponder modules”](#)
- [7.5, “Asynchronous and mapping on Muxponder modules”](#)
- [7.6, “Provision a VCAT cross-connection on a Muxponder module”](#)
- [7.7, “Provision a CCAT cross-connection on a Muxponder module”](#)
- [7.8, “Display cross-connection information for a Muxponder module”](#)
- [7.9, “Delete a cross-connection on a Muxponder module”](#)

7.1 Provisioning cross-connections on Muxponder modules

Cross-connections on a Muxponder provide connectivity between ports. No connectivity exists between ports until a cross-connection is provisioned.

The following cross-connection types are supported on Muxponder modules.

- 2-Way Add/Drop cross-connection is an unprotected, bidirectional, logical connection between a client-side port and a line-side port.
- 2-Way Pass-Through cross-connection is an unprotected, bidirectional, logical connection between a line-side port and another line-side port in a pass-through node.
- 2-WayPR Add/Drop cross-connection is a path protected, bidirectional, logical connection between a client-side port and a line-side port.

Note A cross-connection between two client-side ports is not supported.

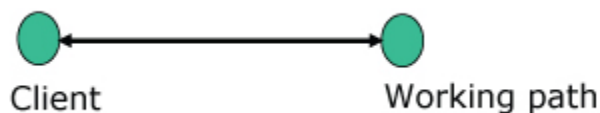
- 2-Port GbE Muxponder modules support only VCAT connections.
- 8-Port and 10-Port Multiprotocol Muxponders support both VCAT and CCAT connections.

You can view information about a provisioned cross-connection, and if you no longer require a cross-connection, you can delete it. Also, because a provisioned cross-connection cannot be modified, if you need to change any parameter of a provisioned cross-connection, such as the source, destination, or type, you must delete it, and then provision a new cross-connection using the revised parameters.

2-Way cross-connection

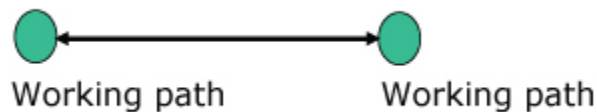
The following figure shows a 2-Way cross-connection between a client-side port and a line-side port. The line-side entity can be either a VCG or an STS path object.

2-Way cross-connection



The following figure shows a 2-Way cross-connection in a pass-through node. The connection is made between a line-side port (source), or working path, and another line-side port (destination), or working path. The source and destination entities can be either VCGs or STS path objects.

2-Way cross-connection in a pass-through node

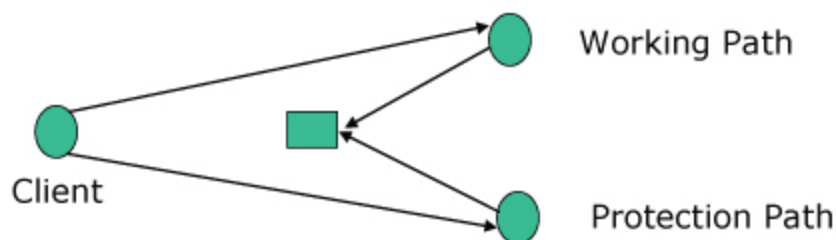


Note On an 8-Port or 10-Port Multiprotocol Muxponder module, a pass-through connection can be any VCAT or CCAT connection supported for a client.

2-WayPR cross-connection

The following figure shows a 2-WayPR Add/Drop cross-connection between a VCG or a time-slot on the line-side and a client-side port. The protection path, or switch mate, is a VCG or a time-slot on the other line.

2-WayPR Add/Drop cross-connection



Note 2-WayPR cross-connections are supported only for VCAT (VCG) connections.

STS-1 and VC-4 path facility objects

Path facility objects are automatically created when a cross-connection is provisioned. STS-1 path facility objects are created on SONET Muxponder modules, while VC-4 path facility objects are created on SDH Muxponder modules.

The following tables list the number of STS and VC-4 path facility objects created on a line-side port when a cross-connection is provisioned on a Muxponder module.

Table 7-1 STS path facility objects created on Muxponder modules

Path Facility Object	2-Port GbE Muxponder	8-Port Multiprotocol Muxponder	10-Port Multiprotocol Muxponder
STS-1	48	48	192
STS-3c	Not supported	16	64
STS-6c	Not supported	8	32
STS-9c	Not supported	5	21
STS-12c	Not supported	4	16
STS-15c	Not supported	3	12
STS-18c	Not supported	2	9
STS-21c	Not supported	2	8
STS-24c	Not supported	2	8
STS-30c	Not supported	1	6
STS-36c	Not supported	1	5

Table 7-1 STS path facility objects created on Muxponder modules (Continued)

Path Facility Object	2-Port GbE Muxponder	8-Port Multiprotocol Muxponder	10-Port Multiprotocol Muxponder
STS-48c	Not supported	1	4
STS-74c	Not supported	Not supported	2

Table 7-2 VC-4 path facility objects created on Muxponder modules

Path Facility Object	2-Port GbE Muxponder	8-Port Multiprotocol Muxponder	10-Port Multiprotocol Muxponder
VC-4	16	16	64
VC-4-2c	Not supported	8	32
VC-4-3c	Not supported	5	21
VC-4-4c	Not supported	4	16
VC-4-5c	Not supported	3	12
VC-4-6c	Not supported	2	10
VC-4-7c	Not supported	2	9
VC-4-8c	Not supported	2	8
VC-4-10c	Not supported	1	6
VC-4-12c	Not supported	1	5
VC-4-16c	Not supported	1	4
VC-4-24c	Not supported	Not supported	2

Note VC-4-3c and VC-4-5c for sub-rate GE CCAT are supported for First Office Applications only.

7.2 VCAT and CCAT connections on Muxponder modules

On Muxponder modules, a cross-connection can be either a Virtual Concatenation (VCAT) connection or a Contiguous Concatenation (CCAT) connection. A VCAT connection uses a Virtual Concatenation Group (VCG) as its source. For information about VCGs, see [7.3, “Virtual Concatenation groups”](#). A CCAT connection uses a time slot on a line port as its source.

The following table identifies the connection types supported on each Muxponder module.

Table 7-3 Muxponder modules supporting VCAT or CCAT connections

Muxponder module	Connection	Destination client ports
2-Port GbE Muxponder	VCAT	All
8-Port Multiprotocol Muxponder	VCAT/CCAT	All
10-Port Multiprotocol Muxponder	VCAT/CCAT	All

The following tables list the VCAT and CCAT types supported by client ports on 8-Port and 10-Port Multiprotocol Muxponder modules. For information about the protocols supported on these modules, see [Chapter 2, “Muxponder features and supported protocols”](#).

Table 7-4 VCAT types

Client protocol	SONET VCAT		SDH VCAT
	STS-1 VCG Type	STS-3c VCG Type	
GE (GFP-T)	STS-1-22v	STS-3c-7v	VC-4-7v
GE (GFP-F)	STS-1-21v	STS-3c-7v	VC-4-7v
FC100	STS-1-19v	STS-3c-6v	VC-4-6v
FC200	STS-1-37v	STS-3c-12v	VC-4-12v
FC400	STS-1-74v	STS-3c-24v	VC-4-24v
SD-SDI	STS-1-6v	STS-3c-2v	VC-4-2v
100FX	STS-1-3v	STS-3c-1v	VC-4-1v
HD-SDI-1.001	STS-1-31v	STS-3c-10v	VC-4-10v
HD-SDI	STS-1-31v	STS-3c-10v	VC-4-10v

Note An STS-1 can start in any position. An STS-3c must start on a boundary.

Table 7-5 CCAT types

Client protocol	SONET CCAT	SDH CCAT
GE (GFP-T)	STS-21c	VC-4-7c
	STS-24c	VC-4-8c
GE (GFP-F)	STS-1	VC-4
	STS-3c	VC-4-2c
	STS-6c	VC-4-3c
	STS-9c	VC-4-4c
	STS-12c	VC-4-5c
	STS-15c	VC-4-6c
	STS-18c	VC-4-7c
	STS-21c	VC-4-8c
	STS-24c	
OC48	STS-1	Not supported
	STS-3c	
	STS-6c	
	STS-9c	
	STS-12c	
	STS-15c	
	STS-18c	
	STS-21c	
	STS-24c	
	STS-30c	
	STS-36c	
	STS-48c	
	STS-74c	
STM16	Not supported	VC-4
		VC-4c
		VC-4-16c
FC100	STS-18c	VC-4-6c
FC200	STS-36c	VC-4-12c
FC400	STS-72c	VC-4-24c
SD-SDI	STS-6c	VC-4-2c
100FX	STS-3c	VC-4
HD-SDI-1.001	STS-30c	VC-4-10c
HD-SDI	STS-30c	VC-4-10c

Rules and restrictions on VCAT and CCAT connections

- VCAT connections can be either 2-Way or 2-WayPR cross-connections.

- 2** CCAT connections can be either 2-Way or 2-wayPR cross-connections.
- 3** For STS-1, connections can begin on any STS-1.
- 4** For all other STSs, CCAT connections must begin on one of the following STSs:
1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76,
79, 82, 85, 88, 91, 94, 97, 100, 103, 106, 109, 112, 115, 118, 121, 124, 127, 130, 133, 136,
139, 142, 145, 148, 151, 154, 157, 160, 163, 166, 169, 172, 175, 178, 181, 184, 187, 190
- 5** For VC-4, connections can begin on any VC-4 (1 to 64).
- 6** For all other VC-4s, CCAT connections can begin on any VC-4 (1-64):
- 7** FC connections into SONET/SDH must be full rate.

7.3 Virtual Concatenation groups

Virtual Concatenation Groups (VCGs) are used to group the STSs and VC-4s that can be used in a Virtual Concatenated (VCAT) connection. They are much like non-contiguous concatenated signals. For information about VCAT connections, see [7.2, “VCAT and CCAT connections on Muxponder modules”](#).

When a SONET or SDH line port on a Muxponder module is provisioned, default VCGs are automatically created. On 2-Port GbE Muxponder default VCGs are fixed and cannot be modified or deleted. However, on 8-Port and 10-Port Multiprotocol Muxponders, default VCGs can be modified and deleted, and new VCGs can be provisioned, modified, and deleted.

SONET VCGs contain any combination of only STS-1s or only STS-3cs. SDH VCGs contain a combination of only VC-4s.

This section covers the following topics:

- [7.3.1, “Provision VCGs on an 8-Port or 10-Port Multiprotocol Muxponder module”](#)
- [7.3.2, “Delete VCGs on an 8-Port or 10-Port Multiprotocol Muxponder module”](#)
- [7.3.3, “Default VCG formats for SONET or SDH line-side ports on 2-Port GbE Muxponder modules”](#)
- [7.3.4, “Default VCG formats for SONET or SDH line-side ports on 8-Port Multiprotocol Muxponder modules”](#)
- [7.3.5, “Default VCG formats for SONET or SDH line-side ports on 10-Port Multiprotocol Muxponder modules”](#)

7.3.1 Provision VCGs on an 8-Port or 10-Port Multiprotocol Muxponder module

Use this procedure to provision deleted default Virtual Concatenation Groups (VCGs) on an 8-Port or 10-Port Multiprotocol Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Line port must be provisioned.
- A default VCG must be deleted.

Provisioning VCGs

Follow these steps to provision a VCG:

Step 1 In the Navigation pane, right-click Line 1 or Line 2 on an 8-Port or 10-Port Multiprotocol Muxponder module, and then click **Provision VCG**.

Step 2 In the **Virtual Concatenation Groups** dialog, click the **Add** button.

- Step 3** In the **Add Virtual Concatenation Group** dialog, choose a value from the following lists:
- **Format** — to specify the format of the concatenation
 - **Group Number** — to specify the identifier (i.e., 1 to 10)
 - **Ascending STS Selection** — optional, to auto-select the contiguous number of time slots required to satisfy the format selected.
- Step 4** Click an available time slot in the **Time Slot** matrix.
- Step 5** Click **Apply**.

You have successfully completed this procedure.

7.3.2 Delete VCGs on an 8-Port or 10-Port Multiprotocol Muxponder module

Use this procedure to delete Virtual Concatenation Groups on an 8-Port or 10-Port Multiprotocol Muxponder module.



Prerequisites

- The VCG must be provisioned.
- The VCG must not be involved in a cross-connection.

Deleting VCGs

Follow these steps to delete a VCG:

- Step 1** In the Navigation pane, right-click Line 1 or Line 2 on an 8-Port or 10-Port Multiprotocol Muxponder module, and then click **Provision VCG**.
- Step 2** In the **Virtual Concatenation Groups** dialog, select a VCG, and then click **Delete**.
- Step 3** Repeat step 2 for each VCG you want to delete.
- Step 4** Optionally, you can multi-select a contiguous set of the VCGs and delete it.
- Step 5** Click **Close**.

You have successfully completed this procedure.

7.3.3 Default VCG formats for SONET or SDH line-side ports on 2-Port GbE Muxponder modules

The following tables list the fixed line port VCGs for SONET and SDH protocols on 2-Port GbE Muxponder modules. These VCGs cannot be deleted.

Table 7-6 SONET line port VCGs on 2-Port GbE Muxponder modules

Name	Format	Time slots
Line 1 VCG 1, Line 2 VCG 1	STS-1-21v	1 to 6 13 to 21 25 to 30
Line 1 VCG 2, Line 2 VCG 2	STS-1-21v	7 to 12 31 to 45
Line 1 VCG 3, Line 2 VCG 3	STS-1-3v	22 to 24
Line 1 VCG 4, Line 2 VCG 4	STS-1-3v	46 to 48

Table 7-7 SDH line port VCGs on 2-Port GbE Muxponder modules

Name	Format	Time slots
Line 1 VCG 1, Line 2 VCG 1	VC-4-7v	1 to 2 5 to 7 9 to 10
Line 1 VCG 2, Line 2 VCG 2	VC-4-7v	3 to 4 11 to 15
Line 1 VCG 3, Line 2 VCG 3	VC-4-1v	8
Line 1 VCG 4, Line 2 VCG 4	VC-4-1v	16

Note For provisioning a cross-connection on a 2-Port GbE Muxponder, Client 1 can connect only to VCG 1, Client 2 can connect only to VCG 2, Client 3 can connect only to VCG 3, and Client 4 can connect only to VCG 4.

7.3.4 Default VCG formats for SONET or SDH line-side ports on 8-Port Multiprotocol Muxponder modules

The following tables list the default line port VCGs for SONET and SDH protocols on 8-Port Multiprotocol Muxponder modules. These VCGs can be deleted.

Table 7-8 Default SONET line port VCGs on 8-Port Multiprotocol Muxponder modules

Name	Format	Time slots
Line 1 VCG 1, Line 2 VCG 1	STS-1-22v	1 to 22
Line 1 VCG 2, Line 2 VCG 2	STS-1-22v	23 to 24

Table 7-9 Default SDH line port VCGs on 8-Port Multiprotocol Muxponder modules

Name	Format	Time slots
Line 1 VCG 1, Line 2 VCG 1	VC-4-7v	1 to 7
Line 1 VCG 2, Line 2 VCG 2	VC-4-7v	8 to 14

7.3.5 Default VCG formats for SONET or SDH line-side ports on 10-Port Multiprotocol Muxponder modules

The following tables list the default line port VCGs for SONET and SDH protocols for 10-Port Multiprotocol Muxponder modules. These VCGs can be deleted.

Table 7-10 Default SONET line port VCGs on 10-Port Multiprotocol Muxponder modules

Name	Format	Time slots
Line 1 VCG 1, Line 2 VCG 1	STS-1-22v	1 to 22
Line 1 VCG 2, Line 2 VCG 2	STS-1-22v	23 to 44
Line 1 VCG 3, Line 2 VCG 3	STS-1-22v	45 to 66
Line 1 VCG 4, Line 2 VCG 4	STS-1-22v	67 to 88
Line 1 VCG 5, Line 2 VCG 5	STS-1-22v	89 to 110
Line 1 VCG 6, Line 2 VCG 6	STS-1-22v	111 to 132
Line 1 VCG 7, Line 2 VCG 7	STS-1-22v	133 to 154
Line 1 VCG 8, Line 2 VCG 8	STS-1-22v	155 to 176

Table 7-11 Default SDH line port VCGs on 10-Port Multiprotocol Muxponder modules

Name	Format	Time slots
Line 1 VCG 1, Line 2 VCG 1	VC-4-7v	1 to 7
Line 1 VCG 2, Line 2 VCG 2	VC-4-7v	8 to 14
Line 1 VCG 3, Line 2 VCG 3	VC-4-7v	15 to 21
Line 1 VCG 4, Line 2 VCG 4	VC-4-7v	22 to 28
Line 1 VCG 5, Line 2 VCG 5	VC-4-7v	29 to 35
Line 1 VCG 6, Line 2 VCG 6	VC-4-7v	36 to 42
Line 1 VCG 7, Line 2 VCG 7	VC-4-7v	43 to 49
Line 1 VCG 8, Line 2 VCG 8	VC-4-7v	50 to 56
Line 1 VCG 9, Line 2 VCG 9	VC-4-7v	57 to 63

7.4 Synchronous CCAT client connections supported on Muxponder modules

The following tables provide information about synchronous SONET/SDH client connections supported Muxponder modules.

Table 7-12 Synchronous SONET CCAT client connections

Client protocol	STS	
	Standard	Irregular
OC3	STS-1	—
	STS-3c	—
OC12	STS-1	—
	STS-3c	—
	STS-12c	—
OC48	STS-1	STS-6c
	STS-3c	STS-9c
	STS-12c	STS-15c
	STS-48c	STS-18c
		STS-21c
		STS-24c
		STS-30c
		STS-36c

Table 7-13 Synchronous SDH CCAT client connections

Client protocol	VC-4	
	Standard	Irregular
STM1	VC-4	—
STM4	VC-4	—
	VC-4c	—
STM16	VC-4	VC-4-2c
	VC-4-4c	VC-4-3c
	VC-4-16c	VC-4-5c
		VC-4-6c
		VC-4-7c
		VC-4-8c
		VC-4-10c
		VC-4-12c

7.5 Asynchronous and mapping on Muxponder modules

Asynchronous mapping refers to the line mapping modes SubODU1-OTU1 for 8-Port Multiprotocol Muxponders and ODU1-OTU2 for 10-Port Multiprotocol Muxponders. It allows SONET/SDH clients to be transported transparently using Sub-ODU1 or ODU1 containers to retain and preserve client timing reference as well as SONET/SDH client transport overheads.

Note With asynchronous mapping, other data traffic (e.g., GE, FC) is transported synchronously along with Asynchronous SONET/SDH client traffic.

Asynchronous Transparency vs. TOH Transparency vs. SDCC Transparency

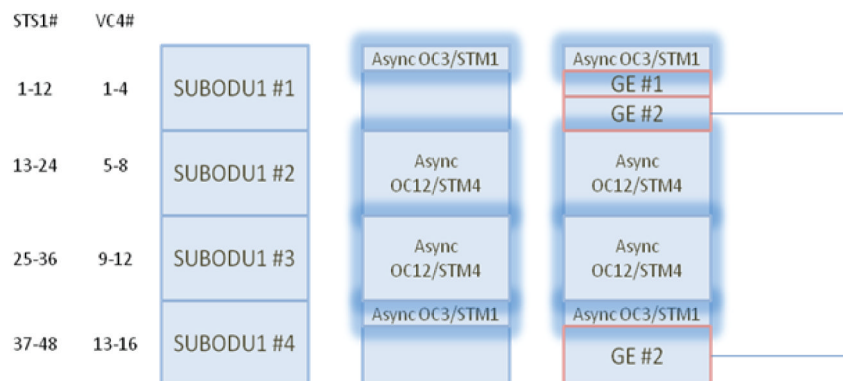
The following table briefly summarizes the capabilities, intended applications and limitations of the Asynchronous Transparency, TOH Transparency, and SDCC Transparency options.

Transparency Option	Description	When to Use	How to Enable
Asynchronous/ synchronous Transparency	Provides full SONET/SDH client transparency, including overhead bytes and client timing reference.	When full client overhead transparency is required and/or client timing reference wants to be retained .	Line Mapping must be SubODU1-OTU1 (MXP8) or ODU1-OTU2 (MXP10) with async SONET/SDH clients.
TOH Transparency	Available when line mapping Sub-ODU1-OTU1 or ODU1-OTU2 is provisioned. When TOH Transparency is disabled, A1, A2, and B1 bytes are regenerated.	Disabled by default. See 6.3.6.7, "TOH Transparency on 8-Port and 10-Port Multiprotocol Muxponder modules" .	Line Mapping must be SubODU1-OTU1 or ODU1-OTU2 with async SONET/SDH clients.
SDCC Transparency	Provides Section DCC (D1, D2, D3) transparency per synchronous SONET/SDH client.	When an OTN interface is not required and when async transparency is not used, this feature provides SDCC transparency for management channel cut-through.	Enable when provisioning the client port.

8-Port Multiprotocol Muxponder asynchronous mapping

- Asynchronous SONET/SDH client connections can be mapped into any of the four SubODU1 frames.
- Sub-ODU1 frames are statically mapped to the line-side time slots STS-1#/VC-4#. For instance, Sub-ODU1 #1 is mapped to STS-1#1 to STS-1#12.
- Asynchronous OC3/STM1 takes up the first three STS-1s or the first VC-4 of the Sub-ODU1 frame.
- Asynchronous OC12/STM4 takes up the whole Sub-ODU1 frame.
- Sub-ODU1s can be used to carry other synchronous data or SONET/SDH traffic (not async SONET/SDH traffic). In fact, the synchronous traffic can occupy any time slots in any of the unused bandwidth available in any or all of the four Sub-ODU1 blocks.
- Multiple synchronous client connections can be carried within a single Sub-ODU1.
- A synchronous client connection can also span across multiple Sub-ODU1s.
- Up to four asynchronous SONET/SDH clients are supported even if the traffic is unprotected.

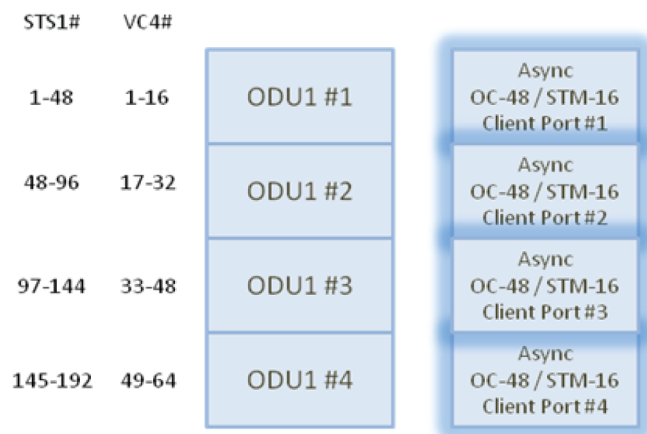
Figure 7-4 8-Port Multiprotocol Muxponder asynchronous mapping



10-Port Multiprotocol Muxponder asynchronous mapping

ODU1 cross connect provisioning is available on all 10-Port Multiprotocol Muxponders when the module is provisioned with ODU1-OTU2 line mapping on both Line ports.

To facilitate asynchronous mapping, time slots on a 10G port have been divided into four ODU1 quadrants. Each quadrant has a designated range of time slots. There are 48 STS-1 in each SONET quadrant and 16 VC-4s in each SDH quadrant.

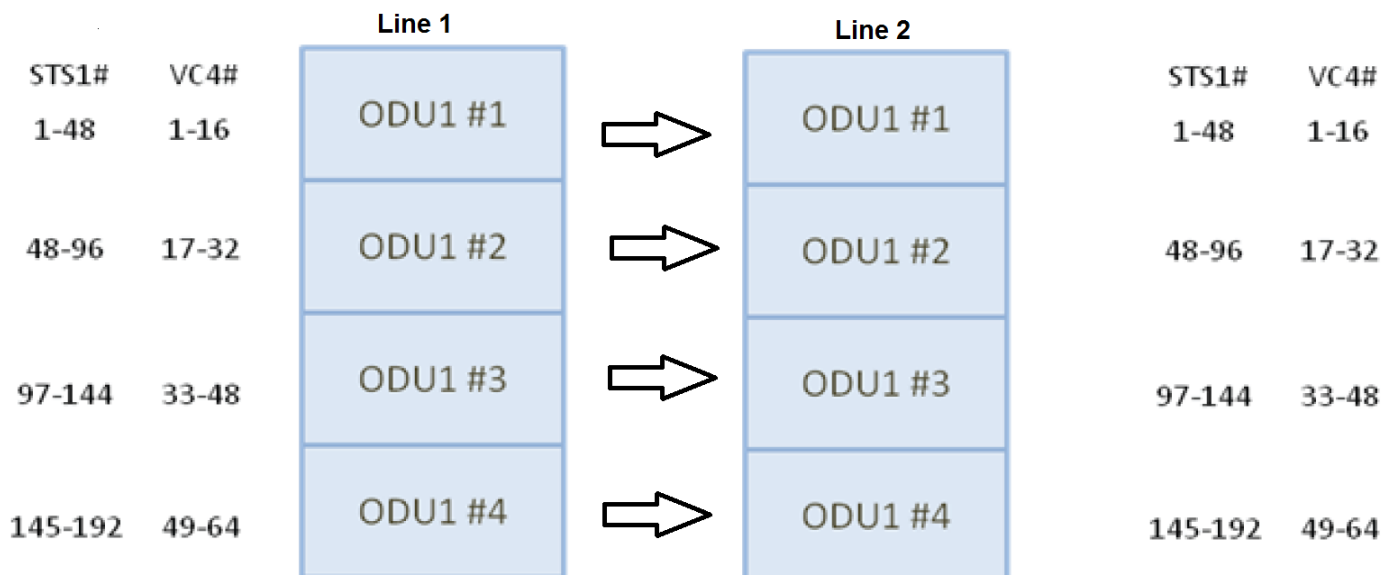
Figure 7-5 10-Port Multiprotocol Muxponder asynchronous mapping

Each ODU1 cross connection is allocated the time slots within one quadrant. Once the ODU1 quadrant is allocated to a cross connection, the time slots within the quadrant are no longer available to any other cross connections. The reverse is also true. If the time slots within the quadrants have been used in other cross connections, they will be unavailable to use in the ODU1 block.

Provisioning ODU1 cross connections may vary between 10-Port Multiprotocol Muxponder types.

ODU1 cross connections on BT7A48AA-I02 [SONET] and BT7A48BA-I02 [SDH] modules

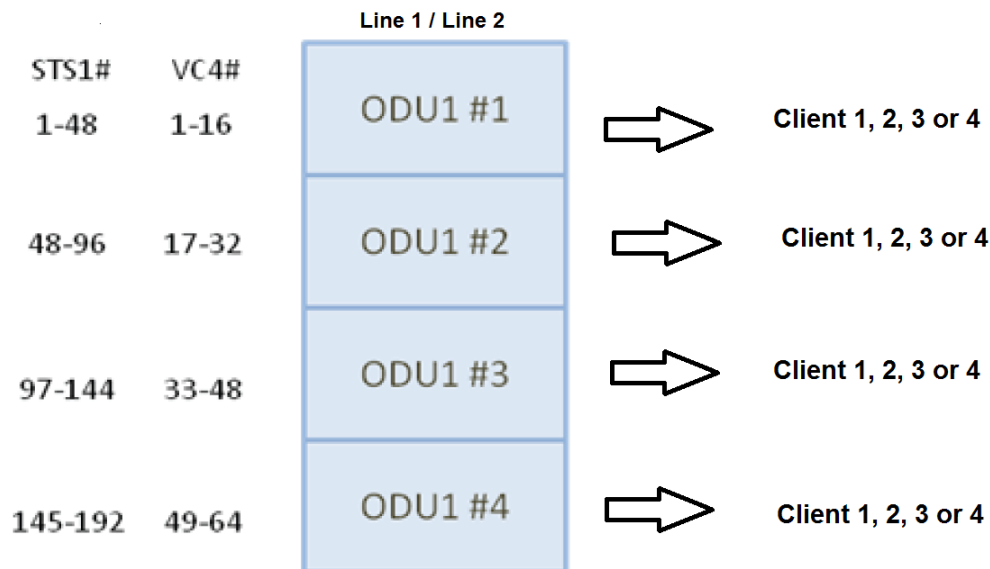
On NE shelves running release 13.2 and higher, BT7A48AA-I02 and BT7A48BA-I02 modules support ODU1 pass-through connection.



When provisioning pass-through connections the ODU1 source quadrants and the ODU destination quadrants must be the same.

This TL1 example below shows how to provision an ODU1 pass-through cross connection.

```
ENT-CRS-ODU1:BTI7000:MXP-1-1-L1-4,MXP-1-1-L2-4:100::2WAY;
```



An add/drop ODU1 connection can be made from any quadrant to any of the SONET/SDH client ports (C1, C2, C3 or C4).

The TL1 example below shows how to provision an ODU1 cross connect between Line 2 , Quadrant 3 and Client 1.

```
ENT-CRS-ODU1:BTI7000:MXP-1-1-L2-3,MXP-1-1-C1:160::2WAY;
```

The table below shows the supported ODU1 cross connections for BT7A48AA-I02 and BT7A48BA-I02 modules.

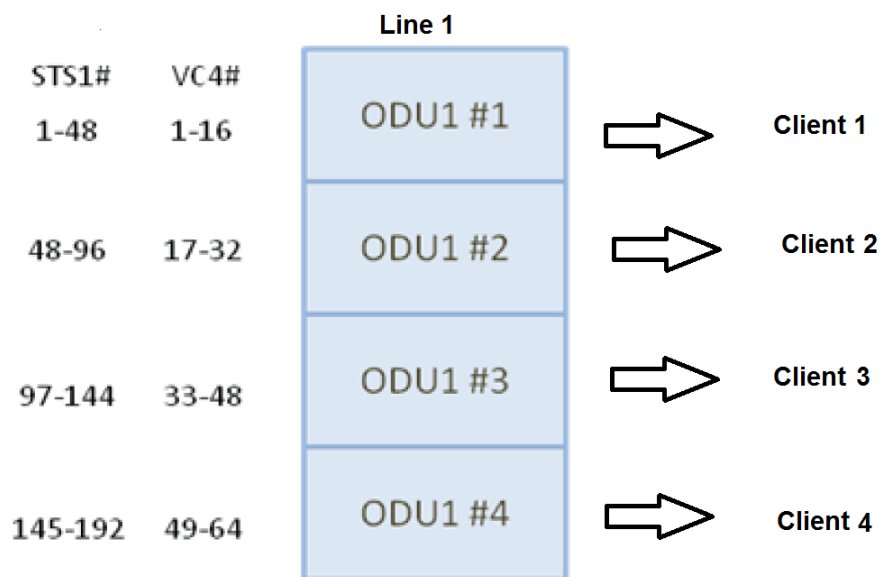
Source	Destination	Quadrant Allocation
Line 1 SONET/SDH ODU1	Line 2 SONET/SDH ODU1	Source and Destination quadrant must be the same. One pass-through cross connect of this type can be made.
Line 1 SONET /SDH ODU1	Client SONET/SDH ODU1	Any available quadrant to Client 1, 2, 3 or 4
Line 2 SONET/ SDH ODU1	Client SONET/SDH ODU 1	Any available quadrant to Client 1, 2, 3 or 4

ODU1 cross connections on BT7A48AA, BT7A48BA, and BT7A48DA

BT7A48AA, BT7A48BA, and modules do not support ODU1 pass-through connections.

In the ProNX 900 manager the option may be displayed on the drop down menu. If selected, the system will redirected to choose an alternative pass-through connection using STS or VC .

An add/drop ODU1 cross connection must be made so that the line quadrant is connected to the corresponding SONET / SDH client port as shown in the diagram below.



This TL1 example below shows how to provision an ODU1 cross connect between Line 1 , Quadrant 1 and Client 1.

```
ENT-CRS-ODU1:BTI7000:MXP-1-1-L1-1,MXP-1-1-C1:40::2WAY;
```

Source	Quadrant Allocation (1-4)	Destination
Line 1 SONET/ SDH ODU1	ODU1#1	Client 1
Line 1 SONET/ SDH ODU1	ODU1#2	Client 2
Line 1 SONET/ SDH ODU1	ODU1#3	Client 3
Line 1 SONET/ SDH ODU1	ODU1#3	Client 4

7.6 Provision a VCAT cross-connection on a Muxponder module

Use this procedure to provision a VCAT cross-connection on a BTI 7000 Series Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Muxponder ports must be provisioned.

Provisioning a VCAT cross-connection

Follow these steps to provision a VCAT cross-connection on a Muxponder module:

Step 1 In the Navigation pane, right-click **Cross Connects** for a Muxponder module, and then click **Provision Cross Connects**.

Step 2 In the **Cross Connects** dialog for the module, click the **Add** button.

Step 3 In the **Add Cross Connect** dialog, choose a value from the following lists:

- **Source** — a source line VCG (e.g., Line 1 VCG 1)
- **Destination** — a destination client port
- **Direction** — the direction of the cross-connection: **2WAY** or **2WAYPR**
- **Switch Mate** — the path protection for a 2-WayPR cross-connection

Note The switch mate must be the same VCG number as the source line VCG, but on the other line. For example, if the source specified is Line 1, VCG 1, the switch mate specified must be of the same type and have the same time slots as the source VCG.

Step 4 Click **Apply**.

Step 5 Optionally, repeat steps 1 to 4 for each additional cross-connection that you want to provision, and then click **Close**.

You have successfully completed this procedure.

7.7 Provision a CCAT cross-connection on a Muxponder module

Use this procedure to provision a CCAT cross-connection on a BTI 7000 Series Muxponder module.



Prerequisites

- Muxponder module must support CCAT connections for the respective client.
- Muxponder ports must be provisioned.

Provisioning a CCAT cross-connection

Follow these steps to provision a CCAT cross-connection on a Muxponder module:

Step 1 In the Navigation pane, right-click **Cross Connects** for a Muxponder module, and then click **Provision Cross Connects**.

Step 2 In the **Cross Connects** dialog for the module, click the **Add** button.

Step 3 In the **Add Cross Connect** dialog, choose a line port (**Line 1** or **Line 2**) from the **Source** list.

An additional **Add Cross Connect** dialog appears, with the selected line port specified in the **Source** field and all available time slots on the line.

Step 4 Specify the following parameters:

- **Destination** — the destination client port
- **Direction** — the direction of the cross-connection: **2WAY** or **2WAYPR**.
- **CRS Type** — the CCAT type. See [7.2, “VCAT and CCAT connections on Muxponder modules”](#).
- **Source Index** — the time slot on the source line port
- **Destination Index** — the time slot on the destination client port

Step 5 Click **Apply**.

Step 6 Optionally, repeat steps 1 to 5 for each additional CCAT cross-connection that you want to provision, and then click **Close**.

You have successfully completed this procedure.

7.8 Display cross-connection information for a Muxponder module

Use this procedure to display cross-connection information for a BTI 7000 Series Muxponder module.



Prerequisites

- Cross-connection must be provisioned.

Displaying cross-connection information

Follow these steps to display cross-connection information for a Muxponder module:

Step 1 In the Navigation pane, right-click **Cross-Connects** for a Muxponder module, and then click **Provision Cross Connects**.

The **Cross Connects** dialog for the Muxponder displays the **Source**, **Destination**, **Type**, and, where applicable, **Switch Mate** for the provisioned cross-connections on the Muxponder module.

Step 2 Optionally, to display a list of the active and stand-by paths, select **Active** from the **Display Type** list.

Step 3 Click **Close**.

You have successfully completed this procedure.

7.9 Delete a cross-connection on a Muxponder module

Use this procedure to delete a cross-connection on a BTI 7000 Series Muxponder module.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- Cross-connection must be provisioned.

Deleting a cross-connection

Follow these steps to delete a cross-connection on a Muxponder module.

Note Deleting a cross-connection will result in loss of traffic.

- Step 1** In the Navigation pane, right-click **Cross Connect** for a Muxponder module, and then click **Provision Cross Connects**.
- Step 2** In the **Cross Connects** dialog for the Muxponder module, click a listed cross-connection, and then click **Delete**.
- Step 3** In the **Delete Cross Connect** confirmation dialog, click **Yes**.
- Step 4** Optionally, repeat steps 2 and 3 for each cross-connection that you want to delete, and then click **Close**.

You have successfully completed this procedure.

8.0 Muxponder monitoring and maintenance

This section provides information about monitoring and maintenance for Muxponder modules.

- [8.1, “Retrieving and exporting performance metrics for Muxponder modules”](#)
- [8.2, “Monitoring threshold crossing alerts”](#)
- [8.3, “Automatic and user-initiated protection switching on Muxponder modules”](#)
- [8.4, “Performing loopback tests on Muxponder modules”](#)
- [8.5, “Muxponder module maintenance signals”](#)
- [8.6, “Laser status control”](#)

8.1 Retrieving and exporting performance metrics for Muxponder modules

You can retrieve active and historical performance metrics (PMs) for ports on Muxponder modules. The following table lists the PM types each module supports.

PM type	Supported on
Physical	All Muxponder modules
GE	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
SONET section	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
SDH section	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
Layer 1 Fibre Channel	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
OTN	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
BRI	8-Port Multiprotocol Muxponder

This section covers the following topics:

- [8.1.1, “Retrieve and export active PMs”](#)
- [8.1.2, “Retrieve and export historical PMs”](#)
- [8.1.3, “Physical PMs”](#)
- [8.1.4, “Gigabit Ethernet PMs supported on Muxponder modules”](#)
- [8.1.5, “SONET PMs supported on Muxponder modules”](#)
- [8.1.6, “SDH PMs supported on Muxponder modules”](#)
- [8.1.7, “Layer 1 Fibre Channel PMs supported on Muxponder modules”](#)
- [8.1.8, “OTN PMs supported on Muxponder modules”](#)
- [8.1.9, “BRI protocol PMs supported on Muxponder modules”](#)

8.1.1 Retrieve and export active PMs

Use this procedure to retrieve and, if required, export active performance metrics (PMs).

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- The port must be provisioned and a transceiver present in the port.

Retrieving and exporting active PMs

Follow these steps to retrieve and, if required, export active PMs:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, click a port on the module.

Step 3 On the **View** menu, choose **Performance Monitoring**.

Step 4 Click the **Active PM** tab in the **Performance Monitoring** window.

Step 5 Specify the following settings:

- **Refresh** — to set the frequency that you want the data to be updated (from 5 seconds to 60 minutes)
- **Bin Type** — to set one of the following the bin-storage intervals:
 - 15-Minute Bin
 - 1 Day Bin
 - Untimed (accumulates indefinitely)

Step 6 Select a PM parameter from the **Parameters** list.

You can select two parameters by holding down the Shift key.

Step 7 Click the **Chart** tab or the **Table** tab to have the data presented as either a chart report or a table report.

The chart report provides actual values and indicates the high and low thresholds for a parameter. Hover text at each collection point on the chart indicates the time and value of the PM.

The table report provides the present value for each parameter.

Step 8 Click **Start**.

The PM data for the parameter (or parameters) appears as a report in the format you specified. To view the data in the alternate report format, click the tab for that format.

Note	Data can be collected for a maximum of 120 data points at different time intervals (5 seconds to 60 minutes). The proNX 900 Node Controller continuously polls for data at the time interval specified. The scroll bar enables you to view the most recent 120 data points collected.
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Step 9 Optionally, click **Export** to save the data retrieved to CSV (.csv) or text (.txt) format.

Step 10 Repeat steps 4 to 8 for each parameter whose data you want to retrieve and, if required, export.

You have successfully completed this procedure.

8.1.2 Retrieve and export historical PMs

Use this procedure to view historical performance metrics (PMs).



Prerequisites

- The port must be provisioned and a transceiver present in the port.

Retrieving and exporting historical PMs

Follow these steps to retrieve and, if required, export historical PMs:

Step 1 In the toolbar, click the System Configuration button.

Step 2 In the Navigation pane, click a port on the module.

Step 3 On the **View** menu, choose **Performance Monitoring**.

Step 4 Click the **Historical PM** tab in the **Performance Monitoring** window.

Step 5 Click one of the following option buttons:

- **15 Min Bins** — to retrieve PMs for the 15-minute period you set using the **From** and **To** lists
- **1 Day Bin** — to retrieve PMs for the most recent 24-hour period

Step 6 Select a PM parameter from the **Parameters** list, and then click **Apply**.

The PM data for the parameter appears as a chart report on the **Chart** tab if you specified a 15-minute bin, and as a table report on the **Table** tab if you specified a 1-day bin.

Note	The chart report provides the actual values and indicates the high and low thresholds for the parameter. Hover text at each collection point on the chart indicates the time and value of the PM. The table report provides the present value for each parameter.
-------------	---

Step 7 Optionally, click **Export** to save the data retrieved to CSV (.csv) or text (.txt) format.

Step 8 Repeat steps 4 to 6 for each parameter whose data you want to retrieve and, if required, export.

You have successfully completed this procedure.

8.1.3 Physical PMs

Table 8-1 Physical PMs (gauges)

PM (montype)	Supported transceivers
Optical Power Received (OPR MIN, OPR MAX, OPR AVG) Optical Power Received measures the minimum, maximum, and average optical power (dBm) received. Measurements are accurate to ± 3.0 dBm for SFPs; to ± 2.0 dBm for XFPs.	Noncopper SFPs All XFPs
Optical Power Transmitted (OPT MIN, OPT MAX, OPT AVG) Optical Power Transmitted measures the minimum, maximum, and average optical power (dBm) transmitted. Measurements are accurate to ± 3.0 dBm for SFPs; to ± 2.0 dBm for XFPs.	Noncopper SFPs All XFPs
Supply Voltage Supply Voltage measures the supply voltage on the 3.3V supply for SFPs; on the 5.0V supply for XFPs. This PM is not supported on all XFPs and the PM line will contain "NA" instead of "CMPL" or "PRTL".	Noncopper SFPs All XFPs
Supply Voltage 2 Supply Voltage 2 measures the supply voltage on the 3.3V supply. This PM is not supported on all XFPs and the PM line will contain "NA" instead of "CMPL" or "PRTL".	All XFPs
Temperature Temperature measures the temperature ($^{\circ}\text{C}$) of the transceiver.	All SFPs All XFPs
Tx Bias current Laser Bias Current measures the laser bias current (mA).	Noncopper SFPs All XFPs

Note Physical PMs are not supported on SFPs on SCP modules and Expansion Shelf Interface ports.

8.1.4 Gigabit Ethernet PMs supported on Muxponder modules

Table 8-2 Gigabit Ethernet PMs (counters) supported on Muxponder modules

Description	GFP Mode	Supported modules
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.)	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
CV (Layer 1) 8B/10B Coding Violations measures the number of 8B/10B coding violations.	GFP-F GFP-T	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
ES (Layer 1) 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.	GFP-F GFP-T	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder

Table 8-2 Gigabit Ethernet PMs (counters) supported on Muxponder modules (Continued)

Description	GFP Mode	Supported modules
FCSE-RX (Layer 2) Total Number of Received Frames with CRC (Cyclic Redundancy Check) Error 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).	GFP-F	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
FRDR (Layer 2) 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.	GFP-F	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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).	GFP-F	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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.)	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
OSIZE Total Oversized Frame Count in Receive Direction measures the total number of received frames that were longer than 9600 octets (excluding framing bits, but including Frame Check Sequence (FCS) octets) and were otherwise well formed).	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
OVER1518 Total > = 1519 Byte Frame Count in Receive Direction Measures the total number of frames received that were greater than or equal to 1519 bytes in length (excluding framing bites, but including Frame Check Sequence (FCS) octets).	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
SES (Layer 1) Severely Errored Seconds measures the number of seconds during which the number of detected coding violations 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 Layer 1 Gigabit Ethernet is 1250.	GFP-F GFP-T	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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).	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder

Table 8-2 Gigabit Ethernet PMs (counters) supported on Muxponder modules (Continued)

Description	GFP Mode	Supported modules
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).	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
SIZE128-255 Total 128-255 Byte Frame Count in Receive Direction measures the total number of 128-255 byte frames received (excluding framing bits, but including Frame Check Sequence (FCS) octets).	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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).	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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).	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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).	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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).	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
TBYC-TX Total Byte Count in Transmit Direction measures the total number of bytes of data (including those in bad frames) transmitted (excluding framing bits, but including Frame Check Sequence (FCS) octets).	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
TFRC-RX (Layer 2) Total Frame Count in Receive Direction measures the total number of frames (bad frames, broadcast frames, and multicast frames) received.	GFP-F	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
TFRC-TX (Layer 2) Total Frame Count in Transmit Direction measures the total number of frames (bad frames, broadcast frames, and multicast frames) transmitted.	GFP-F	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
TPFC-RX Total Pause Frame Count in Receive Direction measures the total number of pause frames received.	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder

Table 8-2 Gigabit Ethernet PMs (counters) supported on Muxponder modules (Continued)

Description	GFP Mode	Supported modules
TPFC-TX Total Pause Frame Count in Transmit Direction measures the total number of pause frames transmitted.	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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.	GFP-F GFP-T	2-Port GbE Muxponder 8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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.	GFP-F	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder

8.1.5 SONET PMs supported on Muxponder modules

Note For information about SONET protocols supported on Muxponder modules, see [Chapter 2, “Muxponder features and supported protocols”](#)

Table 8-3 SONET PMs (counters)

PM (montype)	Supporting entities
CVS Section Coding Violations measures the number of B1 Bit Interleaved Parity (BIP) errors detected at the section layer.	OC3, OC12, OC48, OC192
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.	OC3, OC12, OC48, OC192
SEFS-S Section Severely Errored Framing Seconds measures the number of seconds during which a section SEF defect was present.	OC3, OC12, OC48, OC192
SES-S 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 = 155 OC12 = 616 OC48 = 2392 	OC3, OC12, OC48, OC192

Table 8-3 SONET PMs (counters) (Continued)

PM (montype)	Supporting entities
<ul style="list-style-type: none"> OC192 = 8554 	
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.	OC3, OC12, OC48, OC192
CV-L Line Coding Violations measures the number of B2 Bit Interleaved Parity (BIP) errors detected at the line layer.	OC3, OC12, OC48 ¹ , OC192
ES-L Line Errored Seconds measures the number of seconds during which one or more B2 Bit Interleaved Parity (BIP) errors are detected, or a Line Alarm Indication Signal (AIS-L) defect is present.	OC3, OC12, OC48 ¹ , OC192
SES-L Line Severely Errored Seconds measures the number of seconds during which the number of detected B2 Bit Interleaved Parity (BIP) errors exceeds the severely errored seconds level (SESLVL), or a Line Alarm Indication Signal (AIS-L) defect was present. The SESLVL value for SONET line level is as follows: <ul style="list-style-type: none"> OC3 = 154 OC12 = 615 OC48 = 2459 OC192 = 9835 	OC3, OC12, OC48 ¹ , OC192
UAS-L Line Unavailable Seconds measures the number of seconds during which the line is unavailable. A second is considered UAS-L at the onset of 10 consecutive SES-L seconds, and is no longer considered UAS-L after 10 consecutive seconds that are not SES-L seconds. In seconds that are counted as unavailable, the counting of CV-L, ES-L, and SES-L are inhibited.	OC3, OC12, OC48 ¹ , OC192
CVP Path Coding Violation measures the number of B3 Bit Interleaved Parity (BIP) errors at the path layer.	STS-n/STS-nc
ESP Path Errored Seconds measures the number of seconds during which one or more B3 Bit Interleaved Parity (BIP) errors are detected, or a Path Alarm Indication Signal (AIS-P), Path Unequipped, or a Path Loss of Pointer (LOP-P) defect is present.	STS-n/STS-nc
FC-P Failure Count at Path Layer measures the number of transitions from a second in which a path failure defect is not detected to a second in which one or more failure defects are detected. The monitored PATH failure defects are: <ul style="list-style-type: none"> Path Alarm Indication Signal (AIS-P) Path Unequipped Path Loss of Pointer (LOP-P) 	STS-n/STS-nc

Table 8-3 SONET PMs (counters) (Continued)

PM (montype)	Supporting entities
SES-P Path Severely Errored Seconds measures the number of seconds during which the number of detected B3 Bit Interleaved Parity (BIP) errors exceeds the severely errored seconds level (SESLVL), or a Path Alarm Indication Signal (AIS-P), Path Unequipped, or Path Loss of Pointer (LOP-P) defect was present. The SESLVL value for SONET path level is 2400.	STS-n/STS-nc
UAS-P Path Unavailable Seconds measures the number of seconds during which service at the path layer is unavailable. A second is considered unavailable at the onset of 10 consecutive seconds that are considered SESP, and is no longer unavailable after 10 seconds that are not SESP. In seconds that are counted as unavailable, the counting of CVP, ESP and SESP are inhibited.	STS-n/STS-nc

¹Supported on 8-Port and 10-Port Multiprotocol Muxponders only.

8.1.6 SDH PMs supported on Muxponder modules

Note For information about SDH protocols supported on Muxponder modules, see [Chapter 2, “Muxponder features and supported protocols”](#)

Table 8-4 SDH PMs (counters)

PM (montype)	Supported entities
RS-EB 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.	STM1, STM4, STM16, STM64
RS-BBE Regenerator Section Background Block Errors measures the number of errored blocks not occurring during seconds counted as RS-SES seconds.	STM1, STM4, STM16, STM64
RS-ES 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.	STM1, STM4, STM16, STM64
RS-OFS Regenerator Section out of Frame Seconds measures the number of seconds during which an Out of Frame (OOF) defect was present.	STM1, STM4, STM16, STM64
RS-SES 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.	STM1, STM4, STM16, STM64
RS-UAS Regenerator Section Unavailable Seconds measures the number of seconds during which the regenerator section is unavailable. A second is considered RS-	STM1, STM4, STM16, STM64

Table 8-4 SDH PMs (counters) (Continued)

PM (montype)	Supported entities
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.	
MS-EB Multiplex Section Errored Blocks measures the number of multiplex section errored blocks. An errored block is one that contains one or more (up to eight per block) B2 Bit Interleaved Parity (BIP) errors.	STM1, STM4, STM16 ¹ , STM64
MS-BBE Multiplex Section Background Block Errors measures the number of errored blocks not occurring during seconds counted as MS-SES seconds.	STM1, STM4, STM16 ¹ , STM64
MS-ES Multiplex Section Errored Seconds measures the number of seconds during which one or more errored blocks were detected or a Multiplex Section Alarm Indication Signal (MS-AIS) defect was present	STM1, STM4, STM16 ¹ , STM64
MS-SES Multiplex 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 Multiplex Section Alarm Indication Signal (MS-AIS) defect was present. The SESLVL value for SDH multiplex section is 30% of the nominal block rate	STM1, STM4, STM16 ¹ , STM64
MS-UAS Multiplex Section Unavailable Seconds measures the number of seconds during which the multiplex section is unavailable. A second is considered MS-UAS at the onset of 10 consecutive MS-SES seconds, and is no longer considered MS-UAS after 10 consecutive seconds that are not MS-SES seconds. In seconds that are counted as unavailable, the counting of MS-EB, MS-BBE, MS-ES and MS-SES is inhibited.	STM1, STM4, STM16 ¹ , STM64
HP-EB High Order Path Errored Blocks measures the number of high order path errored blocks. An errored block is one that contains one or more (up to eight per block) B3 Bit Interleaved Parity (BIP) errors.	VC-n/VC-nc
HP-BBE High Order Path Background Block Errors measures the number of errored blocks not occurring during seconds counted as HP-SES seconds.	VC-n/VC-nc
HP-ES High Order Path Errored Seconds measures the number of seconds during which one or more errored blocks were detected, or a High Order Path Alarm Indication Signal (HP-AIS), High Order Path Unequipped, or High Order Path Loss of Pointer (HP-LOP) defect was present.	VC-n/VC-nc
HP-SES High Order Path 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 High Order Path Alarm Indication Signal (HP-AIS), High Order Path Unequipped, or High Order Path Loss of Pointer (HP-LOP) defect was present. The SESLVL value for SDH high order path is 2400.	VC-n/VC-nc

Table 8-4 SDH PMs (counters) (Continued)

PM (montype)	Supported entities
HP-UAS High Order Path Unavailable Seconds measures the number of seconds during which the high order path is unavailable. A second is considered HP-UAS at the onset of 10 consecutive HP-SES seconds, and is no longer considered HP-UAS after 10 consecutive seconds that are not HP-SES seconds. In seconds that are counted as unavailable, the counting of HP-EB, HP-BBE, HP-ES and HP-SES are inhibited.	VC-n/VC-nc
UAS-S Section Unavailable Seconds measures the number of seconds during which the SDH 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.	STM1, STM4, STM16 ¹ , STM64
¹ Supported on 8-Port and 10-Port Multiprotocol Muxponders only.	

8.1.7 Layer 1 Fibre Channel PMs supported on Muxponder modules

Table 8-5 Layer 1 Fibre Channel PMs (counters)

PM (montype)	Supported modules
CV 8B/10B Coding Violations measures the number of 8B/10B coding violations and disparity errors.	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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.	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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.	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
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.	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder

8.1.8 OTN PMs supported on Muxponder modules

Table 8-6 OTN PMs (counters) supported on SONET/SDH line ports

Description	Supported modules
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.	10-Port Multiprotocol Muxponder
NUMBYTESCR Number of Bytes Corrected measures the total number of bytes corrected by the forward error correction scheme.	10-Port Multiprotocol Muxponder
UNCRCDWRD 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.	10-Port Multiprotocol Muxponder
BER 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.	10-Port Multiprotocol Muxponder
BER-AVG 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.	10-Port Multiprotocol Muxponder
OTU-BBE OTU-2 Background Block Error measures the number of errored blocks not occurring during seconds counted as OTU-SES seconds.	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
OTU-EB 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.	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
OTU-ES OTU-2 Errored Seconds measures the number of seconds during which one or more errored blocks was detected or a Loss of Frame (LOF) or a Loss of Signal (LOS) defect was present.	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder
OTU-SES OTU-2 Severely Errored Seconds measures the number of seconds during which the number of detected errored blocks exceeds the severely errored	8-Port Multiprotocol Muxponder 10-Port Multiprotocol Muxponder

Table 8-6 OTN PMs (counters) supported on SONET/SDH line ports (Continued)

Description	Supported modules
seconds level (SESLVL), or a Loss of Frame (LOF) or Loss of Signal (LOS) defect was present. The SESLVL value for OTN is 30% of the nominal block rate.	
OTU-OFS	8-Port Multiprotocol Muxponder
OTU-2 Out of Frame Seconds measures the number of seconds during which a Out of Frame (OOF) defect was present.	10-Port Multiprotocol Muxponder
OTU-UAS	8-Port Multiprotocol Muxponder
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-Port Multiprotocol Muxponder

8.1.9 BRI protocol PMs supported on Muxponder modules

Table 8-7 BRI PMs (gauges)

PM (montype)	Supported modules
LBC	8-Port Multiprotocol Muxponder
Laser Bias Current measures the laser bias current (mA) of the transceiver.	
OPR	8-Port Multiprotocol Muxponder
Optical Power Received measures the optical power (dBm) received by the transceiver. Measurements are accurate to ± 3.0 dBm.	
OPT	8-Port Multiprotocol Muxponder
Optical Power Transmitted measures the optical power (dBm) transmitted by the transceiver. Measurements are accurate to ± 3.0 dBm.	
SUPPLY	8-Port Multiprotocol Muxponder
Supply Voltage measures the supply voltage on the 3.3V supply.	
TEMP	8-Port Multiprotocol Muxponder
Temperature measures the temperature ($^{\circ}\text{C}$) of the transceiver.	

8.2 Monitoring threshold crossing alerts

When the performance metric (PM) parameter reached or exceeded its preset threshold, threshold crossing alerts (TCAs) are autonomously reported to the management system that the TCAs are supported for each monitored parameter for the configured protocol, for both the current 15-minute and 1-day bins. TCAs are not supported for untimed bins.

When a port is provisioned, default PM threshold values are used. You can modify and view the PM threshold levels on provisioned Transponder ports.

This section covers the following topics:

- 8.2.1, “Set Performance Monitoring threshold levels”
- 8.2.2, “View threshold crossing alerts”
- 8.2.3, “Threshold crossing alerts supported on Muxponder modules”

8.2.1 Set Performance Monitoring threshold levels

Use this procedure to set performance monitoring (PM) threshold levels on provisioned ports.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- The module port must be provisioned.

Setting threshold-crossing-alarm levels

Follow these steps to set PM threshold levels:

- Step 1** In the Navigation pane, right-click a port on the module, and then click **View Transceiver PM**.
- Step 2** Click the **Thresholds** tab of the **Provision Transceiver** dialog.
Values for each threshold are provided on the tab.
- Step 3** Type a value in the field that corresponds to each PM whose level you want to set.
- Step 4** Click **Apply**.

You have successfully completed this procedure.

8.2.2 View threshold crossing alerts

Use this procedure to view threshold crossing alerts for module ports.

Authorization Required

Superuser

Provisioning

Maintenance

Surveillance

Prerequisites

- The Transponder port must be provisioned.

Viewing threshold crossing alarms

Follow these steps to view threshold crossing alerts for a port:

Step 1 In the Navigation pane, right-click a port on the module, and then click **View Transceiver PM**.

Step 2 Click the **Thresholds** tab of the **Provision Transceiver** dialog.
Values for each threshold crossing alert are provided on the tab.

Step 3 Click **Close**.

You have successfully completed this procedure.

8.2.3 Threshold crossing alerts supported on Muxponder modules

The following table lists the 15-minute and 1-day default threshold values for TCA-supported PMs for Muxponder modules. The default 15-minute and 1-day ranges are as follows:

- Second-based montypes(e.g., ES, SES), 15-minute range = 0 to 899; 1-day range = 0 to 86400.
- All other montypes, 15-minute range = 0 to 38700; 1-day range = 0 to 215913600.

Protocol	Montype	15-Minute default value	1-Day default value
FC	CV	382	3820
	ES	25	250
	SES	4	40
	UAS	10	10
GE	CV	382	3820
	ES	25	250
	SES	4	40
	UAS	10	10
Layer 2 GE	FRDR	0	0
	FCSE-RX	0	0
	FRGT	0	0
	JABR	0	0
	OSIZE	0	0
	USIZE	0	0
OTN	UNCRCDWRD	10	100
	OTU-EB	0	0
	OTU-BBE	382	3820
	OTU-ES	25	250

Protocol	Montype	15-Minute default value	1-Day default value
OC3, OC12, OC48, OC192	OTU-SES	4	40
	OTU-UAS	10	10
	OTU-OFS	2	8
	CVS	382	3820
	ESS	25	250
	SEFS-S	2	8
	SESS	4	40
	UASS	10	10
	CVL	382	3820
	Note OC3, OC12 only.		
	CVL	18336	183360
	Note OC48, OC192 only.		
	ES-L	25	250
	SES-L	4	40
	UAS-L	10	10
STM1, STM4, STM16, STM64	RS-BBE	382	3820
	RS-EB	0	0
	RS-ES	25	250
	RS-SES	4	40
	RS-UAS	10	10
	RS-OFS	2	8
	MS-BBE	21260	212600
	MS-EB	0	0
	MS-ES	87	864
	MS-SES	1	4
	MS-UAS	10	10
STS-n/STS-nc	CVP	15	125
	ESP	12	100
	SESP	3	7
	UASP	10	10
	FC-P	2	8
VC-n/VC-nc	HP-EB	0	0
	HP-BBE	15	125
	HP-ES	12	100
	HP-SES	3	7
	HP-UAS	10	10

8.3 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 [Chapter 7, “Muxponder cross-connections”](#).

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:

- [8.3.1, “Initiate path protection switching on a Muxponder module”](#)
- [8.3.2, “Release path protection switching on a Muxponder module”](#)
- [8.3.3, “Initiate 1+1 OTN line protection switching on a Muxponder module”](#)
- [8.3.4, “Release automatic 1+1 OTN line protection switching on a Muxponder module”](#)

8.3.1 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.

8.3.2 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.

8.3.3 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.

8.3.4 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.

8.4 Performing loopback tests on Muxponder modules

This section provides information about performing loopback tests on Muxponder modules.

This section covers the following topics:

- [8.4.1, “Performing loopback tests on 2-Port GbE Muxponder modules”](#)
- [8.4.2, “Performing loopback tests on 8-Port and 10-Port Multiprotocol Muxponder modules”](#)
- [8.4.3, “Perform a loopback test on a Muxponder module”](#)

8.4.1 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 8-8 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

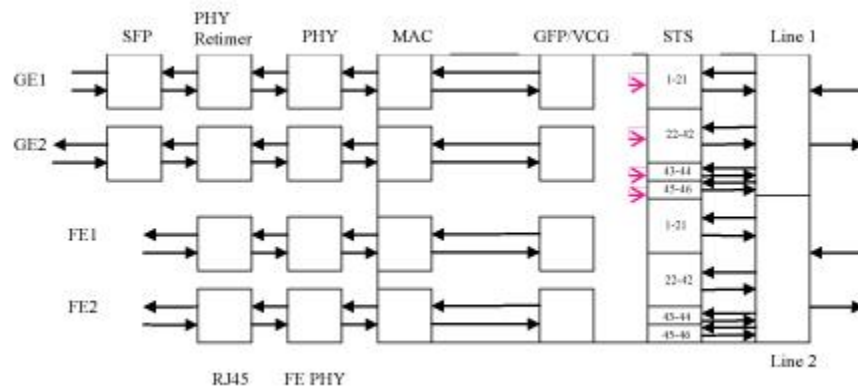
Important A GE port *must* be cross-connected for a terminal loopback test to be successful. For information about provisioning cross-connections, see [7.1, “Provisioning cross-connections on Muxponder modules”](#).

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.

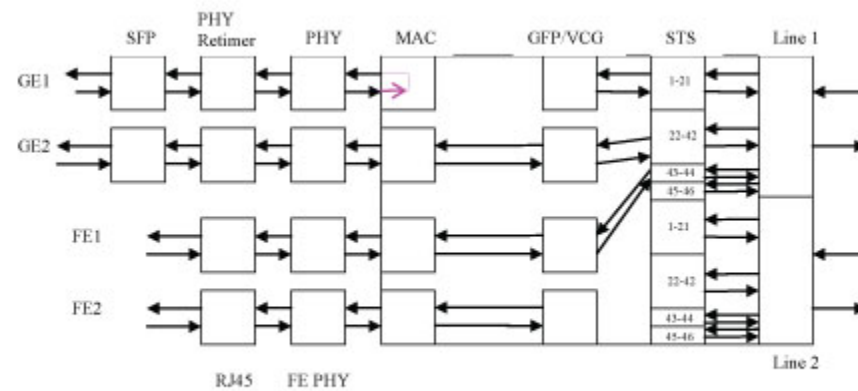
Loopback tests can be manually released. Once a loopback is released and the port is restored to service, end-to-end traffic is immediately restored if the end point is cross-connected and is error- and alarm-free.

The following figures show facility and terminal loopback tests on various entities on a 2-Port GbE Muxponder – SONET module.

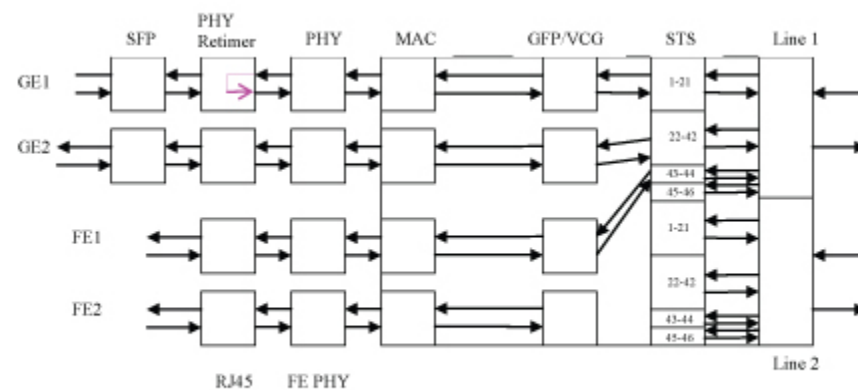
Line-side port facility loopback



GE client-side port facility loopback



GE client-side port terminal loopback



8.4.2 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 [Chapter 2, “Muxponder features and supported protocols”](#).

Table 8-9 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 [7.1, “Provisioning cross-connections on Muxponder modules”](#).

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.

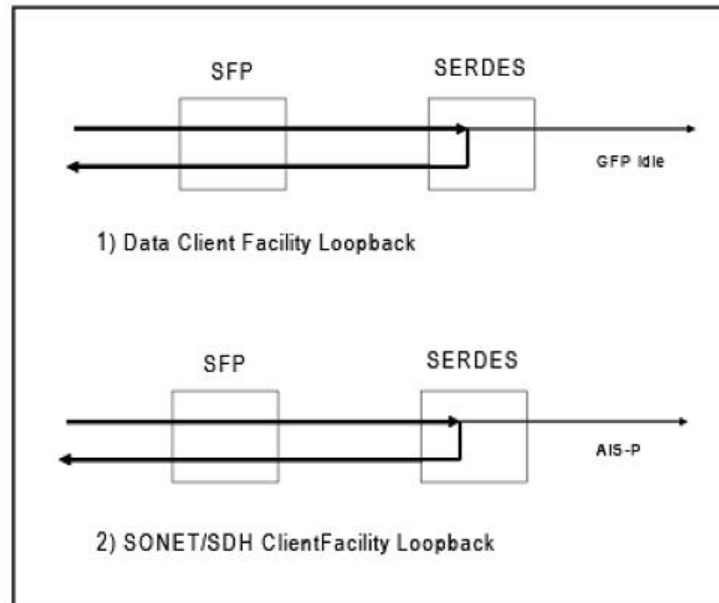
Loopback tests can be performed only on a supported port that is in the Out-of-Service (OOS) state. Performance parameters for a port are available while the port is in a loopback.

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.

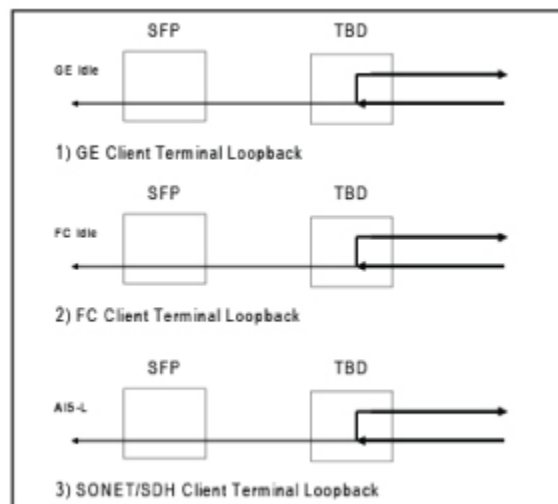
Loopback tests can be manually released. Once a loopback is released and the port is restored to service, end-to-end traffic is immediately restored if the end point is cross-connected and is error- and alarm-free.

The following figures show 8-Port and 10-Port Multiprotocol Muxponder facility and terminal loopback tests on various entities.

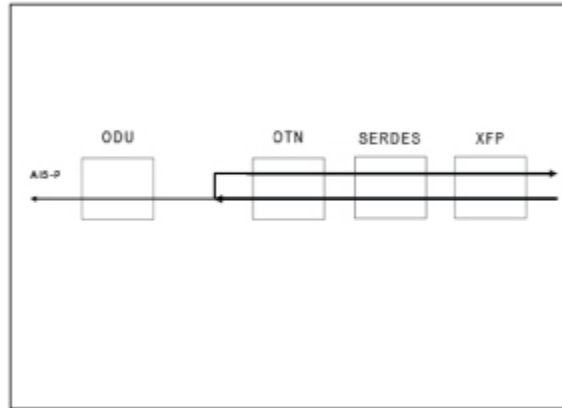
Client-side port facility loopback



Client-side port terminal loopback



Line-side facility loopback



8.4.3 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.

8.5 Muxponder module maintenance signals

Ports on Muxponder modules send maintenance signals according to the protocol a port is provisioned to use and the condition that exists at the port.

This section covers the following topics:

- 8.5.1, “2-Port GbE Muxponder maintenance signals”
- 8.5.2, “Line maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules”
- 8.5.3, “GE client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules”
- 8.5.4, “Fibre Channel client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules”
- 8.5.5, “Unconnected SONET/SDH client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules”
- 8.5.6, “Connected, synchronous SONET/SDH client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules”
- 8.5.7, “Connected, asynchronous SONET/SDH client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules”
- 8.5.8, “BRI client maintenance signals on 8-Port Multiprotocol Muxponder modules”

8.5.1 2-Port GbE Muxponder maintenance signals

OC48/STM16 line maintenance signals

AIS-L is transmitted under the following conditions

- The port is in a maintenance state (OOS-MA) and is not in loopback.

STS1-UEQ is transmitted under the following conditions:

- An STS-1/VC-4 is not connected.
- On the unused path of an unprotected STS-1/VC-4

GFP-IDLE is transmitted under the following conditions:

- A connected data client (GE) is in a maintenance state (OOS-MA), but not in terminal loopback.
- A connected data client (GE) is in facility loopback.
- A failure (LOS, LOSYNC) occurs on a connected data client (GE).

GE client maintenance signals

Ethernet IDLE is transmitted in the Tx direction when the port is not configured.

Ethernet IDLE is transmitted under the following conditions:

- A GE client is not connected.

- A GE client is in a maintenance state (OOS-MA).
- A GE client is connected and in terminal loopback.
- A SONET/SDH line failure (LOS, LOF, AIS-L) has occurred.
- A SONET/SDH path failure (AIS-P, LOOP, UEQ) has occurred.
- A VCAT failure (LOM, SQM, LOA) has occurred.

8.5.2 Line maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Table 8-10 Line maintenance signals for 2.5G line rates on 8-Port Multiprotocol Muxponder modules

Port State	Facility Loopback	Line Mapping	Channel State	Line Fault	Line Condition	Path Condition
IS	None	No effect	Unconnected	No effect	None	None
IS	None	None or OTU1	Connected	No effect	None	STS1-UEQ
IS	None	Sub-ODU1-OTU1	Unconnected	No effect	None	STS1-UEQ and Sub-ODU1-OCI
OOS	None	None	Unconnected	No effect	OC148/STM16 AIS-L	None
OOS	None	OTU1 or Sub-ODU1-OTU1	Connected	No effect	ODU1-AIS	None
OOS	None	None	Connected	No effect	OC148/STM16 AIS-L	STS1-UEQ
OOS	None	OTU21	Connected	No effect	ODU1-AIS	STS1-UEQ
OOS	None	Sub-ODU1-OTU1	Unconnected	No effect	ODU1-AIS	STS1-UEQ and Sub-ODU1-OCI
OOS	Present	No effect	No effect	No effect	None	None
IS	None	No effect	No effect	Present	None	None

Table 8-11 Line maintenance signals on 10-Port Multiprotocol Muxponder modules

Port State	Facility Loopback	Line Mapping	Channel State	Line Fault	Line Condition	Path Condition
IS	None	No effect	Connected	No effect	None	None
IS	None	None or OTU2	Unconnected	No effect	None	STS1-UEQ
IS	None	ODU1-OTU2	Unconnected	No effect	None	STS1-UEQ and ODU1-OCI
OOS	None	None	Connected	No effect	OC192/STM64 AIS-L	None
OOS	None	OTU2 or ODU1-OTU2	Connected	No effect	ODU2-AIS	None
OOS	None	None	Unconnected	No effect	OC192/STM64 AIS-L	STS1-UEQ

Table 8-11 Line maintenance signals on 10-Port Multiprotocol Muxponder modules (Continued)

Port State	Facility Loopback	Line Mapping	Channel State	Line Fault	Line Condition	Path Condition
OOS	None	OTU2	Unconnected	No effect	ODU2-AIS	STS1-UEQ
OOS	None	ODU1-OTU2	Unconnected	No effect	ODU2-AIS	STS1-UEQ and ODU1-OCI
OOS	Present	No effect	No effect	No effect	None	None
IS	None	No effect	No effect	Present	None	None

8.5.3 GE client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Table 8-12 GE client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Port State	Facility Loopback	Terminal Loopback	Cross-connect	Line Fault	Client Fault	Client Condition	Line Condition
IS	None	None	Present	None	None	None	None
IS	None	None	None	None	None	GE Idle	No effect
OOS	None	None	Present	No effect	No effect	GE Idle	GFP Idle
OOS	Present	None	No effect	No effect	No effect	None	GFP Idle
OOS	None	Present	Present	No effect	No effect	GE Idle	None
IS	None	None	Present	Present	None	GE Idle	None
IS	None	None	Present	Present	Present	GE Idle	GFP Idle
IS	None	None	Present	None	Present	None	GFP Idle

Table 8-13 Line and client faults

Type	Fault	Alarms
Line	OTN failure	LOS, LOF, AIS-L, PLM
Line	SONET/SDH line failure	LOS, LOF, AIS-L
Line	SONET/SDH path failure	AIS-P, LOP, UEQ
Line	ODUx path failure	OCI, PLM
Line	VCAT failure (connection to GE client only)	LOM, SQM, LOA
Line	Line state is in OOS-MA	—
Client	—	LOS, LOSYNC

8.5.4 Fibre Channel client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Table 8-14 Fibre Channel client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Port State	Facility Loopback	Terminal Loopback	Cross-connect	Line Fault	Client Fault	Client Condition	Line Condition
IS	None	None	Present	None	None	None	None
IS	None	None	None	None	None	FC Idle	No effect
OOS	None	None	Present	No effect	No effect	FC Idle	GFP Idle
OOS	Present	None	No effect	No effect	No effect	None	GFP Idle
OOS	None	Present	Present	No effect	No effect	FC Idle	None
IS	None	None	Present	Present	None	FC Idle	None
IS	None	None	Present	Present	Present	FC Idle	GFP Idle
IS	None	None	Present	None	Present	None	GFP Idle

Table 8-15 Line and client faults

Type	Fault	Alarms
Line	OTN failure	LOS, LOF, AIS-L, PLM
Line	SONET/SDH line failure	LOS, LOF, AIS-L
Line	SONET/SDH path failure	AIS-P, LOP, UEQ
Line	ODUx path failure	OCI, PLM
Line	VCAT failure (connection to FC client only)	LOM, SQM, LOA
Line	Line state is in OOS-MA	—
Client	—	LOS, LOSYNC

8.5.5 Unconnected SONET/SDH client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Table 8-16 Unconnected SONET/SDH client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Port State	Facility Loopback	Client Fault	Client Condition
IS	None	None	UEQ-P
OOS	None	No effect	AIS-L
OOS	Present	No effect	None
IS	None	Present	None

Note Client faults include LOS, LOF, and AIS-L.

8.5.6 Connected, synchronous SONET/SDH client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Table 8-17 Connected, synchronous SONET/SDH client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Port State	Facility Loopback	Terminal Loopback	Client Fault	Line Fault	Client Condition	Line Condition
IS	None	None	None	None	None	None
OOS	None	None	No effect	No effect	AIS-L	AIS-P
OOS	Present	None	No effect	No effect	None	AIS-P
OOS	None	Present	No effect	No effect	AIS-L	None
IS	None	None	None	None	None	ASI-P
IS	None	Present	Present	Present	AIS-P	AIS-P
IS	None	Present	Present	Present	AIS-P	None
IS	None	None	None	None	AIS-P	None

Table 8-18 Line and client faults

Type	Fault	Alarms
Line	OTN failure	LOS, LOF, AIS-L, PLM
Line	SONET/SDH line failure	LOS, LOF, AIS-L
Line	SONET/SDH path failure	AIS-P, LOP
Line	ODUx path failure	OCI, PLM
Line	Line state is in OOS-MA	—
Client	—	LOS, LOF, AIS-L

8.5.7 Connected, asynchronous SONET/SDH client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Table 8-19 Connected, asynchronous SONET/SDH client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules

Port State	TOH Transparency	Facility Loopback	Terminal Loopback	Client Fault	Line Fault	Client Condition	Far-End Client Condition
IS	No effect	None	None	None	None	None	None
OOS	Present	None	None	No effect	No effect	GEN-AIS	GEN-AIS
OOS	None	None	None	No effect	No effect	AIS-L	AIS-L
OOS	Present	Present	None	No effect	No effect	None	GEN-AIS
OOS	None	Present	None	No effect	No effect	None	ASI-L
OOS	Present	None	Present	No effect	No effect	GEN-AIS	None
OOS	None	None	Present	No effect	No effect	AIS-L	None

Table 8-19 Connected, asynchronous SONET/SDH client maintenance signals on 8-Port and 10-Port Multiprotocol Muxponder modules (Continued)

Port State	TOH Transparency	Facility Loopback	Terminal Loopback	Client Fault	Line Fault	Client Condition	Far-End Client Condition
IS	Present	None	None	Present	None	None	ODUx-AIS (LOS only)
IS	None	None	None	Present	None	None	AIS-L
IS	Present	None	None	Present	Present	GEN-AIS	ODUx-AIS (LOS only)
IS	None	None	None	Present	Present	AIS-L	AIS-L
IS	Present	None	None	None	Present	GEN-AIS	None
IS	None	None	None	None	Present	AIS-L	None

Table 8-20 Line and client faults

Type	Fault	Alarms
Line	OTN failure	LOS, LOF, AIS-L, PLM, OCI. ODUx PLM
Line	Line state is in OOS-MA	—
Client	—	LOS, LOF, AIS-L

8.5.8 BRI client maintenance signals on 8-Port Multiprotocol Muxponder modules

Table 8-21 BRI client maintenance signals on 8-Port Multiprotocol Muxponder modules

Port State	Facility Loopback	Terminal Loopback	Cross-Connect	Line Fault	Client Fault	Client Condition	Line Condition
IS	None	None	Present	None	None	None	None
IS	None	None	None	None	None	PRBS	No effect
OOS	None	None	Present	No effect	No effect	PRBS	PRBS
OOS	Present	None	No effect	No effect	No effect	None	PRBS
OOS	None	Present	Present	No effect	No effect	PRBS	None
IS	None	None	Present	Present	None	PRBS	None
IS	None	None	Present	Present	Present	PRBS	PRBS
IS	None	None	Present	None	Present	None	PRBS

Table 8-22 Line and client faults

Type	Fault	Alarms
Line	OTN failure	LOS, LOF, AIS-L, PLM
Line	SONET/SDH line failure	LOS, LOF, AIS-L
Line	SONET/SDH path failure	AIS-P, LOP, UEQ

Table 8-22 Line and client faults (Continued)

Type	Fault	Alarms
Line	ODUx path failure	OCI, PLM
Line	VCAT failure (connection to BRI client only)	LOM, SQM, LOA
Line	Line state is in OOS-MA	—
Client	—	LOS, LOL

8.6 Laser status control

Laser status control provides the ability for an operator to turn a transmitting laser on or off, and is supported on SFP/XFP ports on transponder and muxponder modules. When the transmitting laser is shut down, the far end port detects the fault and reacts in a way similar to a fiber cut, which may include executing a protection switch.

The operator is not allowed to turn the laser on or off if Fault Propagation Shut Down (FPSD) is enabled on the port, or on GCC-enabled links. In these situations, the operator must configure the laser control parameter to have the laser automatically controlled by software.

In all other situations, including other protection schemes, the operator is allowed to control the laser status.

9.0 Troubleshooting Muxponder modules

This section provides information for troubleshooting issues on Muxponder modules.

- [9.1, “Alarms and events on Muxponder modules”](#)
- [9.2, “Upgrade of the system software”](#)

9.1 Alarms and events on Muxponder modules

The proNX 900 Node Controller allows you to view alarms and events reported on a Muxponder module at any time. If a Muxponder module is in the In-Service state, any fault condition pertaining to the module is reported as an autonomous alarm. For information about clearing alarms pertaining to Muxponder modules, see the *Alarm and Troubleshooting Guide*.

An event reported on a Muxponder module can indicate the module's status, a periodic report of information, or asynchronous command completion information.

For a description of the information provided by the proNX 900 Node Controller about an alarm or event, see the *proNX 900 Node Controller Online Help*.

This section covers the following topics:

- 9.1.1, “View alarms or events for a Muxponder module”
- 9.1.2, “Muxponder module alarms”

9.1.1 View alarms or events for a Muxponder module

Use this procedure to view alarms or events reported on a BTI 7000 Series Muxponder module.



Prerequisites

- Muxponder module must be provisioned and physically present in the shelf.

Viewing alarms and events

Follow these steps to view alarms and events on a Muxponder module:

Step 1 Click one of the following tabs in the **Alarm** pane:

- **Alarms** — to view the list of alarms
- **Events** — to view the list of events
- **Conditions** — to view the list of conditions

Step 2 Double-click an alarm or event to view detailed information about it.

You have successfully completed this procedure.

9.1.2 Muxponder module alarms

The following is a list of the alarms supported on Muxponder modules. For detailed information about each alarm, see the *Alarm and Troubleshooting Guide*.

- AIS-L
- AIS-P

- BWMISM
- GFPPLM
- LOA
- LOCKPROG
- LOF
- LOL
- LOM
- LOP-P
- LOS
- LOSYNC
- LSRMANOFF
- OCI
- ODUPLM
- OTNPLM
- PLM
- REPLUNITUS-SFP
- SD
- SD-P
- SQM
- SYNCPRI
- SYNCSEC
- UEQ-P
- UNEQ-P

9.2 Upgrade of the system software

If you have upgraded from a release earlier than 8.1.x, you must perform a cold restart of all 8-Port and 10-Port Multiprotocol Muxponder modules installed on the system. A cold restart is required to activate software updates and to restart traffic flow on these Muxponder modules.

For information about performing a system software upgrade and about auto-upgrade support, see the *Upgrade Guide*.

10.0 Replacing Muxponder modules and transceivers

This section provides instructions for replacing Muxponder modules in supported shelves, and replacing transceivers in Muxponder modules.

- [10.1, “Replacing muxponder modules”](#)
- [10.2, “Replacing optical transceivers”](#)
- [10.3, “Replacing copper transceivers”](#)

10.1 Replacing muxponder modules

10.1.1 System behavior when replacing the 10-Port Multiprotocol Muxponder

When replacing one issue of the 10-Port Multiprotocol Muxponder with another issue, the general rule is that higher issues of the module support a superset of hardware functionality when compared to lower issues of that module. There are two situations to consider:

- The new module contains hardware features that require new system software. Full support of the hardware features only occurs on a shelf running the new system software. When you install the new module on a shelf that is running software that pre-dates the software introduction release of that module, the functionality of the new module reverts to the functionality that is supported by the software running on the older system.
- The new module does not contain hardware features that require new system software. In this situation, the new hardware features are supported regardless of the software release of the shelf in which the module is installed.

The behavior of the new module is therefore dictated by which of the above two situations applies. This is depicted in the following table for the 10-Port Multiprotocol Muxponder modules:

Table 10-1 10-Port Multiprotocol Muxponder replacement

Module issues	Software introduction release	Can be installed in software release	Resulting functionality
BT7A48AA/BA	7.1	Release 7.1 and higher	BT7A48AA/BA
BT7A48AA-I02/BA-I02	13.1	Release 10.3 up to but not including release 13.1	Equivalent to the BT7A48AA/BA
		Release 13.1 and higher	BT7A48AA-I02/BA-I02

The rest of this section provides additional details to the table above:

- For the list of features that each issue supports, see [2.5, “10-Port Multiprotocol Muxponder features”](#).
- In all supported replacement situations, the inventory displays the PEC of the replacement module once the replacement module is inserted into the shelf. Note that this inventory PEC might be different from the configured equipment PEC.
- **When you install a BT7A48AA-I02/BA-I02 module into an unprovisioned slot**
 - In shelves running release 13.1 or higher, the system auto-provisions the equipment PEC to match the PEC of the inserted module. Full functionality of the BT7A48AA-I02/BA-I02 module is supported.
 - In shelves running releases prior to release 13.1, the system auto-provisions the equipment PEC to BT7A48AA or BT7A48BA respectively. You cannot change the equipment PEC and you cannot enable the new features of the BT7A48AA-I02/BA-I02. In effect, the functionality of the BT7A48AA-I02/BA-I02 module is downgraded to be the same as the functionality of

the BT7A48AA/BA module. This situation arises when you use the BT7A48AA-I02/BA-I02 to spare for the BT7A48AA/BA in shelves running releases prior to release 13.1.

- **When you replace a provisioned BT7A48AA/BA module with a BT7A48AA-I02/BA-I02 module**

- A provisioned BT7A48AA/BA module, in this context, is a module that has been provisioned with a PEC of BT7A48AA or BT7A48BA.
- In all situations where the original module is already provisioned, the provisioning remains unchanged. This means that the equipment PEC remains configured as the original module PEC.
- In shelves running release 13.1 or higher, you can change the equipment PEC to match the PEC of the replacement module to support the new features of the replacement module. Use the TL1 command **EDT-EQPT** to perform this function. If you do not change the equipment PEC, the functionality of the replacement module is downgraded to be the same as the functionality of the original module.
- In shelves running releases prior to release 13.1, you cannot change the equipment PEC and you cannot enable the new features of the replacement module. In effect, the functionality of the replacement module is downgraded to be the same as the functionality of the original module. This situation arises when you use the BT7A48AA-I02/BA-I02 to spare for the BT7A48AA/BA in shelves running releases prior to release 13.1.

Note When the module is installed in a shelf running a release prior to release 13.1, a CONTCOM alarm might be raised after 2 minutes. The alarm will clear in approximately 30 seconds. The module will provision and function normally. Should the alarm not clear after 3 minutes, refer to the Alarm and Troubleshooting Guide.

- **When you replace a higher issue provisioned module with a lower issue module**

- The system generates a Circuit Pack Mismatch Alarm (REPLUNITMEA). Configuration settings are not transferred to the replacement module. You will need to deprovision the original module along with all associated services and provision the replacement module. Note that replacing the higher issue module with a lower issue module will take longer and will therefore affect traffic for a longer duration. Only those features supported by the lower issue module are supported after the replacement.

10.1.2 Replacing 2-Port GbE Muxponder modules

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

What you need

- Slot-head or Phillips screwdriver
- Electrostatic discharge (ESD) wrist strap
- Muxponder module
- Replacement SFP transceivers

- Isopropyl alcohol and lint-free pads

Prerequisites

- None



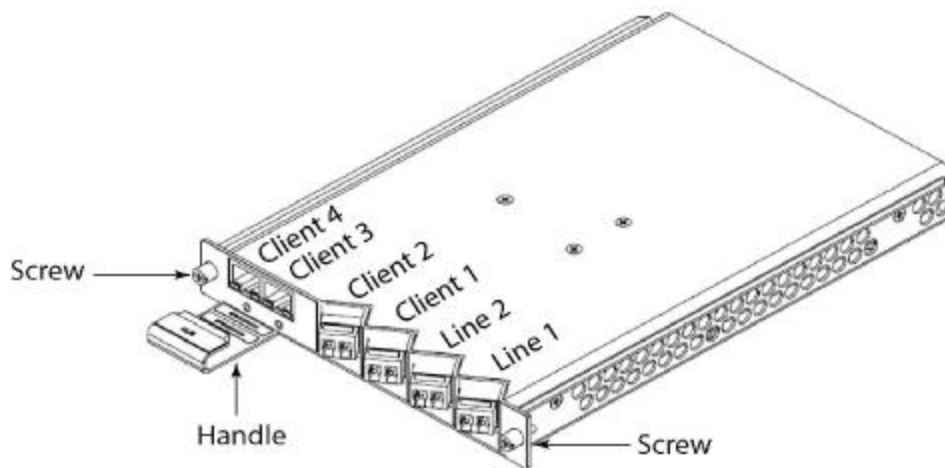
Caution

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 module replacement features

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

2-Port GbE Muxponder module



Replacement procedure

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

Step 1 Reroute Traffic

Caution Failure to reroute traffic can result in lost data. Select an alternate route for the traffic that passes through the module. Transfer traffic to this alternate route before proceeding with this procedure.

Step 2 Remove the Transceiver Ports from Service

Remove the transceiver ports from service.

Step 3 Move the Cables

Shelf cables may need to be moved aside to get clear access to the module. The cables rest on the handles that are at the front of the module.

Step 4 Disconnect the Cables

Disconnect the optical cables from the ports on the faceplate of the module.

Note Ensure that the optical ports on the module and the optical cables are protected with protective caps while disconnected.

Step 5 Loosen the Faceplate Screws

- a) Facing the front of the shelf, locate the faceplate screws.
- b) Using a slot-head or Phillips screwdriver, loosen the screws.

Step 6 Remove the Module

- a) Grasp the handles on the front of the module and firmly pull the module straight out.

Note An equipment missing alarm appears once you remove the module.

- b) Place the module on a flat work surface.

Step 7 Replace the Module

- a) Align the replacement module to the slot in which it is being inserted.
- b) Carefully push the module straight into the slot.

Step 8 Replace 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 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 9 Replace the Transceivers

See [10.2, “Replacing optical transceivers”](#) to insert the transceivers into the module, and then return to this procedure.

Step 10 Reconnect Optical Cables

Clean the optical cables and then reconnect them to their original positions.

Note If you loop excess fiber around the fiber management spool, allow sufficient slack for the fiber management spool to move freely.

Step 11 Restore the Transceiver Ports to Service

Restore the transceiver ports to service.

Step 12 Replace Cables

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

You have successfully completed this procedure.

10.1.3 Replacing 8-Port and 10-Port Multiprotocol Muxponder modules

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

What you need

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

Prerequisites

- None



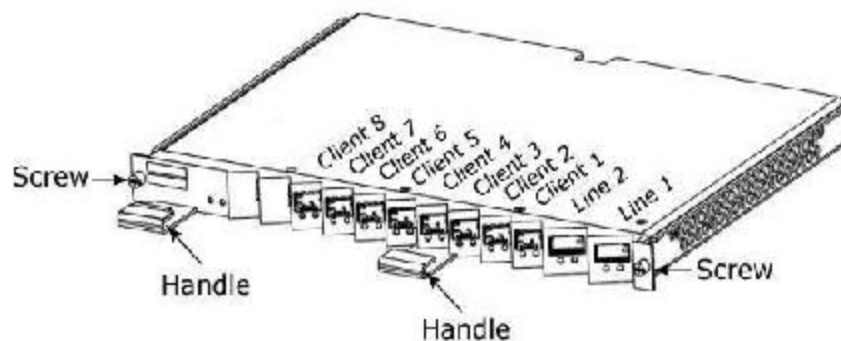
Caution

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).

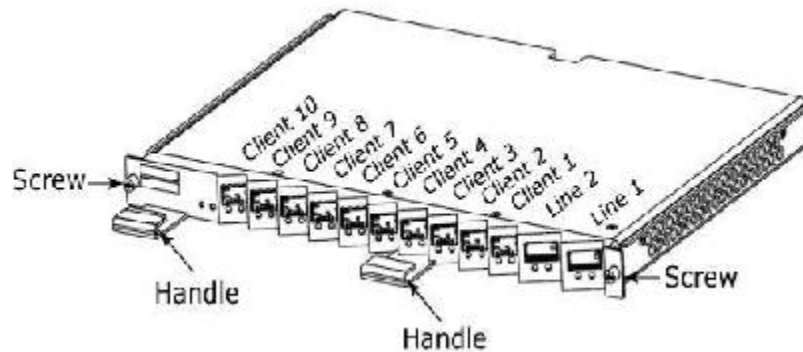
Key module replacement features

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

8-Port Multiprotocol Muxponder



10-Port Multiprotocol Muxponder



Replacement procedure

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

Step 1 Reroute Traffic

Important Failure to reroute traffic can result in lost data. Select an alternate route for the traffic that passes through the module and then transfer traffic to the alternate route before proceeding to step 2.

Caution Failure to reroute traffic can result in lost data. Select an alternate route for the traffic that passes through the module. Transfer traffic to this alternate route before proceeding with this procedure.

Step 2 Remove the Transceiver Ports from Service

Remove the transceiver ports from service.

Step 3 Move the Cables

Shelf cables may need to be moved aside to get clear access to the module. The cables rest on the handles that are at the front of the module.

Step 4 Disconnect the Cables

Disconnect the optical cables from the ports on the faceplate of the module.

Note Ensure that the optical ports on the module and the optical cables are protected with protective caps while disconnected.

Step 5 Loosen the Faceplate Screws

- a) Facing the front of the shelf, locate the faceplate screws.
- b) Using a slot-head or Phillips screwdriver, loosen the screws.

Step 6 Remove the Module

- a) Grasp the handles on the front of the module and firmly pull the module straight out.

Note An equipment missing alarm appears once you remove the module.

- b) Place the module on a flat work surface.

Step 7 Replace the Module

- a) Align the replacement module to the slot in which it is being inserted.
- b) Carefully push the module straight into the slot.

Step 8 Replace 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 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 9 Replace the Transceivers

See [10.2, “Replacing optical transceivers”](#) to insert the transceivers into the module, and then return to this procedure.

Step 10 Reconnect Optical Cables

Clean the optical cables and then reconnect them to their original positions.

Note If you loop excess fiber around the fiber management spool, allow sufficient slack for the fiber management spool to move freely.

Step 11 Restore the Transceiver Ports to Service

Restore the transceiver ports to service.

Step 12 Replace Cables

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

You have successfully completed this procedure.

10.2 Replacing optical transceivers

Use this procedure to replace optical small form factor (SFP) or 10 Gb/s (XFP) transceivers.

What you need

- Electrostatic discharge (ESD) wrist strap
- Replacement 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.



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.

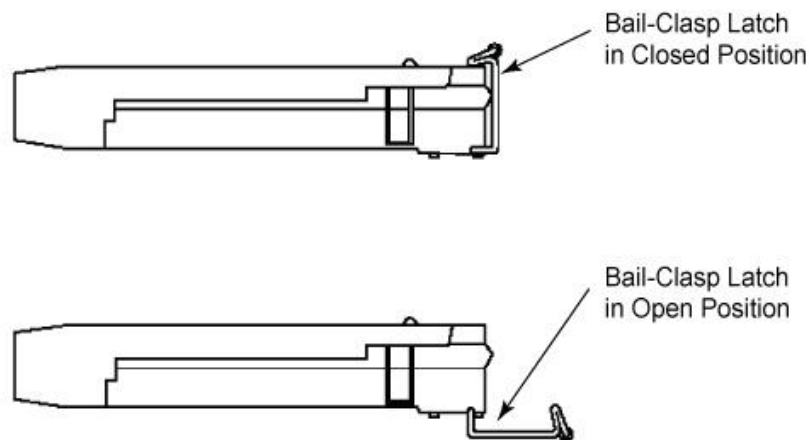


Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

Transceiver key features

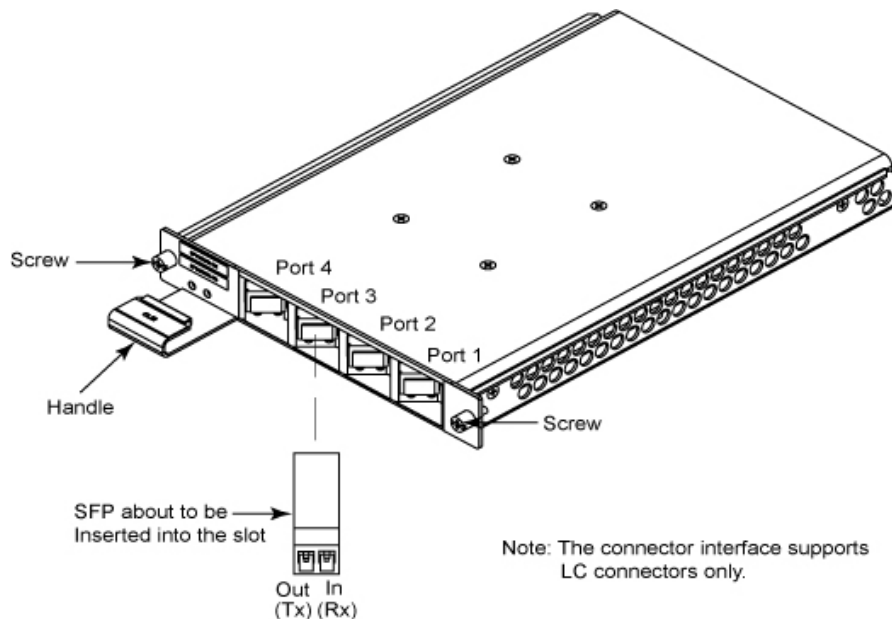
The following figure shows a typical SFP transceiver with a bale-clasp latch.

SFP transceiver with a bale-clasp latch



The following figure shows an SFP transceiver about to be inserted into its slot in a generic module.

Transceiver insertion



Replacement procedure

Follow these steps to replace a transceiver:

Step 1 Reroute Traffic

Caution Failure to reroute traffic can result in lost data. Select an alternate route for the traffic that passes through the module. Transfer traffic to this alternate route before proceeding with this procedure.

Step 2 Remove the Transceiver Port from Service

Remove the port from service.

Step 3 Move the Cables

Shelf cables may need to be moved aside to get clear access to the transceiver. The cables rest on the handles that are at the front of the circuit pack.

Step 4 Disconnect the Optical Cables

Disconnect the optical cables from the optical ports of the transceiver. Label the cables transmit and receive so that you can reconnect them to the correct ports later in this procedure.

Note Ensure that the optical ports on the transceiver and the optical cables are protected with protective caps while disconnected.

Step 5 Disengage the Latch Handle

Facing the front of the shelf, locate the latch handle on the transceiver. For a bale-clasp latch, pull the latch handle down until it is at a 90-degree angle to the transceiver.

Step 6 Remove the Transceiver

- a) Grasp the latch handle on the transceiver and firmly pull the transceiver straight out.

Note If the transceiver port is provisioned, an alarm (REPLUNITMISS) appears and the red LED turns on once you remove the transceiver.

- b) Place the transceiver into anti-static packaging and then lay it on a flat work surface.

Step 7 Insert the Replacement Transceiver

- a) Hold the transceiver so that the optical connectors face you. On an SFP, the product label will be visible. On an XFP, the product label is not visible.
- b) Ensure that the latch handle is in the closed position. For a bale-clasp latch, this is in the upright 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.

Note If the port is provisioned and the replacement transceiver has the same the wavelength, the REPLUNITMISS alarm clears.

Note If the port is provisioned, but the replacement transceiver has a different wavelength, the mismatch alarm (REPLUNITMEA) appears and the red LED turns on.

- e) Remove the plastic protective cover, if fitted.

Step 8 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 9 Connect the Optical Cables

Note Before connecting the optical cables to the transceiver, ensure that both the optical cable connectors and the optical surfaces are clean and that there is no residue on the optical surfaces.

Connect the input and output optical cables to the transceiver as follows:

- a) Ensure that the latch handle (or bale) of the transceiver is in the closed (up) 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 opening until a distinctive click is heard. Then continue exerting pressure on the connector to ensure a good connection is achieved.

Step 10 Restore the Transceiver Port to Service

Important XFPs and DWDM SFPs take about 90 seconds to reach a stable operating temperature. As a result, the REPLUNITFAIL (SFP or XFP Failure) alarm is disabled for 95 seconds after a transceiver is seated. If there is a transceiver hardware fault, the REPLUNITFAIL alarm is raised subsequent to the 95-second time delay.

Step 11 Replace the Cables

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

You have successfully completed this procedure.

10.3 Replacing copper transceivers

Use this procedure to replace copper (electrical) small form factor pluggable (SFP) transceivers.

What you need

- Electrostatic discharge (ESD) wrist strap
- Replacement 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.

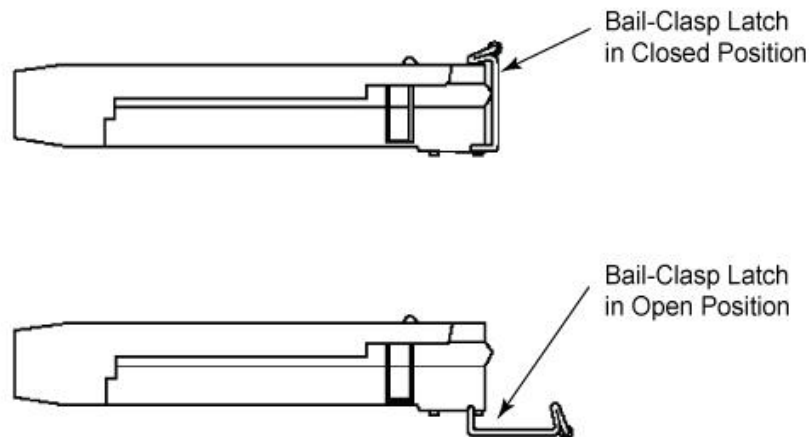


Caution

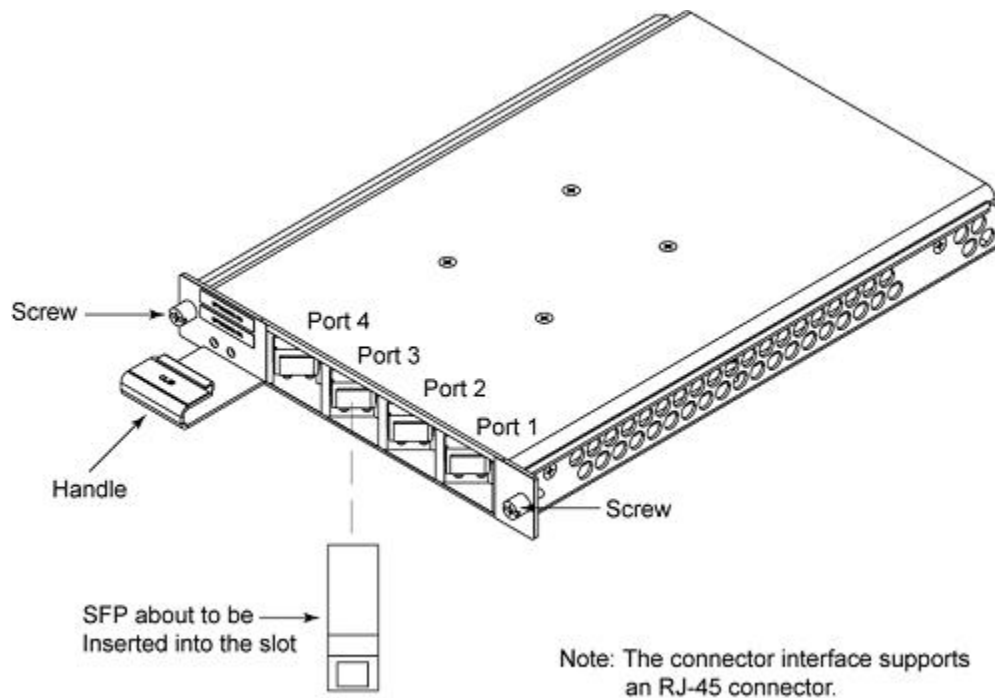
Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

The following figure shows a typical SFP transceiver with a bale-clasp latch.

Figure 10-6 SFP Transceiver key features



The following figure shows a copper SFP transceiver about to be inserted into its slot in a generic module.

Figure 10-7 Copper SFP insertion into a generic module

To prevent potential damage from electrostatic discharge, observe the following when handling SFP transceivers:

- Do not remove an SFP 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 an SFP transceiver.
- Always store or transport an SFP transceiver in anti-static packaging.

Procedure

Step 1 Reroute Traffic

Important Failure to reroute traffic can result in lost data. Select an alternate route for the traffic that passes through the SFP transceiver and then transfer traffic to the alternate route before proceeding with this procedure.

Step 2 Remove SFP port from service

Step 3 Move Cables

Shelf cables may need to be moved aside to get clear access to the SFP transceiver. The cables rest on the handles that are at the front of the module.

Step 4 Disconnect Cable

Disconnect the electrical cable from the electrical (RJ45) port of the SFP transceiver.

Step 5 Disengage Latch Handle

Facing the front of the module, locate the latch handle on the SFP transceiver. For a bale-clasp latch, pull the latch handle down until it is at a 90-degree angle to the transceiver.

Step 6 Remove Transceiver

- a) Grasp the latch handle on the SFP transceiver and firmly pull the transceiver straight out.

Note If the SFP transceiver port is provisioned, an SFP missing alarm (REPLUNITMISS) appears and the red LED turns on once you remove the transceiver.

- b) Place the SFP transceiver into anti-static packaging and then lay it on a flat work surface.

Step 7 Insert the SFP Replacement Transceiver

- a) Hold the SFP transceiver so that the RJ45 connector faces you and the product label is visible.
- b) Ensure that the latch handle is in the closed position. For a bale-clasp latch, this is in the upright position.
- c) Carefully slide the SFP transceiver straight into the port until it clicks.

Note If you are going from an optical to an electrical SFP, provision a wavelength with a value of 0.

- d) Remove the plastic protective cover, if fitted.

Step 8 Connect an RJ45 Cable to the Transceiver

Connect an RJ45 cable to each electrical 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*.

Step 9 Restore SFP Port to Service**Step 10 Replace Cables**

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

You have successfully completed this procedure.

Appendix A: Muxponder interoperability

This section explains the Brocade switch settings required for interoperability with 8-Port and 10-Port Multiprotocol Muxponder modules. For detailed information on settings and configuration, refer to Brocade Communications Systems, Inc. documentation.

FC-SONET/SDH

FC-SONET/SDH is the protocol that provides the means for transporting FC frames over SONET/SDH networks. FC frames are mapped onto a SONET or SDH payload using an ITU standard called Generic Framing Procedure (GFP).

FC-SONET devices, such as 8-Port and 10-Port Multiprotocol Muxponder modules, require non-proprietary switch configuration to ensure the use of Idle rather than ARB primitives for compatibility.

Switch configuration

Note	Incorrect configuration may result in errors or link failure.
-------------	---

Note	CLI commands in the examples in this section are given in uppercase and lowercase for readability.
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It is usually required that you configure the E_Port to operate with Idle rather than ARB primitives to maintain synchronization. Muxponder modules also require ports to be configured to G_Port mode so that loop initialization is not attempted. Credit recovery and quality of Service (QoS) are not activated on the ISL in these configurations.

Brocade switch setup:

- 1 Configure E_Ports to ensure the use of Idle rather than ARB primitives.
- 2 Configure Brocade Extended Fabrics for the appropriate distance.
- 3 Set FC port speed on long-distance E_Ports.

4 Configure E_Ports to G_Port mode.

For Brocade FOS versions earlier than 6.1.1, the port should be configured for R_RDY mode in order to interoperate with Muxponder modules. The following example shows how a port can be configured, via CLI commands, for a 100km link.

```
Switch> portCfgISLMode 1/0 1
Switch> portCfgSpeed 1/0 4
Switch> portCfgGport 1/0 1
Switch> PortCfgLongDistance 1/0 LS 1 100
```

Brocade FOS versions 6.1.1 and later allow Extended Fabrics to operate in VC_RDY mode using FC Idles as fill words. This allows Brocade frame-based trunking to be supported, assuming latency restrictions are met by the distance extension device. Idle fill words are enabled on the E_Port by setting the “VC Translation Link Init” parameter of the portCfgLongDistance command to 0 (“zero”) and disabling QoS and credit recovery. The following example shows how a port can be configured:

```
Switch> portCfgCreditRecovery --disable 1/0
Switch> portCfgQos --disable 1/0
Switch> portCfgSpeed 1/0 4
Switch> portCfgGport 1/0 1
Switch> PortCfgLongDistance 1/0 LS 0 100
```

Buffer allocation

While exact calculations are possible, a simple rule of thumb is often used to calculate the BB credit requirement of a given link. Based on the speed of light in an optical cable, a full-size FC frame spans approximately 4 km at 1 Gbit/sec, 2 km at 2 Gbit/sec, or 1 km at 4 Gbit/sec. The rule of thumb is this: 1 credit is required for every kilometer at 2 Gbit/sec; therefore half a credit is required for every kilometer at 1 Gbit/sec and 2 credits are required for every kilometer at 4 Gbit/sec. With this simple set of guidelines it is easy to estimate the amount of required credits per link to maintain line speed.

The buffer credit calculation does not take Muxponder module latency into account. When applying this equation to a span, extra credits must be added for Muxponder module latency.

Having insufficient BB credits does not cause link failure, but does reduce the maximum throughput.



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