



## PRODUCT DOCUMENTATION

### *BTI 7000 Series Transceiver Information Guide*

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# Preface

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

## Audience

This guide is primarily intended for technicians and network operations 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)**

<b>Equipment</b>	<b>PEC</b>
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**

<b>proNX Management Suite</b>
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
<b>FDA</b>	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.
<b>FCC</b>	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.
<b>Industry Canada</b>	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
<b>Note</b>	Means reader take note. Notes contain helpful suggestions or background information.
 <b>Caution</b>	Means reader be careful. Equipment damage or loss of data can result from your actions.
 <b>Warning</b>	Means reader be careful. Harm to yourself or others can result from your actions.
 <b>Laser Warning</b>	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 About BTI 7000 Series transceivers

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This section provides an overview of the transceivers that the BTI 7000 Series supports.

- [1.1, “SFP transceivers”](#)
- [1.2, “XFP transceivers”](#)
- [1.3, “Module and transceiver compatibility”](#)
- [1.4, “Power consumption of SFPs and XFPs”](#)
- [1.5, “About pluggable transceivers ”](#)
- [1.6, “Benefits of using pluggable transceivers”](#)
- [1.7, “Copper SFP applications”](#)

## 1.1 SFP transceivers

The following table lists the SFP transceivers available from BTI. For specifications information, see [2.1, “SFP specifications”](#) and [2.3, “Optical Supervisory Channel integrated on the System Control Processor”](#).

**Table 1-1 SFP portfolio**

<b>SFP Type</b>	<b>SFP</b>	<b>PEC</b>
<b>850 nm SFPs</b>	2.5G 850 nm SX	BP3AD1SS
	4 Gigabyte Quad-Rate 850 nm	BP3AD2SS
<b>1310 nm SFPs</b>	2.5G 1310 nm SR	BP3AM1MS
	2.5G 1310 nm IR	BP3AM1MI
	4 Gigabyte Quad-Rate 1310 nm	BP3AD2MS
<b>Bidirectional SFPs</b>	1310 TX/1550nm RX	BP3AM5MB
	1550 TX/1310nm RX	BP3AM5LB
	100BX, 1310nm TX/1490nm RX GE, SR	BP3AM5PB
	100BX, 1490nm TX/1310nm RX GE, SR	BP3AM5QB
	100BX, 1310nm TX/1490nm RX GE, IR	BP3AM5PI
	100BX, 1490nm TX/1310nm RX GE, IR	BP3AM5QI
<b>CWDM SFPs</b>	2.5G CWDM LR	BP3AM1CL
	4G CWDM	BP3AM2CL
<b>DWDM SFPs</b>	2.5G Multirate DWDM ER	BP3AM1DE
	4G DWDM	BP3AM2DL
<b>Copper SFPs</b>	10/100/1000BT Copper	BP3AD3ES
	1000BT Copper	BP3AE2ES
<b>SFPs for OSC or multishelf use</b>	1510 XR (for OSC)	BP3AE1CX
	CWDM ER (for OSC)	BP3AE1CE
	Multimode 1310 SR (for multishelf use)	BP3AE1MM

## 1.2 XFP transceivers

The following table lists the XFP transceivers available from BTI. For specifications information, see [2.2, “XFP specifications”](#).

**Table 1-2 XFP portfolio**

XFP	PEC
850 nm XFP	BP3AM4SS
1310 nm SR XFP	BP3AM4MS
1550 nm IR XFP	BP3AM4LI
CWDM XFP	BP3AM4CL
DWDM XFP	BP3AM4DL
Tunable XFP	BP3AM4TL (manufacture discontinued, use BP3AM4TF instead) BP3AM4TF (50 GHz full-band 96-channel) BP3AM4TB-Bnn (100 GHz sub-band 40-channel) BP3AM4TC-Bnn (50 GHz sub-band 96-channel)
	<b>Note</b> The BP3AM4TC-Bnn is intended for 50 GHz spacing applications only.

### XFP Cold Reboot

packetVX, transponder, and muxponder modules support an XFP cold reboot on only 10G ports. An XFP cold reboot may be performed provided one of the following conditions exist:

- The associated port is manually put out of service (OOS-MA).
- There is no provisioned port against it.

To perform an XFP cold reboot use the **reset** command from Ethernet interface configuration mode.

## 1.3 Module and transceiver compatibility

The following tables provide information about the transceiver types supported on Transponders, Muxponders, and packetVX modules. For a list of BTI-qualified transceivers, see [1.1, “SFP transceivers”](#) and [1.2, “XFP transceivers”](#).

### Module–SFP compatibility

Module	Supported SFP type
<b>Transponders</b>	
Dual 1G Multiprotocol Transponders, Dual 2.5G Multiprotocol Transponders, Dual 4G Multiprotocol Transponder	All 850nm All 1310nm All Birdirectional All CWDM All DWDM 1000BTCopper <b>Note</b> 1000BT Copper SFP not supported on 1G Wavelength Translator and 2.5G Wavelength Manager modules.
<b>Muxponders</b>	
2-Port Gbe Muxponders, 8-Port Multiprotocol Muxponders, 10-Port Multiprotocol Muxponders (Client ports only)	All 850nm All 1310nm All Birdirectional All CWDM All DWDM 1000BTCopper
<b>packetVX</b>	
packetVX 12/2, packetVX 24/2, packetVX 24/4, packetVX 80	2.5G 850nm SX 2.5G 1310nm SR 2.5G 1310nm IR 2.5G CWDM 23 dB 2.5G CWDM LR 2.5G Multirate DWDM ER 10/100/1000BT Copper

### Module–XFP compatibility

Module	Supported XFP type
<b>Transponders</b>	
Dual 10G Multiprotocol Transponder, Dual 10G Multiprotocol Transponder Lite, 10G Multiprotocol Transponder	All 850nm All 1310nm



Module	Supported XFP type
	All CWDM All DWDM Tunable
<b>Muxponders</b>	
10-Port Multiprotocol Muxponders (Line ports only)	All 850nm All 1310nm All CWDM All DWDM Tunable
<b>packetVX</b>	
packetVX 12/2, packet VX 24/2, packetvx 24/4	All 850nm All 1310nm All CWDM All DWDM Tunable

## 1.4 Power consumption of SFPs and XFPs

Table 1-3 SFP power consumption

SFP Type	SFP	Power Consumption
<b>850 nm SFPs</b>	2.5G 850 nm SX SFP	1.0 W
	4 Gigabyte Quad-Rate 850 nm SFP	1.0 W
<b>1310 nm SFPs</b>	2.5G 1310 nm SR SFP	1.0 W
	2.5G 1310 nm IR SFP	1.3 W
	4 Gigabyte Quad-Rate 1310 nm SFP	1.5 W
<b>Bidirectional SFPs</b>	Bidirectional 1310/1550 nm SFP	1.3 W
	Bidirectional 1550/1310 nm SFP	1.3 W
<b>CWDM SFPs</b>	2.5G CWDM 23 dB SFP	1.2 W
	2.5G CWDM LR SFP	1.3 W
	4G CWDM SFP	1.5 W
<b>DWDM SFPs</b>	2.5G Multirate DWDM ER SFP	1.3 W
	2.5G Multirate DWDM 200 KM SFP	1.5 W
	4G DWDM SFP	1.5 W
<b>Copper SFPs</b>	10/100/1000BT Copper SFP	1.3 W
	1000BT Copper SFP	1.3 W
<b>SFPs for OSC or multishelf use</b>	1510 Extended Reach SFP (for OSC use)	1.1 W
	Single-mode CWDM ER SFP (for OSC use)	1.1 W
	1510 Extended Reach SFP (for OSC use)	
	Multimode 1310 SR SFP (for multishelf use)	1.0 W

Table 1-4 XFP power consumption

XFP	Power Consumption
850 nm XFP	1.5 W
1310 nm SR XFP	2.5 W
1550 nm IR XFP	3.5 W
CWDM XFP	3.5 W
DWDM XFP	4.0 W
Tunable XFP	4.0 W

## 1.5 About pluggable transceivers

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SFP and XFP transceivers are optimized for simple configurations that support a large number of protocols, bit rates and distances. For information about the transceiver types that a BTI 7000 Series module supports, see the specifications for that module.

Protocols supported by SFPs include:

- ESCON
- FC100 and FC200
- FDDI
- FE
- Gigabit Ethernet
- OC3/OC12/OC48/OC192
- SMPTE-259/SMPTE-292/SMPTE-344
- STM1/STM4/STM16/STM64

Protocols supported by XFPs include:

- OC192
- STM16
- 10GE LAN
- 10GE WAN
- OTN
- 10.7G

## 1.6 Benefits of using pluggable transceivers

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The inherent advantages of using pluggable transceivers include flexibility, scalability, cost savings and management.

### **Flexibility and scalability**

Dual 1G and 2.5G Multiprotocol Transponders can be equipped initially with two SFPs and upgraded to four SFPs as needed. Adding SFPs to accommodate speed or distance requirements does not result in service interruption.

### **Cost savings**

Modules equipped with SFPs/XFPs are simple to use and reconfigure, allowing transceivers to be replaced without taking the rest of the network out of service. This reduces operating expenses by eliminating downtime for parts of the network that are not in the line of a fault.

Modules equipped with pluggables also confer advantages in inventory control. Service providers need only stock SFP/XFP spares instead of the full module replacements necessary when using fixed optic equipment. The use of pluggables reduces on-hand spares inventory, resulting in capital and operational savings. In addition, pluggable replacement does not require taking the entire module out of service.

### **Management**

SFPs/XFPs used in Transponder modules implement Digital Diagnostics, providing a powerful optical network management and diagnostic tool. SFP/XFP optical interfaces supply a database of information about the component itself. This enables network operators to easily track changes and replacements of components, and to know exactly in which module a pluggable transceiver is provisioned, reducing operating expense when a change is necessary. Digital Diagnostics provide information on a variety of manageable parameters:

- Optical Transmit and Receive Power for monitoring and setting alarm thresholds
- Voltage and temperature measurement for environmental monitoring
- Inventory retrieval of factory set parameters, including vendor code, serial number and wavelength

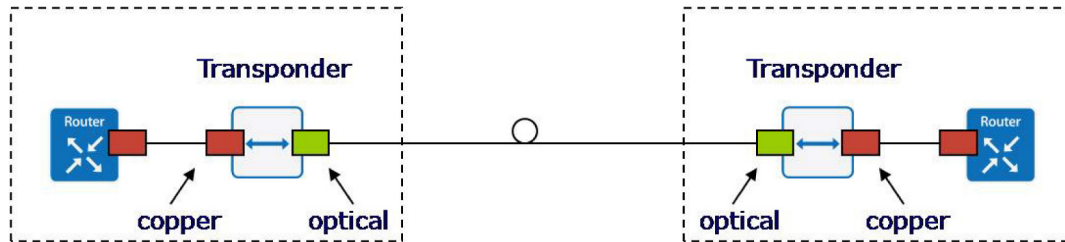
Transponder and muxponder modules with SFPs/XFPs support laser status control. Laser status control enables an operator to turn on or off the transmitting laser on user command.

## 1.7 Copper SFP applications

Copper SFPs can be used in various applications in which Transponders or Muxponders are deployed, including the following applications.

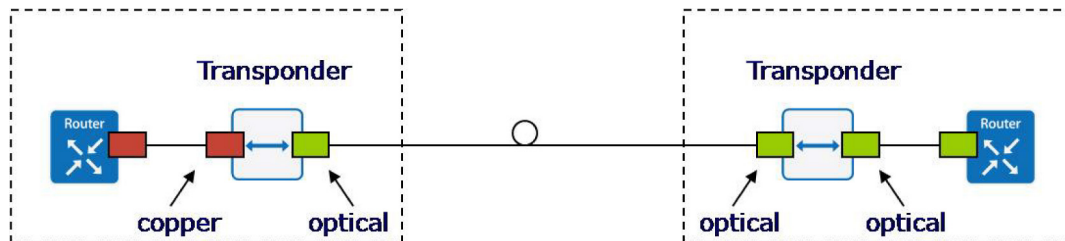
### Copper to optical to fiber to optical to copper

The 1000Base-T signal can be converted into an optical signal for reach extension and DWDM multiplexing, and then be returned to a 1000Base-T signal.



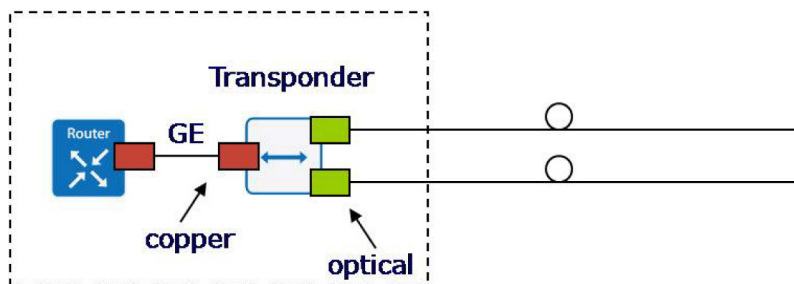
### Copper to optical to fiber to optical to optical

The 1000Base-T signal can be converted into an optical signal for reach extension and DWDM multiplexing, and then be handed off as a 1000Base-X optical signal.



### Copper to optical to fiber with protection

The transponder module can optically protect a client 1000Base-T signal.





## 2.0 Transceiver specifications

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This section provides information about SFP and XFP transceivers that BTI 7000 Series modules support.

- [2.1, “SFP specifications”](#)
- [2.2, “XFP specifications ”](#)
- [2.3, “Optical Supervisory Channel integrated on the System Control Processor”](#)
- [2.4, “Physical PMs”](#)

## 2.1 SFP specifications

**Note** Optical performance has been characterized for SM fiber. Networks can be deployed on other fiber types. Contact your BTI representative for information about supporting these designs.

This section covers the following topics:

- 2.1.1, “850 nm SFPs”
- 2.1.2, “1310 nm SFPs”
- 2.1.3, “Bidirectional 1310nm TX/1550nm RX SFP specifications”
- 2.1.4, “Bidirectional 1310nm/1490nm SR SFP specifications”
- 2.1.5, “Bidirectional 1310nm/1490nm IR SFP specifications”
- 2.1.6, “CWDM SFPs”
- 2.1.7, “DWDM SFPs”
- 2.1.8, “Copper SFPs”

For specifications on SFPs for multishelf or OSC use, see 2.3, “Optical Supervisory Channel integrated on the System Control Processor”.

### 2.1.1 850 nm SFPs

This section covers the following topics:

- 2.1.1.1, “Tri-rate 850 nm SX SFP optical specifications”
- 2.1.1.2, “Tri-rate 850 nm SX SFP cable and connector specifications”
- 2.1.1.3, “4 Gigabyte Quad-Rate 850 nm SX SFP optical specifications”
- 2.1.1.4, “4 Gigabyte Quad-Rate 850 nm SX SFP cable specifications”

#### 2.1.1.1 Tri-rate 850 nm SX SFP optical specifications

Table 2-1 Tri-rate 850 nm SX SFP BP3AD1SS optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	—	1.0625	—	Gb/s
	—	1.25	—	Gb/s
	—	2.125	—	Gb/s
<b>Transmitter</b>				
Laser source	—			
Tx center wavelength	840	—	860	nm
Average operating power	-9.0	—	-1.5	dBm
Spectral width (-20 dB)	—	—	0.65	nm
Extinction ratio	9	—	—	dB



Table 2-1 Tri-rate 850 nm SX SFP BP3AD1SS optical specifications (Continued)

Parameter	Min	Typ	Max	Units
Receiver				
Rx operating wavelength	770	—	860	nm
Stressed Rx sensitivity (BER=1x10 <sup>-12</sup> )				
50/125 μm cable specifications				
1.0625 Gb/s	-14.6	—	3	dBm
1.25 Gb/s	-13.6	—	3	dBm
2.125 Gb/s	-12.2	—	3	dBm
62.5/125 μm cable specifications				
1.0625 Gb/s	-13.7	—	3	dBm
1.25 Gb/s	-12.6	—	3	dBm
2.125 Gb/s	-11.6	—	3	dBm
Reflectance	—	—	-12	dB
Other				
Connector/Latch type	LC/Bail			
SFP MSA 8074 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

### 2.1.1.2 Tri-rate 850 nm SX SFP cable and connector specifications

Table 2-2 Tri-rate 850 nm SX SFP BP3AD1SS cable and connector specifications

Parameter	Min	Typ	Max	Units
<b>50/125 µm Cable Specifications (multimode 850 nm)</b>				
Bandwidth @ 850 nm	2000	—	—	MHz-km
Length - 2.125 Gb/s	0.5	—	500	m
Length - 1.0625 Gb/s	0.5	—	860	m
Length - 1.250 Gb/s	0.5	—	860	m
Bandwidth @ 850 nm	500	—	—	MHz-km
Length - 2.125 Gb/s	0.5	—	300	m
Length - 1.0625 Gb/s	0.5	—	550	m
Length - 1.250 Gb/s	0.5	—	550	m
Bandwidth @ 850 nm	400	—	—	MHz-km
Length - 2.125 Gb/s	0.5	—	260	m

**Table 2-2 Tri-rate 850 nm SX SFP BP3AD1SS cable and connector specifications (Continued)**

Parameter	Min	Typ	Max	Units
Length - 1.0625 Gb/s	0.5	—	500	m
Length - 1.250 Gb/s	0.5	—	500	m
<b>62.5/125 <math>\mu</math>m Cable Specifications (multimode 850 nm)</b>				
Bandwidth @ 850 nm	200	—	—	MHz-km
Length - 2.125 Gb/s	0.5	—	150	m
Length - 1.0625 Gb/s	0.5	—	300	m
Length - 1.250 Gb/s	0.5	—	275	m
Bandwidth @ 850 nm	160	—	—	MHz-km
Length - 2.125 Gb/s	0.5	—	120	m
Length - 1.0625 Gb/s	0.5	—	250	m
Length - 1.250 Gb/s	0.5	—	220	m
<b>LC Optical Connector Specifications (multimode)</b>				
Nominal Attenuation	—	0.25	0.4	dB
Attenuation Standard Deviation	—	0.15	—	dB
Connects/Disconnects	—	—	250	cycles

### 2.1.1.3 4 Gigabyte Quad-Rate 850 nm SX SFP optical specifications

**Table 2-3 4 Gigabyte Quad-Rate 850 nm SFP BP3AD2SS optical specifications**

Parameter	Min	Typ	Max	Units
Bit rate	—	1.0625	—	Gb/s
	—	1.25	—	Gb/s
	—	2.125	—	Gb/s
	—	4.25	—	Gb/s
<b>Transmitter</b>				
Laser source	—			
Tx center wavelength	830	—	860	nm
Average operating power	-9.0	—	-2.5	dBm
Spectral width (-20 dB)	—	—	0.85	nm
Extinction ratio	9	—	—	dB
<b>Receiver</b>				
Rx operating wavelength	770	—	860	nm
<b>Stressed Rx sensitivity (BER=1x10<sup>-12</sup>)</b>				
1.0625 Gb/s	-14.5	—	0	dBm
1.25 Gb/s	-13.5	—	0	dBm
2.125 Gb/s	-12.0	—	0	dBm
4.25 Gb/s	-10.5	—	0	dBm

**Table 2-3 4 Gigabyte Quad-Rate 850 nm SFP BP3AD2SS optical specifications (Continued)**

Parameter	Min	Typ	Max	Units
Reflectance	—	—	-12	dB
Other				
Connector type	LC			
Latch type	Bail			
SFP MSA 8074 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

### 2.1.1.4 4 Gigabyte Quad-Rate 850 nm SX SFP cable specifications

**Table 2-4 4 Gigabyte Quad-Rate 850 nm SFP BP3AD2SS cable specifications**

Parameter	Min	Typ	Max	Units
<b>50/125 µm Cable Specifications (multimode 850 nm)</b>				
Bandwidth @ 850 nm	2000	—	—	MHz-km
Length - 4.250 Gbps	2	—	270	m
Length - 2.125 Gbps	2	—	500	m
Length - 1.250 Gbps	0.5	—	860	m
Length - 1.0625 Gbps	2	—	860	m
Bandwidth @ 850 nm	1500	—	—	MHz-km
Length - 4.250 Gbps	2	—	215	m
Length - 2.125 Gbps	2	—	430	m
Length - 1.250 Gbps	0.5	—	740	m
Length - 1.0625 Gbps	2	—	755	m
Bandwidth @ 850 nm	900	—	—	MHz-km
Length - 4.250 Gbps	2	—	175	m
Length - 2.125 Gbps	2	—	350	m
Length - 1.250 Gbps	0.5	—	595	m
Length - 1.0625 Gbps	2	—	630	m
Bandwidth @ 850 nm	500	—	—	MHz-km
Length - 4.250 Gbps	2	—	150	m
Length - 2.125 Gbps	2	—	300	m
Length - 1.250 Gbps	0.5	—	550	m
Length - 1.0625 Gbps	2	—	500	m
<b>62.5/125 µm Cable Specifications (multimode 850 nm)</b>				

**Table 2-4 4 Gigabyte Quad-Rate 850 nm SFP BP3AD2SS cable specifications (Continued)**

Parameter	Min	Typ	Max	Units
Bandwidth @ 850 nm	200	—	—	MHz-km
Length - 4.250 Gbps	2	—	70	m
Length - 2.125 Gbps	2	—	150	m
Length - 1.250 Gbps	0.5	—	275	m
Length - 1.0625 Gbps	2	—	300	m

**Note** Optical performance has been characterized for SM fiber. Networks can be deployed on other fiber types. Please contact your BTI representative for information about supporting these designs.

## 2.1.2 1310 nm SFPs

This section covers the following topics:

- [2.1.2.1, “1310 nm SR SFP optical specifications”](#)
- [2.1.2.2, “1310 nm IR SFP optical specifications ”](#)
- [2.1.2.3, “4 Gigabyte Quad-Rate 1310 nm SFP optical specifications”](#)

### 2.1.2.1 1310 nm SR SFP optical specifications

**Table 2-5 1310 nm SR SFP BP3AM1MS optical specifications**

Parameter	Min	Typ	Max	Units
Bit rate	125	—	2.67	Gb/s
<b>Transmitter</b>				
Laser source	single-mode			
Tx operating wavelength	1266	1310	1360	nm
Average operating power	-10	—	-3	dBm
Spectral width (rms)	—	—	4	nm
Extinction ratio	8.2	—	—	dB
<b>Receiver</b>				
Rx operating wavelength	1266	—	1620	nm
Rx sensitivity (BER=1x10 <sup>-10</sup> )	-18	—	—	dBm
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-17	—	—	dBm
Rx overload	-3	—	—	dBm
Optical path penalty	—	—	1	dB
Dispersion	—	—	12	ps/nm
Reach	—	—	2	km
Reflectance	—	—	-27	dB
<b>Other</b>				

**Table 2-5 1310 nm SR SFP BP3AM1MS optical specifications (Continued)**

Parameter	Min	Typ	Max	Units
Connector/Latch type	LC/Bail			
GR 253, ITU-T G.957 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

### 2.1.2.2 1310 nm IR SFP optical specifications

**Table 2-6 1310 nm IR SFP BP3AM1MI optical specifications**

Parameter	Min	Typ	Max	Units
Bit rate	125	—	2.67	Gb/s
Transmitter				
Laser source	single-mode			
Tx operating wavelength	1260	1310	1360	nm
Average operating power	-5	—	0	dBm
Spectral width (-20 dB)	—	—	1	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx operating wavelength	1260	—	1620	nm
Rx sensitivity (BER=1x10 <sup>-10</sup> )	-18	—	—	dBm
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-17	—	—	dBm
Rx overload	0	—	—	dBm
Optical path penalty	—	—	1	dB
Reach	—	—	15	km
Reflectance	—	—	-24	dB
Other				
Connector/Latch type	LC/Bail			
GR 253, ITU-T G.957 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			

**Table 2-6 1310 nm IR SFP BP3AM1MI optical specifications (Continued)**

Parameter	Min	Typ	Max	Units
Rx power accuracy	$\pm 3$ dB			

### 2.1.2.3 4 Gigabyte Quad-Rate 1310 nm SFP optical specifications

**Table 2-7 4 Gigabyte Quad-Rate 1310 nm SFP BP3AD2MS optical specifications**

Parameter	Min	Typ	Max	Units
Bit rate	—	1.0625	—	Gb/s
	—	1.25	—	Gb/s
	—	2.125	—	Gb/s
	—	4.25	—	Gb/s
Transmitter				
Laser source	—			
Tx center wavelength	1285	—	1350	nm
Average operating power	-8.4	—	-1.0	dBm
Spectral width (rms)	—	—	2.0	nm
Extinction ratio	—	6	—	dB
Receiver				
Rx operating wavelength	1270	—	1365	nm
Reach				
4G FC	—	—	4	km
1G/2G FC, GE	—	—	10	km
Stressed Rx sensitivity (BER=1x10 <sup>-12</sup> )				
1.0625 Gb/s	-20	—	1	dBm
1.25 Gb/s	-20	—	1	dBm
2.125 Gb/s	-20	—	1	dBm
4.25 Gb/s	-17	—	1	dBm
Reflectance	—	—	-12	dB
Other				
Connector type	LC			
Latch type	Bail			
SFP MSA 8074 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 2 dB			
Rx power accuracy	± 2 dB			

### 2.1.3 Bidirectional 1310nm TX/1550nm RX SFP specifications

**Note** This SFP is used for single fiber interconnection. On a single fiber, a matched pair of SFPs must be used; that is, a 1310nm TX/1550nm RX (BP3AM5MB) can only communicate with a 1550nm TX/1310nm RX (BP3AM5LB).

**Table 2-8 Optical specifications for bidirectional SFPs: 1310nm TX/1550nm RX (BP3AM5MB) and 1550nm TX/1310nm RX (BP3AM5LB)**

Parameter	Min	Typ	Max	Units
Bit rate	125	—	1250	Mb/s
Transmitter				
Tx operating wavelength: 1310	1270	1310	1360	nm
Tx operating wavelength: 1550	1530	1550	1570	nm
Average operating power	-9.5	—	-3	dBm
Spectral width (rms) - 1310 nm	—	—	5.5	nm
Spectral width (-20 dB) - 1550 nm	—	—	1	nm
Side Mode Suppression Ratio @ 1550 nm	30	—	—	dB
Extinction ratio	9	—	—	dB
Receiver				
Rx operating wavelength: 1310	1260	—	1360	nm
Rx operating wavelength: 1550	1480	—	1620	nm
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-20	—	—	dBm
Rx overload	-3	—	—	dBm
Reach	—	—	10	km
Reflectance	—	—	-12	dB
Other				
Connector/Latch type	LC/Bail			
IEEE 802.3, SFP MSA compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

### 2.1.4 Bidirectional 1310nm/1490nm SR SFP specifications

**Note** This SFP is used for single fiber interconnection. On a single fiber, a matched pair of SFPs must be used; that is, a 1310nm TX/1490nm RX GE, SR (BP3AM5PB) can only communicate with a 1490nm TX/1310nm RX GE, SR (BP3AM5QB).

**Table 2-9 Optical specifications for bidirectional SFPs: 1310nm /1490nm SR (BP3AM5PB) and 1490nm/1310nm SR (BP3AM5QB)**

Parameter	Min	Typ	Max	Units
Bit rate	125	—	1250	Mb/s
Transmitter				
Tx operating wavelength: 1310	1260	1310	1360	nm
Tx operating wavelength: 1490	1480	1490	1500	nm
Average operating power	-5.0	—	0	dBm
Extinction ratio	6	—	—	dB
Receiver				
Rx operating wavelength: 1310	1260	1310	1360	nm
Rx operating wavelength: 1490	1480	1490	1500	nm
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-20	—	—	dBm
Rx overload	—	—	-3	dBm
Reach	—	—	20	km
Other				
Connector/Latch type	LC/Bail			
IEEE 802.3, SFP MSA compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

### 2.1.5 Bidirectional 1310nm/1490nm IR SFP specifications

**Note** This SFP is used for single fiber interconnection. On a single fiber, a matched pair of SFPs must be used; that is, a 1310nm TX/1490nm RX GE, IR (BP3AM5PI) can only communicate with a 1490nm TX/1310nm RX GE, IR (BP3AM5QI).

**Table 2-10 Optical specifications for bidirectional SFPs: 1310nm/1490nm IR (BP3AM5PI) and 1490nm/1310nm IR (BP3AM5QI)**

Parameter	Min	Typ	Max	Units
Bit rate	125	—	1250	Mb/s
<b>Transmitter</b>				
Tx operating wavelength: 1310	1260	1310	1360	nm
Tx operating wavelength: 1490	1480	1490	1500	nm
Average operating power	-2	—	+3	dBm
Extinction ratio	6	—	—	dB



**Table 2-10 Optical specifications for bidirectional SFPs: 1310nm/1490nm IR (BP3AM5PI) and 1490nm/1310nm IR (BP3AM5QI) (Continued)**

Parameter	Min	Typ	Max	Units
Receiver				
Rx operating wavelength: 1310	1260	1310	1360	nm
Rx operating wavelength: 1490	1480	1490	1500	nm
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-24	—	—	dBm
Rx overload	—	—	-3	dBm
Reach	—	—	40	km
Other				
Connector/Latch type	LC/Bail			
IEEE 802.3, SFP MSA compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

## 2.1.6 CWDM SFPs

This section covers the following topics:

- [2.1.6.2, “CWDM LR SFP optical specifications ”](#)

### 2.1.6.1 CWDM 23 dB SFP optical specifications

**Table 2-11 CWDM 23 dB SFP BP3AM1CJ optical specifications**

Parameter	Min	Typ	Max	Units
Bit rate	155	—	2670	Mb/s
<b>Transmitter</b>				
Laser source	single mode			
Tx center wavelength	1271	—	1611	nm
Tx center wavelength accuracy	-6.5	—	+6.5	nm
Average operating power	-2	—	3	dBm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
<b>Receiver</b>				
Rx operating wavelength	1260	—	1620	nm
Rx sensitivity (BER=1x10 <sup>-10</sup> )	-25	—	—	dBm
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-24	—	—	dBm

**Table 2-11 CWDM 23 dB SFP BP3AM1CJ optical specifications (Continued)**

Parameter	Min	Typ	Max	Units
Rx overload	-8	—	—	dBm
Dispersion	—	—	1680	ps/nm
Optical path penalty	—	—	2	dB
Reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Bail			
GR 253, ITU-T G.957 compliant				
Digital Diagnostics SFF-8472 compliant				
Temperature accuracy	± 3 C			
Supply Voltage accuracy	± 0.1 V			
Tx Bias Current accuracy	± 5 mA			
Tx power accuracy	± 3 dB			
Rx power accuracy	± 3 dB			

## 2.1.6.2 CWDM LR SFP optical specifications

**Table 2-12 CWDM LR SFP BP3AM1CL optical specifications**

Parameter	Min	Typ	Max	Units
Bit rate	125	—	2.67	Gb/s
Transmitter				
Laser source	single-mode			
Tx center wavelength	1271	—	1611	nm
Tx center wavelength accuracy	-6.5	—	+6.5	nm
Average operating power	0	—	4	dBm
Spectral width (-20 dB)	—	—	1	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx sensitivity (BER=1x10 <sup>-10</sup> )	-28	—	—	dBm
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-27	—	—	dBm
Rx overload	-8	—	—	dBm
Dispersion	—	—	1600	ps/nm
Optical path penalty	—	—	2.5	dB
Reflectance	—	—	-24	dB
Other				
Connector/Latch type	LC/Bail			
SFP MSA 8074, GR 253, ITU-T G.957 compliant				

Table 2-12 CWDM LR SFP BP3AM1CL optical specifications (Continued)

Parameter	Min	Typ	Max	Units
<b>Digital Diagnostics SFF-8472 compliant</b>				
Temperature accuracy		± 3 C		
Supply Voltage accuracy		± 0.1 V		
Tx Bias Current accuracy		± 5 mA		
Tx power accuracy		± 3 dB		
Rx power accuracy		± 3 dB		

### 2.1.6.3 4G CWDM SFP specifications

Table 2-13 4G CWDM SFP BP3AM2CL optical specifications

Parameter	Min	Typ	Max	Units
<b>Bit rate</b>				
GbE	—	1.25	—	Gb/s
OC48	—	2.48832	—	Gb/s
1XFC	—	1.062	—	Gb/s
2XFC	—	2.12	—	Gb/s
4XFC	—	4.24	—	Gb/s
<b>Transmitter</b>				
Tx center wavelength	1471	—	1611	nm
Tx center wavelength accuracy	-6.5	—	6.5	nm
Channel Spacing	See <a href="#">2.1.6.4, "CWDM wavelength plan"</a> .			GHz
Average operating power	0	—	4	dBm
Spectral width (-20 dB)	—	—	0.3	nm
Side mode suppression ratio	40	—	—	dB
<b>Extinction ratio</b>				
GbE, OC48, 1XFC, 2XFC	—	—	8.2	dB
4XFC	—	—	6	dB
<b>Receiver</b>				
Rx operating wavelength	1461	—	1617.5	nm
<b>Rx overload</b>				
GbE, OC48, 1XFC, 2XFC	-7	—	—	dBm
4XFC	-9	—	—	dBm
Dispersion (all rates)	0	—	1600	ps/nm
Reflectance	—	—	-27	dB
<b>Rx characteristics for OSNR ≥ 30 dB @ 1e-12</b>				
GbE, OC48, 1XFC, 2XFC				
0 ps/nm	-28	—	—	dBm
1600 ps/nm	-26	—	—	dBm

**Table 2-13 4G CWDM SFP BP3AM2CL optical specifications (Continued)**

Parameter	Min	Typ	Max	Units
4XFC				
0 ps/nm	-24	—	—	dBm
1600 ps/nm	-21	—	—	dBm

### 2.1.6.4 CWDM wavelength plan

The 4-channel CWDM multiplexer/demultiplexer modules support 4 channels in each module. The 16 wavelengths supported by the modules combined are listed in the following table.

**Note** Channels 1391 nm and 1441 nm are not supported as a result of high fiber attenuation at those wavelengths.

**Table 2-14 CWDM Wavelength Plan**

Available Wavelengths (nm)	Mux/Demux Modules	BTI Channel Numbers
1271	4	16
1291	4	15
1311	4	14
1331	4	13
1351	3	12
1371	3	11
1431	3	10
1451	3	9
1471	2	8
1491	2	7
1511	2	6
1531	2	5
1551	1	4
1571	1	3
1591	1	2
1611	1	1

### 2.1.7 DWDM SFPs

This section covers the following topics:

- [2.1.7.1, “Multirate DWDM ER SFP optical specifications”](#)

### 2.1.7.1 Multirate DWDM ER SFP optical specifications

Table 2-15 Multirate DWDM ER SFP BP3AM1DE optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	125	—	2.67	Mb/s
Transmitter				
Laser source	single-mode			
Tx center wavelength	1529.55	—	1560.61	nm
Tx center wavelength accuracy	-0.1	—	+0.1	nm
Average operating power	0	—	4	dBm
Spectral width (-20 dB)	—	—	0.3	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx operating wavelength	1260	—	1580	nm
Rx overload	-8	—	—	dBm
Dispersion	—	—	2100	ps/nm
Receiver characteristics for OSNR ≥ 30 dB <sup>1</sup>				
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-28	—	-9	dBm
Optical path penalty	—	—	2	dB
Receiver characteristics for OSNR ≥ 20 dB				
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-24	—	-12	dBm
Optical path penalty	—	—	2	dB
Receiver characteristics for OSNR ≥ 18 dB				
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-22	—	-12	dBm
Optical path penalty	—	—	2	dB
Reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Bail			
DWDM SFP MSA, GR 253 and SFF 8472 compliant				
<sup>1</sup> Optical Path Penalty needs to be applied to Rx Sensitivity only.				

### 2.1.7.2 Multirate DWDM 200 KM SFP optical specifications

Table 2-16 Multirate DWDM 200 KM SFP BP3AM1DX optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	100	—	2700	Mb/s
<b>Transmitter</b>				
Laser source	single-mode			
Tx center wavelength	1529.55	—	1560.61	nm

**Table 2-16 Multirate DWDM 200 KM SFP BP3AM1DX optical specifications (Continued)**

Parameter	Min	Typ	Max	Units
Tx center wavelength accuracy	-0.1	—	+0.1	nm
Channel spacing	—	100	—	GHz
Average operating power	3	—	7	dBm
Spectral width (-20 dB)	—	—	0.5	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx operating wavelength	1260	—	1565	nm
Rx overload	-8	—	—	dBm
Dispersion	—	—	3600	ps/nm
Receiver characteristics for OSNR ≥ 21 dB @1e-12				
Back-to-Back	-28	—	-8	dBm
4000 ps/nm	-25	—	-8	dBm
Receiver characteristics for OSNR ≥ 19 dB @ 1e-12				
4000 ps/nm	-22	—	-9	dBm
Reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Bail			
DWDM SFP MSA, GR 253 and SFF 8472 compliant				

### 2.1.7.3 4G DWDM SFP specifications

**Table 2-17 4G DWDM SFP BP3AM2DL optical specifications**

Parameter	Min	Typ	Max	Units
<b>Bit rate</b>				
GbE	—	1.25	—	Gb/s
OC48	—	2.48832	—	Gb/s
1XFC	—	1.062	—	Gb/s
2XFC	—	2.12	—	Gb/s
4XFC	—	4.24	—	Gb/s
<b>Transmitter</b>				
Tx center wavelength	1530.33	—	1559.79	nm
Tx center wavelength accuracy	-0.1	—	0.1	nm
Channel Spacing	—	100	—	GHz
Average operating power	0	—	4	dBm
Spectral width (-20 dB)	—	—	0.3	nm
Side mode suppression ratio	40	—	—	dB
Extinction ratio				

Table 2-17 4G DWDM SFP BP3AM2DL optical specifications (Continued)

Parameter	Min	Typ	Max	Units
GbE, OC48, 1XFC, 2XFC	—	—	8.2	dB
4XFC	—	—	6	dB
<b>Receiver</b>				
Rx operating wavelength	1520	—	1570	nm
Rx overload				
GbE, OC48, 1XFC, 2XFC	-7	—	—	dBm
4XFC	-9	—	—	dBm
Dispersion				
GbE, OC48, 1XFC, 2XFC	0	—	4000	ps/nm
4XFC	0	—	1600	ps/nm
Reflectance	—	—	-27	dB
<b>Rx characteristics for OSNR <math>\geq</math> 30 dB @ 1e-12</b>				
GbE, OC48, 1XFC, 2XFC				
0 ps/nm	-28	—	—	dBm
2100 ps/nm	-26	—	—	dBm
4XFC				
0 ps/nm	-25	—	—	dBm
1600 ps/nm	-22	—	—	dBm
<b>Rx characteristics for OSNR <math>\geq</math> 25 dB @ 1e-12</b>				
4XFC, 1600 ps/nm	-22	—	—	dBm
<b>Rx characteristics for OSNR <math>\geq</math> 20 dB @ 1e-12</b>				
GbE, OC48, 1XFC, 2XFC, 2100 ps/nm	-24	—	—	dBm
<b>Rx characteristics for OSNR <math>\geq</math> 18 dB @ 1e-12</b>				
GbE, OC48, 1XFC, 2XFC, 2100 ps/nm	-22	—	—	dBm

## 2.1.8 Copper SFPs

This section covers the following topics:

- [2.1.8.1, “Copper SFP BP3AD3ES specifications”](#)
- [2.1.8.2, “Copper SFP BP3AE2ES specifications”](#)

### 2.1.8.1 Copper SFP BP3AD3ES specifications

Table 2-18 Copper SFP BP3AD3ES specifications

Parameter	Min	Typ	Max	Units
Data rate (10/100/1000Base-T)	0.0125	—	1.25	Gbps
Reach (CAT 5 cable)	100	—	—	m
Clock Tolerance	-50	—	50	ppm

**Table 2-18 Copper SFP BP3AD3ES specifications (Continued)**

Parameter	Min	Typ	Max	Units
Rise/fall time (20%-80%)	—	175	—	ps
Power dissipation	—	—	1.3	W
Latency	—	—	1	μs
Regulatory compliance	Class A EMI GR1089 lightning protection: Type 2 (intra-building) from NEBS-3, unshielded cable IEEE 802.3			

### 2.1.8.2 Copper SFP BP3AE2ES specifications

**Table 2-19 Copper SFP BP3AE2ES specifications**

Parameter	Min.	Typical	Max.	Units
Data rate (1000Base-T)	—	1.25	—	Gb/s
Reach (CAT 5 cable)	100	—	—	m
Clock Tolerance	-50	—	50	ppm
Rise/fall time (20%-80%)	—	175	—	ps
Power dissipation	—	—	1.3	W
Latency	—	—	1	μs
Regulatory compliance	Class A EMI; GR1089 lightning protection: Type 2 (intra-building) from NEBS-3, unshielded cable; IEEE 802.3			



## 2.2 XFP specifications

**Note** Optical performance has been characterized for SM fiber.

### 2.2.1 850 nm XFP specifications

Table 2-20 850 nm XFP BP3AM4SS optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	9.953	—	10.7	Gb/s
Transmitter				
Tx operating wavelength	840	850	860	nm
Average operating power	-4.4	—	-1.1	dBm
Spectral width (rms)	—	—	0.45	nm
Extinction ratio	3	—	—	dB
Optical Return Loss Tolerance	—	—	12	dB
Receiver				
Rx operating wavelength	840	850	860	nm
Stressed Rx sensitivity (BER = 1e-12)	-7.5	—	—	dBm
Rx overload	—	—	-1.0	dBm
Optical Path Penalty	—	—	3.9	dB
Reflectance	—	—	-12	dB
50/125 μm Cable Specifications (multimode 850 nm)				
Length @ 2000 MHz-km	2	—	300	m
Length @ 500 MHz-km	2	—	82	m
62.5/125 μm Cable Specifications (multimode 850 nm)				
Length @ 200 MHz-km	2	—	33	m
Other				
Connector/Latch type	LC/Lever			
IEEE 802.3 ae and XFP MSA compliant				

### 2.2.2 1310 nm SR XFP optical specifications

Table 2-21 1310 nm SR XFP BP3AM4MS optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	9.953	—	10.7	Gb/s
<b>Transmitter</b>				
Tx operating wavelength	1290	1310	1330	nm
Average operating power	-6	—	-1	dBm
Spectral width (-20dB)	—	—	1	nm

**Table 2-21 1310 nm SR XFP BP3AM4MS optical specifications (Continued)**

Parameter	Min	Typ	Max	Units
Side mode suppression ratio	30	—	—	dB
Extinction ratio	6	7	—	dB
Optical Return Loss Tolerance	—	—	12	dB
Receiver				
Rx operating wavelength	1260	—	1355	nm
Stressed Rx sensitivity (BER = 1e-12)	-10.3	—	—	dBm
Rx overload	—	—	+0.5	dBm
Optical path penalty (@ 6.6 ps/nm)	—	—	1.2	dB
Reflectance	—	—	-14	dB
Reach				
SONET	—	—	7	km
Ethernet/FC	—	—	10	km
Other				
Connector/Latch type	LC/Lever			
GR 253, ITU-T G.957, IEEE 802.3 ae and XFP MSA compliant				

## 2.2.3 1550 nm IR XFP optical specifications

**Table 2-22 1550 nm IR XFP BP3AM4LI optical specifications**

Parameter	Min	Typ	Max	Units
Bit rate	9.953	—	10.7	Gb/s
Transmitter				
Tx operating wavelength	1530	—	1565	nm
Average operating power	-1	—	+2	dBm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB
Receiver				
Rx operating wavelength	1270	—	1600	nm
Stressed Rx sensitivity (BER = 1e-12)	-11.3	—	—	dBm
Rx overload	—	—	-1	dBm
Optical path penalty (at 800 ps/nm)	—	—	2	dB
Reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Lever			
GR 253, ITU-T G.957, IEEE 802.3 ae and XFP MSA compliant				

## 2.2.4 CWDM XFP BP3AM4CL optical specifications

Table 2-23 CWDM XFP BP3AM4CL optical specifications

Parameter	Min	Typ	Max	Units
Bit rate	9.953	—	10.7	Gb/s
Transmitter				
Tx center wavelength	1471	—	1611	nm
Tx center wavelength accuracy	-6.5	—	+6.5	nm
Average operating power	0	—	4	dBm
Spectral width (-20dB)	—	—	1	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	9	—	—	dB
Receiver				
Rx operating wavelength	1460	—	1620	nm
Rx reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Lever			
Compliant to XFP MSA and GR 253				

Table 2-24 CWDM XFP Rx Optical Performance Specifications

Bit Rate (Gb/s)	Dispersion (ps/nm)	Receiver Sensitivity (dBm)	BER
9.953/10.312/10.5	0	-21 to -9	1e-12
	1400	-20.5 to -9	
10.7 with FEC	0	-25 to -9	1e-4
	1400	-24.5 to -9	
10.7 with EFEC	0	-26 to -9	1e-3
	1400	-25.5 to -9	

## 2.2.5 DWDM XFP optical specifications

Table 2-25 DWDM XFP BP3AM4DL optical specifications

Parameter	Min	Typ	Max	Units
Bit Rate	9.953	—	10.7	Gb/s
<b>Transmitter</b>				
Tx operating wavelength	1529.55	—	1560.61	nm
Average operating power	-1	—	+3	dBm
Spectral width (-20dB)	—	—	0.3	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	8.2	—	—	dB

**Table 2-25 DWDM XFP BP3AM4DL optical specifications (Continued)**

Parameter	Min	Typ	Max	Units
Receiver				
Rx operating wavelength	1528	—	1565	nm
Reflectance	—	—	-27	dB
Other				
Connector/Latch type	LC/Lever			
Compliant to XFP MSA				

**Table 2-26 DWDM XFP Rx Optical Performance Specifications**

Bit Rate (Gb/s)	Dispersion (ps/nm)	OSNR (dB)	Receiver Sensitivity (dBm)	BER
9.95/10.3	0	≥30	-24 to -7	1e-12
		≥25	-18 to -7	
	1200	≥30	-23 to -7	
		≥27	-18 to -7	
	1600	≥30	-22 to -7	
		≥28	-18 to -7	
10.5	0	≥30	-23 to -7	1e-12
		≥26	-18 to -7	
	1200	≥30	-22 to -7	
		≥28	-18 to -7	
	1600	≥30	-18 to -7	
10.7/ with FEC	0	≥30	-26 to -7	1e-4
		≥18	-18 to -7	
	1200	≥30	-25 to -7	
		≥18	-18 to -7	
	1600	≥30	-24 to -7	
		≥19	-18 to -7	
10.7/ with EFEC	0	≥30	-27 to -7	1e-3
		≥16	-18 to -7	
	1200	≥30	-26 to -7	
		≥16	-18 to -7	
	1600	≥30	-25 to -7	
		≥17	-18 to -7	

## 2.2.6 Tunable DWDM LR XFP optical specifications

**Table 2-27 Tunable DWDM LR XFP BP3AM4TL, BP3AM4TF, BP3AM4TB-Bnn, BP3AM4TC-Bnn optical specifications**

Parameter	Min	Max	Units
Bit Rate	9.953	10.7	Gb/s
<b>Transmitter</b>			
Tx operating wavelength:			
BP3AM4TL <sup>1</sup>	1529.55	1560.61	nm
BP3AM4TF	1528.77	1566.72	nm
BP3AM4TB-Bnn	See <a href="#">Table 2-28</a> .		
BP3AM4TC-Bnn	See <a href="#">Table 2-29</a> .		
Average operating power	-1	+3	dBm
Spectral width (-20dB)	—	0.3	nm
Side mode suppression ratio	30	—	dB
Extinction ratio	8.2	—	dB
<b>Receiver</b>			
Rx operating wavelength	1528.77	1566.72	nm
Reflectance	—	-27	dB
<b>Other</b>			
Connector/Latch type	LC/Lever		
Compliant to XFP MSA			

<sup>1</sup>This transceiver is manufacture discontinued. Use BP3AM4TF instead.

**Note** The BP3AM4TC-Bnn is intended for 50 GHz spacing applications only.

**Table 2-28 100 GHz sub-band tunable (BP3AM4TB-Bnn) transmit frequencies**

Part Number	Sub-band	Min	Max	Units
BP3AM4TB-B01	1	192.10	193.00	THz
BP3AM4TB-B02	2	193.10	194.00	THz
BP3AM4TB-B03	3	194.10	195.00	THz
BP3AM4TB-B04	4	195.10	196.00	THz

**Table 2-29 50 GHz sub-band tunable (BP3AM4TC-Bnn) transmit frequencies**

Part Number	Sub-band	Min	Max	Units
BP3AM4TC-B01	1	191.35	191.80	THz
BP3AM4TC-B02	2	191.85	192.30	THz
BP3AM4TC-B03	3	192.35	192.80	THz
BP3AM4TC-B04	4	192.85	193.30	THz
BP3AM4TC-B05	5	193.35	193.80	THz

**Table 2-29 50 GHz sub-band tunable (BP3AM4TC-Bnn) transmit frequencies (Continued)**

Part Number	Sub-band	Min	Max	Units
BP3AM4TC-B06	6	193.85	194.30	THz
BP3AM4TC-B07	7	194.35	194.80	THz
BP3AM4TC-B08	8	194.85	195.30	THz
BP3AM4TC-B09	9	195.35	195.80	THz
BP3AM4TC-B10	10	195.85	196.10	THz

**Table 2-30 Tunable XFP Rx Optical Performance Specifications**

Bit Rate (Gb/s)	Dispersion (ps/nm)	OSNR (dB)	Receiver Sensitivity (dBm)	BER
9.95/10.3	0	$\geq 30$	-24 to -7	1e-12
		$\geq 25$	-18 to -7	
	1200	$\geq 30$	-23 to -7	
		$\geq 27$	-18 to -7	
	1600	$\geq 30$	-22 to -7	
		$\geq 28$	-18 to -7	
10.5	0	$\geq 30$	-23 to -7	1e-12
		$\geq 26$	-18 to -7	
	1200	$\geq 30$	-22 to -7	
		$\geq 28$	-18 to -7	
	1600	$\geq 30$	-18 to -7	
		$\geq 30$	-18 to -7	
10.7/ with FEC	0	$\geq 30$	-26 to -7	1e-4
		$\geq 18$	-18 to -7	
	1200	$\geq 30$	-25 to -7	
		$\geq 18$	-18 to -7	
	1600	$\geq 30$	-24 to -7	
		$\geq 19$	-18 to -7	
10.7/ with EFEC	0	$\geq 30$	-27 to -7	1e-3
		$\geq 16$	-18 to -7	
	1200	$\geq 30$	-26 to -7	
		$\geq 16$	-18 to -7	
	1600	$\geq 30$	-25 to -7	
		$\geq 17$	-18 to -7	

## 2.2.7 Wavelengths supported on Tunable XFP BP3AM4TL

**Note** This transceiver is manufacture discontinued. Use BP3AM4TF instead.

Table 2-31 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

## 2.2.8 Wavelengths supported on Tunable XFP BP3AM4TF

Table 2-32 96-channel DWDM Wavelength Plan

DOLChannel Numbers	Frequency (THz)	Wavelength (nm)
610	196.10	1528.77
605	196.05	1529.16
600	196.00	1529.55
595	195.95	1529.94
590	195.90	1530.33
585	195.85	1530.72
580	195.80	1531.12
575	195.75	1531.51
570	195.70	1531.90
565	195.65	1532.29
560	195.60	1532.68
555	195.55	1533.07

**Table 2-32 96-channel DWDM Wavelength Plan (Continued)**

<b>DOLChannel Numbers</b>	<b>Frequency (THz)</b>	<b>Wavelength (nm)</b>
550	195.50	1533.47
545	195.45	1533.86
540	195.40	1534.25
535	195.35	1534.64
530	195.30	1535.04
525	195.25	1535.43
520	195.20	1535.82
515	195.15	1536.22
510	195.10	1536.61
505	195.05	1537.00
500	195.00	1537.40
495	194.95	1537.79
490	194.90	1538.19
485	194.85	1538.58
480	194.80	1538.98
475	194.75	1539.37
470	194.70	1539.77
465	194.65	1540.16
460	194.60	1540.56
455	194.55	1540.95
450	194.50	1541.35
445	194.45	1541.75
440	194.40	1542.14
435	194.35	1542.54
430	194.30	1542.94
425	194.25	1543.33
420	194.20	1543.73
415	194.15	1544.13
410	194.10	1544.53
405	194.05	1544.92
400	194.00	1545.32
395	193.95	1545.72
390	193.90	1546.12
385	193.85	1546.52
380	193.80	1546.92
375	193.75	1547.32
370	193.70	1547.72
365	193.65	1548.11



Table 2-32 96-channel DWDM Wavelength Plan (Continued)

DOLChannel Numbers	Frequency (THz)	Wavelength (nm)
360	193.60	1548.51
355	193.55	1548.91
350	193.50	1549.32
345	193.45	1549.72
340	193.40	1550.12
335	193.35	1550.52
330	193.30	1550.92
325	193.25	1551.32
320	193.20	1551.72
315	193.15	1552.12
310	193.10	1552.52
305	193.05	1552.93
300	193.00	1553.33
295	192.95	1553.73
290	192.90	1554.13
285	192.85	1554.54
280	192.80	1554.94
275	192.75	1555.34
270	192.70	1555.75
265	192.65	1556.15
260	192.60	1556.55
255	192.55	1556.96
250	192.50	1557.36
245	192.45	1557.77
240	192.40	1558.17
235	192.35	1558.58
230	192.30	1558.98
225	192.25	1559.39
220	192.20	1559.79
215	192.15	1560.20
210	192.10	1560.61
205	192.05	1561.01
200	192.00	1561.42
195	191.95	1561.83
190	191.90	1562.23
185	191.85	1562.64
180	191.80	1563.05
175	191.75	1563.45

**Table 2-32 96-channel DWDM Wavelength Plan (Continued)**

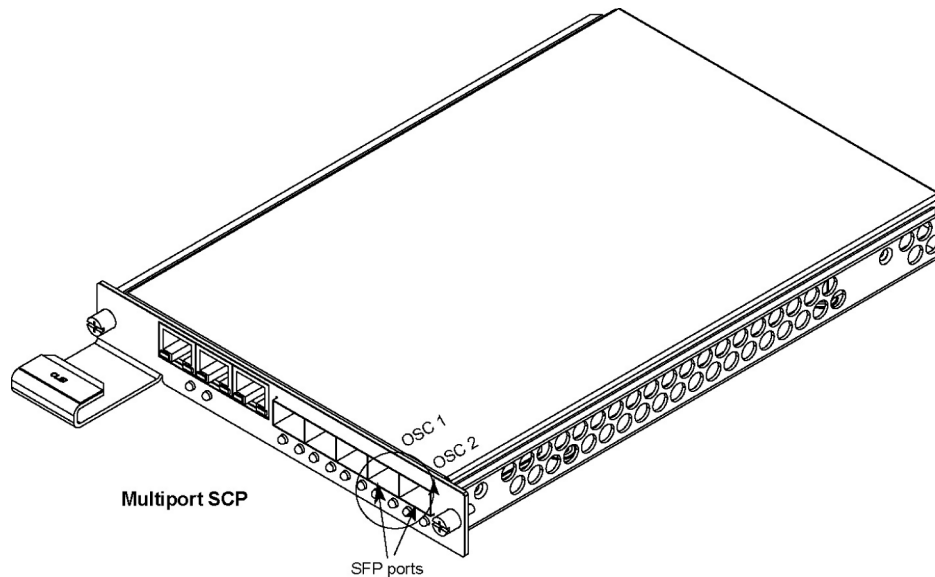
<b>DOLChannel Numbers</b>	<b>Frequency (THz)</b>	<b>Wavelength (nm)</b>
170	191.70	1563.86
165	191.65	1564.27
160	191.60	1564.68
155	191.55	1565.09
150	191.50	1565.50
145	191.45	1565.91
140	191.40	1566.31
135	191.35	1566.72

## 2.3 Optical Supervisory Channel integrated on the System Control Processor

The System Control Processor (SCP) provides Optical Supervisory Channel (OSC) functionality for remote management of a BTI 7000 Series shelf. The SCP has two SFP-based OSC ports supporting 1511 channels. The OSC integrated on the SCP must be combined with a separate Coupler/Splitter module for full functionality.

**Note** For OSC applications using the 1511 SFP, use the 1-Channel or Double 1-Channel CWDM OADM/OSC Coupler Splitter, Channel 6 (1511 nm) Optical Coupler / Splitter Single Direction or Optical Coupler / Splitter Dual Direction module.

The following figure shows the OSC ports on the SCP.



### 2.3.1 1510 XR SFP (for OSC) specifications

The following table provides specifications for the 1510 XR SFP (for OSC) supported for use in the OSC ports on the SCP.

**Table 2-33 1510 XR SFP (for OSC) BP3AE1CX specifications**

Parameter	Min	Typ	Max	Units
Bit rate <sup>1</sup>	—	156	—	Mb/s
<b>Transmitter</b>				
Laser source	single-mode			
Tx center wavelength	1500	1511	1520	nm
Average operating power	1	—	5	dBm
Spectral width (-20 dB)	—	—	1	nm

**Table 2-33 1510 XR SFP (for OSC) BP3AE1CX specifications (Continued)**

Parameter	Min	Typ	Max	Units
Side mode suppression ratio	30	—	—	dB
Extinction ratio	10	—	—	dB
Receiver				
Rx operating wavelength	1100	—	1600	nm
Max Input (BER=1x10 <sup>-10</sup> )	-7	—	—	dBm
Rx sensitivity (BER=1x10 <sup>-10</sup> )	-43	—	—	dBm
Optical Return Loss	25	—	—	dB
Other				
Connector/Latch type	LC/Bail			
¹Data rate ranges from 50 Mb/s to 266 Mb/s. However, device performance is not guaranteed.				

### 2.3.2 CWDM ER SFP (for OSC) specifications

The following table provides specifications for the CWDM ER SFP (for OSC) supported for use in the OSC ports on the Multiport SCP.

**Table 2-34 CWDM ER SFP (for OSC) BP3AE1CE specifications**

Parameter	Min	Typ	Max	Units
Bit rate	50	156	266	Mb/s
<b>Transmitter</b>				
Laser source	single-mode			
Tx center wavelength	1511	—	1611	nm
Tx center wavelength accuracy	-6.5	—	6.5	nm
Average operating power	0	—	5	dBm
Spectral width (-20 dB)	—	—	1	nm
Side mode suppression ratio	30	—	—	dB
Extinction ratio	10	—	—	dB
<b>Receiver</b>				
Rx operating wavelength	1100	—	1620	nm
Max Input (BER=1x10 <sup>-10</sup> )	-7	—	—	dBm
Rx sensitivity (BER=1x10 <sup>-10</sup> )	-34	-37	—	dBm
Optical Return Loss	25	—	—	dB
<b>Other</b>				
Connector/Latch type	LC/Bail			

### 2.3.3 Multimode 1310 SR SFP optical specifications

The following table provides specifications for the Multimode 1310 SR SFP supported for multishelf use.

**Table 2-35 Multimode 1310 SR SFP BP3AE1MM optical specifications**

Parameter	Min	Typ	Max	Units
Bit rate	—	125	—	Mb/s
<b>Transmitter</b>				
Laser source	multimode			
Tx operating wavelength	1270	—	1380	nm
Average operating power	-20	—	-14	dBm
Spectral width (-20 dB)	—	—	200	nm
Extinction ratio	10	—	—	dB
<b>Receiver</b>				
Rx operating wavelength	1100	—	1600	nm
Max input (BER=2.5x10 <sup>-10</sup> )	-14	—	—	dBm
Rx sensitivity (BER=1x10 <sup>-10</sup> )	-30	—	—	dBm
Rx sensitivity (BER=1x10 <sup>-12</sup> )	-29	—	—	dBm
<b>Other</b>				
Connector/Latch type	LC/Bail			

## 2.4 Physical PMs

Table 2-36 Physical PMs (gauges)

PM (montype)	Supported transceivers
<b>Optical Power Received</b> (OPR MIN, OPR MAX, OPR AVG) Optical Power Received measures the minimum, maximum, and average optical power (dBm) received. Measurements are accurate to $\pm 3.0$ dBm for SFPs; to $\pm 2.0$ dBm for XFPs.	Noncopper SFPs All XFPs
<b>Optical Power Transmitted</b> (OPT MIN, OPT MAX, OPT AVG) Optical Power Transmitted measures the minimum, maximum, and average optical power (dBm) transmitted. Measurements are accurate to $\pm 3.0$ dBm for SFPs; to $\pm 2.0$ dBm for XFPs.	Noncopper SFPs All XFPs
<b>Supply Voltage</b> 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
<b>Supply Voltage 2</b> 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
<b>Temperature</b> Temperature measures the temperature ( $^{\circ}\text{C}$ ) of the transceiver.	All SFPs All XFPs
<b>Tx Bias current</b> 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.





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