



## PRODUCT DOCUMENTATION

### *BTI SA-821 Carrier Ethernet Switch Installation and System Configuration Guide*

**Part Number:** BT7D21PD0011  
**Document Version:** 02  
**Published:** January 2017  
**Type:** STANDARD

***product release 2.2.1***



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# Preface

## Audience

This guide is primarily intended for installers, technicians, and network operation center (NOC) staff.

## Equipment compliance

### Agency compliance

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.



The BTI Service Access 800 Series is suitable for installation in a Common Bonding Network.

The BTI Service Access 800 Series is suitable for installation in Network Telecommunication Facilities and in locations where the National Electrical Code (NEC) applies.

The DC power port shall be treated as DC-I (Isolated DC return).

**Model Number:**

**Mfg Date:**

This product complies with FDA-21, CFR Chapter 1, Sub-Chapter J as a Class 1M LASER PRODUCT, Class 1M Hazard Rating.

This product 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.




This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la Class A est conforme à la norme NMB-003 du Canada.

Made in Korea / Fabriqué en Corée

## Documentation suite

- *BTI SA-805, BTI SA-821, BTI SA-822 Carrier Ethernet Switch Release Notes*
- *BTI SA-805, BTI SA-821, BTI SA-822 Carrier Ethernet Switch Command Line Reference Guide*
- *BTI SA-821 Carrier Ethernet Switch Installation and System Configuration Guide*

## 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.

# Installation and Power Requirements, Warnings and Cautions

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## Ordering Requirements for Power and Fan Modules and Cables

The switch can be powered from a DC or AC power source using an DC or AC power module. The power modules are not supplied with the switch and should be ordered if required. The switches also supports a fan module [with four fans] which is not supplied with the switch and can also be ordered if required.

- Fan module [with four fans]
- DC power module [-48V | +24V DC]
- AC power module assembly [100V - 240V AC]

Cables and accessories to wire the switch to a DC power source can be purchased from any hardware or electrical depot.

If you intend to power the switch from the mains or 100V - 240V AC you will require the AC power module assembly, which contains the AC power module and an AC cord which is used to plug the module into the mains supply. The AC cord has a North American 3 pin plug [NEMA 5-15P 120V 60HZ].

The switches are compliant to universal power requirements. Contact Technical Support if you wish to order an alternative cord with a different plug.

## Site Requirements

- The environmental conditions of the site should be with the temperature range -40 to 65 °C | -40 to 149 ° F with up to 85 % non condensing atmosphere

## Installation Requirements.

- The socket-outlet shall be installed near the equipment and shall be easily accessible
- Sufficient rack access for maintenance to work safely and comfortably in front and behind the rack should exist
- It is recommended that 1RU of empty space should exist above and below the switch for ventilation
- Ground the equipment chassis
- The -48V DC and +24V DC power are connected on the switch using a small terminal block with screw fasteners. You must ensure power is switched off at the distribution panel before inserting or removing the power cables.
- AC power cables should be unplugged from the switch in the same manner as regular AC power sockets.
- If installed on a shelf, the surface must be flat, even and capable of supporting the switch weight [ 5.3lbs | 2.4 kg ]. The surface area must be greater than the dimensions of the switch [ 440 wide x 255 depth [mm]
- The switch should not be located close to any equipment or machinery which may cause electromagnetic interference

## Electrical and Wiring Requirements and Considerations

- A readily accessible disconnect device shall be incorporated into the installation wiring. For optimum system power performance, a power distribution panel with line conditioning filtering capabilities should be used



- Surge damage to network equipment can be minimized using proper grounding methods and adhering to electrical wiring codes
- Ground potential differences between buildings should be minimized
- Connect only a DC power source that complies with the Safety Extra-Low Voltage (SELV) requirements inclusive of UL1950, CAN/CSA 22.2 No. 60950, EN60950 or IEC 60950 to the DC input power supply unit
- Install DC power supplies used in restricted access areas in accordance with Articles 110-16, 110-17, and 110-18 of the National Electric Code, ANSI/NFPA 70.

**Cautions and Warnings**

- When replacing or handling the power modules never touch the electronic components. As with all power units, capacitors may retain a charge even after they are removed from the power supply source. Always handle the power modules by the front plate and underneath the lower insulated surface.
- You may install and remove the second DC power module while the switch is in operation. However you should ensure the +24V DC and -48V DC power is switched OFF to that DC module before the module is installed or removed
- If you remove the AC power module or if you remove the DC power in a system provisioned with only one working DC power module, traffic on that switch will be down until the power to the switch is restored
- You may install and remove the second DC power module while the switch is in operation. However you should ensure the +24V DC and -48V DC power is switched OFF to that DC module before the module is installed or removed. If the switch is in operation while you are removing the second DC power module, you should ensure that power to the remaining module is maintained
- Always ensure the DC wiring has been disconnected before removing the DC modules
- Never touch the wiring terminals when the DC power is ON
- Always ensure the AC power cord is unplugged from the AC power module before installing or removing the AC module
- Provisioning the switch with protected AC power, may require you to remove the DC terminal screw block from the DC power modules. Always ensure the DC power is OFF to that module before removing the terminal screw block
- Always perform a visual inspection of the switch and its surrounding installation for electrical damage, arcing or poor cable connections before touching the switch or removing / installing the power, fan and transceiver modules
- Ensure all DC cables are de-energized before handling or connecting to equipment
- Always wear an ESD strap when handling or performing maintenance on the switch.
- Always follow electrical safety precautions, use the appropriate tools and follow the health and safety guidelines for for safety protection clothing when working in areas with electricity or installation.

**Optical and Laser Precautions**

- The switches are classified by the FDA as class 1 laser products with a class 1 hazard rating. A caution label appears on the equipment. Read and understand all caution labels before working with the equipment
- Terminate all laser and SFP transceiver outputs properly before connecting laser inputs.
- Disconnect the input end of an optical fiber jumper cable before disconnecting the output end.

- System equipment should be used in a controlled access area. Limit the number of personnel that have access to the optical transmission systems.
  - Handle glass fiber with care. Glass fiber can be broken if mishandled
  - Protect skin from exposed glass fiber. It can penetrate the skin
  - Measure optical power levels to ensure that they are within expected limits. Attenuate optical power levels as needed before connecting laser inputs.
  - Limit the use of laser test equipment to authorized, trained personnel during installation and service. This precaution includes using optical loss test (OLT) set, optical spectrum analyzer (OSA), and optical time domain reflectometer (OTDR) equipment.
  - Exclude any unauthorized personnel from the immediate laser radiation area during service and installation when there is a possibility that the system may become energized. Consider the immediate service area to be a temporary laser-controlled area.
  - The system functions in the 850-nm to 1620-nm wavelength window that is considered invisible radiation. Laser light being emitted by a fiber, a pigtail, or a bulkhead connector cannot be seen by the naked eye. Use appropriate eye protection during fiber-optic system installation or maintenance whenever there is potential for laser radiation exposure, as recommended by the company's health and safety procedures. Observe this precaution whether or not warning labels have been posted.
  - During installation or service, a broken optical fiber or non-terminated connector should only be viewed with an indirect image converter or with a filtered optical instrument of optical density sufficient to reduce the exposure levels below the appropriate maximum permissible exposure, unless it has been verified that all optical transmitters are turned off and will remain off during the installation or service operation.
  - During all splicing operations that require viewing the end of a fiber of an SG3a, SG3b or SG4 optical-fiber communication systems, the laser source on the fiber involved shall be de-energized or viewing the systems incorporating personal protection shall be employed. A responsible person(s) shall verify that the system is de-energized before splicing proceeds. Where applicable, ensure compliance with lockout/tagout requirements of OSHA Standard 29 CFR Part 1910.147.
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# 1.0 BTI SA-821 Carrier Ethernet Switch Hardware and Software Description

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This section covers the following topics:

- 1.1, “BTI SA-821 Carrier Ethernet Switch Product Overview”
- 1.2, “BTI SA-821 Carrier Ethernet Switch Interfaces Connectors and LED indicators”
- 1.3, “BTI SA-821 Carrier Ethernet Switch Software Feature Summary”
- 1.4, “BTI SA-821 Carrier Ethernet Switch Quick Start Up Guide”
- 1.5, “ Alarms”

## 1.1 BTI SA-821 Carrier Ethernet Switch Product Overview

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The BTI SA-821 is a cost effective, multi service, carrier-grade ETSI 300 rack mount compliant unit designed to provide Backhaul Layer 2 switching capabilities in 20G Ethernet Metro Core rings.

With compact and low power architecture the unit is ready to be installed in customer premises to solve space and power challenges, deliver high performance scalable services and reduce operational costs.

The BTI SA-821 provides Ethernet services demarcation, classification, traffic management, prioritization, aggregation and service inter-working in up to 64 Gbps switching fabrics. It provides twenty four 1GE ports and an additional 4 ports which can support either 1GE or 10GE operation.

- Ethernet services aggregation and transport in 20G Metro core rings
- Between-rings high speed protected mesh
- Synchronization source derived from SyncE Ethernet interfaces or 1588v2 slave clock
- System clock meets the accuracy, stability, and holdover specifications required for stratum 3 timing (G.813)
- Carrier grade platform with low latency, and highly reliable service delivery with 50ms ring protection G.8032v2
- Standards-based and interoperable with MEF Carrier Ethernet 2.0
- Deep fault and performance management with Y.1731, Y.1564 loopback, link trace, delay, jitter and loss measurement with customer SLA Portal access.

Feature	Specification
Dimension	44h x 440w x 255d(mm)
1GbE SFP Interface	24
10GbE SFP+ Interface	4
Console interface (RJ-45) Management Interface	1 RS-232C Console [cable supplied] 1 RJ-45
AC Power Supply	Single AC power module [100V - 240V AC ]
DC Power Supply	Integrated -48VDC /+24VDC [nominal]
Power Consumption	Typical 70W
Fan	One Fan Module with 4 Fans
Operating Temperature	-40°C to +65°C
Storage Temperature	-40°C to +85°C
Time Synchronization	SyncE, 1588v2

With a 1 RU height and 440 mm wide and 255 mm depth, the switch is compact and portable. It can be installed onto a 19, 21 or 23 inch and is shipped with the universal mounting bracket for ETSI | ANSI racks. It can also be installed on a shelf.

With the exception of the grounding screw [which is located on the side of the switch] all ports, interfaces, LEDs, power supply and fan modules slots are very accessible and are located on the front panel of the switch.

The switch can be powered by slotting one or two DC power units or one AC power supply unit into the front of the switch. The second DC power supply will automatically power the switch should the first DC power supply unit fail. The second DC power supply will be hot swappable however traffic on the switch will be temporarily off line while a single DC or the AC power supply unit is being replaced.

Each DC power supply module supports dual feed -48V DC and +24V DC. The AC power supply supports universal power supply. It is shipped with an AC cord with a US plug switch connects to a 120V AC mains power supply. However alternative power cords to support the power requirements of all countries are available.

If installing the switch with a DC power supply, do not wire two different voltages into the switch. Connect the switch to the distribution panel using either the +24V DC or -48V DC. If you are using 1+1 protected equipment, you may wire one switch to the +24V DC supply and the other to the -48V DC supply.

Power supply units are not shipped with the switch base system and should be ordered as a separate item.

The switch supports a fan module with four fans which is slotted into the front of the switch. The fan module is hot swappable. A green LED will turn ON to indicate a fan malfunction.

The BTI SA-821 has twenty eight ports which support 1GE, 10GE and 10/100/100BT copper SFPs. Twenty four ports are designated for 1G Ethernet and 10/100/1000BT Copper SFPs and four ports are designated for 1Gbe fiber, 10 Gbe fiber or 1000BT copper. The transceivers use LC fiber optic connectors which use a push to engage/pull to disengage technology. The SFPs transceiver modules should be ordered in addition to the switch and are available for long reach, intermediate reach and short reach, DWDM [32 channels], DWDM [channel E1-E8] and 10/100/1000BT copper. Multi mode and single mode fiber are supported.

By default the ports will auto detect the media type [i.e. whether a RJ45 or SFP module is inserted] and will auto detect 10, 100 or 1000 mbits/s, half or full duplex on the copper interfaces. 1GE and 10GE are autosensed. However you will need to configure the port speed as 1G or 10G for the port to function correctly.

The base switch unit is supplied with 4 x 1GE enabled ports. RTU licences need to be purchased for 10GE ports. The system will prompt the user to order additional RTU licences. The switch ports can be provisioned as all SFP, SFP+ or SFP copper or any combination of SFP, SFP+ or copper SFP.

A series of red LEDs indicate if a minor, major or critical alarm has occurred. A green RUN LED indicates if the switch has booted up and running in operational mode. A green ON/OFF LED is located on the rear panel.

Office alarms are provided on a DB-9 female connector that provides two relay alarm relay output and two optical isolation inputs to and from external supervisory equipment.

For timing reference and synchronization two SMA type connectors provide 1PPS input/output and an external reference clock input/output. An RJ48c type external reference clock input/output

The switch supports in-band and out-of-band SNMP management as well as a Command Line Interface (CLI) for configuration monitoring and control functions.

The switch has a RJ-45 RS232 serial console port which provides a local connection from a PC or laptop directly to the switch. The console port provides quick access to the local node for minor configuration changes or to set up other management access options.

The switch also has an RJ-45 management port on the front panel for Out of Band or In Band management. The default IP address of the management Ethernet port is 192.168.5.100/24. The switch supports only one default gateway. It is recommended that if In-Band and Out-of Band [OOB] management is configured the default gateway should be specified for the In-Band. The OOB management IP address must be unique and must be on a different IP subnet from the in band IP address. If a default gateway is not specified all stations connected to the management Ethernet port must be on the same subnet. If you make this change while logged into the management port you will be logged out of the session. Before accessing the CLI again you must remember to change the IP and subnet on your computer.

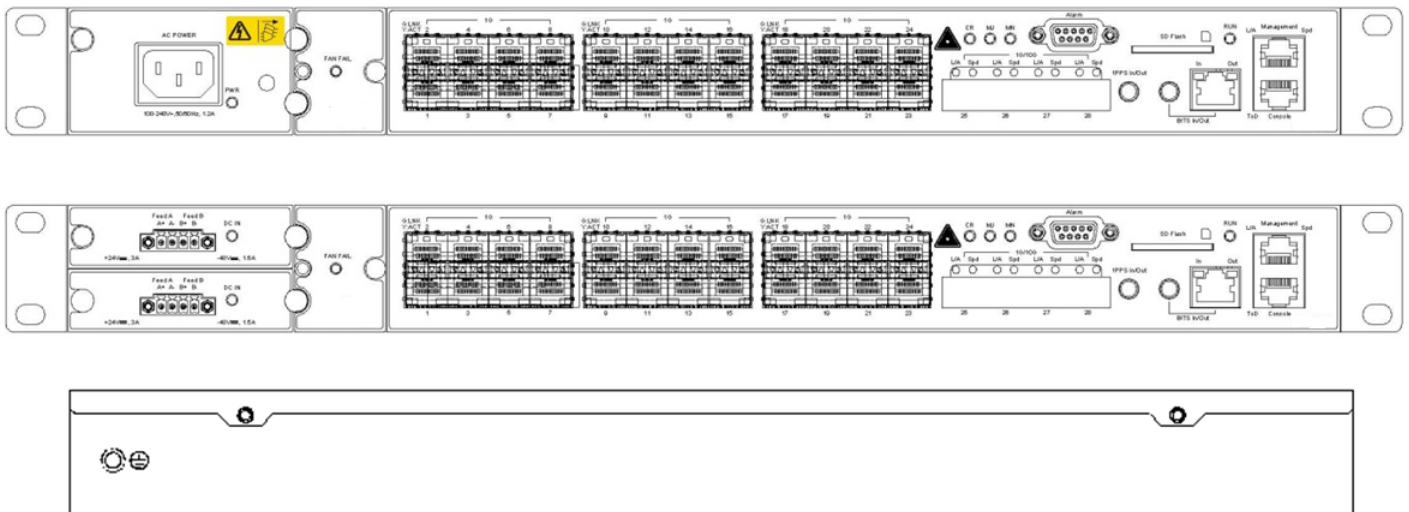
The default login credentials to access the CLI are username <admin > and password <btiadmin> .

Once the switch is provisioned in the network, the user can also telnet from the switch to other network elements. A maximum of three telnet sessions are permitted.

It is recommended to provision the system clock to use the NTP protocol.

The switch is also supplied with the software [image.img file] and details of supported MIBs. You may choose to download the latest software, should a version be available.

### BTI SA-821 Front and rear provisioned with AC PSU and DC PSU



## Hardware and software

PEC	QTY	ITEM
BT7D21AA	1	BTI SA-821 Base System
BT7D21AA-I02	1	Console Cable Rack Mount Kit
	1	<ul style="list-style-type: none"> <li>• 2 L brackets for 19 in. rack [left and right]</li> <li>• 2 L brackets for 21 and 23 in. racks [left and right]</li> <li>• 8 M3 X 8 flat head screws</li> </ul>
		DC Power Module Blanking Plate
Additional Optional Items	QTY	ITEM
BT7D61AA	1	Fan Module Assembly
BT7D62AA	1	DC Power Module
BT7D63AA	1	120V-240V AC Power Module with 3 pin 120V AC Cable [US]
<b>Port Interfaces</b>	<b>1 GE SFP, 10GE SFP+</b>	
BT7D21AA , BT7D21AA-I02	24 interfaces assigned to 1 GE SFP and 4 interfaces assigned to 10GE SFP+	

## 1.2 BTI SA-821 Carrier Ethernet Switch Interfaces Connectors and LED indicators

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### Interfaces and Indicators

All the interfaces, connectors and LEDs are located on the front panel of the switch.

These include:

- DC or AC power module
- Fan module
- BTI SA-821
  - Twenty four port interfaces - which can be provisioned as 4 x 1 GbE ports, 4 X 10/100/1000BT Ethernet or a combination of 1Gbe and 10/100/1000BT ethernet.
  - Four port interfaces - which can be provisioned as 4 x 10 GbE ports, 4 X 1 GbE or a combination of 10 Gbe and 1 GbE.
- 3 red alarm LEDs [minor, major and critical]
- An alarm interface
- SD card slot
- Two SMA connectors [Sync for carrying either T1 or E1 signals and 1 PPS for phase synchronization]
- An RJ48c type interface for external reference clock [input/output]
- One green LED [RUN] which indicates the switch boot up status and operation
- One RJ-45 management interface for In Band and Out of Band management
- The RJ-45 RS232 serial console port which provides a local connection to the switch from a laptop or computer

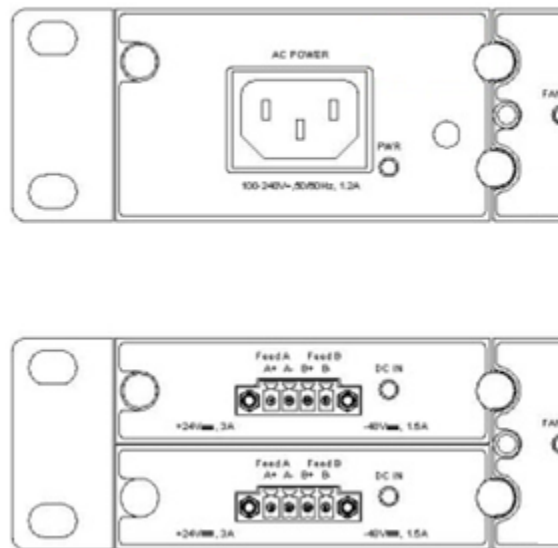
The switch name BTI SA-821 is situated in the top right corner. The switch PEC , serial number and MAC address are labelled on the rear of the switch .

A laser radiation warning label is positioned at the Ethernet port.

### 1.2.1 BTI SA-821 Carrier Ethernet Switch Power Supply Module

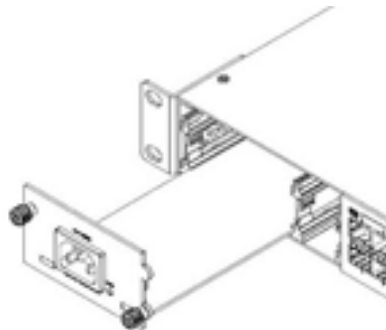
The BTI SA-821 can be provisioned with either one or two DC power modules or one AC power module.

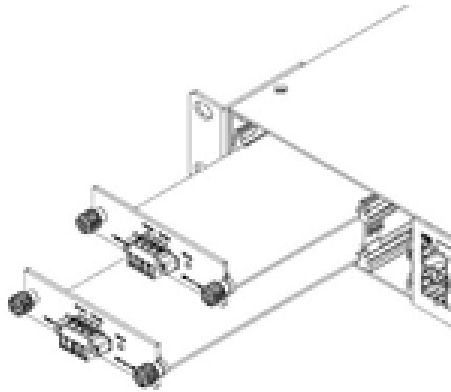




If using only one DC power module, a blanking plate should be installed to cover the unprovisioned DC power module slot. When using the CLI to display or provision the DC power module, power slot 1 will denote the bottom power module and 2 will denote the upper power module. The AC is provisioned in power slot 1.

The power modules are installed by sliding the module into the relevant slot until the module engages into position and tightening the thumbscrews .





Each DC power module has a 4 screw terminal block to facilitate dual feed -48V DC and +24V DC wiring. When wiring the DC power modules to the distribution panel, it is recommended to connect the wires on the bottom power module first.



**Caution : Requirements for handling the power modules**

When replacing or handling the power modules never touch the electronic components. As with all power units, capacitors may retain a charge even after they are removed from the power supply source. Always handle the power modules by the front plate and underneath the lower surface which is insulated.

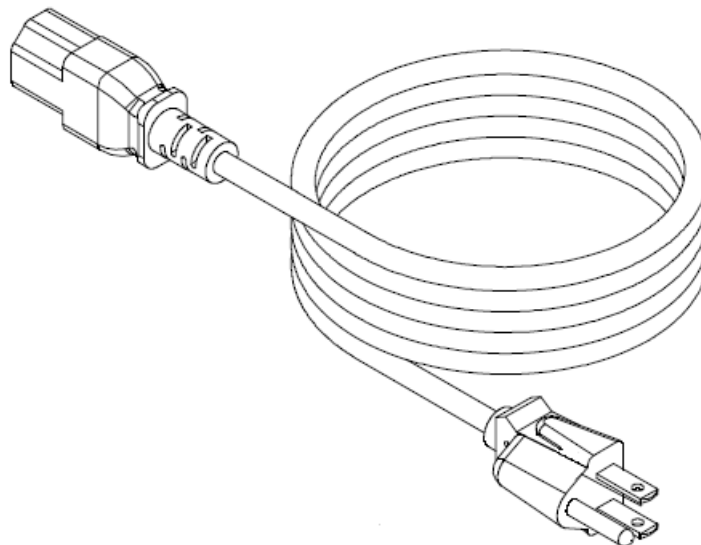
When removing or inserting the power modules

- Ensure the AC power cord is unplugged from the AC module

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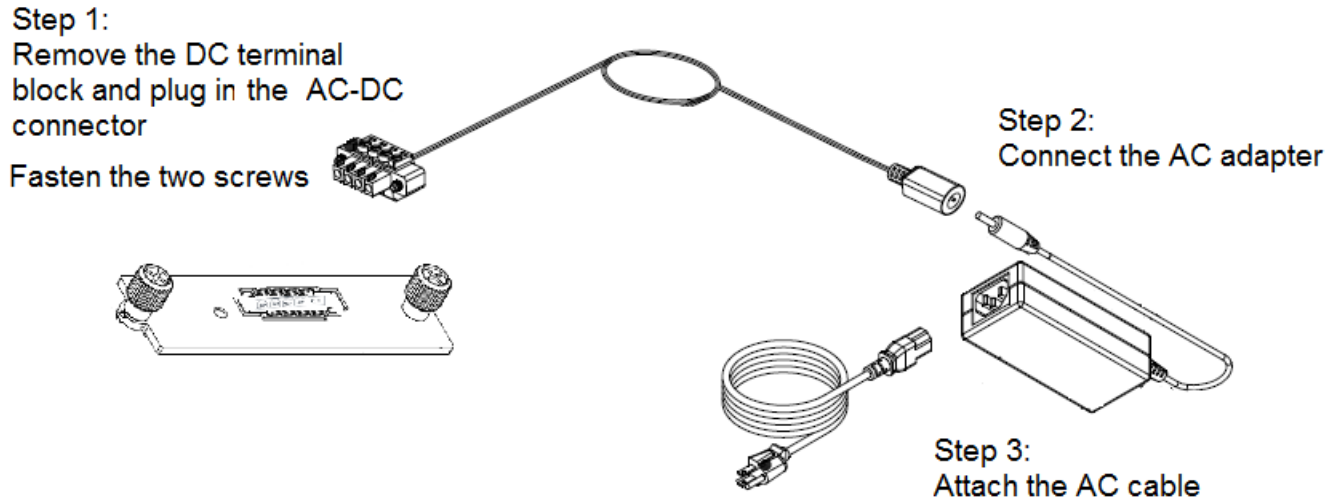
When the green AC or DC LED is ON, the switch is powered.

The AC power supply supports universal power supply. It is shipped with an AC cord with a US plug which connects to a 120V AC mains power supply. However alternative power cords to support the power requirements of all countries are available.



Power supply modules are not shipped with the switch base system and should be ordered as a separate item.

Note: The switch can be AC power protected by using two AC to DC adapter kits. The diagram below shows how to provision one DC power module to support the AC -DC adapter kit.



The following alarms may be raised against a power module.

Condition	Alarm Name	Status	Severity	To Clear the alarm
One power module has failed	Module Failure Enable CR	Enable	CR	Replace the faulty power module
Supply power is outside the voltage threshold	Supply Voltage	Enable	MJ	Replace the faulty power module

The CLI command **show power status** will display the power configuration installed on the switch.

```
BTI-SA-821# show power status
```

```

-----
                        Power  Status
-----
No.    AdminStatus    EquipStatus    Type          Operation
-----
1       enable         Equipped       AC POWER      ON
2       enable         Unequipped     -----      OFF
-----

```

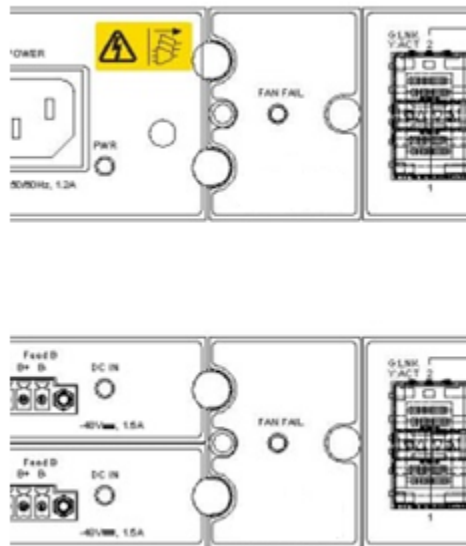
The CLI command `BTI-SA-821config# power <1|2>` will provision the upper or lower power module to act as the primary power source. The default is to use power module 1 as the primary power source. The no power command will disable power to the switch.

```
BTI-SA-821(config)# power ?  
 1 Bottom Power Module  
 2 Upper Power Module
```

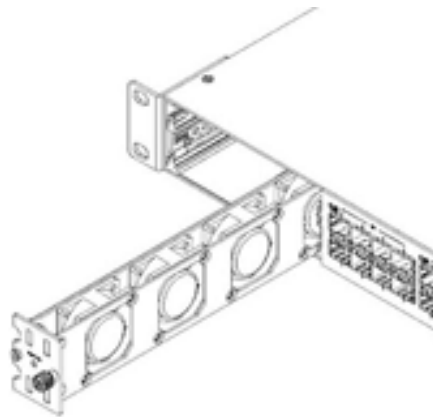
## 1.2.2 BTI SA-821 Carrier Ethernet Switch Fan Module

The switch fan module, with four fans, is used to maintain the switch operating temperature . In the default state, alarms will be raised if the environment temperature falls to -10 [lower alarm limit], 80 [upper alarm limit] and 85 [critical alarm limit]. These temperature thresholds are configurable.

All switches must be provisioned with a fan module. The fan module can be replaced while the switch is operation. The fan will start to operate when the temperature of the switch exceeds 30° C and will switch off when the switch temperature is below 10° C.



The fan module is installed by sliding the module into the fan module slot until the module engages into position and tightening the thumb screws.



The fan module RED LED will activate to indicate a fan failure exists on one or more than one fan within the module and an major alarm will be raised.

The following alarms may be raised against a fan module.

Condition	Alarm Name	Status	Severity	To Clear the alarm
The fan module is not installed in the switch.	Module Missing	Enable	MJ	Install an operational fan module.
One or more than one fan is operating in overdrive.	Fan_High_Over_Flow	Enable	MJ	Replace the fan module.
One or more than one fan has failed.	Fan_Low_Under_Flow	Enable	MJ	Replace the fan module.

The CLI command **show fan status** will display each fan operational status, the rated RPM, low and high tolerance and the fan start and stop temperature.

```
BTI-SA-821# show fan status
```

```

-----
                        Fan Status
-----
Fan Operation                ON
Fan1 current RPM             10231(normal)
Fan2 current RPM             10039(normal)
Fan3 current RPM             10291(normal)
Fan4 current RPM             10304(normal)
-----
Rated RPM                    8000
Low Tolerance                 50%(4000 )
High Tolerance                50%(12000)
Fan Start Temperature         30 C
Fan Stop Temperature          10 C
-----

```

The CLI command **show environment** will display the fan tray status. It will also display the lower, upper and critical temperature alarm thresholds. The default parameters are shown below.

```
BTI-SA-821# show environment
```

```
Fan tray status:
```

Index	Status
1	PRESENT

FanIndex	Status	SpeedRate	Mode
----------	--------	-----------	------

```
-----  
Power status:
```

Index	Status	Power	Type	Fans	Control
1	PRESENT	OK	AC	OK	ON
2	ABSENT	-	-	-	-

```
-----  
Sensor status (Degree Centigrade):
```

Index	Temperature	Lower_alarm	Upper_alarm	Critical_limit
1	33	-30	80	85
2	32	-30	80	85
3	35	-30	80	85

All fan operating thresholds and RPM settings are provisionable. Temperature thresholds are also provisionable.

```
BTI-SA-821(config)# fan ?BTI-SA-821(config)#fan low-tolerance Fan low-under-  
flow fail-range
```

```
<10-80> Fan low-under-flow range - 10-80%
```

```
BTI-SA-821(config)#fan rpm Fan rpm
```

```
<5000-20000> Fan rpm range : 5000-20000
```

```
BTI-SA-821(config)#threshold Temperature Threshold to start or stop  
FAN
```

```
STOPTEMP <-30 and 30> Stop Temperature : between -30 and 30
```

```
STARTTEMP < 0 and 100> Start Temperature : between 0 and 100  
-----  
-----
```

```
BTI-SA-821(config)# temperature?
```

```
temperature Temperature threshold configuration
```

```
BTI-SA-821(config)# temperature ?
```

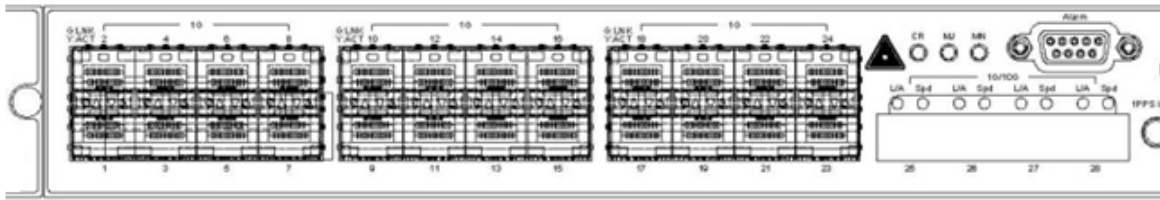
```
LOW < -30 to -1> Low alarm temperature degree celsius between -30 to -1
```

```
HIGH <0 to 100> High alarm temperature degree celsius between 0 to 100
```

### 1.2.3 BTI SA-821 Carrier Ethernet Switch Port Interfaces

The BTI SA-821 has a total of twenty eight ports :

- Twenty four port interfaces - which can be provisioned as 24 x 1 GbE fiber ports, 24 X 10/100/1000BT copper ports or a combination of 1GbE fiber and 10/100/1000BT copper ports.
- Four port interfaces - which can be provisioned as 4 x 1 GbE fiber ports, 4 X 10 GbE fiber , 4 x 1000BT copper or a combination of 1 GbE fiber, 10 GbE fiber and 1000BT copper ports.



## Interface types

In the CLI all port interfaces can be provisioned as :

- Physical interfaces - ethernet ports [eth-0-1 to eth-0-28 port :BTI SA-821 Carrier Ethernet Switch ]
- Aggregation interfaces - <1-63> Port number
- Loopback interfaces - <0-255> Port number
- VLAN interfaces - <1-4094> Vlan number

```
BTI-SA-821(config)# interface ?
eth      Physical interface
agg      Aggregation interface
loopback Loopback interface
vlan     Vlan interface
range    Interface range command
```

The range command allows the user to provision or issue commands to a range of interfaces :  
For example : To shut down ports 1-24 the following command may be used:

```
BTI-SA-821# interface range eth-0-1 - 24
BTI-SA-821(config-if-range)#shutdown
```

To shutdown all ports in VLAN 1-20 the following command may be used:.

```
BTI-SA-821# interface range vlan 1 - 20
BTI-SA-821(config-if-range)#shutdown
```

All interface types are provisionable using the CLI commands. See Command Line Reference Guide.

## SPF and SPF+ transceiver modules and interfaces

The switch supports a wide range of SPF and SPF+ transceiver modules.

**Table 1-1 SFP and SFP+ Interface Modes**

SFP Module Specification		1G Fiber	10G Fiber	10/100/1000BT Copper / Auto Enabled		
System	Port	SFP	SFP+	10M	100M	1 G
BTI-SA 821	1 - 24	Y	X	Y	Y	Y
	25 -28	Y	Y	X	X	Y

The SFP and SFP+ interface modes are listed in the table below.

Y = Supported

X = Not Supported

**Note** 1GE and 10GE are autosensed. However, in addition, you will need to configure the port speed as 1G or 10G for the port to function correctly. Auto negotiation is a requirement for using 1000BASE-T, therefore auto cannot be disabled on interfaces provisioned as 1000BASE-T.

**Table 1-2 Supported Transceiver Modules**

Transceiver	Grade	PEC	Supported and Non Supported Temperatures		
			0C to +40C	-5C to +55C	-40C to +65C
SFP: 10/100/1000BT Copper	C-Temp -5C to +70C	BP3AD3ES	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 850nm SX	C-Temp -5C to +70C	BP3AD1SS	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 1310nm SR	C-Temp -5C to +70C	BP3AM1MS	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 1310nm IR	C-Temp -5C to +70C	BP3AM1MI	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 100BX GE, SR, bidi 1310tx/1490nm (20km)	C-Temp -5C to +70C	BP3AM5PB	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 100BX GE, SR, bidi 1490tx/1310nm (20km)	C-Temp -5C to +70C	BP3AM5QB	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 100BX GE, IR, bidi 1310T/1490R (40km)	C-Temp -5C to +70C	BP3AM5PI	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 100BX GE, IR, bidi 1490T/1310R (40km)	C-Temp -5C to +70C	BP3AM5QI	Supported Mandatory	Supported Mandatory	Not Supported
SFP: CWDM LR Channel xx	C-Temp -5C to +70C	BP3AM1CL-x	Supported Mandatory	Supported Mandatory	Not Supported
SFP: CWDM LR Channel 4 (1551nm) / 1550nm LR	C-Temp -5C to +70C	BP3AM1CL-xx	Supported Mandatory	Supported Mandatory	Not Supported
SFP: DWDM ER Channel xx	C-Temp -5C to +70C	BP3AM1DE-xx	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 10/100/1000BT	I-Temp -40C	BP3AD7ES	Supported	Supported	Supported



**Table 1-2 Supported Transceiver Modules (Continued)**

Transceiver	Grade	PEC	Supported and Non Supported Temperatures		
			0C to +40C	-5C to +55C	-40C to +65C
Copper (I-temp)	to +85C		Not Mandatory	Not Mandatory	Mandatory
SFP: 850nm	I-Temp -40C	BP3AD7SS	Supported	Supported	Supported
SX (I-temp)	to +85C		Not Mandatory	Not Mandatory	Mandatory
SFP: 1310nm	I-Temp -40C	BP3AD7MS	Supported	Supported	Supported
SR (I-temp)	to +85C		Not Mandatory	Not Mandatory	Mandatory
SFP+: 850nm 200m, dual-rate 10.3 and 10.5Gbps	C-Temp -5C to +70C	BP3AD6SS	Supported Mandatory	Supported Mandatory	Not Supported
SFP+: 1310nm 10km, multi-rate 9.9 to 11.1Gbps	C-Temp -5C to +70C	BP3AM6MS	Supported Mandatory	Supported Mandatory	Not Supported
SFP+: DWDM fixed 80km, multi-rate, 9.9 to 11.1Gbps	C-Temp -5C to +70C	BP3AM6DL-xx	Supported Mandatory	Supported Mandatory	Not Supported
SFP+: 850nm 200m, 10GE 10.3Gbps (I-temp)	I-Temp -40C to +85C	BP3AD8SS	Supported Not Mandatory	Supported Not Mandatory	Supported Mandatory
SFP+: 1310nm 10km, 10GE 10.3Gbps (I-temp)	I-Temp -40C to +85C	BP3AM8MS	Supported Not Mandatory	Supported Not Mandatory	Supported Mandatory
SFP+: 1550nm IR 40km, 10GE 10.3Gbps (I-temp)	I-Temp -40C to +85C	BP3AM8LI	Supported Mandatory	Supported Mandatory	Supported Mandatory
SFP+: DWDM fixed 80km, 10GE 10.3Gbps (I-temp)	I-Temp -40C to +85C	BP3AM8DL-xx	Supported Not Mandatory	Supported Not Mandatory	Supported Mandatory
SFP+: Tunable 96 Channel DWDM 80km, 10G Multi-Rate / Multi-Protocol	C-Temp -5 to +75C	BP3AM6TL	Supported Not Mandatory	Not Supported	Not Supported

**Note** Wait 3 seconds after removing or installing copper SFPs to enable the system to detect and update the interface.

**Table 1-3 Media Type, Duplex and Speed configuration and Default Settings**

CLI Command	Description	Default Setting
media-type {auto-select  rj45 sfp}	auto-select: Enable the switch to dynamically select the type based on which one first links up  rj45: Select the RJ-45 interface  sfp: Select the small form-factor pluggable (SFP) module interface  CLI command: Switch(config-if)# media-type {auto-select rj45 sfp}	auto-select
duplex {auto  full  half} The command is not permitted to be set on the 10G ports or the optical mode of combo ports	Auto :port automatically detects whether it should run in full- or half-duplex  Full: Enable full-duplex mode  Half: Enable half-duplex mode (only for interfaces operating at 10 or 100 Mb/s  Switch(config-if)# duplex [auto full half]	Auto
speed {10  100  1000  auto}	auto: Port automatically detects the speed it should run  10: Port runs at 10 Mb/s.  100: Port runs at 100 Mb/s.  1000: Port runs at 1000 Mb/s.  Switch(config-if)# speed {10  100  1000  auto}	Auto

The Media type, Duplex and Speed of the interfaces are listed in the table below.

**Table 1-4 Media Type, Duplex and Speed configuration and Default Settings**

CLI Command	Description	Default Setting
media-type {auto-select  rj45 sfp}	auto-select: Enable the switch to dynamically select the type based on which one first links up  rj45: Select the RJ-45 interface  sfp: Select the small form-factor pluggable (SFP) module interface  CLI command: Switch(config-if)# media-type {auto-select rj45 sfp}	auto-select
duplex {auto  full  half} The command is not permitted to be set on the 10G ports or the optical mode of combo ports	Auto :port automatically detects whether it should run in full- or half-duplex  Full: Enable full-duplex mode  Half: Enable half-duplex mode (only for interfaces operating at 10 or 100 Mb/s  Switch(config-if)# duplex [auto full half]	Auto
speed {10  100  1000  auto}	auto: Port automatically detects the speed it should run  10: Port runs at 10 Mb/s.  100: Port runs at 100 Mb/s.  1000: Port runs at 1000 Mb/s.  Switch(config-if)# speed {10  100  1000  auto}	Auto

## Transceiver information

The CLI command **show transceivers** will display the Transceiver Type, Vendor Name, Part Number, Serial Number, PEC Code, Transceiver Output Wavelength, Link Type and Length for each installed transceiver module.

```
BTI-SA-821# show transceiver
```

```
Port eth-0-1 transceiver info:
```

```
Transceiver Type: 1000BASE-T_SFP
```

```
Transceiver Vendor Name : DELTA
```

```
Transceiver PN          : LCP-1250RJ3SR-Sx
```

```
Transceiver S/N         : 122104100061
```

```
Transceiver PEC Code    : BP3AD3ES
```

```
Transceiver Output Wavelength: N/A
```

```
Supported Link Type and Length:
```

```
Link Length for copper: 100 m
```

```
Port eth-0-25 transceiver info:
```

```
Transceiver Type: 1000BASE-SX
```

```
Transceiver Vendor Name : JDS UNIPHASE
```

```
Transceiver PN          : JSH-21S3AB3
```

```
Transceiver S/N         : F82447040136
```

```
Transceiver PEC Code    : OCODE COPYRIGHT
```

```
Transceiver Output Wavelength: 850 nm
```

```
Supported Link Type and Length:
```

```
Link Length for 50/125um multi-mode fiber: 300 m
```

```
Link Length for 62.5/125um multi-mode fiber: 150 m
```

```
Port eth-0-26 transceiver info:
```

```
Transceiver Type: 1000BASE-LX
```

```
Transceiver Vendor Name : Optech
```

```
Transceiver PN          : OP6E-S05-13-CM
```

```
Transceiver S/N         : 8527669323
```

```
Transceiver PEC Code    : EMELY COMPATIBLE
```

```
Transceiver Output Wavelength: 1310 nm
```

```
Supported Link Type and Length:
```

```
Link Length for 9/125um single mode fiber: 5 km
```

```
Link Length for 9/125um single mode fiber: 5000 m
```

## 1.2.4 BTI SA-821 Carrier Ethernet Switch LED Indicators

Table 1-5 BTI SA-821LED Indicators

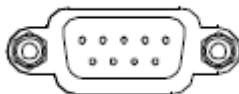
LED	Activity	Description
RUN	Green Blink	: During boot up : Booting success
	Green ON	: Normal operation
	Green ON, then changes state to OFF	: Booting success but there is abnormal operation
CR	Red ON	: During boot up
	Red OFF	: Booting success and no critical alarm
	Red Blink	: Booting success and critical alarm

**Table 1-5 BTI SA-821 LED Indicators (Continued)**

LED	Activity	Description
MJ	Red ON	: During boot up
	Red OFF	: Booting success and no major alarm
	Red ON	: Booting success and major alarm
MN	Red ON	: During boot up
	Red OFF	: Booting success and no minor alarm
	Red ON	: Booting success and major alarm
L/A	Green ON	: Link up, Ethernet ports
	Green OFF	: Link down, Ethernet ports
	Green Blink	: Activity on Ethernet ports
SPD	Yellow ON	: 10GbE link-up
	Yellow OFF	: 1GbE link-up
L/A	Green ON	: Link up, Management port
	Yellow ON	: Activity on Management port
PWR	Green ON	: 24VDC   -48VDC   120-240VAC
	Green OFF	: No power
FAN	Red ON	: One or more fans has failed
	Red OFF	: Normal operation
<b>Console/ToD</b>		
Green (left and right)	The Console LEDs are always off [You can view the connection status via your computer or laptop]	

## 1.2.5 BTI SA-821 Carrier Ethernet Switch Alarm Interface

Office alarms are provided on a DB-9 female connector that provides two relay alarm relay output and two optical isolation inputs to and from external supervisory equipment.

**Table 1-6 Alarms interface connector pin numbering scheme**

Pin	Name	Definition
1	Major Line Input A	Isolated input A
2	Major Line Input B	Isolated input B
3	Major_C	Major, common contact
4	Major_NO Each of the dry relay contacts on the interface is rated to support a switching current of 1 A @ 30V DC.	Major, normally open contact
5	Minor_C	Minor, common contact

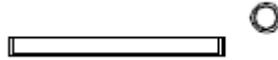
**Table 1-6 Alarms interface connector pin numbering scheme (Continued)**

Pin	Name	Definition
6	Minor_NO	Minor, normally open contact
7	Minor Line Input A	Isolated input A
8	Minor Line Input B	Isolated input B
9	Not connected	

Each of the dry relay contacts on the interface is rated to support a switching current of 1 A @ 30V DC.

## 1.2.6 BTI SA-821 Carrier Ethernet Switch SD Flash and Timing Reference and Synchronization Interfaces

### SD FLASH

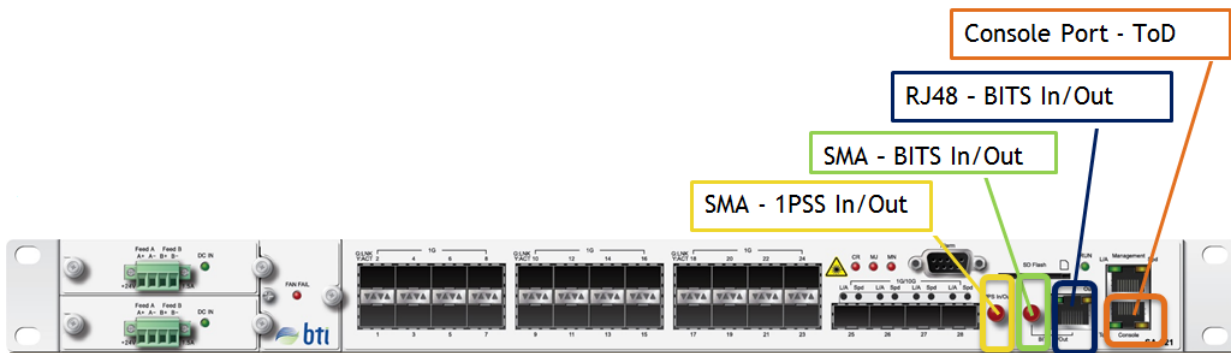


### Timing reference and synchronization interfaces

The switch supports I-TUT G.8261, G.8262, G.8264 SyncE on all interfaces, SyncE Status Message Support, IEEE 1588 TC/OC/BC and internal Stratum 3 clock with holdover to meet I-TUT G.813.

The following interfaces are located on the front panel:

- SMA type 1PPS input/output
- SMA type external reference clock input/output [BITS]
- RJ48c type external reference clock input/output [BITS]



### SMA and RJ48c connection requirements

The switch can support BITS on either the SMA or the RJ48c interface, but not both at the same time. Do not connect cables to the SMA [BITS] and RJ48c interfaces at the same time.

Either the external clock-in mode or the external clock-out mode can be provisioned.

**Table 1-7 1PPS and ToD Specifications**

Connector Label	Specification
1PPS (SMA)	Pulse Width : Amplitude : 3.3 volts LVTTTL On-Time Edge : Rising Impedance : 50ohm
ToD (RJ45)	Protocol : NMEA0183 GPRMC Interface : RS-232

Connector Label	Input Specification	Out Specification
BITS (50ohm SMA)	1544Khz : 3.3Vp-p Square wave	2048Khz : G.703.13
	2048Khz : 3.3Vp-p Square wave	2048Khz : G.703.13
	1544Kpbs (T1)	1544Kpbs (T1) G.703.5
	2048Kpbs (E1)	2048Kpbs (E1) : G.703.9
BITS (RJ48c)	1544Kpbs (T1)	1544Kpbs (T1) : G.703.5
	2048Kpbs (E1)	2048Kpbs (E1) : G.703.9

**Table 1-8 RJ45 Pin Out**

RJ45 Pin No.	Description
1	RX_TIP
2	RX_RING
3	
4	TX_TIP
5	TX_RING
6	
7	
8	

**Table 1-9 RJ48c Pin Out**

RJ48c Pin No.	Description
1	1PPS
2	ToD
3	Console TXD
4	GND
5	GND
6	Console RXD
7	
8	

**Table 1-10 ToD string**

Element	Description
\$GPRMC	Message header
hhmmss	UTC value (e.g. 122356 = 12:23:56 UTC)
A	Status (A= active, V=void)
0000.0000,N	Latitude, north (fixed to zero)
00000.0000,W	Longitude, west (fixed to zero)
0.0	Speed over ground (fixed to zero)
0.0	Track angle (fixed to zero)
ddmmyy	Date (e.g. 120511 = 12-May-2011)
A	A=autonomous, D=differential, E=estimated, S=simulation, N=not valid
*F6	Checksum

For time management the switch supports SNTP [Client and Primary Server] and Time Zone and Daylight Savings Time.

## 1.2.7 BTI SA-821 Carrier Ethernet Switch Network Management and Console Interfaces

The switches support standard communication interfaces over serial and Ethernet connections.

The switch supports only one default gateway. It is recommended that if In-Band and Out-of-Band [OOB] management is configured the default gateway should be specified for the In-Band. The OOB management IP address must be unique and must be on a different IP subnet from the in band IP address. If a default gateway is not specified all stations connected to the management ethernet port must be on the same subnet. If you make this change while logged into the management port you will be logged out of the session. Before accessing the CLI again you must remember to change the IP and the subnet on your computer.

Although VLAN 1 is set aside for the management VLAN you can provision any of the 1-4090 VLANs as the management VLAN provided it is a dedicated as a management VLAN.

### Network management interface

The network management interface is a RJ-45 Ethernet port [10/100Mbps] which provides IP-level connectivity for SSH, Telnet access to the CLI and SNMP.

The network management interface is the upper RJ-45 connector.



The SSH and telnet use standard session settings.

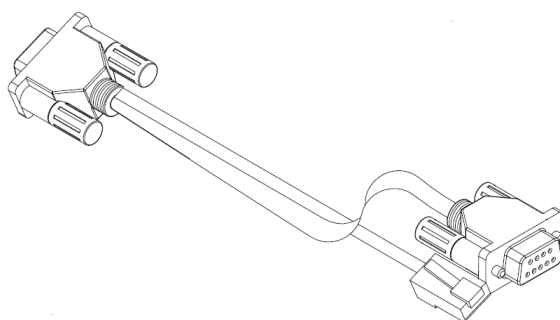
Session	IP Address	Default Gateway	Port	No. Simultaneous Sessions
SSH	192.168.5.100/24		22	6
Telnet	192.168.5.100/24		23	3

**Note** When rebooting the switch, the telnet or SSH session will be terminated. You should ensure you have saved all provisioning and configuration changes, noted any changes to the management IP address, ensured all user access is configured correctly and verified the correct images files are located in the relevant banks prior to rebooting the switch.

The switch supports SNMPv2c to sets and gets traps. SNMP v3. is also supported.

### Console Interface

The console interface is a RS-232 RJ-45 serial port providing CLI connectivity to the system. The console port is also shared with the Time of Day (ToD) interface output. BTI Service Access 800 Series switches are provisioned with a RS-232 DB-9 to RJ-45 console cable.



When connecting a PC or laptop to the Console port, use a straight-through RS-232 cable with a DB-9 pin male connector at one end and an RJ-45 connector at the other.

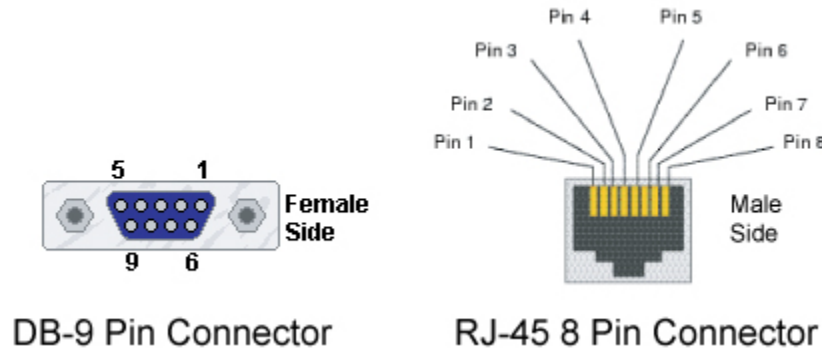
If you anticipate using the RS-232 serial port, determine the length of cable required to connect the BTI 7000 Series equipment to your PC, and prepare the cable with the appropriate male connector.



## RS-232 pin assignment

The following figure shows the RS-232 DB-9 pin DCE connector as well as the RS-232 RJ-45 8 pin connector and the associated pin numbering schemes.

### DB-9 Pin Connector and 8 Pin RJ-45 Connector Numbering Schemes

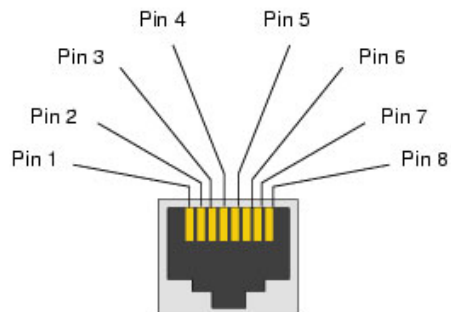


The following table lists the RS-232 pin assignment for the DB-9 pin connector and RJ-45 connector pin numbering schemes.

**Table 1-11 Pin Assignments for RS-232 DB-9 Pin Connector and RS-232 RJ-45 Connector**

DB-9 Pin Connector	DCE Purpose	RJ-45 Connector	DCE Purpose
1	Data Terminal Ready	1	Not Connected
2	Transmitted Data	2	Time of Day Transmitted Data
3	Received Data	3	Console Transmitted Data
4	DTE Ready	4	Signal Ground
5	Signal Ground	5	Signal Ground
6	DCE Ready	6	Console Received Data
7	Clear to Send	7	Not Connected
8	Request to Send	8	Not Connected
9	Ring Detector		

The following figure shows the RS-232 RJ-45 connector and the associated pin numbering scheme.

**Figure 1-2 8-Pin RJ-45 connector numbering scheme****Table 1-12 RS-232 RJ-45 connector pin numbering scheme**

RJ-45 Connector	DCE Purpose	RJ-45 Connector	DCE Purpose
1	Not Connected	5	Signal Ground
2	Not Connected	6	Received Data
3	Transmitted Data	7	Not Connected
4	Signal Ground	8	Not Connected

Console Terminal Emulation Software Parameters		
PC Settings	Default Management IP address	192.168.5.100/24
	Default Gateway IP address	
Session	Connection Type	Serial
	Serial Line	COM1
	Speed	9600
Terminal : Keyboard	Function Keys and Keypad	VT100+
Connection: Serial	Serial Line	COM1
	Baud rate	9600bps
	Parity	None
	Stop bits	None
	Flow Control	None

## 1.3 BTI SA-821 Carrier Ethernet Switch Software Feature Summary

Many of the software features are common to the BTI SA-805 , BTI SA-821 and BTI SA-822 switches. Features marked in *Italic* are specific to the switches.

Ethernet interfaces	BTI SA-805	BTI SA-821	BTI SA-822
<i>Number of Interfaces</i>	<i>total 4 ethernet ports</i>	<i>total 28 ethernet ports</i>	<i>total 12 ethernet ports</i>
<i>1 GigE - optical SFP</i>	<i>4 - all interfaces 1GigE optical SFP</i>	<i>24 - all interfaces 1GigE optical SFP</i>	<i>12 - all interfaces 1GigE optical SFP</i>
<i>10 GigE - optical SFP+</i>	<i>4 - all interfaces 10 GigE optical SFP</i>	<i>4 - all interfaces 10 GigE optical SFP</i>	<i>12 -all interfaces 10 GigE optical SFP</i>
<i>10/100/1000 T Copper SFP</i>	<i>4 - all interfaces 10/100/1000T Copper SFP</i>	<i>24 - all interfaces 10/100/1000T Copper SFP</i> <i>4 - all interfaces 1000T Copper SFP</i>	<i>12 - all interfaces 1000T Copper SFP</i>
<i>Combination optical SFP, optical SFP+, Copper SFP</i>	<i>4 interfaces with combination of 1 GigE SFP, 10 GigE SFP+ and 10/100/1000T copper SFP</i>	<i>24 interfaces with combination of 1 GigE SFP and 10/100/1000 T Copper SFP</i>  <i>Additional 4 ports can be set as all 10 GigE SFP+ or a combination of 10 GigE, 1 GigE and 1000T Copper SFP</i>	<i>12 interfaces with combination of 10 GigE SFP+, 1 GigE SFP and 1000T Copper SFP</i>

The following table lists the key features and features introduced in this release:

<b>Note</b>	* = New feature introduced
<b>Note</b>	FS = This feature was introduced in a previous release with limitations. Now it is <i>Fully Supported</i> .

**Table 1-13 Key features and features introduced in this release**

Features	Additional Information
<b>Bridging</b>	
CVLAN Translation - At UNI only	
SVLAN Translation - At E-NNI only	
802.1ad Provider bridging for E-LINE	
802.1ad Provider bridging for E-LAN	
802.1ad Provider bridging for E-ACCESS	
<b>Forwarding Database</b>	
MAC learning and aging	
Enable / Disable MAC learning per Port	

**Table 1-13 Key features and features introduced in this release (Continued)**

<b>Features</b>	<b>Additional Information</b>
Enable / Disable MAC learning per VLAN	
Limit number of MAC addresses learned per VLAN	
Static MAC entries	
Broadcast, Multicast and DLF storm control	
<b>Layer 2 Protocols</b>	
IEEE 802.3ad link aggregation	
IEEE 802.3ad with LACP	
Multi-chassis LAG (MLAG)- static and LACP with active / standby mode and non-revertive opmode	*
Layer 2 Station Loopback	
<b>Loopbacks</b>	
Layer 2 Station Loopback - MAC src dst swap supporting - UNI, NNI and Service Activation Test (SAT)	
Layer 2 Station Loopback - Line rate based loopback with variable frame size including jumbo frames	
Support loopback traffic from centralized test sets (EXFO, JDSU, Accedian loop, etc.)	
Loopback based upon L2 Filter MAC dst, MAC src,VLAN (Outer VLAN, Inner VLAN), Priority, EtherType, Combination of parameters	
Loopback based upon IPv4 Filter IP dst, IP src, L4 ports (TCP or UDP), IP protocol, combination of parameters	
Throughput Test - packetVX interop	
Y.1564 loopback support (interop with EXFO)	
<b>Ethernet Operations, Administration and Maintenance (OAM)</b>	
<b>IEEE 802.3ah Ethernet in the First Mile (EFM)</b>	
Discovery	
Link Performance Monitoring	
Remote Loopback	
Critical Event	
Dying Gasp	
<b>ITU-T Y.1731 ( Connectivity Fault Management &amp; Performance Monitoring)</b>	
MEG, MIP and MEP	
Continuity check messages (CCM)	
Rate of CCMs (3.3ms, 10ms, 100ms, 1 Sec, 1 Min, 10 Min)	
Loopback messages (LBM)	
Loopback reply (LBR)	
Linktrace messages (LTM)	
Linktrace replies (LTR)	
Frame Delay (FD) - 2 way measurement	
Frame Delay Variation (FDV) - 2 way measurement	

**Table 1-13 Key features and features introduced in this release (Continued)**

<b>Features</b>	<b>Additional Information</b>
Frame Loss Ratio (FLR)	
UP MEP on UNIs	
DOWN MEP on NNIs	
Support for on-demand loopback	
Support for on-demand linktrace	
Support for on-demand FD, FDV and FLR test	
<b>RFC2544 (embedded)</b>	The available RFC2544 sessions are shown by the CLI command <code>show ethernet rfc2544 brief</code> . However when the Y.1564 session is created on the same MEP, the RFC2544 session does not display on the brief list. Remove the Y.1564 session, to enable the RFC2544 session to be displayed.
Throughput Test (Y.1731 Test message)	
Latency Test (Y.1731 DM)	
Frame Loss Rate test (using TST frame)	
<b>Y.1564 Service Activation Test (SAT)</b>	
Up to 4 sessions at the same time	
CIR Configuration Test	
EIR Configuration Test	
Traffic Policing Configuration Test	
Service Performance Test (Aggregation Test)	
<b>Ethernet Service Level Agreement (SLA) Statistics</b>	
Frame Delay	
2-way Frame Delay Minimum	
2-way Frame Delay Maximum	
2-way Frame Delay Average	
2-way Frame Delay Most Recent	
Frame Delay Variation	
2-way Frame Delay Variation Minimum	
2-way Frame Delay Variation Maximum	
2-way Frame Delay Variation Average	
2-way Frame Delay Variation Most Recent	
Frame Loss Ratio	
Near-End Frame Loss Ratio	
Far-End Frame Loss Ratio	
Ethernet SLA Statistics Bins & collection	

**Table 1-13 Key features and features introduced in this release (Continued)**

<b>Features</b>	<b>Additional Information</b>
2 x 24 hour interval for all statistics per Service	
32 x 15 minute interval for all statistics per Service (8 Hours)	
96 x 5 minute interval for all statistics per Service(8 Hours)	
120 x 1 minute interval for all statistics per Service(8 Hours)	
Performance monitoring for all statistics collected by SNMP on demand, SNMP scheduled, ftp/sftp on demand and ftp/sftp scheduled.	
<b>Ethernet Service Statistics</b>	
Traffic Statistics per E-Service	
Total Received Packets	
Number of bytes declared RED	
Number of bytes declared YELLOW	
Numer of bytes declared GREEN	
Received Packets Dropped	
Total Transmitted Packets	
Total Transmitted Bytes	
Traffic Rate per E-Service	
Last 5 minutes input rate per EVC Bps	
Last 5 minutes input rate per EVC pps	
Last 5 minutes output rate per EVC Bps	
Last 5 minutes output rate per EVC pps	
Utilization per E-Service	
Last 5 minutes input link utilization rate per committed CIR %	
Last 5 minutes output link utilization rate per committed CIR %	
EVC Statistics Bins & Collection	
2 x 24 hour interval for all EVC statistics per Service	
32 x 15 minute interval for all EVC statistics per Service (8 Hours)	
96 x 5 minute interval for all EVC statistics per Service(8 Hours)	
<b>Ethernet Advanced Features</b>	
IEEE 802.1AB LLDP	
<b>Protection / Rapid restoration</b>	
<b>ITU-T G.8031 1:1 Linear Protection</b>	
ITU-T G.8031-2009 Revertive Mode	
ITU-T G.8031-2009 Non Revertive mode	
ITU-T G.8031 1:1 Ethernet Linear Protection Switching (Supports both software based and hardware assisted working and protection path switching)	
ITU-T G.8031 Switching time is 50ms on hardware supported automatic protection switching platforms	
ITU-T G.8031 Supports lockout, forced and manual protection switches	

**Table 1-13 Key features and features introduced in this release (Continued)**

<b>Features</b>	<b>Additional Information</b>
ITU-T G.8031 Supports prioritized protection between Signal Fail (SF) and operator requests	
<b>ITU-T G.8032 v2 Ethernet Ring Protection Switching (ERPS)</b>	
ITU-T G.8032 - Reverative Mode	
ITU-T G.8032 - Non Reverative Option	
ITU-T G.8032 - Interconnected Rings	PVX inter-operability with link-scan only
ITU-T G.8032 - Laddered (Sub) Rings with and without Virtual Channel Mode	
ITU-T G.8032 - Multiple Instances	
Multi Traffic-Channel per Ring Instance	
Multi Ring Instance per Physical Interface	
Protection switching based upon 3.3ms CCMs	
LAG Link Protection	
Active Standby LAG	
<b>Ethernet Fault Propagation Shutdown (EFPD)</b>	
Ethernet Fault Propagation Shutdown (EFPD) on EPLINE services	Interoperability with SA-810 : eth-cc EFPDS must be disabled on the BTI SA-805.
<b>Quality of Service (QoS) and Class of Service (CoS)</b>	
Per-port rate-limiting	
802.1p (Traffic Class)	
Traffic classification based on Port	
Traffic classification based on TOS	
Traffic classification based on DSCP	
Traffic classification based on 802.1P	
Traffic classification based on 802.1Q	
Priority queues per port	
Strict Priority(SP) and Deficit Weighted Round Robin (DWRR) Scheduling	
CIR/CBS bandwidth management	
EIR/EBS bandwidth management	
Bandwidth Profiles per UNI	
Bandwidth Profiles per EVC	
Bandwidth Profiles per CoS	
Ingress Filters	
Egress Filters	
Advanced Filter (and/or for L2 and L3 combined)	
Per port Policers	
Per flow Policers	

**Table 1-13 Key features and features introduced in this release (Continued)**

<b>Features</b>	<b>Additional Information</b>
Egress Queuing	
Egress Strict Priority	
MEF Multiple BW Profile (MBWP)	
<b>Security</b>	
Port mirroring - local	
ACL based on MAC Src, MAC Dst, EtherType, IP Src, IP Dst, TCP Port, UDP Port, VLAN ID, 802.1p, Port	
Filters	
UNI defaults -- UNI down, no local switching	
CPU Protection with Filters and ACLs	
Radius Client	
<b>Command Line Interface</b>	
CLI	
CLI via Telnet	
CLI via SSHv2	
<b>Out-of-Band and In-Band Management</b>	
Craft Console Port RJ-45 Serial RS-232	
Network Management Port RJ-45 Ethernet 100Mbps	
Management VLAN (CVLAN and SVLAN)	
<b>IPv4 Management</b>	
In Band IPv4	
Out of Band IPv4	
<b>Time Management</b>	
Time Zone and Daylight Savings Time	
<b>SNMP Interface</b>	
SNMP v2c sets/gets/traps	
<b>Performance Monitoring</b>	
Layer 2 PMs per port - Rx Statistics (octets, packets, unicast, multicast, broadcast)	
Layer 2 PMs per port - Tx Statistics (octets, packets, unicast, multicast, broadcast)	
Layer 2 PMs per port - Error Statistics (fragments, jumbo, FCS errors, collisions, undersize, drop events, Rx Pause, Tx pause, collisions)	
Last 5 minutes input and output rate per port Bps and pps	
Last 5 minutes input and output link utilization rate per port %	
"Report SFP/SFP+ Information and Performance Temperature, Bias-Current, Tx-Power and Rx-Power"	
"Set SFP/SFP+ Alarms and send SNMP traps Temperature, TX Power and Rx Power"	



**Table 1-13 Key features and features introduced in this release (Continued)**

Features	Additional Information
RMON Groups 1	
Local Sys Log	
Remote Sys Log	
PM File transfer for Ethernet PM, E-Service PM and OAM PM	
<b>External Clock</b>	
Supports external clock modes t1 and e1.	<p>The default external clock-in mode is t1.</p> <p>BTI SA-821/BTI SA-822 do not support clock-in and clock-out mode simultaneously.</p> <p>BTI SA-805, BTI SA-821 and BTI SA-822 do not support the CLI command <code>no ext clk-out</code>.</p>
<b>SyncE</b>	
ITU-T G.8261: Timing and synchronization aspects in packet network	
ITU-T G.8262: Timing characteristics of Synchronous Ethernet equipment slave clock	
ITU-T G.8264: Distribution of timing through packet networks	
ITU-T G.781: Synchronization layer functions	
SyncE with Ethernet Synchronization Messaging Channel (ESMC) support	
Synchronization Status Messages (SSM)	
Support up to two SyncE reference inputs for primary and secondary	
<b>1588v2</b>	
ITU-T G.8261: Timing and synchronization aspects in packet network	<p>1588v2 Ordinary Clock is supported.</p> <p>Boundary and Transparent Clock are not supported in this release.</p> <p>Sync and delay_req message are supported up to 64 PTP packets per second on the Ordinary Clock Servo.</p>
Best Master Clock Algorithm	
Support single reference input for primary and secondary	<p>Recommended configuration when provisioning 1588v2 is to set 1588v2 as the "primary" clock and set the secondary clock to "none".</p>
Slave Clock OC	
Provides 1PPS	
Provides ToD	
ToD Displayed via CLI	
ToD Retrivable via SNMP	
<b>Software upgrades and file management</b>	

**Table 1-13 Key features and features introduced in this release (Continued)**

Features	Additional Information
Upgrade Firmware / OS Management	
Upgrade BIOS Management	
TFTP Client (tftp)	
FTP Client (ftp)	
Telnet Client (telnet)	
Telnet Server (telnetd)	
<b>Standard MIBs</b>	
RFC1213 MIB-II	
RFC3418 MIB for SNMP	
RFC2863 Interface Group	
RFC1643 Ethernet-like Interface	
RFC4188 Bridge	
RFC2922 Physical Topology	
LLDP(802.1AB) MIB	
MEF defined E-LINE & E-LAN (MEF 40 UNI/NNI MIBs)	
MEF defined SOAM FM (MEF 31/31.0.1 FM MIBs)	
MEF defined SOAM PM (MEF36 PM MIBs)	
<b>Industry Certifications</b>	
MEF CE 2.0 EPL	
MEF CE 2.0 EVPL	
MEF CE 2.0 EP-LAN	
MEF CE 2.0 EVP-LAN	
<b>Software Image</b>	
Software image	BTI SA-805 and BTI SA-821/BTI SA-822 use different software images.  If an incorrect image is used an error message is displayed and the invalid image is removed.

**Table 1-14 proNX Service Manager (PSM) and proNX SLA Portal supported features**

Features	Additional Information
<b>PSM Release 6.2.0 - CA</b>	
<b>Nodal Management - FCAPS</b>	
NE discovery & Alarms	Basic discovery and alarming, system settings, inventory, shelf view, scripts, software upgrade, database backup/restore
System info and settings, inventory	
Software upgrades, db backup/restore	
Network Topology	LLDP and network topology, E-Service provisioning (a-z). SLA and Performance Monitoring statistic support.
<b>E-Services (and ERPS Visualization)</b>	

**Table 1-14 proNX Service Manager (PSM) and proNX SLA Portal supported features (Continued)**

<b>Features</b>	<b>Additional Information</b>
ERPS visualization & details	
A-Z circuit provisionning and bandwidth profile application	
Y.1731 CFM	
CCM Auto-configuration	
SLA Initiator Responder Pair configuration	
Real time PMs (port, soam)	
<b>proNX SLA Portal</b>	
<b>SLA Portal Release 2.3.0 - CA</b>	
Circuit Auto-discovery	
Metric Collection and Reporting	
Dynamic Bandwidth Provisionning	

## 1.4 BTI SA-821 Carrier Ethernet Switch Quick Start Up Guide

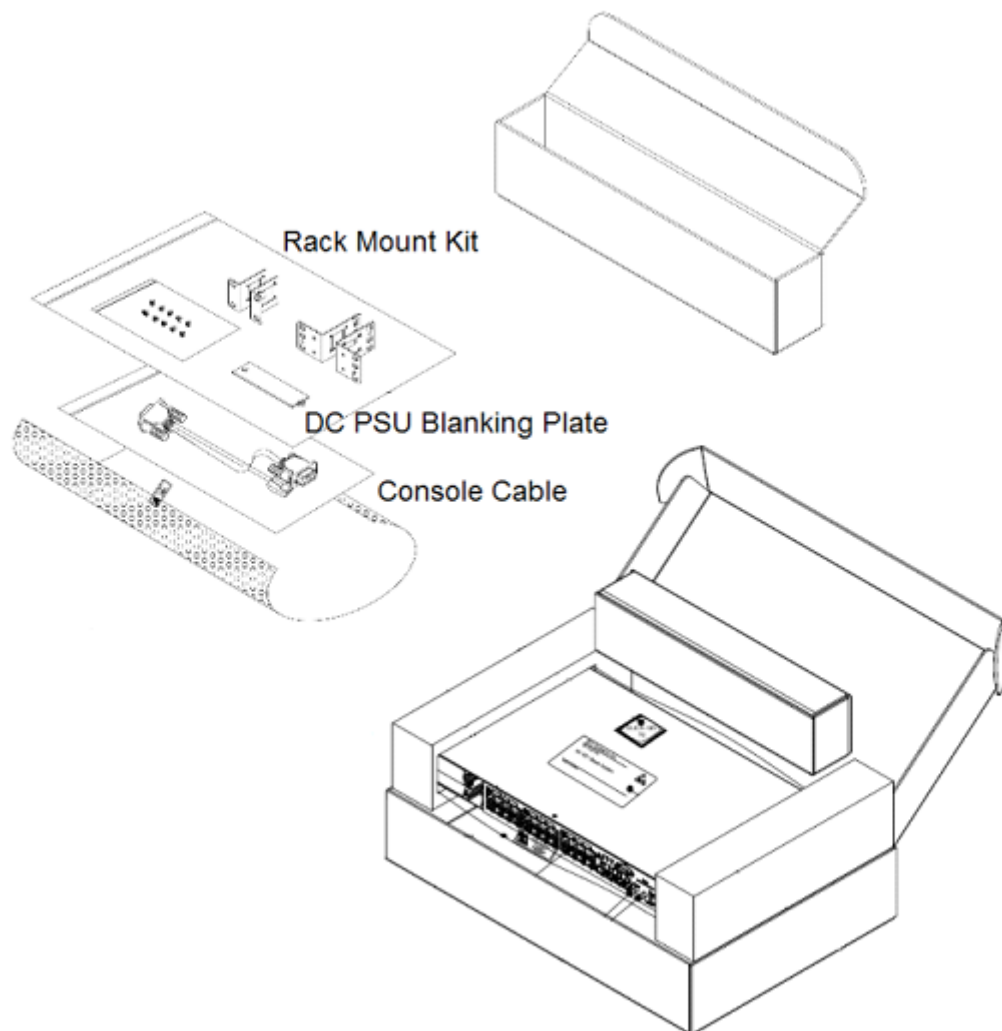
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This is a Quick Start Up Guide. For additional information see:

- [Chapter 2, “BTI SA-821 Carrier Ethernet Switch Installation”](#)
- [Chapter 3, “BTI SA-821 Carrier Ethernet Switch Power Connection to an AC or DC Power Source”](#)
- [Chapter 4, “BTI SA-821 Carrier Ethernet Switch Fan Module Installation”](#)
- [1.5, “ Alarms”](#)

Tasks listed in the Quick Start Up Guide must be performed in accordance with the regulations listed in the Preface : Installation and Power Requirements, Warnings and Cautions .

### BTI SA-821 equipment



**BTI SA-821 hardware and software**

PEC	QTY	ITEM
BT7D21AA	1	Console Cable Rack Mount Kit
BT7D21AA-I02	1	<ul style="list-style-type: none"> <li>• 2 L brackets for 19 in. rack [left and right]</li> <li>• 2 L brackets for 21 and 23 in. racks [left and right]</li> <li>• 8 M3 X 8 flat head screws</li> </ul> DC Power Module Blanking Plate
Additional Optional Items	QTY	ITEM
BT7D61AA	1	Fan Module Assembly
BT7D62AAxxxxxxxx	1	DC Power Module
<b>Transceiver Module Interfaces</b>	24 interfaces assigned to 1 GE SFP and 4 interfaces assigned to 10GE SFP+	

**Installing the BTI SA-821 on a shelf****CAUTION**

Always use an ESD wrist strap when handling the switch and SFP transceivers.

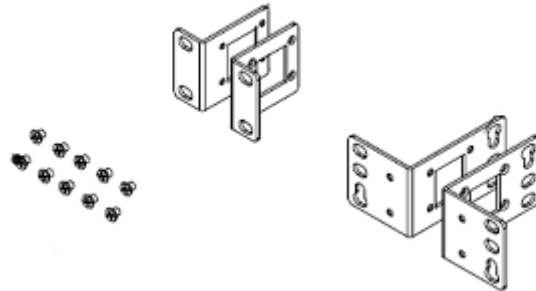
The switch can be installed on a secure shelf with dimensions greater than 44 wide x 255 diameter [mm] and capable of supporting a weight greater than 5.3 lbs./2.4 kg.

**Installing the BTI SA-821 on a rack****Equipment list :**

- Rack mount kit
- ESD grounding strap
- Screwdrivers
- Additional screws for rack mounting

The rack mount kit consists of two L brackets for switch installation on to 19 in. racks and 2 dual use L brackets.

**2 L Brackets for 19 in. rack [left & right]**

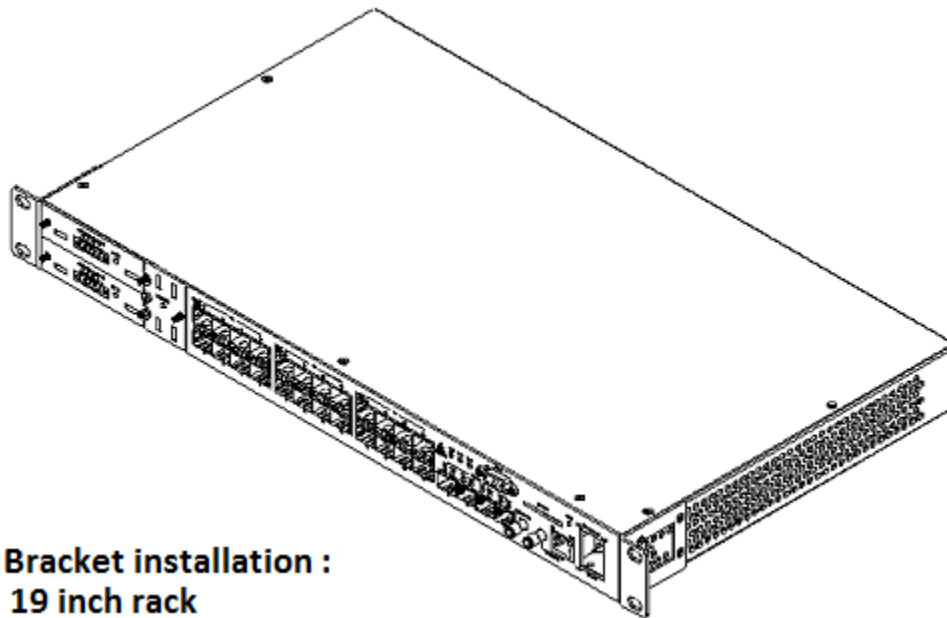


**2 Dual Use L Brackets [21 & 23 in. left & right]**

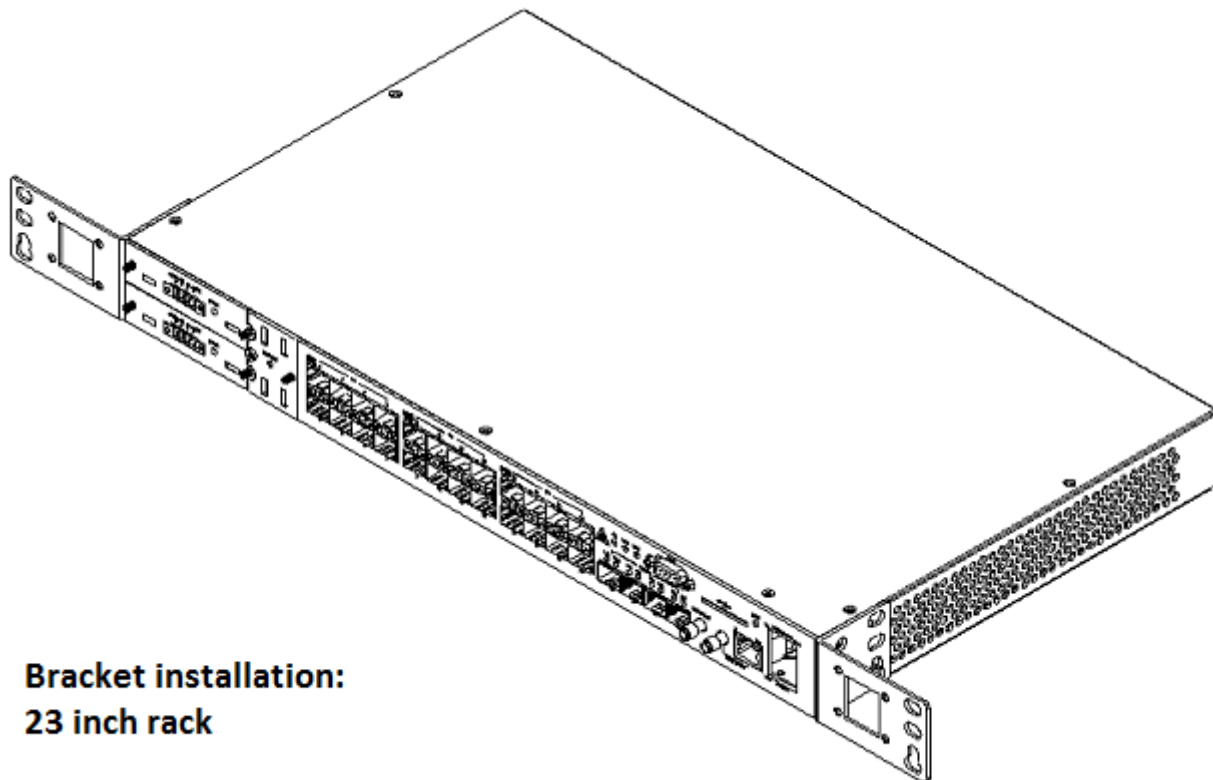
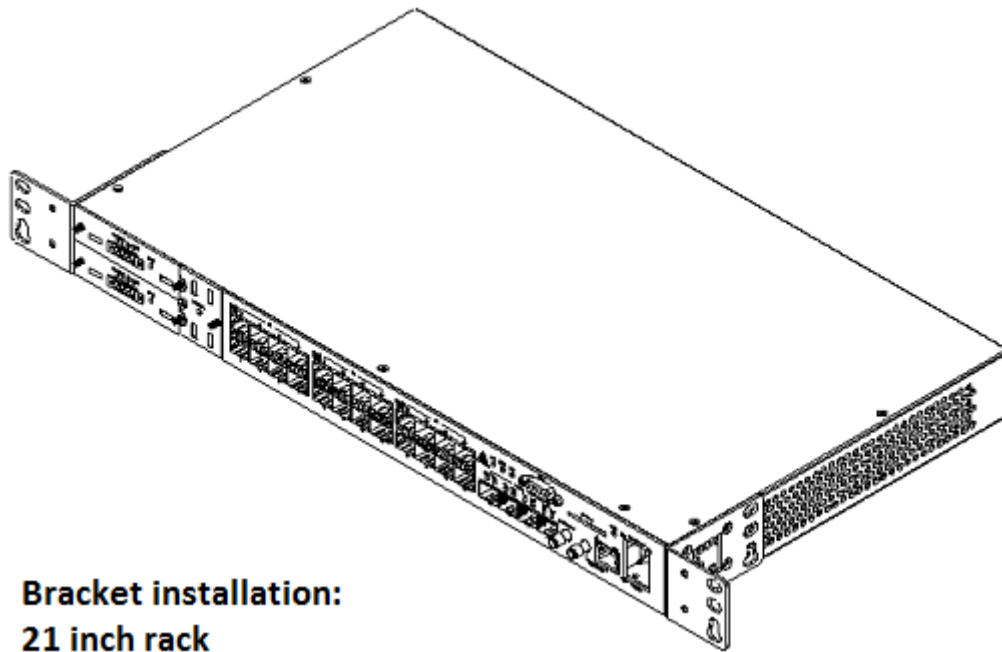
The dual use L brackets are installed in different orientations to allow the switch to be mounted on to 21 or 23 inch rack.

To mount the switch onto a rack perform the following tasks:

- Choose the 19, 21 or 23 inch rack mount option



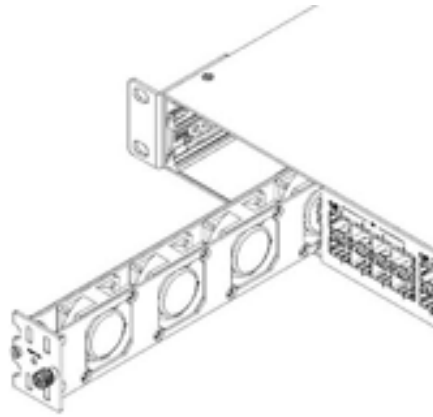
**Bracket installation :  
19 inch rack**



- The 4 screw inserts at each front side of the switch are intended to mount the side L brackets. Attach the right and left L brackets using the 8 M3x8 screws

- Ensure all screws are fastened securely
- Use the appropriate lock bolt kit to attach the end front plates of the bracket to the rack

### Installing the BTI SA-821 fan module



The fan module can be replaced when the switch is operating.

- Slide the fan module into the slot until it engages
- Tightened the thumbscrews
- Verify the RED LED is OFF.

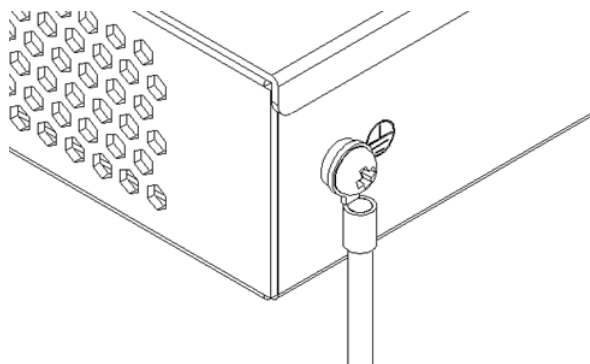
### Grounding the BTI SA-821



This equipment must be grounded. Never operate the equipment in the absence of a suitably installed ground conductor. If you are uncertain that suitable grounding is available, contact the appropriate electrical inspection authority or an electrician.

The ground screw is located at the rear of the switch. The lug is provided in the installation kit. The ground cable is not supplied.





To ground the switch, do the following:

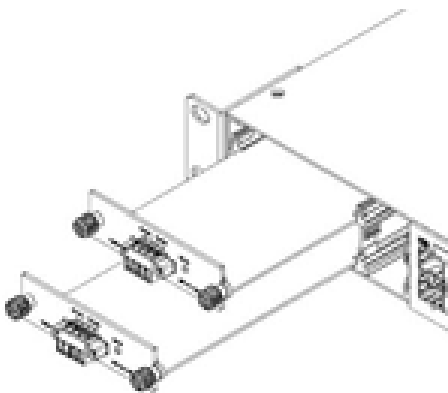
- Connect the grounding wire to the grounding point on the rack
- On the rear panel, loosen the grounding screw
- Connect the grounding wire and tighten the grounding screw.

### **Powering the BTI SA-821**

Power the switch by either installing one or two DC power modules or one AC power module.

#### **Installing and wiring the DC Power Module**

If provisioning and connecting two DC power modules to the DC power supply, either one of the power modules can be replaced when the switch is operating. Replacing a module provisioned in a switch with only one operating DC power supply will cause the switch power to turn OFF and no data will be transmitted or received by the switch until the power module is replaced. Before removing a DC power module verify the LED on the remaining module is GREEN before removing the second power module.

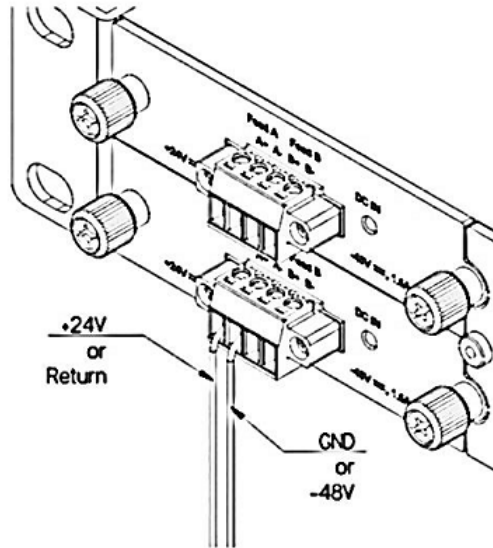


If you intend to wire two DC power modules, wire the lower DC module first.

- Ensure that the power is turned off at the distribution panel
- Slide the DC power module into the slot until it engages
- Tightened the thumb screws.

### Wiring the BTI SA-821 to a -48V or +24V DC Power Supply

- Ensure that the power is turned off at the distribution panel

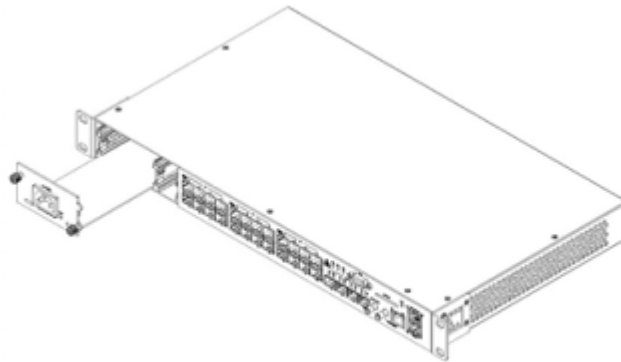


- With a pair of wire strippers, strip the power wire leads by removing the first 5 mm (1/4-inch) of insulation from the DC power wires.
- Insert the stripped end of the -48 V Feed A power feed wire or +24V Feed A GND wire into the opening of the Feed A A- terminal. With the wire held in place, tighten the associated slot-head screw on the top of the power block until the wire is firmly secured
- Insert the stripped end of the -48 V Feed A power return wire or +24V Feed A +24V wire into the opening of the Feed A A+ terminal. With the wire held in place, tighten the associated slot-head screw on the top of the power block until the wire is firmly secure
- Insert the stripped end of the -48 V Feed B power feed wire or +24V Feed B GND wire into the opening of the Feed B B- terminal. With the wire held in place, tighten the associated slot-head screw on the top of the power block until the wire is firmly secured
- . Insert the stripped end of the -48 V Feed B power return wire or +24V Feed B +24V wire into the opening of the Feed B B+ terminal. With the wire held in place, tighten the associated slot-head screw on the top of the terminal block until the wire is firmly secured.

### Installing the AC power module and powering the BTI SA-821 from the 120V | 240V AC mains supply

- Ensure that the power cable is removed from the AC power module
- Slide the AC power module into the slot until it engages

- 



- Tightened the thumb screws.
- Connect the power cable

### Accessing the Command Line Interface (CLI)

Access the CLI using the console serial port [The cable is included with base system]	Access the CLI using the management port
1 Insert the RJ-45 serial cable connector into the console port on the front panel of the system	The default IP address of the management Ethernet port is 192.168.5.100/24
2 Insert the DB-9 end of the cable in the RS-232 connector on the PC	Configure your PC to be on the 192.168.5.0/24 subnet
3 Start the terminal emulation software, and specify the following communication parameters Terminal IP : VT100 Baud rate : 9600bps Data bits : 8 bits Parity : None Stop bits : None Flow control : None	Connect your PC and management Ethernet port either directly with the RJ-45 Ethernet cable or over the LAN
4 Use the terminal emulation software to open a connection to the switch	Start the terminal emulation software, and telnet to the telnet to the switch on the standard TCP telnet port 23
Access the CLI by entering your username and password	Access the CLI by entering your username and password
The default username is "admin" and password is "btiadmin"	The default username is "admin" and password is "btiadmin"

### Installing the transceivers

Following the Cautions and installation instructions when installing the transceivers.

## 1.5 Alarms

The following alarms may be raised against the switch.

Name	Severity	Description	Clearing
Module Missing	MJ	One of the following situations exists: <ul style="list-style-type: none"> <li>The power module is not in the slot.</li> <li>The fan module is not in the slot.</li> <li>The SFP module is not in the indicated slot and the associated Ethernet port is enabled.</li> </ul>	The alarm clears if the missing module is inserted into the slot.  If the missing module is an SFP, the alarm also clears if the SFP module or the associated Ethernet port is disabled.
Module Failure	CR	The DC output voltage of the power module is too low.	The alarm clears when the DC output voltage is back to normal.
High Temperature	CR	One of the following situations exists: <ul style="list-style-type: none"> <li>The system temperature has exceeded the High Alarm Threshold.</li> <li>The temperature of the specified SFP module has exceeded the High Alarm Threshold.</li> </ul>	The alarm clears when the temperature drops below the High Alarm Threshold.
Low Temperature	CR	One of the following situations exists: <ul style="list-style-type: none"> <li>The system temperature has dropped below the Low Alarm Threshold.</li> <li>The temperature of the specified SFP module has dropped below the Low Alarm Threshold.</li> </ul>	The alarm clears when the temperature is higher than the Low Alarm Threshold.
CPU High Usage	CR	CPU utilization has exceeded the threshold.	The alarm clears when the CPU utilization is below the threshold.
Memory High Usage	CR	Memory usage has exceeded the threshold.	The alarm clears when the memory usage is below the threshold.
Fan_High_Over_Flow	MJ	The fan speed has exceeded the High Tolerance threshold.	The alarm clears when the fan speed is below the High Tolerance threshold.
Fan_Low_Under_Flow	MJ	The fan speed has dropped below the Low Tolerance threshold.	The alarm clears when the fan speed is higher than the Low Tolerance threshold.
Module Mismatch	MJ	A transceiver has been inserted into a slot that has been provisioned for a different transceiver.	The alarm clears when the mismatched transceiver is removed or if the provisioning is changed to match the inserted transceiver.

Name	Severity	Description	Clearing
Module Unknown	MJ	An unknown transceiver is inserted.	The alarm clears when the unknown transceiver is removed.
Loss of signal	MJ	No input Ethernet signal is detected on the specified port.	The alarm clears when an input Ethernet signal is detected.
Loss of Sync	MJ	A loss of synchronization has occurred between the local port and the remote port. This can happen if there is a Loss of Signal condition at the remote end.	The alarm clears when the Loss of Signal condition is cleared at the remote end.
LAG Interface Link Down	MJ	The LAG is down.	The alarm clears when the LAG is up.
ERP State Change to Protection	MJ	The ERP ring is in "Protection" state.	The alarm clears when the ERP ring changes out of "Protection" state.
ERP State Change to Pending	MJ	The ERP ring is in "Pending" state.	The alarm clears when the ERP ring changes out of "Pending" state.
ERP State Change to Forced Switch	MJ	The ERP ring is in "FS" state.	The alarm clears when the ERP ring changes out of "FS" state.
ERP State Change to Manual Switch	MJ	The ERP ring is in "MS" state.	The alarm clears when the ERP ring changes out of "MS" state.
Remote Defect Indication	MJ	The local MEP is receiving "RDI-set" CCMs from its peer, indicating that there is a CFM defect at the remote MEP.	The alarm clears when the local MEP receives "RDI-reset" CCMs from its peer to indicate that the remote MEP defect has cleared.
MAC Status Defect	MJ	An interfaceStatus TLV with a value other than isUp has been received from some remote MEP, or a portStatus TLV with a value other than psUp has been received from all remote MEPs.	An interfaceStatus TLV with a value equal to isUp has been received from all remote MEPs, and a portStatus TLV with a value equal to psUp has been received from at least one remote MEP.
Loss of Connectivity	MJ	The local MEP has not received any CCM from its peer for a duration of 3.5 times the CCM interval.	The local MEP has received no fewer than 3 CCMs from its peer within a duration of 3.5 times the CCM interval.
Error of Connectivity	MJ	One of the following situations exist: <ul style="list-style-type: none"> <li>The local MEP is receiving CCMs with an unexpected CCM interval.</li> <li>The local MEP is receiving CCMs with a duplicate MEPID (same MEPID as the local MEP).</li> </ul>	The alarm clears when the local MEP receives expected CCMs (with the correct MEG level, CCM interval, and MEPID).

Name	Severity	Description	Clearing
		<ul style="list-style-type: none"> <li>The local MEP is receiving CCMs with a MEG level lower than that of the MEP.</li> </ul>	
Cross Connected Connectivity	MJ	The local MEP is receiving CCMs with an expected MEG level but with a different MEGID from the peer end.	<p>The local MEP receives expected CCMs (with the correct MEGID).</p> <p>Ensure the MEGID of all nodes in this domain are the same.</p>
Alarm Indication Signal	MJ	A client MEP is receiving AIS frames from a server MEP to indicate a CC fail condition or a LCK condition at the server MEG level.	The client MEP has not received AIS within an interval of 3.5 times the AIS transmission period. This indicates that the CC fail or LCK condition has cleared at the server MEG level.
Switch Sync Holdover	MJ	The system timing is in Holdover state.	The system timing is in Sync state.
Loss of timing Reference	MJ	The timing reference is out of sync.	The system timing is in Sync state.
Optical Power Received	MJ	The Optical Receive Power is higher than "High Alarm Threshold" or lower than "Low Alarm Threshold".	The Optical Receive Power is within the normal level (between High and Low threshold).
Optical Power Transmitted	MJ	The Optical Transmit Power is higher than "High Alarm Threshold" or lower than "Low Alarm Threshold".	The Optical Transmit Power is within the normal level (between High and Low threshold).
Laser Bias Current	MJ	The Transceiver Bias Current is higher than "High Alarm Threshold" or lower than "Low Alarm Threshold"	The Transceiver Bias Current is within the normal level (between High and Low threshold).
Supply Voltage	MJ	The Transceiver Supply Voltage is higher than "High Alarm Threshold" or lower than "Low Alarm Threshold"	The Transceiver Supply Voltage is within the normal level (between High and Low threshold)
Temperature	MJ	The Transceiver Temperature is higher than "High Alarm Threshold" or lower than "Low Alarm Threshold"	The Transceiver Temperature is within the normal level (between High and Low threshold).
Code Violations	MJ	The count of CV exceeds the threshold in the current 15-min bin.	The count of CV is less than the threshold in the next 15-min bin.
Errored Seconds	MJ	The count of ES exceeds the threshold in the current 15-min bin.	The count of ES is less than the threshold in the next 15-min bin.
Severely Errored Seconds	MJ	The count of SES exceeds the threshold in the current 15-min bin.	The count of SES is less than the threshold in the next 15-min bin.

<b>Name</b>	<b>Severity</b>	<b>Description</b>	<b>Clearing</b>
E-Service TX CIR OverFlow	MJ	The utilization of egress CIR exceeds the threshold.	The utilization of egress CIR is lower than the threshold.
E-Service TX EIR OverFlow	MJ	The utilization of egress EIR exceeds the threshold.	The utilization of egress EIR is lower than the threshold.
E-Service RX CIR OverFlow	MJ	The utilization of ingress CIR exceeds the threshold.	The utilization of ingress CIR is lower than the threshold.
E-Service RX EIR OverFlow	MJ	The utilization of ingress EIR exceeds the threshold.	The utilization of ingress EIR is lower than the threshold.
Optical Power Received High	MJ	The Optical Receive Power is higher than "High Alarm Threshold".	The Optical Receive Power is lower than "High Alarm Threshold".
Optical Power Received Low	MJ	The Optical Receive Power is lower than "Low Alarm Threshold".	The Optical Receive Power is higher than "Low Alarm Threshold".
Optical Power Transmitted High	MJ	The Optical Transmit Power is higher than "High Alarm Threshold".	The Optical Transmit Power is lower than "High Alarm Threshold".
Optical Power Transmitted Low	MJ	The Optical Transmit Power is lower than "Low Alarm Threshold".	The Optical Transmit Power is higher than "Low Alarm Threshold".





## 2.0 BTI SA-821 Carrier Ethernet Switch Installation

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This section covers the following topics:

- [2.1, “BTI SA-821 Carrier Ethernet Switch Unpackaging”](#)
- [2.2, “BTI SA-821 Carrier Ethernet Switch Installation on to a 19, 21 or 23 Inch Rack”](#)

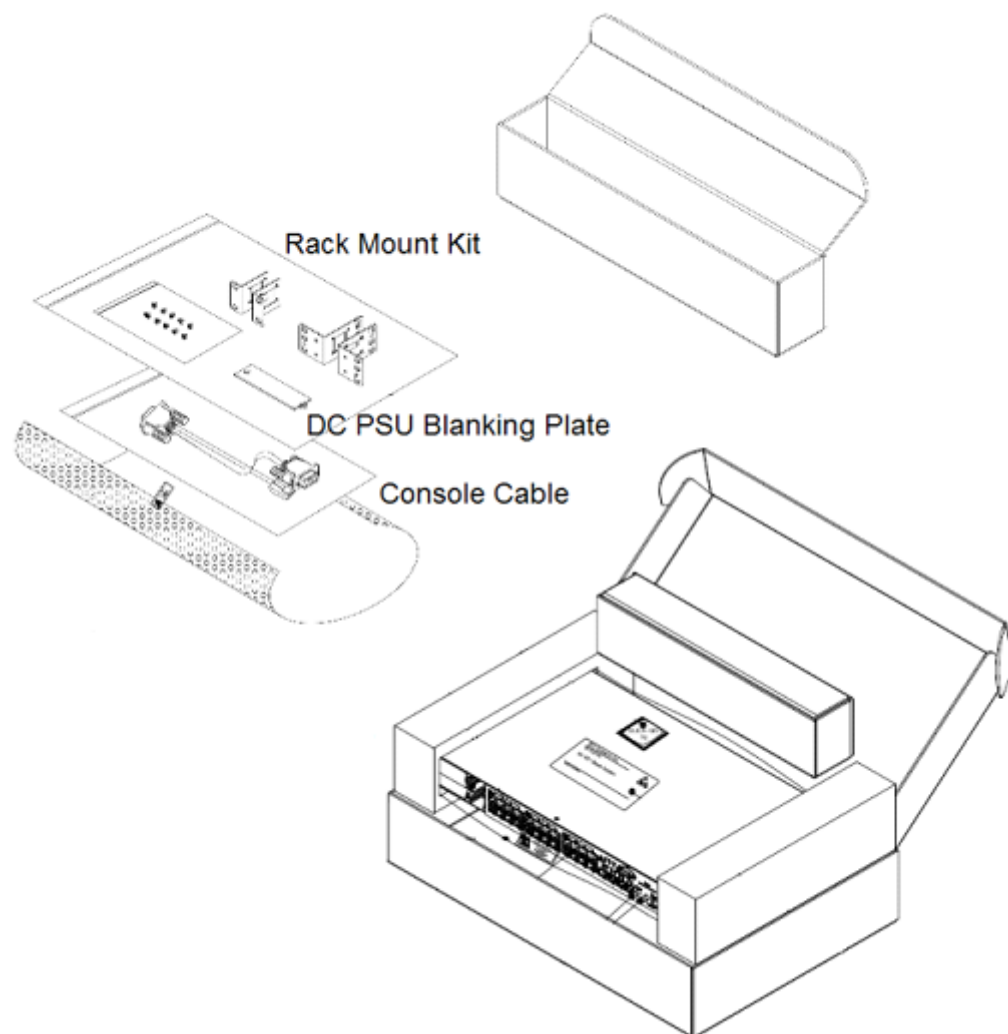
## 2.1 BTI SA-821 Carrier Ethernet Switch Unpackaging

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- Leave equipment packed until it is needed for immediate installation.
- After unpacking the equipment, save and store the packaging material in case the equipment must be returned.

**Caution** When opening the container, use caution to avoid damaging the contents.

**Caution** Static electricity can damage electro-optical equipment. While unpacking and handling a switch, wear an electrostatic discharge (ESD) wrist strap to discharge the static buildup.



**Step 1** Open the top of the shipping container.

**Step 2** Remove any information sheets from the shipping container.

**Step 3** Carefully remove the protective packing material from the switch and other equipment shipped with it.

**Step 4** Remove the switch and other equipment from the container and place them on a secure horizontal surface.

**Step 5** Remove the antistatic packaging from the switch and other equipment, and place the packaging on an ESD-safe surface. An ESD-safe surface is a conductive surface connected directly to an earth ground.

**Step 6** Do the following:

- a) Verify all parts received against the packing slip or sales order.
- b) Visually inspect the switch and other equipment received to ensure that they were not physically damaged during transport.

PEC	QTY	ITEM
BT7D21AA	1	Base System
BT7D21AA-I02	1	Console Cable Rack Mount Kit
	1	<ul style="list-style-type: none"> <li>2 L brackets for 19 in. rack [left and right]</li> <li>2 L brackets for 21 and 23 in. racks [left and right]</li> <li>8 M3 X 8 flat head screws</li> </ul> DC Power Module Blanking Plate
<b>Additional Optional Items</b>		
BT7D61AA	1	Fan Module Assembly
BT7D62AA	1 or 2	DC Power Module
BT7D63AA	1	120V-240V AC Power Module with 3 pin 120V AC Cable [US]
	1	Lock Bolt kit: <u>ETSI</u> :10 M5 X 12 Pan head Phillips MS M4 lug insulated 10-12 AWG <u>Telecom</u> :10 #12-24 0.6 in lg Pan Phillips MS 8 washers # 12 flat 6 washers # 12 ext lock tooth 1 lug #12 insulated 10-12 AWG <u>Standard</u> :10 #10-32 0.6 in lg pan hd MS SS 8 washers #10 flat 4 washers #10 ext lock tooth 1 lug # 10 insulated 10-14 AWG
<b>Transceiver Modules [SFP, 1GE and Cooper]</b>		
BP3AD3ES	N/A	SFP: 10/100/1000BT Copper

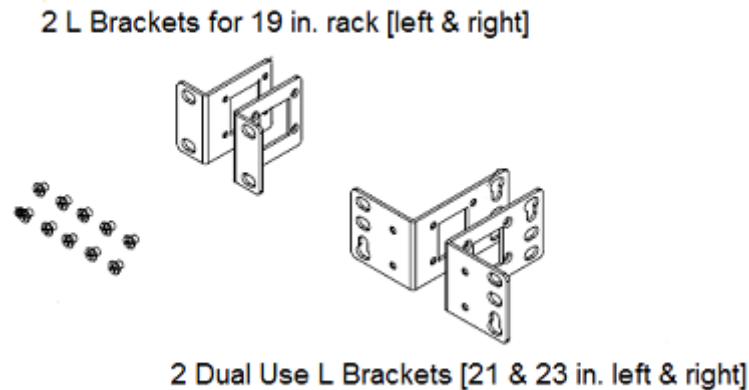
PEC	QTY	ITEM
BP3AE2ES	N/A	SFP: 1000BT Copper
BP3AD1SS	N/A	SFP: 850nm SX
BP3AM1MS	N/A	SFP: 1310nm SR
BP3AM1MI	N/A	SFP: 1310nm IR
BP3AM5PB	N/A	SFP: 100BX, GE, SR, bidi 1310tx/ 1490nm (20km)
BP3AM5QB	N/A	SFP: 100BX, GE, SR, bidi 1490tx/ 1310nm (20km)
BP3AM5PI	N/A	SFP: 100BX, GE, IR, bidi 1310T/1490R (40km)
BP3AM5QI	N/A	SFP: 100BX, GE, IR, bidi 1490T/1310R (40km)
BP3AM1CL-xx xx = [01-16]	N/A	SFP: CWDM LR
BP3AM1DE-xx xx = [01-32, E1-E8]	N/A	SFP: DWDM ER
<b>Transceiver Modules [SFP+, 10GE]</b>		
BP3AD6SS	N/A	SFP+, 850nm, 200m, dual-rate, 10.3 and 10.5Gbps
BP3AM6MS	N/A	SFP+, 1310nm, 10km, multi-rate, 9.9 to 11.1Gbps
BP3AM6DL-xx	N/A	SFP+, DWDM fixed, 80km, multi-rate, 9.9 to 11.1Gbps
BP3AM8LI	N/A	SFP+: 1550nm IR 40km, 10GE 10. 3Gbps (I-temp)

**Note** If the packaging is damaged and possible equipment damage is present, preserve as much of the packaging as possible to allow Customer Service and the shipper to analyze any possible equipment damage. Contact Technical Support if you require additional or replacement equipment.

## 2.2 BTI SA-821 Carrier Ethernet Switch Installation on to a 19, 21 or 23 Inch Rack

The mounting brackets and screws required to attach the mounting brackets to the switch are supplied with the switch base system. The lock bolt kit [the fasteners required to attach the switch brackets to the rack] are not supplied with the switch base system.

### Equipment Required



PEC	QTY	ITEM
	1	2 L Brackets for 19 inch rack [left and right]
	1	2 Dual use L Brackets for 21 and 23 inch racks
	1	Bag of 10 M3 X 8 flat head screws Phillips SS
		Note : 2 of the 10 screws may be required for fitting the DC blanking plate

### Additional Equipment [not supplied]

Lock Bolt kit ETSI :10 M5 X 12 Pan head Phillips MS M4 lug insulated 10-12 AWG

Telecom:10 #12-24 0.6 in lg Pan Phillips MS 8 washers # 12 flat 6 washers # 12 ext lock tooth 1 lug #12 insulated 10-12 AWG

Standard:10 #10-32 0.6 in lg pan hd MS SS 8 washers #10 flat 4 washers #10 ext lock tooth 1 lug # 10 insulated 10-14 AWG

Screw driver

Philips Loctite 243 color Blue

ESD strap

### Site Requirements

- The environmental conditions of the site should be with the temperature range -40 to 65 °C | -40 to 149 ° F with up to 85 % non-condensing atmosphere

- Sufficient rack access for maintenance to work safely and comfortably in front and behind the rack should exist
- It is recommended that 1RU of empty space should exist above and below the switch for ventilation
- Ground the equipment chassis
- The socket-outlet shall be installed near the equipment and shall be easily accessible
- Stow the switch in the ESD bag until it is ready to be installed
- Never install the mounting brackets when the switch is powered
- Visually inspect the switch and mounting brackets before installing the switch
- Do not install the switch with the power cables attached
- If you are installing multiple switches try to install the switches in the lowest position first

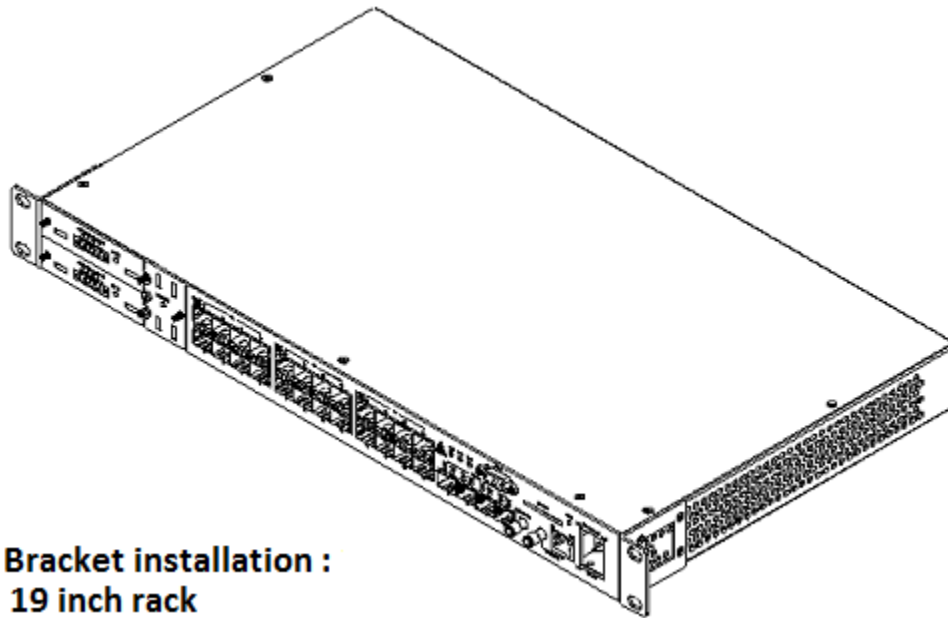


Use an ESD wrist strap whenever you open the equipment, particularly when you are handling modules as well as SFP and XFP transceivers. To work properly, the wrist strap must make good contact at both ends (that is, with your skin at one end and with the chassis at the other).

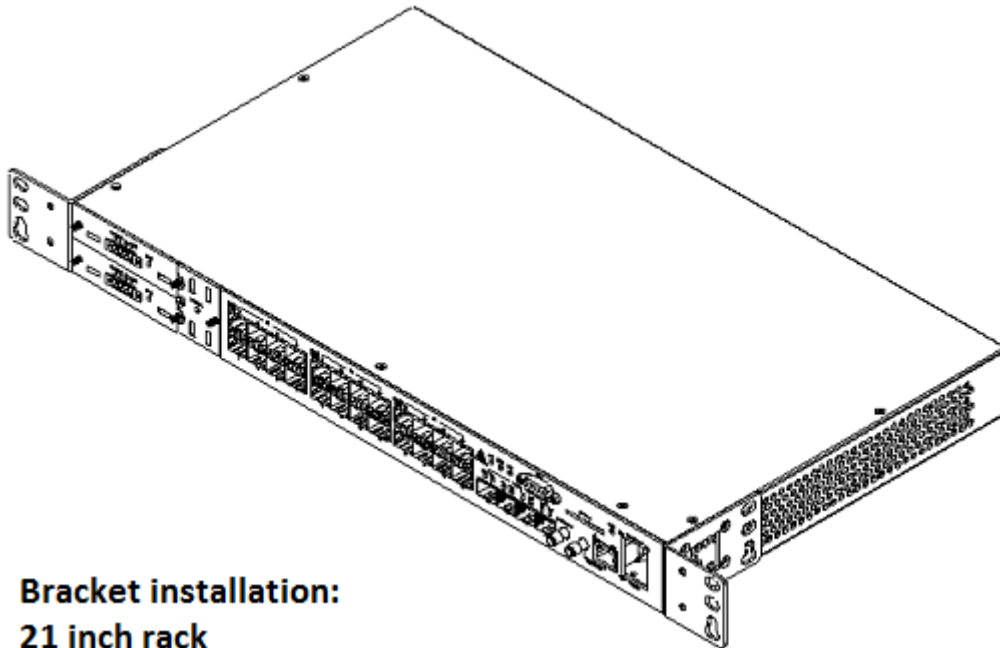
The rack mount kit consists of two L brackets for switch installation on to 19 in. racks and 2 dual use L brackets.

The dual use L brackets are installed in different orientations to allow the switch to be mounted on to 21 or 23 inch rack.

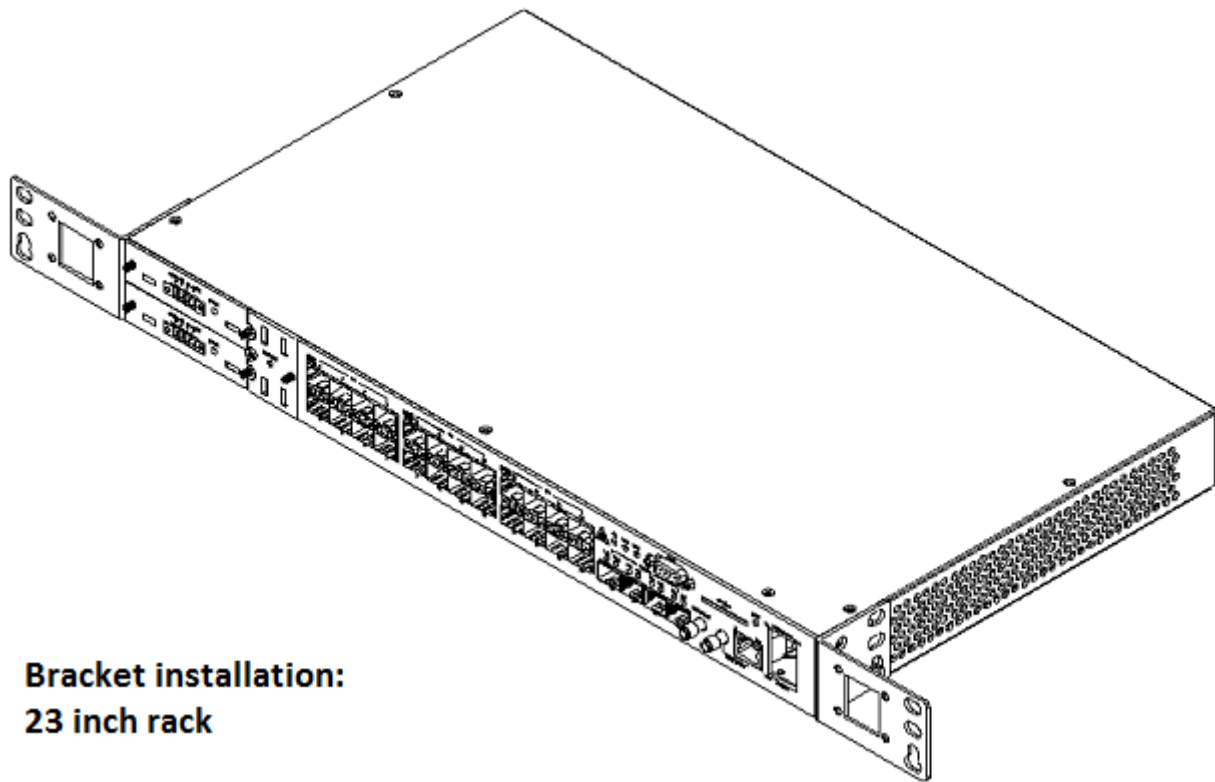
- Step 1** Choose either the 19, 21 or 23 inch rack single mount option and orient the L brackets as shown in the figures
- Step 2** The 4 screw inserts at each front side of the switch are intended to mount the side L brackets. Using Loctite, attach the right and left L brackets using the 8 M3x8 screws provided.
- Step 3** Ensure all screws are fastened securely.
- Step 4** Use the appropriate lock bolt kit to attach the end front plates of the bracket to the rack.



**Bracket installation :  
19 inch rack**

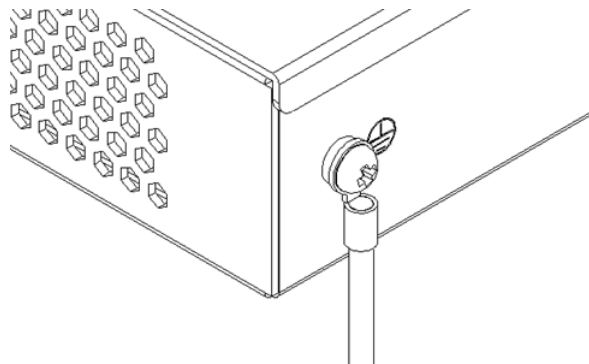


**Bracket installation:  
21 inch rack**



**Bracket installation:  
23 inch rack**

**Step 5** Ensure the insulated lug is attached and the mounting plate is connected to ground.





## 3.0 BTI SA-821 Carrier Ethernet Switch Power Connection to an AC or DC Power Source

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This section covers the following topics:

- 3.1, “BTI SA-821 Carrier Ethernet Switch Connecting to a Power Source”
- 3.2, “BTI SA-821 Carrier Ethernet Switch Connecting to an AC Mains Supply using the AC Power Module Assembly”
- 3.3, “BTI SA-821 Carrier Ethernet Switch Connecting to an AC Mains Supply using the AC-DC Adapter Kit”
- 3.4, “BTI SA-821 Carrier Ethernet Switch Connecting to a DC Power Source”

## 3.1 BTI SA-821 Carrier Ethernet Switch Connecting to a Power Source

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The switch can be wired to a DC power source or can be plugged into an AC outlet.

Before connecting the power, the switch should be installed in the mounting brackets and securely attached in a rack .

### Power Specifications

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#### Power Specifications

AC Power Supply	Universal
DC Power Supply	Dual Integrated -48VDC or 24VDC Input

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#### Ordering Requirements for Power and Fan Modules and Cables

The switch can be powered from a DC or AC power source using an DC or AC power module. The power modules are not supplied with the switch and should be ordered if required. The switches also supports a fan module [with four fans] which is not supplied with the switch and can also be ordered if required.

- BT7D61AA Fan module [with four fans]
- BT7D62AA DC power module [-48V | +24V DC]
- BT7D63AA AC power module assembly [100V - 240V AC]

Cables and accessories to wire the switch to a DC power source can be purchased from any hardware or electrical depot.

If you intend to power the switch from the mains or 100V - 240V AC you will require the AC power module assembly, which contains the AC power module and an AC cord which is used to plug the module into the mains supply. The AC cord has a North American 3 pin plug [NEMA 5-15P 120V 60HZ].

The switches are compliant to universal power requirements. Contact Technical Support if you wish to order an alternative cord with a different plug.

#### Site Requirements

- The environmental conditions of the site should be with the temperature range -40 to 65 °C | -40 to 149 ° F with up to 85 % non condensing atmosphere

#### Installation Requirements.

- The socket-outlet shall be installed near the equipment and shall be easily accessible
- Sufficient rack access for maintenance to work safely and comfortably in front and behind the rack should exist
- It is recommended that 1RU of empty space should exist above and below the switch for ventilation
- Ground the equipment chassis
- The -48V DC and +24V DC power are connected on the switch using a small terminal block with screw fasteners. You must ensure power is switched off at the distribution panel before inserting or removing the power cables.
- AC power cables should be unplugged from the switch in the same manner as regular AC power sockets.

- If installed on a shelf, the surface must be flat, even and capable of supporting the switch weight [ 5.3lbs | 2.4 kg ]. The surface area must be greater than the dimensions of the switch [ 440 wide x 255 depth [mm]
- The switch should not be located close to any equipment or machinery which may cause electromagnetic interference

#### **Electrical and Wiring Requirements and Considerations**

- A readily accessible disconnect device shall be incorporated into the installation wiring. For optimum system power performance, a power distribution panel with line conditioning filtering capabilities should be used
- Surge damage to network equipment can be minimized using proper grounding methods and adhering to electrical wiring codes
- Ground potential differences between buildings should be minimized
- Connect only a DC power source that complies with the Safety Extra-Low Voltage (SELV) requirements inclusive of UL1950, CAN/CSA 22.2 No. 60950, EN60950 or IEC 60950 to a BTI SA-821 DC input power supply unit
- Install DC power supplies used in restricted access areas in accordance with Articles 110-16, 110-17, and 110-18 of the National Electric Code, ANSI/NFPA 70.

#### **Cautions and Warnings**

- When replacing or handling the power modules never touch the electronic components. As with all power units, capacitors may retain a charge even after they are removed from the power supply source. Always handle the power modules by the front plate and underneath the lower insulated surface.
- You may install and remove the second DC power module while the switch is in operation. However you should ensure the +24V DC and -48V DC power is switched OFF to that DC module before the module is installed or removed
- If you remove the AC power module or if you remove the DC power in a system provisioned with only one working DC power module, traffic on that switch will be down until the power to the switch is restored
- You may install and remove the second DC power module while the switch is in operation. However you should ensure the +24V DC and -48V DC power is switched OFF to that DC module before the module is installed or removed. If the switch is in operation while you are removing the second DC power module, you should ensure that power to the remaining module is maintained
- Always ensure the DC wiring has been disconnected before removing the DC modules
- Never touch the wiring terminals when the DC power is ON
- Always ensure the AC power cord is unplugged from the AC power module before installing or removing the AC module
- Provisioning the switch with protected AC power, may require you to remove the DC terminal screw block from the DC power modules. Always ensure the DC power is OFF to that module before removing the terminal screw block
- Always perform a visual inspection of the switch and its surrounding installation for electrical damage, arcing or poor cable connections before touching the switch or removing / installing the power, fan and transceiver modules
- Ensure all DC cables are de-energized before handling or connecting to equipment
- Always wear an ESD strap when handling or performing maintenance on the switch.
- Always follow electrical safety precautions, use the appropriate tools and follow the health and safety guidelines for safety protection clothing when working in areas with electricity or installation.

**Optical and Laser Precautions**

- All BTI SA-821 switches are classified by the FDA as class 1 laser products with a class 1 hazard rating. A caution label is located on the BTI SA-821 equipment. Read and understand all caution labels before working with the equipment
  - Terminate all laser and SFP transceiver outputs properly before connecting laser inputs.
  - Disconnect the input end of an optical fiber jumper cable before disconnecting the output end.
  - System equipment should be used in a controlled access area. Limit the number of personnel that have access to the optical transmission systems.
  - Handle glass fiber with care. Glass fiber can be broken if mishandled
  - Protect skin from exposed glass fiber. It can penetrate the skin
  - Measure optical power levels to ensure that they are within expected limits. Attenuate optical power levels as needed before connecting laser inputs.
  - Limit the use of laser test equipment to authorized, trained personnel during installation and service. This precaution includes using optical loss test (OLT) set, optical spectrum analyzer (OSA), and optical time domain reflectometer (OTDR) equipment.
  - Exclude any unauthorized personnel from the immediate laser radiation area during service and installation when there is a possibility that the system may become energized. Consider the immediate service area to be a temporary laser-controlled area.
  - The system functions in the 850-nm to 1620-nm wavelength window that is considered invisible radiation. Laser light being emitted by a fiber, a pigtail, or a bulkhead connector cannot be seen by the naked eye. Use appropriate eye protection during fiber-optic system installation or maintenance whenever there is potential for laser radiation exposure, as recommended by the company's health and safety procedures. Observe this precaution whether or not warning labels have been posted.
  - During installation or service, a broken optical fiber or non-terminated connector should only be viewed with an indirect image converter or with a filtered optical instrument of optical density sufficient to reduce the exposure levels below the appropriate maximum permissible exposure, unless it has been verified that all optical transmitters are turned off and will remain off during the installation or service operation.
  - During all splicing operations that require viewing the end of a fiber of an SG3a, SG3b or SG4 optical-fiber communication systems, the laser source on the fiber involved shall be de-energized or viewing the systems incorporating personal protection shall be employed. A responsible person(s) shall verify that the system is de-energized before splicing proceeds. Where applicable, ensure compliance with lockout/tagout requirements of OSHA Standard 29 CFR Part 1910.147.
- 



Voltage	Connector Type on switch	Adapter and Cabling	Power Source
AC 100-240v (50/60Hz) 10A	North American 3 pin plug [NEMA 5-15P]	1 cable and plug [120V AC with US plug]	AC socket outlet

+24V DC	4 pin screw terminal block:	16 copper wire Gauge AWG cable : +24V Supply A / terminal A+ Return Supply A / terminal A- +24V Supply B / terminal B+ Return Supply B / terminal B-	DC distribution panel with 5A fuse and 21V DC min input voltage tolerance
-48V DC	4 pin screw terminal block:	16 copper wire Gauge AWG cable : -48V Supply A / terminal A- Return Supply A / terminal A- -48V Supply B / terminal B- Return Supply B / terminal B+	DC distribution panel with 5A fuse and -60V DC max input voltage tolerance
Ground	Ground Screw	16 Gauge AWG with 16-14 AWG 1/4 ring terminal	Chassis / rack ground point

**Note** The switch must be connected to ground in **all** power modes. The grounding terminal is located at the rear of the switch. Each module must be wired to either +24V or -48V DC supply. If the switch is provisioned with two DC power modules both modules may be wired to the +24V or -48V DC supply or one module may be wired to the +24V DC supply and the other to the -48V DC supply.

**Model Number:**

**Mfg Date:**

This product complies with FDA-21, CFR Chapter 1, Sub-Chapter J as a Class 1M LASER PRODUCT, Class 1M Hazard Rating.

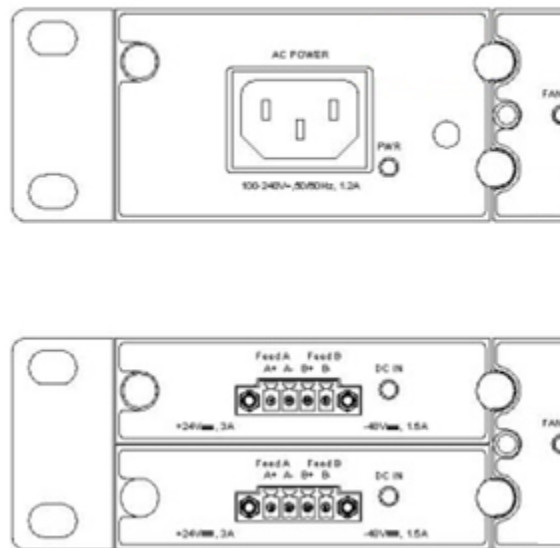
This product complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la Class A est conforme à la norme NMB-003 du Canada.

Made in Korea / Fabriqué en Corée

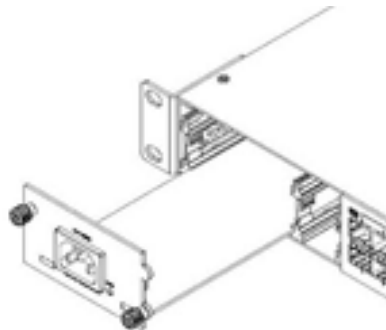
### BTI SA-821 power supply modules

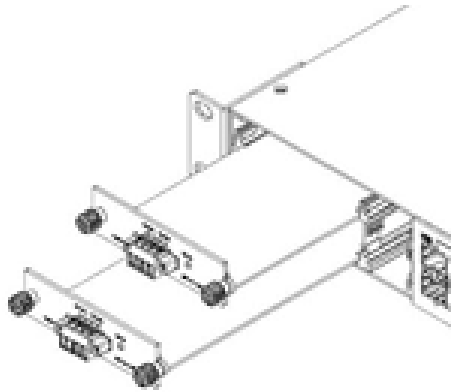
The switch can be provisioned with either one or two DC power modules or one AC power module.



If using only one DC power module, a blanking plate should be installed to cover the unprovisioned DC power module slot. When using the CLI to display or provision the DC power module, power slot 1 will denote the bottom power module and 2 will denote the upper power module. The AC is provisioned in power slot 1.

The power modules are installed by sliding the module into the relevant slot until the module engages into position and tightening the thumb screws to secure.





Each DC power module has a 4 screw terminal block to facilitate dual feed -48V DC or +24V DC wiring. When wiring the DC power modules to the distribution panel, it is recommended to connect the wires on the bottom power module first.



**Caution : Requirements for handling the power modules**

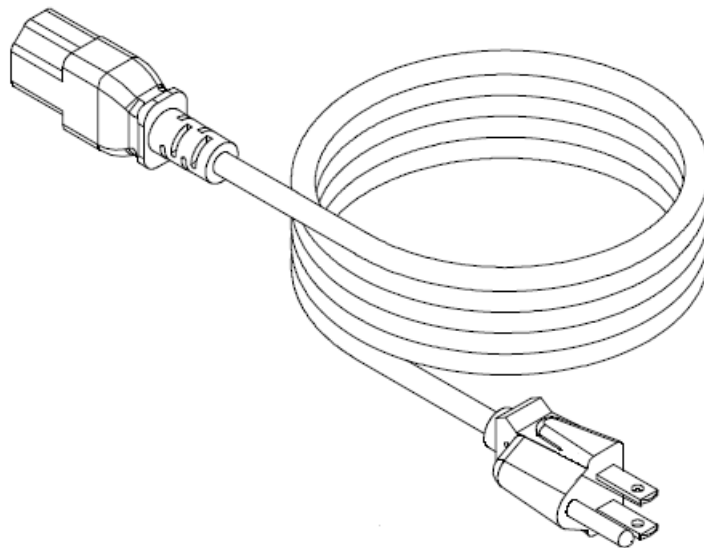
When replacing or handling the power modules never touch the electronic components. As with all power units, capacitors may retain a charge even after they are removed from the power supply source. Always handle the power modules by the front plate and underneath the lower surface which is insulated.

When removing or inserting the power modules ensure the AC power cord is unplugged from the AC module or that the wiring is removed from the DC

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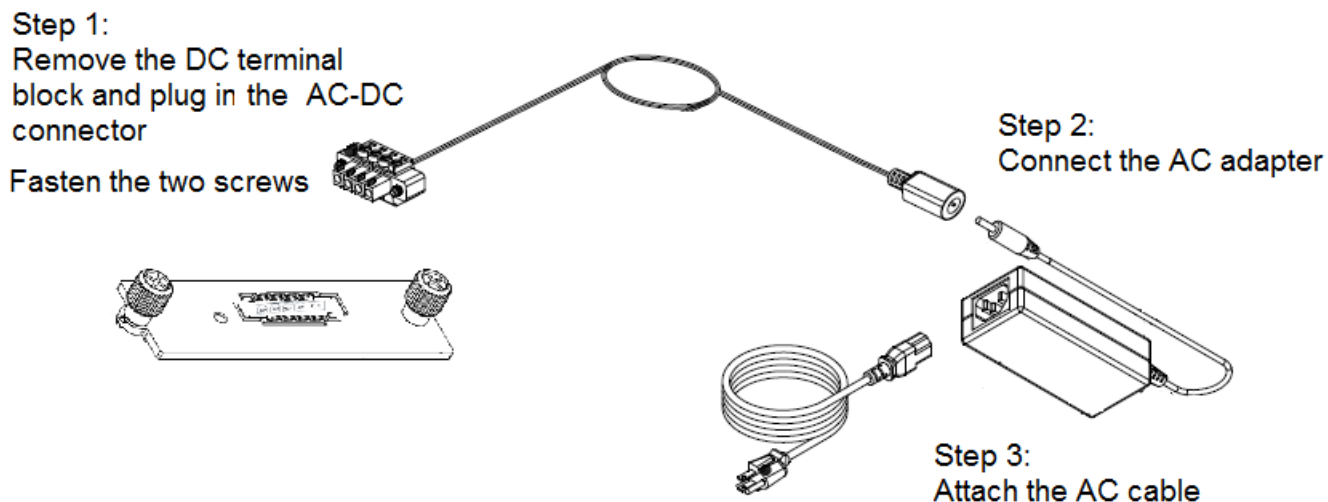
When the AC green power or DC IN, LED is ON, the switch is powered.

The AC power supply supports universal power supply. It is shipped with an AC cord with a US plug which connects to a 120V AC mains power supply. However alternative power cords to support the power requirements of all countries are available.



Power supply units are not shipped with the switch base system and should be ordered as a separate item.

Note: The switch can be AC power protected by using two AC to DC adapter kits. The diagram below shows how to provision one DC power module to support the AC -DC adapter kit.



The following alarms may be raised against a power module.

Condition	Alarm Name	Status	Severity	To Clear the alarm
One power module has failed	Module Failure Enable CR	Enable	CR	Replace the faulty power module
Supply power is outside the voltage threshold	Supply Voltage	Enable	MJ	Replace the faulty power module

The CLI command **show power status** will display the power configuration installed on the switch.

```
BTI-SA-821# show power status
```

```

-----
                        Power  Status
-----
No.    AdminStatus    EquipStatus    Type          Operation
-----
1       enable         Equipped       AC POWER      ON
2       enable         Unequipped     -----      OFF
-----

```

The CLI command `BTI-SA-821(config)# power <1|2>` will provision the upper or lower power module to act as the primary power source. The default setting is to use power module 1 as the primary power source. The no power command will disable power to the switch.



```
BTI-SA-821(config)# power ?  
 1  Bottom Power Module  
 2  Upper Power Module
```

### **BTI SA-821 power configurations**

Before powering the switch you should first choose one of the following power configurations :

- Powering the switch from 120V / 240V AC Mains Supply using one AC module assembly
- Powering the switch from a 120V / 240V AC Mains Supply using the AC - DC adapter assembly kit
- Powering the switch from a DC power Source [+24V or -48V DC] using one DC power module
- Powering the switch from a DC power Source [ +24V or -48V DC] using two DC power modules.

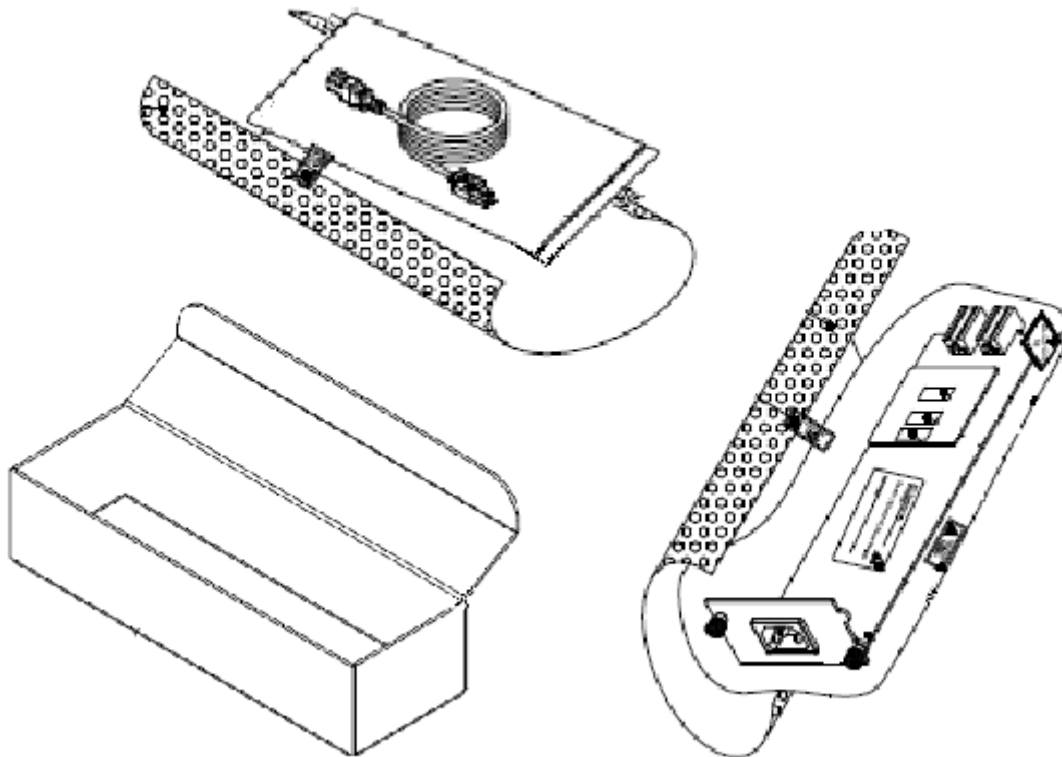
## 3.2 BTI SA-821 Carrier Ethernet Switch Connecting to an AC Mains Supply using the AC Power Module Assembly

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### Before You Begin :

- Follow the Cautions and Safety Warnings and Electrical recommendations listed in 3.1, “BTI SA-821 Carrier Ethernet Switch Connecting to a Power Source”
- Always ensure the AC cable is removed while installing the switch on a rack or wall
- Visually inspect the switch and cable assembly for damage before powering the switch
- If required, you can also power up the switch and verify the switch boot up before mounting the switch on a rack or wall.

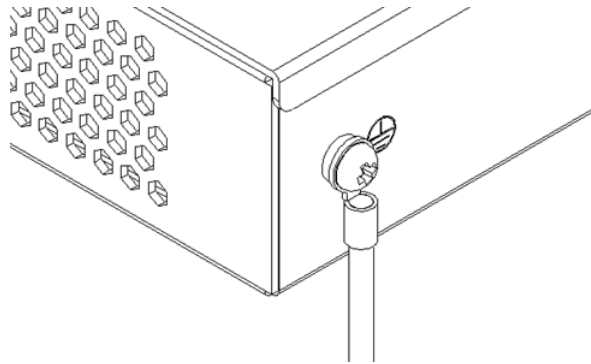
### AC Power Module Assembly Equipment



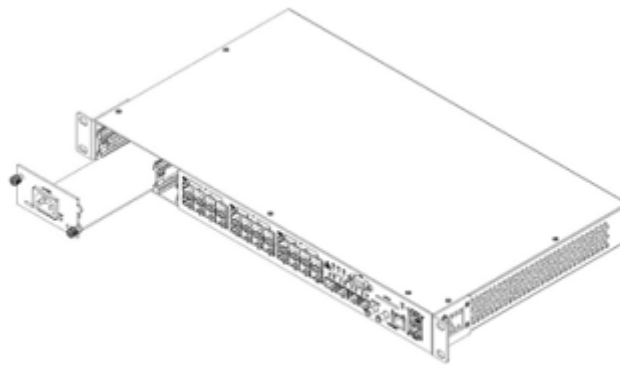
The power module assembly consists of an AC power module and an AC cable.

**Step 1** Verify the circuit breaker in the electrical cabinet is sufficient to handle the power requirements of the switch [5 amps].

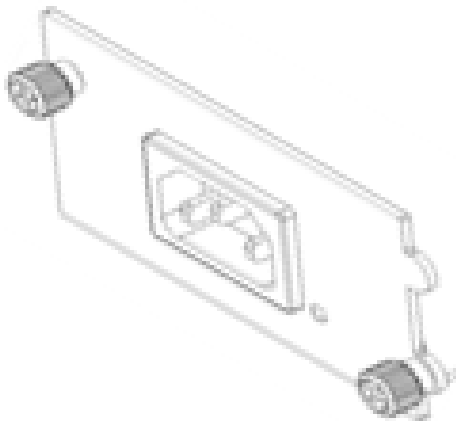
**Step 2** Verify the switch is grounded correctly.



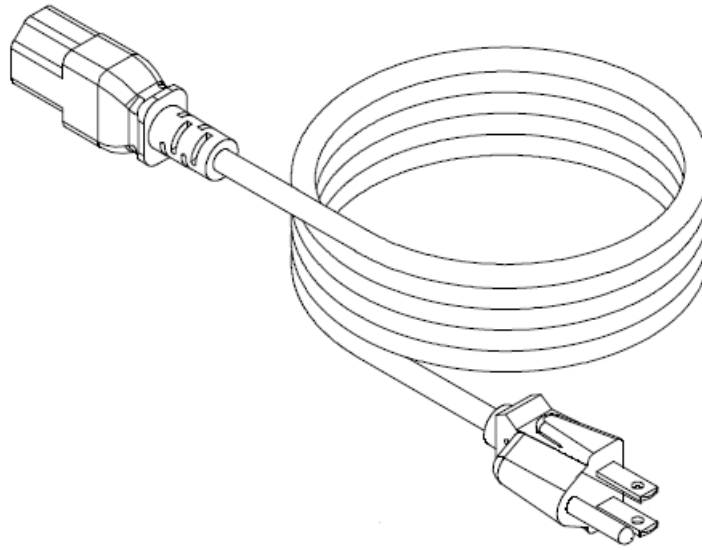
**Step 3** Slide the power-supply module into its slot until it engages.



**Step 4** Tighten the thumbscrew to secure.



**Step 5** Connect the switch to the AC power source using the AC cord.



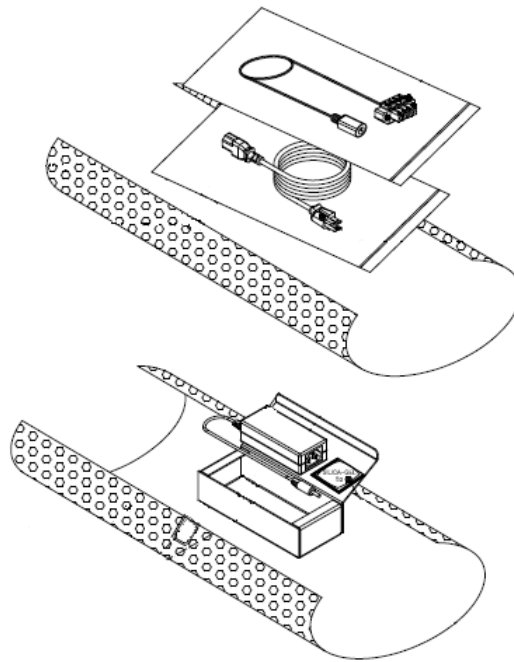
**Step 6** Verify the power LED is green and that the switch has booted up correctly. [The RUN LED should be green blinking].

### 3.3 BTI SA-821 Carrier Ethernet Switch Connecting to an AC Mains Supply using the AC-DC Adapter Kit

#### Before You Begin :

- Follow the Cautions and Safety Warnings and Electrical recommendations listed in 3.1, “BTI SA-821 Carrier Ethernet Switch Connecting to a Power Source”
- Always ensure the AC cables are removed while installing the switch on a rack
- Visually inspect the switch and cable assembly for damage before powering the switch
- If required, you can also power up the switch and verify the switch boot up before mounting the switch on a rack or wall
- Always ensure the switch power is OFF when removing the screw terminal blocks
- Always ensure the switch power is OFF when connecting the cable screw terminal block connector

#### AC-DC Adapter Kit Equipment



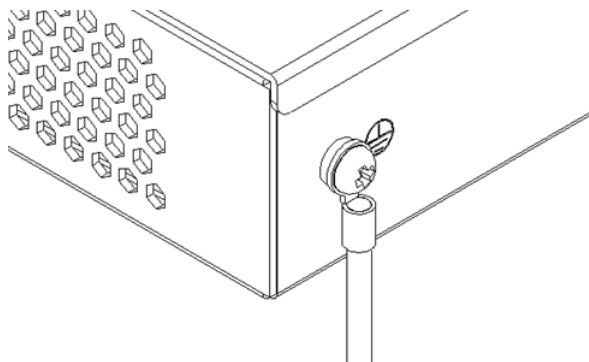
The AC power module assembly kit consists of a customized AC adapter, an AC cable and a customized cable assembly with a screw terminal block connector. Two kits are required to provision 1+1 AC power protection. The kits are used in conjunction with two DC module assemblies.

Equipment and tools required to provide 1+1 AC power protection	PEC
2 DC power modules [with screw terminal block removed]	BT7D62AA

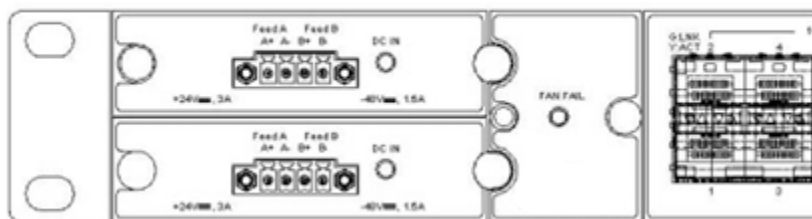
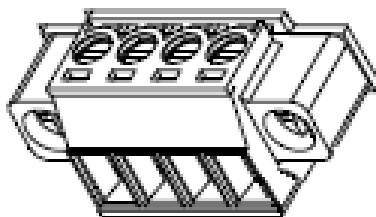
Equipment and tools required to provide 1+1 AC power protection	PEC
2 AC-48VDC adapter kits	BT7D52BA(-I02)
Precision Screw driver [insulated]	N/A
ESD strap	N/A

**Step 1** Verify the circuit breaker in the electrical cabinet is sufficient to handle the power requirements of the switch [5 amps].

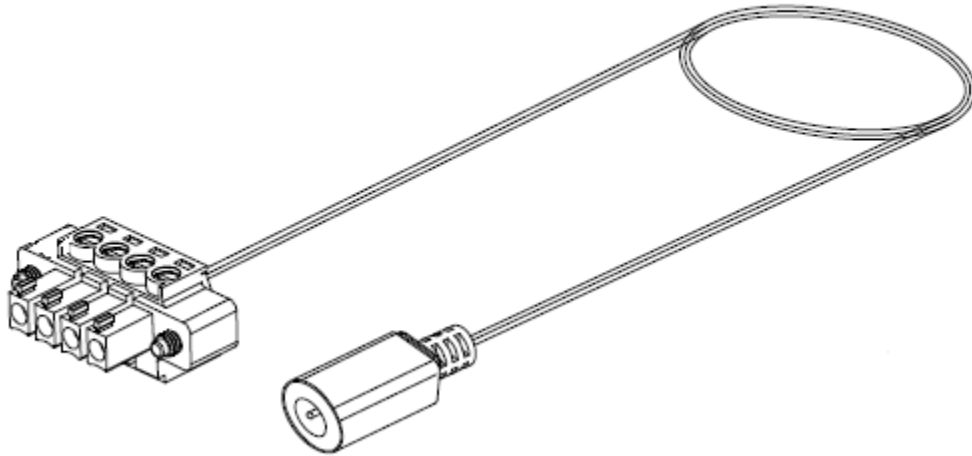
**Step 2** Verify the switch is grounded correctly.



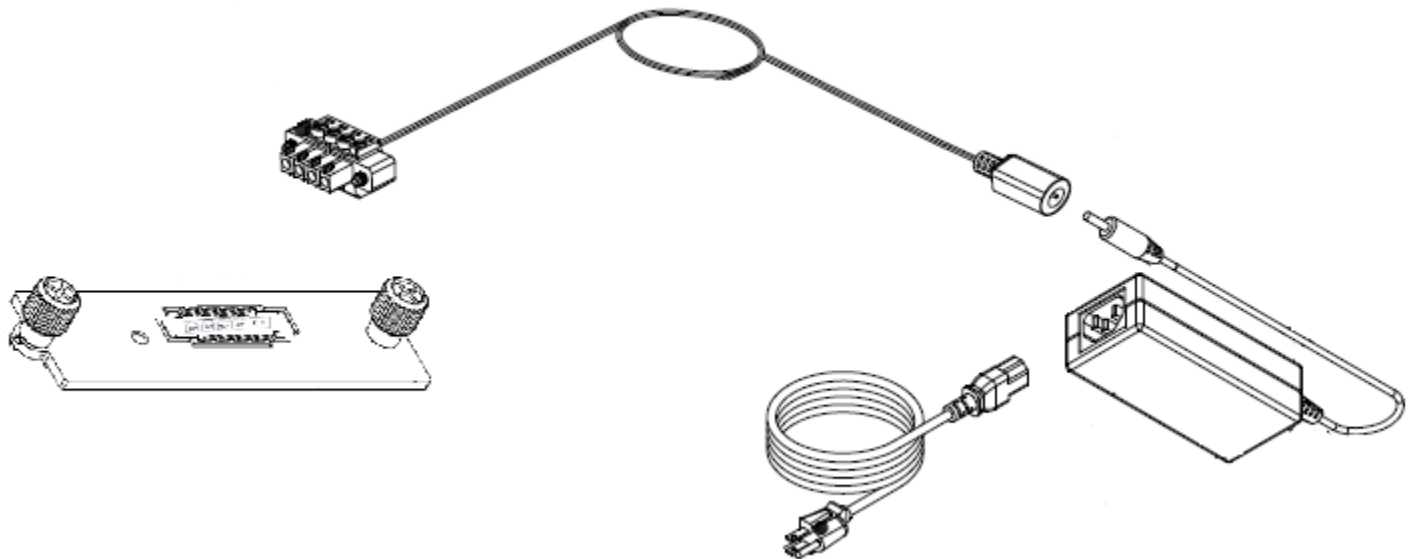
**Step 3** Verify the DC modules are installed and that the terminal blocks have been removed from each module by unfastening the two screws of the terminal block.



- Step 4** Plug the terminal block connector into the power interface of the DC module and secure by fastening the two end screws.



- Step 5** Plug the other end of the cable into the AC adapter and attach the AC cable.



- Step 6** Perform Steps 4 to 5 to complete the 1+1 AC protection installation.
- Step 7** Plug the cables into the AC outlet.
- Step 8** Verify the power LED is green and that the switch has booted up correctly. [The RUN LED should be green blinking].

## 3.4 BTI SA-821 Carrier Ethernet Switch Connecting to a DC Power Source

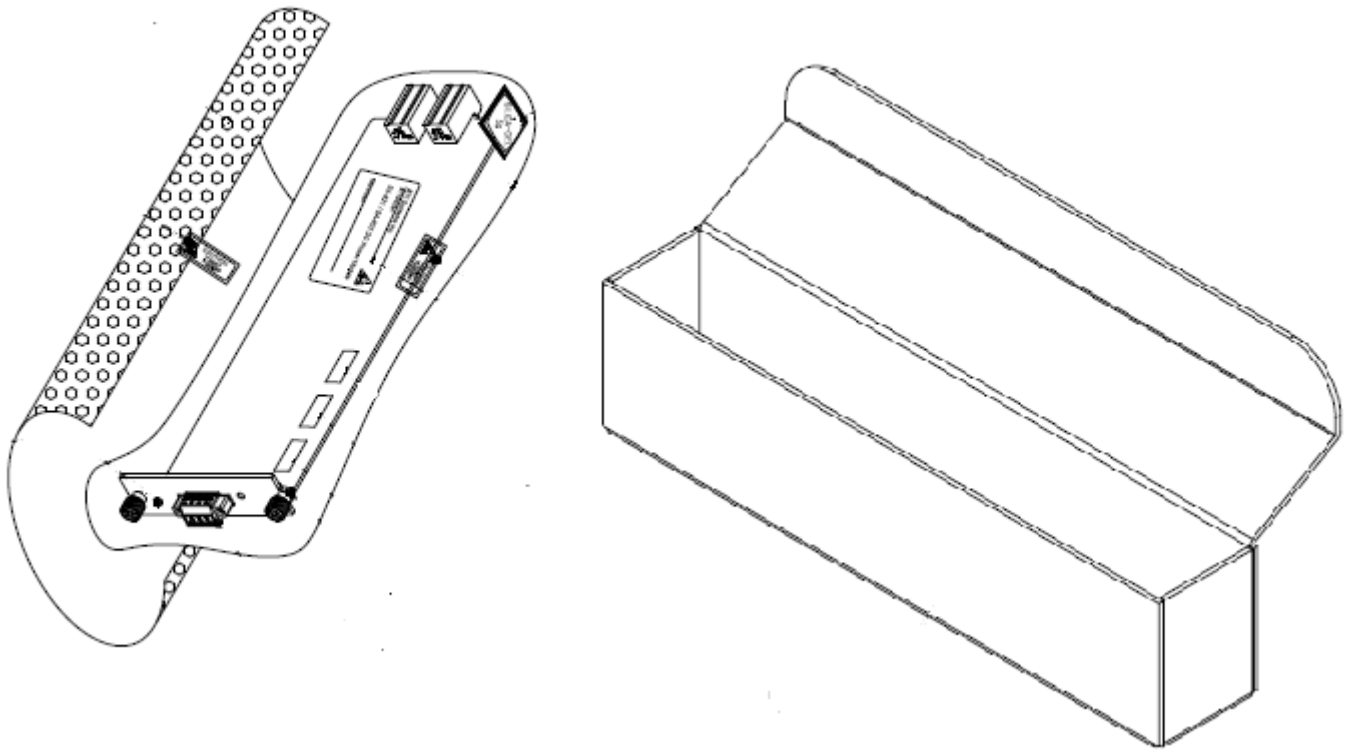
---

### Before You Begin :

- Follow the Cautions and Safety Warnings and Electrical recommendations listed in [3.1, “BTI SA-821 Carrier Ethernet Switch Connecting to a Power Source”](#)
- The switch can be provisioned with dual power feeds [+24V DC and -48V DC]
- A second DC power module may be installed to provide power redundancy
- If a functioning switch is wired with two DC power modules, one DC power module can be removed without affecting the functionality of the switch, if the remaining power module is operational
- If installing two DC power modules install the lower DC power module first
- Always ensure the power module is right way up [use the writing on the front plate as a reference] before installing into its slot
- Always ensure the module power is OFF when wiring the DC power module
- Do not leave exposed copper wire on the terminal block. Strip no more than 8 mm of cladding from the cable
- Always ensure the screws in the terminal block clamp the wire securely

### DC Power Module Equipment

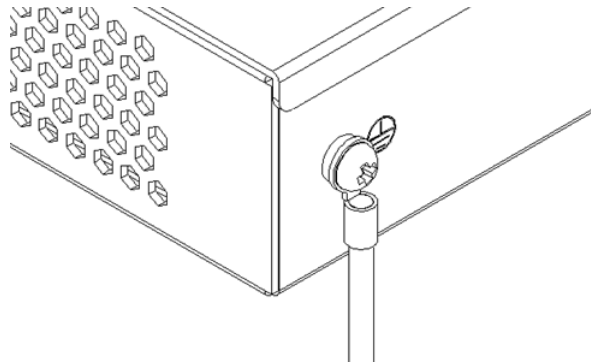




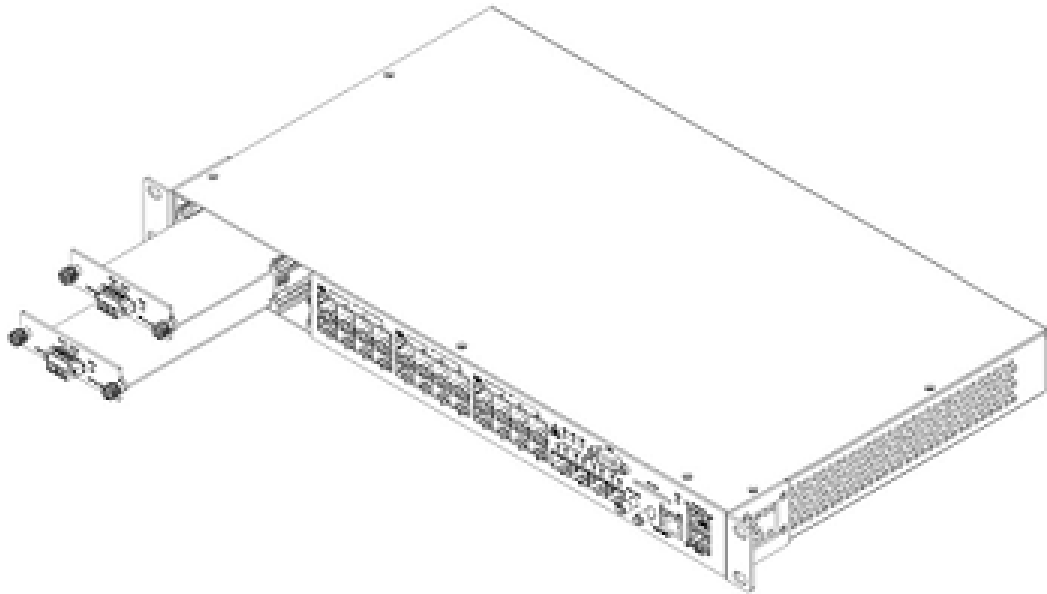
Equipment	PEC
48V   +24V DC Power Module	1 or 2 modules
16 AWG power cable	N/A
16 AWG ground cable with lug	N/A
Wire strippers	N/A
Insulated precision slotted screw driver #0	N/A

**Step 1** Verify the circuit breaker in the electrical cabinet is sufficient to handle the power requirements of the switch [5 amps].

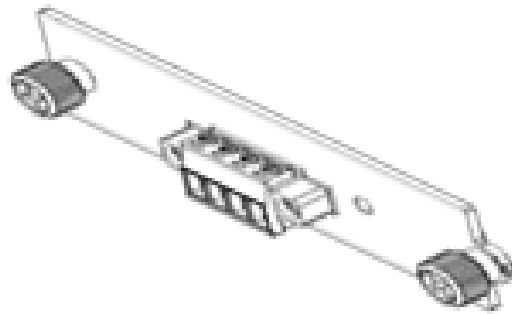
**Step 2** Verify the switch is correctly grounded.



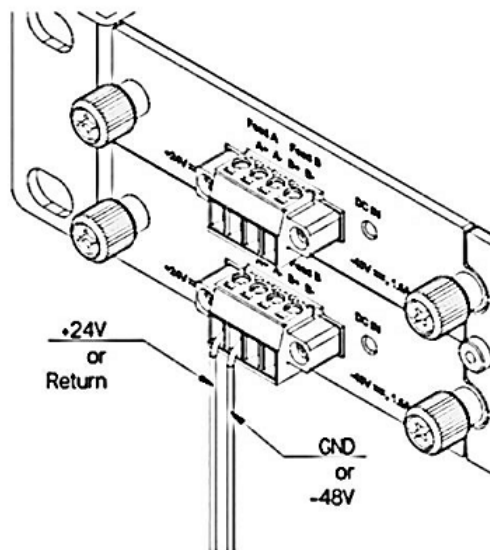
**Step 3** Slide the power-supply module into its slot until it engages.



**Step 4** Tighten the thumbscrew to secure.



- Step 5** With a pair of wire strippers, strip the power wire leads by removing the first 5 mm (1/4-inch) of insulation from the DC power wires.
- Step 6** Insert the stripped end of the -48 V Feed A power feed wire or +24 V Feed A GND wire into the opening of the Feed A A- terminal. With the wire held in place, tighten the associated slot-head screw on the top of the power block until the wire is firmly secured



- Step 7** Insert the stripped end of the -48 V Feed A power return wire or +24 V Feed A +24V wire into the opening of the Feed A A+ terminal. With the wire held in place, tighten the associated slot-head screw on the top of the power block until the wire is firmly secured.

- Step 8** Insert the stripped end of the -48 V Feed B power feed wire or +24 V Feed B GND wire into the opening of the Feed B B- terminal. With the wire held in place, tighten the associated slot-head screw on the top of the power block until the wire is firmly secured.
- Step 9** Insert the stripped end of the -48 V Feed B power return wire or +24 V Feed B +24V wire into the opening of the Feed B B+ terminal. With the wire held in place, tighten the associated slot-head screw on the top of the power block until the wire is firmly secured
- Step 10** Repeat Steps 5 to 9 to wire the second DC power module [If required]
- Step 11** Turn ON the power at the distribution panel and verify that the switch has booted up correctly [The RUN LED should be green blinking].

## 4.0 BTI SA-821 Carrier Ethernet Switch Fan Module Installation

---

This section covers the following topics :

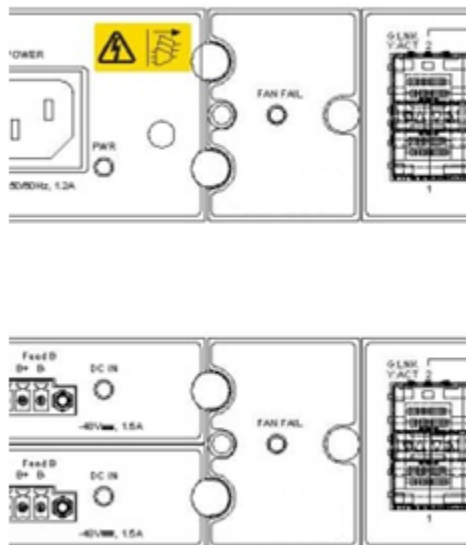
- [4.1, “BTI SA-821 Carrier Ethernet Switch Fan Module Installation”](#)

## 4.1 BTI SA-821 Carrier Ethernet Switch Fan Module Installation

**Before You Begin:** You should be familiar with the basic operating conditions of the fan.

The fan module, with four internal fans, is used to maintain the switch operating temperature .

All switches must be provisioned with a fan module. The fan module can be replaced while the switch is operation. By default, the fan will start to operate when the temperature of the switch exceeds 30° C and will switch off when the switch temperature is below 10° C.



The fan module RED LED will activate to indicate a fan failure exists on one or more than one fan within the module and the default major alarm will be raised.

The following alarms may be raised against a fan module.

Condition	Alarm Name	Status	Severity	To Clear the alarm
The fan module is not installed in the switch	Module Missing	Enable	MJ	Install an operational fan module
One or more than one fan is operating in overdrive.	Fan_High_Over_Flow	Enable	MJ	Replace the fan module
One or more than one fan has failed.	Fan_Low_Under_Flow	Enable	MJ	Replace the fan module

The CLI command `show fan status` will display each fan operational status, the rated RPM, low and high tolerance and the fan start temperature and stop temperature.

```
BTI-SA-821# show fan status
```

```
-----
                        Fan Status
-----
Fan Operation           ON
Fan1 current RPM        10231(normal)
Fan2 current RPM        10039(normal)
Fan3 current RPM        10291(normal)
Fan4 current RPM        10304(normal)
-----
Rated RPM               8000
Low Tolerance           50%(4000 )
High Tolerance          50%(12000)
Fan Start Temperature    30 C
Fan Stop Temperature     10 C
-----
```

```
BTI-SA-821# show environment
```

```
Fan tray status:
```

```
Index      Status
1          PRESENT
FanIndex   Status SpeedRate Mode
-----
```

```
Power status:
```

```
Index      Status   Power    Type      Fans      Control
1          PRESENT  OK       AC         OK         ON
2          ABSENT   -        -          -          -
-----
```

```
Sensor status (Degree Centigrade):
```

```
Index Temperature Lower_alarm Upper_alarm Critical_limit
1      33          -10         80          85
2      32          -10         80          85
3      35          -10         80          85
```

All fan operating thresholds and RPM settings are provisionable. Temperature thresholds are also provisionable.

```
BTI-SA-821(config)# fan ?BTI-SA-821(config)#fan low-tolerance Fan low-under-
flow fail-range
```

```
<10-80> Fan low-under-flow range - 10-80%
```

```
BTI-SA-821(config)#fan rpm Fan rpm
```

```
<5000-20000> Fan rpm range : 5000-20000
```

```
BTI-SA-821(config)#threshold Temperature Threshold to start or stop
FAN
```

```
STOPTEMP <-30 and 30> Stop Temperature : between -30 and 30
```

```
STARTTEMP < 0 and 100> Start Temperature : between 0 and 100
-----
```

```
BTI-SA-821(config)# temperature?
```

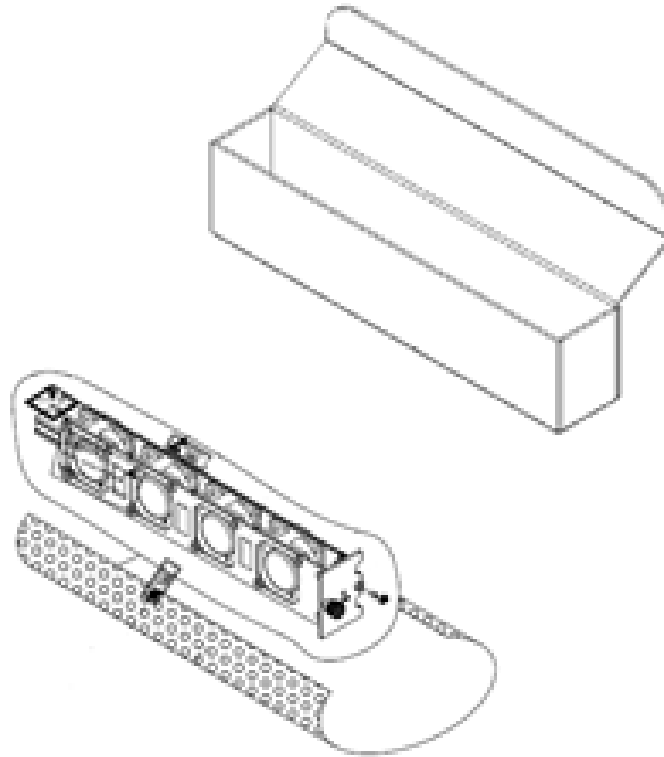
```
temperature Temperature threshold configuration
```

```
BTI-SA-821(config)# temperature ?
```

```
LOW < -30 to -1> Low alarm temperature degree celsius between -30 to -1
```

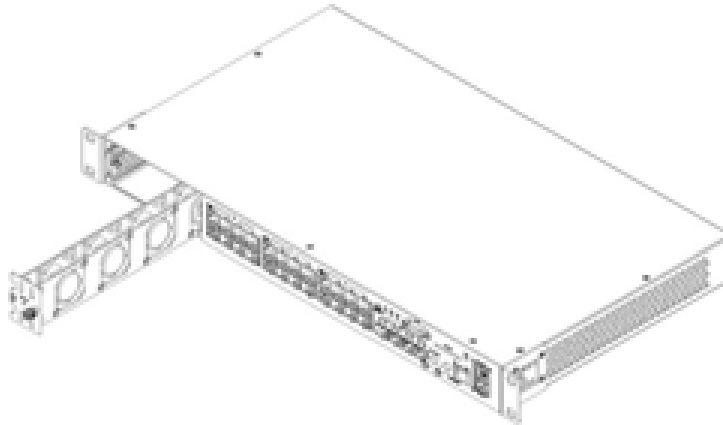
```
HIGH <0 to 100> High alarm temperature degree celsius between 0 to 100
```

## Fan Module Equipment

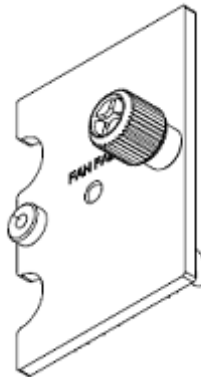


**Step 1** Slide the fan unit into the slot until it engages.





**Step 2** Tighten the thumbscrew to secure.



**Step 3** Verify the fan module fail LED is not ON.

**Step 4** If required, provision the Fan Module settings in the CLI.



## 5.0 BTI SA-821 Carrier Ethernet Switch Optical and Copper Transceiver Installation

---

This section details the following topics:

- [5.1, “BTI SA-821 Carrier Ethernet Switch Optical Transceivers Installation and Removal”](#)
- [5.2, “BTI SA-821 Carrier Ethernet Switch Copper SFPs Installation and Removal”](#)
- [5.3, “BTI SA-821 Carrier Ethernet Switch Fiber Optic Connectors Maintenance”](#)
- [5.4, “BTI SA-821 Carrier Ethernet Switch Transceiver Maintenance”](#)

## 5.1 BTI SA-821 Carrier Ethernet Switch Optical Transceivers Installation and Removal

---

- Caution**
- All optical transceivers should perform within the calibrated thresholds for temperature, voltage, current and power alarms. The power received on the transceiver must be within the limits of the receiver sensitivity and below the receiver damage threshold. The transceivers are internally calibrated to fixed alarm / warning thresholds. Fixed thresholds are not provisionable. Use the CLI command `show transceiver detail` to view the:
    - Transceiver auto provisioning settings
    - Transceiver calibrated thresholds for temperature, voltage, current and power alarms
    - Transceiver hardware, output wavelength and supported link type and length information.
  - Do not connect the fiber into the transceiver until the local and remote transmit and receive signals are tested and the fibers attenuated with pads accordingly. Failure to test the power levels before connecting the fibers to the transceiver may result in permanent damage to the receiver, cause the laser to shutdown during provisioning or create excessive bit errors in the signal.
  - Clean all cable and attenuator connectors using the appropriate fiber optic cleaning kits and to the manufactures cleaning process, before connecting the cables for test and for installation.
  - Tunable DWDM transceiver modules and transceivers tuned to a specific wavelength should be provisioned in a bookend manner with the local and the remote transceiver provisioned to the same channel, frequency and wavelength. Changing the wavelength, frequency or channel, on tunable transceivers does not require the optical power budget / optical link budget to be re-calculated. There is no requirement to replace the transceiver. Changing the wavelength, frequency or channel may disrupt traffic, re-route traffic if required.
  - Follow the Optical and Laser precautions listed in [“Installation and Power Requirements, Warnings and Cautions”](#).

### What you need:

- Optical transceivers
- Optical power meter and if required wavelength testing capabilities for singlemode and multimode fiber testing
- Singlemode 9/12 or Multimode 50/125 or Multimode 62.5/125 fiber
- Fiber optic attenuators for singlemode 9/12 or multimode 50/125 or multimode 62.5/125 applications.

- Electrostatic discharge (ESD) wrist strap
- Fiber optic cleaning equipment
- Protective optical connector covers
- Transceiver protective covers

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
- 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 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).

### Physical Features of an Optical Transceiver

Optical transceivers, typically contain a transmit (Tx) and Receive (Rx) port which are marked on the transceiver casing. They are locked into the switch interface using a bail latch. The bail latch must be closed in order for fiber connector to be installed or removed.

The name of the SFP(+) and the Product Equipment Code (PEC) is located on the transceiver labels. After installation the transceiver can be identified by the color of the bail latch. For example BP3AM6TL has a green bail latch.

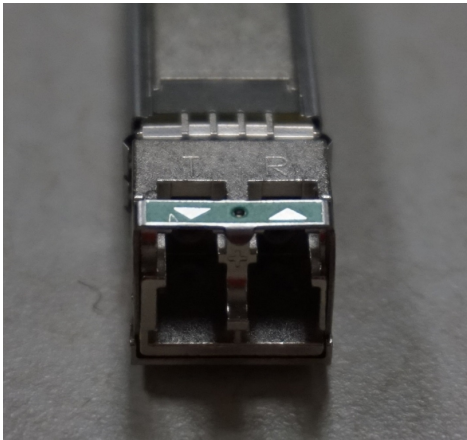
The following diagrams shows an example of the top, bottom and front facing (bail latch open and bail latch closed) of the transceiver.



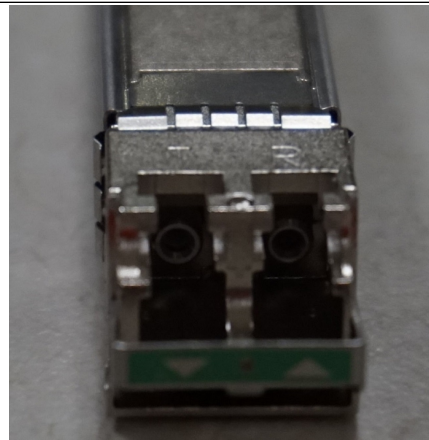
Top view of optical transceiver



Bottom view of optical transceiver



Front facing view of optical transceiver  
Bail latch closed (installed state in the interface)



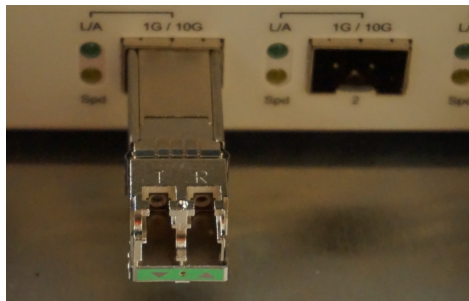
Front facing view of optical transceiver  
Bail latch open (installing into or removing from the interface state)

**Step 1** Do one of the following:

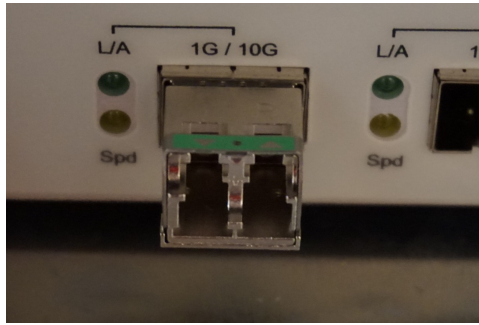
- To install a transceiver, proceed to [Step 2](#)
- To remove a transceiver proceed to [Step 3](#).

**Step 2** Perform the following steps to install an optical transceiver :

- a) Perform the power level tests and adjust the attenuation on the fiber accordingly.
- b) If required, admin down the interface.
- c) If required, remove the protective cover from the transceiver connector
- d) Hold the transceiver in the upright position, ensure the bail latch is open and install as shown below.



- e) Slide the transceiver straight into the interface until it clicks, then close the bail lock.



The port LEDs will not activate until the fiber is connected and the link is UP.

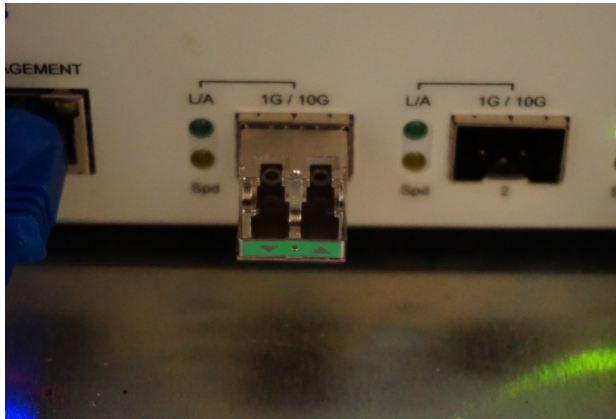
- f) Ensure the following before connecting the optical cables to the transceiver:
- Verify power levels are within specifications before connecting the Tx and Rx optical cables to the transceiver
  - Verify that both the optical cable connectors and the optical surfaces are clean and that there is no residue on the optical surfaces
- g) After the optical cables are connected perform the following:
- Verify that the interface ports are defaulted to disabled until they are provisioned. This can be done manually, or by restoring the last saved configuration
  - If any cables were moved, return them to their original locations.
- h) After provisioning, if required perform tests to verify the channel frequency and power levels are correct.

**Step 3** Perform the following steps to remove a transceiver:

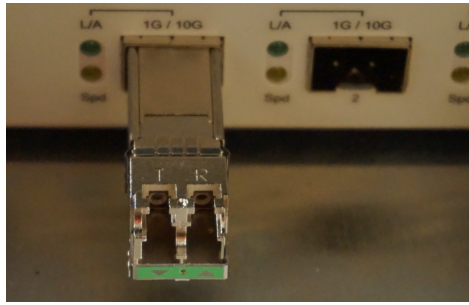
- a) If required, reroute traffic.

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

- b) If required, move aside cables to access the transceiver.
- c) Perform the following to disconnect the optical cables:
- If required admin down the interface
  - If required label the receive optical cable Rx and the transmit optical cable Tx
  - Disconnect the optical cables from the optical ports of the transceiver
  - Ensure the optical ports on the transceiver and the optical cables are protected with protective caps when not connected.
- d) Open the bail latch.



- e) Pull the transceiver from the interface. Use the bail latch as an extraction handle if required.



- f) Ensure the following:

- Verify that the interface ports are defaulted to disabled until they are provisioned. This can be done manually, or by restoring the last saved configuration
- Verify that both the optical cable connectors and the optical surfaces are clean and that there is no residue on the optical surfaces
- Verify the transceiver and optical connectors connectors are fitted with protective covers
- Place the transceiver into anti-static packaging for storage.



## 5.2 BTI SA-821 Carrier Ethernet Switch Copper SFPs Installation and Removal

### What you need

- Electrostatic discharge (ESD) wrist strap
- Copper SFPs to be installed

### Prerequisites

Observe the following when installing, removing and handling transceivers:

- Do not remove an SFP from its packaging until you are ready to install it.
- Do not touch any of the pins, connections, or components of an SFP.
- Always store or transport an SFP in anti-static packaging.

**Caution** Wait 3 seconds after removing or installing copper SFPs to enable the system to detect and update the interface change. Failure to observe the wait time may result in no transmitted or received traffic on that interface. To correct the fault the user may be required to perform the CLI commands to `shutdown` and `no shutdown` the interface to restore traffic.

**Important** Never insert a copper SFP that is connected to a Cat 5. Always fully insert the SFP first, and then connect the Cat 5 cable to it.



**Caution**

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

**Step 1** Do one of the following:

- To replace an SFP, proceed to [Step 2](#).
- To install an SFP, proceed to [Step 3](#).

**Step 2** Do the following to remove an SFP to be replaced, and then proceed to [Step 3](#):

a) If required, reroute traffic.

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

- b) If required, move aside cables to get clear access to the SFP to be replaced.
- c) Disconnect the UTP cable from the electrical (RJ-45) port of the copper SFP.
- d) Facing the front of the switch, locate the latch handle on the SFP. For a bale-clasp latch, pull the latch handle down until it is at a 90-degree angle to the SFP.

- e) Grasp the latch handle on the transceiver and firmly pull the SFP straight out.
- f) Remember to wait 3 seconds to enable system interface update recognition before installing a different SFP or re-inserting the same SFP.
- g) Place the SFP into anti-static packaging and then lay it on a flat work surface.

**Step 3** Hold the copper SFP to be installed so that the electrical RJ-45 connector faces you (i.e., the product label is visible).

**Step 4** Ensure that the latch is in the closed position.

**Step 5** Align the SFP to the port in which it is being inserted.

**Step 6** Carefully slide the copper SFP straight into the port until it clicks.

**Step 7** Remove the plastic protective cover, if fitted.

**Step 8** To connect an UTP cable to the copper SFP, push the RJ-45 connector into the SFP until a distinctive click is heard.

**Step 9** Remember to wait 3 seconds to enable system interface update recognition.

**Step 10** If any cables were moved, return them to their original locations.

All interface ports default to disabled until they are provisioned. This can be done manually, or by restoring the last saved configuration.

## 5.3 BTI SA-821 Carrier Ethernet Switch Fiber Optic Connectors Maintenance

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



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

### Inspecting a fiber connector

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

Use the following procedure to inspect a fiber connector.

#### Guidelines

Use the following guidelines to achieve the best possible performance:

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

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

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

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

### Cleaning procedure

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

Use the following procedure to clean a fiber connector.

**Step 1** Verify that the opposite end of the fiber is disconnected from its laser source.

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

## **5.4 BTI SA-821 Carrier Ethernet Switch Transceiver Maintenance**

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



## 6.0 BTI SA-821 Carrier Ethernet Switch System Configuration and Turning Up

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This section details the basic setup procedures needed to bring a BTI SA-821 Carrier Ethernet Switch Ethernet switch up into a state where you can manage it remotely and begin service creation and/or more elaborate provisioning.

Because there are many approaches to turning up a node and a network, use these procedures as guidelines only.

- [6.1, “Configuring Access to the Command Line Prompt”](#)
- [6.2, “Configuring In-Band Management ”](#)
- [6.3, “Configuring Out-Of-Band Management IP Address”](#)
- [6.4, “Common System Commands”](#)
- [6.5, “Configuring Date and Time”](#)
- [6.6, “Configuring User Profiles”](#)
- [6.7, “Configuring RADIUS Client”](#)
- [6.8, “Configuring Secure Shell \(SSH\)”](#)
- [6.9, “Configuring SNMP Community Strings”](#)
- [6.10, “Configuring Syslog Server”](#)

## 6.1 Configuring Access to the Command Line Prompt

---

BTI SA-821 Carrier Ethernet Switch supports the following options to access the Command Line Prompt (CLI):

- Local connection via the console port
- In-band management
- Out-of-band management
- Combination of the above

With the console port, you have direct access to the CLI once you are physically connected. With in-band or out-of-band management, you telnet or SSH-1/SSH-2 into the node to access the CLI.

### Local connection via the console port

The switches are equipped with an RJ-45 console port that provides craft serial port connectivity.

The console port allows you to connect a PC or a laptop directly to the switch to provide CLI access using a terminal emulation program, for example PuTTY.

**Table 6-1 Default parameters for the console port**

Parameter	Value
Rate	9600 bps
Data Bits	8 bit
Parity	None
Stop Bits	1 bit
Flow Control	None

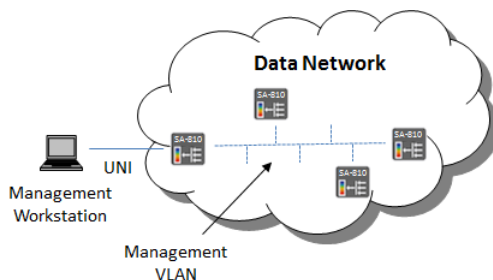
The console port provides you with quick access to the local node for minor configuration changes or to set up other management access options.

If in-band management has been set up, you can use the CLI to telnet to other nodes from the console port.

### In-band management

The switches support a management VLAN that allows access to the management plane. Management traffic is carried in-band with regular data traffic on the UNIs and NNIs that comprise the management VLAN. In-band, in this context, refers to management traffic sharing the same physical network as regular data traffic.



**Figure 6-1 In-band management**

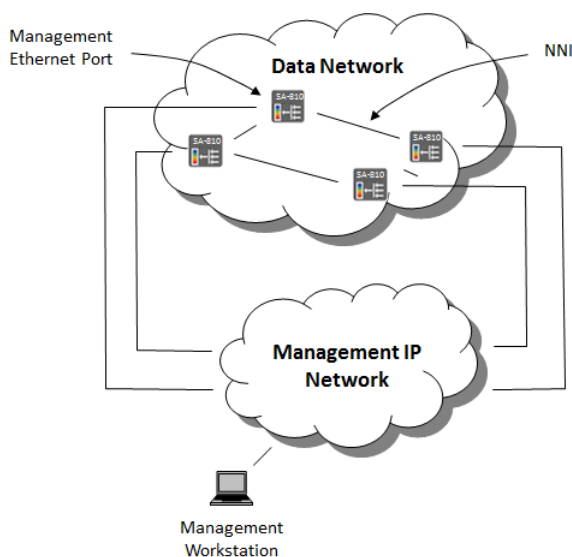
The management VLAN is a well-defined Ethernet service (S-VLAN). Packets received on the management VLAN are forwarded to the system management plane if their destination MAC address matches the MAC address of the system or if they are sent to the broadcast address (e.g. ARP messages). The packets are received on either a Network-to-Network interface (NNI) in the management VLAN or on a User-Network Interface (UNI) that is mapped to the management VLAN. All NNIs in the managed network should belong to the management VLAN, as should all UNIs that lead to management workstations.

From the management workstation, you can telnet or SSH-1/SSH-2 directly to any node in the managed network.

### Out-of-band management

The network management port on the switch can be connected to a dedicated management network that is distinct and out-of-band with the regular data network. Out-of-band, in this context, refers to management traffic being carried on its own physical network, separate from the regular data traffic network.

Once the management ports are set up, you can telnet or SSH-1/SSH-2 directly to any node from the management workstation.

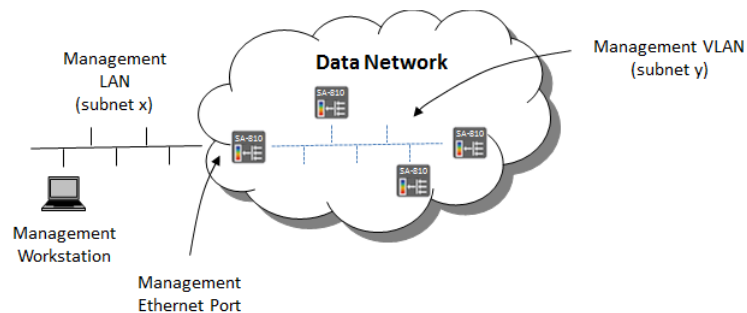
**Figure 6-2 Out-of-band management**

## In-band and out-of-band management

A combined approach can be adopted where connectivity to the local node is through an out-of-band management LAN while connectivity to remote nodes is through the in-band management VLAN. In this way, the local node acts as a gateway to other nodes. This setup requires the management LAN to be on a different subnet from the management VLAN.

To access remote nodes, you first telnet or SSH-1/SSH-2 to the local node, and then use the CLI to telnet to remote nodes.

**Figure 6-3 In-band and out-of-band management**



## Using a default gateway

The switches support only one default gateway system-wide. Therefore, a default gateway can be specified for either in-band management or out-of-band management, but not for both.

BTI recommends that when both in-band management and out-of-band management are configured, the default gateway be specified for in-band management. Since in-band management is connected on the network side, users can connect directly to the switch via an NNI.

The implication with having no default gateway for out-of-band management is that access to the out-of-band management interface must be from the subnet local to the management Ethernet port.

Log in to the local node using one of the following options:

- 6.1.1, “Accessing the Command Line Prompt using the Console Serial Port”
- 6.1.2, “Accessing the Command Line Prompt using the Management Ethernet Port”

## 6.1.1 Accessing the Command Line Prompt using the Console Serial Port

### Prerequisites

- You will need a serial cable that is fitted with an RS-232 DB-9 connector at one end and an RJ-45 connector at the other end. This cable is available from BTI .

**Step 1** Insert the RJ-45 end of the cable in the CONSOLE port and then insert the DB-9 end of the cable in the RS-232 connector on the PC.

**Step 2** Start the terminal emulation software, and specify the following communication parameters:

- Terminal type = VT100
- Baud rate = 9600 bps
- Data bits = 8 bits
- Parity = None
- Stop bits = 1 bit
- Flow control = None

**Step 3** Use the terminal emulation software to open a connection to the switch.

**Step 4** At the login prompt, log in to the CLI by entering your username and password.  
The default username is `admin`, and the default password is `btiaadmin`.

**Step 5** Change the default password using the CLI.

## 6.1.2 Accessing the Command Line Prompt using the Management Ethernet Port

### Prerequisites

- An RJ-45 Ethernet cable

**Step 1** Configure your PC (and LAN if you are connecting over a LAN) to be on the 192.168.5.0/24 subnet.

**Step 2** Connect your PC and the Management Ethernet port either directly with the RJ-45 Ethernet cable or over the LAN.

**Step 3** Start the terminal emulation software (e.g., PuTTY), and telnet to the switch on the standard TCP telnet port:

For example:

```
telnet 192.168.5.100 23
```

**Note** The default IP address of the management Ethernet port is 192.168.5.100/24.

**Step 4** At the login prompt, log in to the CLI by entering your username and password.  
The default username is `admin` and the default password is `btiaadmin`.

**Step 5** Change the default `admin` password using the CLI.

## 6.2 Configuring In-Band Management

---

Use this procedure to configure in-band management (that is, the management VLAN).

In-band management allows you to manage remote nodes without requiring a physically separate management network. Management traffic is carried on a management VLAN on the regular data network.

**Step 1** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**Step 2** Provision an SVLAN:

a) Enter the VLAN configure mode.

```
BTI-SA-821(config)# vlan database
```

b) Create the VLAN ID and name.

```
BTI-SA-821(config-vlan)# vlan <VLAN-ID> name <VLAN-Name>
```

where:

- *VLAN-ID* = VLAN interface name (1-4094)
- *VLAN-Name* = ASCII name of the VLAN (1-16 characters)

For example:

```
BTI-SA-821(config-vlan)# vlan 2000 name MGMT_VLAN
```

c) Exit the VLAN configure mode.

```
BTI-SA-821(config-vlan)# exit
```

**Step 3** Provision an Eservice for remote management:

<b>Note</b>	You are creating a regular multipoint-to-multipoint Eservice that you will use for management connectivity.
-------------	---

a) Enter the VLAN configure mode and create the EVC.

```
BTI-SA-821(config)# ethernet evc add <EVC-ID>
```

<b>Note</b>	The EVC ID is an arbitrary string administered by the Service Provider that is used to identify an EVC within the MEN. The EVC ID MUST be unique across all EVCs in the MEN. It is intended for management and control purposes. The EVC ID is not carried in any field in the Service Frame.
-------------	---

For example:

```
BTI-SA-821(config)# ethernet evc add MGMT
```

b) Set the service type to EVPLAN.

```
BTI-SA-821(config-evc)# service type evplan
```

**c) Set the SVLAN ID of the EVC.**

```
BTI-SA-821(config-evc)# svlan <VLAN-ID>
```

For example:

```
BTI-SA-821(config-evc)# svlan 2000
```

**d) Exit the EVC configure mode.**

```
(BTI-SA-821(config-evc)# exit
```

**Note** Unlike a regular Eservice that connects two or more UNIs, the Eservice used for management connects the local management plane to the management VLAN. You do not need to associate the management Eservice to UNIs, except on those nodes with UNIs that lead to management workstations.

For more information on creating Eservices, see the *Technical Product Guide*.

**Step 4** Provision a unique management VLAN IP address:**a) Enter the interface configuration mode for the management VLAN.**

```
BTI-SA-821(config)# interface vlan <VLAN-ID>
```

For example:

```
BTI-SA-821(config)# interface vlan 2000
```

**b) Set the IP address for the management VLAN.**

**Note** The management VLAN IP address must be unique and must be on a different IP subnet than the out-of-band IP address.

```
BTI-SA-821(config-if)# ip address < A.B.C.D | A.B.C.D/M >
```

For example:

```
BTI-SA-821(config-if)# ip address 10.1.71.222/24
```

**c) Enable the management VLAN.**

```
BTI-SA-821(config-if)# no shut
```

**d) Return to the EXEC mode.**

```
BTI-SA-821(config-if)# end
```

**Note** The switch supports only one default gateway system-wide. Therefore, a default gateway can be specified for either in-band management or out-of-band management, but not for both. If both in-band and out-of-band management are used, then specify the default gateway here.

**Step 5** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**Step 6** Associate the SVLAN to the local management plane, and set the priority for the management traffic.

**Note** By default, the local management plane is associated with VLAN 1, so this association must be changed to match the new SVLAN.

**Note** In general, the management traffic priority should be set higher than the regular customer traffic priority. Priority values are 0 to 7 (default = 7, best practice = 6).

```
BTI-SA-821(config)# system cpu-vlan outer <VLAN-ID> <priority>
```

For example:

```
BTI-SA-821(config)# system cpu-vlan outer 2000 5
```

**Step 7** Return to the EXEC mode.

```
BTI-SA-821(config)# end
```

**Step 8** Verify the management VLAN IP address.

```
BTI-SA-821# show interface vlan <VLAN-ID>
```

For example:

```
BTI-SA-821# show interface vlan 2000
```

```
Interface vlan2000
```

```
Interface current state: DOWN
```

```
Hardware is VLAN, address is 0014.d060.01a6 (bia 0014.d060.01a6)
```

```
Bandwidth 1000000 kbits
```

```
Index 6096 , Metric 1 , Encapsulation ARPA
```

```
The maximum transmit unit (MTU) is 1500 bytes
```

```
VRF binding: not bound
```

```
Label switching is disabled
```

```
No Virtual private Wire service configured
```

```
VRRP master of : VRRP is not configured on this interface
```

```
ARP timeout 01:00:00, ARP retry interval 1s
```

```
Internet primary address:
```

```
10.1.71.222/24 broadcast 10.1.71.255
```

**Step 9** Verify the VLAN provisioning.

```
BTI-SA-821# show system
```

For example:

```
BTI-SA-821# show system
```

```
-----
                        Information
-----
ContactInfo           : BTI
Location              : BTI
-----
                        Product
-----
Product Name          : 821-22
```

```

System Name           :           821-22
-----
                        Release
-----
SW Release Version    :           1.1Build11
SW Release Date & Time : Oct   3 2014 21:46:30
-----
                        MAC_&_IP
-----
IP Address(In-Band)   :           10.1.71.222
Netmask(In-Band)     :           255.255.255.0
Network Address(In-Band) :           10.1.71.0
MAC Address(In-Band)  :           00:14:d0:60:01:a6
Mgmt VLAN ID(pri)     :           2000(5)
Mgmt Inner VLAN ID    :           untagged
IP Address(OOB)       :           192.168.20.22
Netmask(OOB)         :           255.255.255.0
Network Address(OOB)  :           192.168.20.0
MAC Address(OOB)      :           00:14:d0:60:01:a6
Default Gateway       :           -
-----
                        Time
-----
Auto Logout Time (Min) :           15
System up Time         : Up 0(days) 0(h) 19(m) 52(s)
Last Save Time        :
-----

```

**Attention** Now that the MVLAN has been provisioned, it must be associated with an NNI port. This step is covered in the next procedure.

## 6.3 Configuring Out-Of-Band Management IP Address

---

Use this procedure to configure the management Ethernet port IP address.

If the default out-of-band management IP address (192.168.0.237/24) can be used in your network, then you can skip this procedure.

**Step 1** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**Step 2** Provision a unique management IP address and specify the default gateway if necessary.

For example:

```
BTI-SA-821(config)# management ip address 192.168.100.100/24
```

<b>Note</b>	This IP address must be unique and must be on a different IP subnet from the in-band management IP address.
-------------	---

<b>Note</b>	The switch supports only one default gateway system-wide. Therefore, a default gateway can be specified for either in-band management or out-of-band management, but not for both. If you are planning on using in-band management as well, then do not specify the default gateway here.
-------------	---

<b>Note</b>	If you do not specify a default gateway, all stations connected to the management Ethernet port must be on the same subnet.
-------------	---

<b>Note</b>	If you are making this change while logged in to the management Ethernet port, you will lose connectivity. Before you can log in again, you may need to change the IP address and subnet on your PC (and LAN if applicable) to be compatible with the new settings.
-------------	---



## 6.4 Common System Commands

In general, the BTI SA-821 CLI has a hierarchical structure.

Task	Enter this command
Configures system features and environments interactively.	<code>configure</code>
Exits the current terminal session.	<code>exit</code>
Sends ICMP (Request) packet to the remote device to check the network connection. If the connection is OK, ICMP (Reply) packet is received.	<code>ping</code>
Restart the system.	<code>reboot</code>
Saves the current configuration to the system memory.	<code>write</code>
Sets the feature and system environments individually.	<code>set</code>
Shows the current system configuration.	<code>show</code>
Open a TELNET Client. TELNET is limited by 3 sessions.	<code>telnet</code>
Opens a tftp connection to get file.	<code>tftp</code>
Replaces the old system image with the new system image on the system memory. Uploads a current configuration or downloads a configuration file.	<code>update</code>

**Note** For more information about supported commands, see the *CLI Reference Guide*.

## 6.5 Configuring Date and Time

---

Records of alarms and other events that occur on the include information about the date and time the alarm or event occurred. Configuring the system date and time settings on a switch ensures that the date and time recorded are accurate.

**Step 1** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**Step 2** Do one of the following:

- To configure the system date and time manually, proceed to the next step.
- To configure the system date and time using NTP, proceed to Step 4 .

**Note** Using NTP is recommended.

**Step 3** Enter the system date and time, and then proceed to Step 5 .

```
BTI-SA-821(config)# clock set datetime <Hour>:<Minute>:<second>  
<Month> <day> <Year>
```

**For example:**

```
BTI-SA-821(config)# clock set datetime 05:13:00 10 16 2014
```

**Step 4** Do the following:

**a)** Specify the IP address of an NTP server.

If this is the preferred NTP server, then specify the `prefer` option.

```
BTI-SA-821(config)# ntp server <ip_address> [prefer]
```

**For example:**

```
BTI-SA-821(config)# ntp server 192.168.0.1 prefer
```

**b)** Enable the NTP client.

```
BTI-SA-821(config)# ptp time-source ntp
```

**Step 5** Specify the time zone.

```
BTI-SA-821(config)# clock set timezone <time_zone>
```

Valid time zones are:

act - Australia Central Time(GMT+9:00)	hst - Hawaii Standard Time(GMT-10:00)
aet - Australia Eastern Time(GMT+10:00)	iet - Indiana Eastern Standard Time(GMT-5:00)
agt - Argentina Standard Time(GMT-3:00)	ist - India Standard Time(GMT+5:00)
art - (Arabic) Egypt Standard Time(GMT+2:00)	jst - Japan Standard Time(GMT+9:00)
ast - Alaska Standard Time(GMT-9:00)	kst - Korea Standard Time(GMT+9:00)
bet - Brazil Eastern Time(GMT-3:00)	met - Middle East Time(GMT+3:00)
bst - Bangladesh Standard Time(GMT+6:00)	mit - Midway Islands Time(GMT-11:00)
cat - Central African Time(GMT-1:00)	mst - Mountain Standard Time(GMT-7:00)
cnt - Canada Newfoundland Time(GMT-3:00)	net - Near East Time(GMT+4:00)
cst - Central Standard Time(GMT-6:00)	nst - New Zealand Standard Time(GMT+12:00)
ctt - China Taiwan Time(GMT+8:00)	plt - Pakistan Lahore Time(GMT+5:00)
eat - (Arabic) Egypt Standard Time(GMT+3:00)	pnt - Phoenix Standard Time(GMT-7:00)
ect - European Central Time(GMT+1:00)	prt - Puerto Rico and US Virgin Islands Time(GMT-4:00)
edt - Eastern Daylight Time(GMT-4:00)	pst - Pacific Standard Time(GMT-8:00)
eet - Eastern European Tim(GMT+2:00)	sst - Solomon Standard Time(GMT+11:00)
est - Eastern Standard Time(GMT-5:00)	utc - Universal Coordinated Time
gmt - Greenwich Mean Time	vst - Vietnam Standard Time(GMT+7:00)

**For example:**

```
BTI-SA-821(config)# clock set timezone est
```

**Step 6** Verify that the date and time settings were provisioned correctly.

```
BTI-SA-821# show clock
```

**For example:**

```
BTI-SA-821# show clock
05:13:25 EST Thu Oct 16 2014
```

## 6.6 Configuring User Profiles

User profiles are required to access a BTI Service Access 800 Series Ethernet Switch. Each profile added to the system requires a user name, a password, and a security authorization level that governs the access rights available to the user profile.

**Table 6-2 Security authorization levels**

Authorization Level	Access Rights
ROOT <sup>1</sup>	Full access to all system operations including operations for configuring users. Default session time-out is 30 minutes.
operator or admin	Full access to all system operations except operations for configuring users. Default session time-out is 30 minutes.
viewer	Read-only access. Default session time-out is 30 minutes.
<sup>1</sup> Only the user named <b>admin</b> can have an authorization level of <b>ROOT</b> .	

You cannot explicitly configure a user to have an authorization level of **ROOT**. The **ROOT** level is automatically and permanently given to the user named **admin**. This cannot be changed.

To change the session time-out value, use the `configure line autologout` command. This command changes the session time-out for all users.

User names can contain 3 to 8 alphanumeric characters. Passwords can contain from 5 to 10 characters, including a combination of alphanumeric and special characters. All special characters are supported for passwords except the characters : - = ; : ' " , ?.

**Note** User names and passwords are case-sensitive.

The BTI Service Access 800 Series supports up to 10 user profiles and 10 concurrent CLI sessions. However, only one login per user profile is supported on the system. When a user profile is no longer required, it can be deleted.

**Step 1** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**Step 2** Configure the username, password, and privilege level for the new user.

```
BTI-SA-821(config)# username <username> privilege <privilege_level>
password <password>
```

where:

- *<username>* is a 6-digit username.
- *<privilege\_level>* is user privilege level 1, 2, or 3:
  - 1 = viewer
  - 2 = operator
  - 3 = admin
- *<password>* is a password consisting of 1 to 64 characters.

For example:

```
BTI-SA-821(config)# username DMarie privilege 2 password catof9lives
```

**Step 3** Return to the EXEC mode.

```
BTI-SA-821(config)# end
```

**Step 4** Verify that the user was provisioned correctly.

```
BTI-SA-821# show usernames
```

For example:

```
BTI-SA-821# show usernames
```

Number	User name	Privilege	Password	Rsa Key
1	admin	3	*	
2	DMarie	2	*	

### Related tasks

Task	Command
Show users currently logged in	show users

## 6.7 Configuring RADIUS Client

---

Use this procedure to configure the RADIUS client.

### Prerequisites:

- The RADIUS server has been set up and configured.

You can configure the switch to authenticate its users with RADIUS. When a user tries to log in, the switch acts as a RADIUS client and sends the login request to the RADIUS server for authentication.

#### Step 1 Access Configuration mode

```
BTI-SA-821# configure terminal
```

#### Step 2 Enable the RADIUS authentication type.

```
BTI-SA-821(config)# radius-server enable
```

#### Step 3 Specify the primary RADIUS server to use, along with the shared key string that has been configured on the RADIUS server.

```
BTI-SA-821(config)# radius-server host <authserver_IP> key <keystring>
```

For example:

```
BTI-SA-821(config)# radius-server host 192.168.5.250 key bigsecret123
```

#### Step 4 Add a secondary RADIUS server as desired.

```
BTI-SA-821(config)# radius-server host <authserver_IP> key <keystring>  
mgmt
```

For example:

```
BTI-SA-821(config)# radius-server host 192.168.0.253 key bigsecret123  
mgmt
```

#### Step 5 If desired, you can configure the switch to fall back to local authentication if the RADIUS server authentication fails.

```
BTI-SA-821(config)# radius-server fallback disable
```

If you enable this setting (and authentication with the primary server fails), the switch tries to authenticate with the secondary server. If that authentication also fails, then the switch authenticates with the local database.

If you disable this setting (and authentication with *either* the primary or the secondary server fails), the switch denies access to the user.

**Note** This setting does not apply in the situation where a RADIUS server is reachable. If the primary server is unreachable, the switch tries to authenticate with the secondary server. If the secondary server is also unreachable, then the switch authenticates with the local database. This behavior is provided to prevent inadvertent lockout due to network connectivity or server problems.

**Step 6** Configure the maximum timeout value (in seconds) for receiving the response packet.

```
BTI-SA-821(config)# radius-server timeout <seconds>
```

where: <seconds> = 1-1000 (default = 5)

For example:

```
BTI-SA-821(config)# radius-server timeout 10
```

**Step 7** Configure the retransmit count. ‘Retransmit’ means the maximum send count of authentication request packets.

```
BTI-SA-821(config)# rads-server retransmit <retries>
```

where: <retries> = 1-100 (default = 3)

For example:

```
BTI-SA-821(config)# radius-server retransmit 10
```

**Step 8** Configure the order of authentication. You can specify whether you want to authenticate the login using the RADIUS server first or the local database first.

```
BTI-SA-821(config)# radius-server auth-order <radius|local>
```

For example, if you want to specify RADIUS authentication before local authentication, enter:

```
BTI-SA-821(config)# radius-server auth-order radius
```

**Step 9** Return to the EXEC mode.

```
BTI-SA-821(config)# end
```

**Step 10** Confirm that the RADIUS client was configured correctly and is enabled.

```
BTI-SA-821# show radius-server
```

For example:

```
BTI-SA-821# show radius-server
```

```
=====
RADIUS : Enable
=====
First      RADIUS Auth Server IP :
           RADIUS Auth port      : 1812
           RADIUS Auth Path      : ib-ip
           RADIUS Auth Secret    :
Second     RADIUS Auth Server IP :
           RADIUS Auth port      : 1812
           RADIUS Auth Path      : ib-ip
```

```

        RADIUS Auth Secret      :
RADIUS Auth Order               : RADIUS
RADIUS retrial number           : 10
RADIUS timeout(sec)             : 10
RADIUS fallback                  : enable
=====
```



## 6.8 Configuring Secure Shell (SSH)

Secure Shell (SSH) is an industry-standard network protocol that allows data to be exchanged using a secure channel between two networked devices. The encryption used by SSH provides confidentiality and integrity of data over an insecure network, such as the Internet. The switch support SSH-1 and SSH-2.

**Step 1** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**Step 2** Enable the SSH service.

```
BTI-SA-821(config)# ip ssh server enable
```

**Step 3** Return to the EXEC mode.

```
BTI-SA-821(config)# end
```

**Step 4** To confirm the configuration settings, display the IP SSH server version and configuration data.

```
BTI-SA-821# show ip ssh server status
```

For example:

```
BTI-SA-821# show ip ssh server status
SSH server enabled
Version: 2.0
Authentication timeout: 120 second(s)
Authentication retries: 6 time(s)
Server key lifetime: 60 minute(s)
Authentication type: password, public-key
```

**Step 5** To verify that the SSH server is running, display the IP SSH server session information.

```
BTI-SA-821# show ip ssh server session
```

For example:

```
BTI-SA-821# show ip ssh server session
```

```
Version Encryption Hmac      User IP              State
=====2.0          aes128-
cbc  hmac-md5 abc   10.10.29.22  Session started
```

## 6.9 Configuring SNMP Community Strings

---

Use this procedure to configure SNMP community strings and enable SNMP on the switch. Up to four community strings can be created for each type.

The Simple Network Management Protocol (SNMP) is a messaging protocol used by the switch to communicate configuration and status information with a network management system. Ethernet Switches support SNMPv2c.

SNMP messages are exchanged within an SNMP community, which consists of one or more switches and one or more management workstations. Membership in a community is controlled by community strings, which function as passwords for the community. The community strings are embedded in every SNMP packet exchanged between the members of the community to authenticate access to the Management Information Base (MIB) on the switch.

You can configure multiple SNMP communities on the switch. For example, you can create a community that provides full read-write access to the MIBs, one that provides read-only access to the MIBs, and a third that provides access to a limited set of objects (OIDs) in the MIBs. Access is further controlled by configuring users and groups.

**Step 1** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**Step 2** Enable SNMP service.

```
BTI-SA-821(config)# snmp-server enable
```

**Step 3** Configure the SNMP Read-only community string on the switch.

```
BTI-SA-821(config)# snmp-server community <community_name> read-only
```

For example:

```
BTI-SA-821(config)# snmp-server community public read-only
```

**Step 4** Configure the SNMP Read/Write community string on the switch.

```
BTI-SA-821(config)# snmp-server community <community_name> read-write
```

For example:

```
BTI-SA-821(config)# snmp-server community private read-write
```

**Step 5** Specify the management workstation IP address and port to which SNMP traps will be sent.

```
BTI-SA-821(config)# snmp-server trap target-address [mgmt-if] <ip-address> community <community_name> [udpport <number>]
```

For example:

```
BTI-SA-821(config)# snmp-server trap target-address mgmt-if 192.168.1.100 community public udpport 6000
```

**Step 6** Enable all SNMP trap notifications.

```
BTI-SA-821(config)# snmp-server trap enable <notification-type>
```

where *notification-type* indicates the type of notification to enable:

- event
- alarm
- v2 all
- v2 coldstart
- v2 linkup
- v2 linkdown
- v2 authentication

For example:

```
BTI-SA-821(config)# snmp-server trap enable event
```

### Related tasks

Task	Command
Show the current SNMP configuration	<code>show snmp</code>
Disable SNMP	<code>configure snmp disable</code>
Delete an SNMP get-community	<code>configure snmp get-community clear {&lt;1-4&gt; all}</code>
Delete an SNMP set-community	<code>configure snmp set-community clear {&lt;1-4&gt; all}</code>
Delete an SNMP trap-community	<code>configure snmp trap-community clear {&lt;1-4&gt; all}</code>
Show the SNMP PEN (Private Enterprise Number & Product & Model oid) code	<code>show snmp pen</code>
Configure the SNMP PEN code	<code>configure snmp pen PEN_STR</code>

## 6.10 Configuring Syslog Server

---

BTI SA-821 support the Syslog protocol. When enabled on the BTI SA-821, this feature allows log messages to be sent to a local console or to a remote Syslog server for monitoring or processing. Message levels (for example, critical, major, minor) can be specified so that only messages up to a particular level are forwarded. When the Syslog protocol is disabled, log information is stored in the local file system, and is accessible using the `show syslog` command.

**Step 1** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**Step 2** Specify the IP address of the Syslog server. To use the management port, specify the `mgmt-if` option.

```
BTI-SA-821(config)# syslog remote address [mgmt-if]
<remote_Syslog_IP_address>
```

For example:

```
BTI-SA-821(config)# syslog remote address mgmt-if 192.168.5.31
```

**Step 3** Enable the transmission of trap information to the Syslog server.

```
BTI-SA-821(config)# syslog output { console | remote } enable
```

For example:

```
BTI-SA-821(config)# syslog output remote enable
```

**Step 4** Specify the Syslog severity.

```
BTI-SA-821(config)# syslog severity { critical | major | minor |
notice | info | all } enable
```

For example:

```
BTI-SA-821(config)# syslog severity minor enable
```

**Step 5** Enable Syslog.

```
BTI-SA-821(config)# syslog enable
```

## 7.0 BTI SA-821 Carrier Ethernet Switch Provisioning

---

This section covers the following topics :

- 7.1, “Creating an NNI Port”
- 7.2, “Provisioning the Wavelength on the 10G Multi-Rate / Multi-Protocol Tunable DWDM 80 km Transceiver”
- 7.3, “Configuring Ethernet Ring Protection Switching (G.8032)”
- 7.4, “Configuring Ethernet Protection Switching (G.8031)”
- 7.5, “Provisioning MEF E-Service”

## 7.1 Creating an NNI Port

---

Use this procedure to configure and associate an NNI with one or more SVLANs.

### Prerequisites

- Ensure the addition of this NNI does not create a loop in the network. If it does, then be sure to leave this NNI disabled.

### Restrictions and limitations

- All interface ports default to disabled.
- The interface must not be a member of a LAG.

Only a subset of the interface configuration attributes is shown.

#### Step 1 Provision the NNI port:

**a)** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**b)** Enter the Ethernet NNI configuration mode, and create the NNI.

```
BTI-SA-821(config)# ethernet nni add <NNI-ID>
```

For example:

```
BTI-SA-821(config)# ethernet nni add NNI-3
```

**c)** Associate the NNI with the Ethernet interface.

```
BTI-SA-821(config-nni)# map interface <physical-interface>
```

For example:

```
BTI-SA-821(config-nni)# map interface eth-0-4
```

**d)** Set the maximum transmission unit (MTU) value (in bytes) for the interface.

```
BTI-SA-821(config-nni)# mtu <1526-9608>
```

For example:

```
BTI-SA-821(config-nni)# mtu 9600
```

**e)** Add a description.

```
BTI-SA-821(config-nni)# description <character_string>
```

For example:

```
BTI-SA-821(config-nni)# description NNI-3
```

**f)** Return to the EXEC mode.

```
BTI-SA-821(config-nni)# end
```

#### Step 2 Verify that the NNI port was provisioned correctly.

```
BTI-SA-821# show ethernet nni <NNI-ID>
```

For example:

```
BTI-SA-821# show ethernet nni NNI-3
```

```
-----
NNI NNI-3
  Description           : NNI-3
  Mapped Interface      : eth-0-4
  TPID Value            : 0x88a8
  MTU Size              : 9600
  Number of VC          : 0
-----
```

**Step 3** Associate the NNI port with the desired SVLAN(s), including the management VLAN (if it exists).

**a)** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**b)** Enter the EVC configuration mode for the EVC.

```
BTI-SA-821(config)# ethernet evc <EVC-ID>
```

For example:

```
BTI-SA-821(config)# ethernet evc MGMT
```

**c)** Associate the EVC with the NNI.

```
BTI-SA-821(config-evc)# add nni <NNI-NAME>
```

For example:

```
BTI-SA-821(config-evc)# add nni NNI-3
```

**d)** If necessary, associate the EVC with the UNI.

```
BTI-SA-821(config-evc)# add uni <UNI-ID>
```

For example:

```
BTI-SA-821(config-evc)# add uni UNI-3
```

**e)** Return to the EXEC mode.

```
BTI-SA-821(config-evc)# end
```

**Step 4** Verify that the EVC was provisioned correctly.

```
BTI-SA-821# show ethernet evc
```

For example:

```
BTI-SA-821# show ethernet evc
```

```
-----
EVC EVC1
  Service Type           : epline
  VC Type                : Point-to-Point
-----
```

```
SVLAN ID                : 10
VLAN Preservation        : Yes
CoS Preservation         : Yes
Maximum Number of UNI    : 1
Number of UNI            : 0
Number of RUNI           : 0
NNI List
NNI-1, NNI-2, NNI-3,
```

-----

**Step 5** Enable the NNI port.

**Important** Before you enable this NNI port, ensure the addition of this port does not create routing loops in the network.

**a)** Access Configuration mode.

```
BTI-SA-821# configure terminal
```

**b)** Enter the interface configuration mode for the NNI port.

```
BTI-SA-821(config)# interface <physical-interface>
```

For example:

```
BTI-SA-821(config)# interface eth-0-4
```

**c)** Enable the NNI port.

```
BTI-SA-821(config-if)# no shutdown
```

**d)** Return to the EXEC mode.

```
BTI-SA-821(config-if)# end
```

**Step 6** Save the current configuration to system memory.

```
BTI-SA-821# write mem
```

**Step 7** Display the summary information for the interface.

```
BTI-SA-821# show interface status
```

```
BTI-SA-821# show ethernet nni <NNI-ID>
```

For example:

```
BTI-SA-821# show interface status
```

Port	Status	Duplex	Speed	Mode	Type	Description
eth-0-1	down	auto	auto	TRUNK	Unknown	NNI-1
eth-0-2	down	auto	auto	TRUNK	Unknown	NNI-2
eth-0-3	admin down	auto	auto	ACCESS	Unknown	
eth-0-4	admin down	auto	auto	ACCESS	Unknown	
eth-0-5	admin down	auto	auto	ACCESS	Unknown	



```
BTI-SA-821# show ethernet nni NNI-3
```

```
-----  
NNI NNI-3  
Description           : NNI-3  
Mapped Interface      : eth-0-4  
TPID Value            : 0x88a8  
MTU Size              : 9600  
Number of VC          : 1  
EVC List  
EVC1,  
-----
```

## 7.2 Provisioning the Wavelength on the 10G Multi-Rate / Multi-Protocol Tunable DWDM 80 km Transceiver

---

The BP3AM6TL transceiver is mainly used on line interfaces and supports 10GE LAN on 96 channels.

The following link type and span is supported:

- Link Length for 9/125um single mode fiber: 80 km

The transceiver is provisioned automatically when installed on the interface. It cannot be manually provisioned. When installed, the transceiver wavelength, frequency or channel can be configured. You must remember to set the interface speed to 10G using the CLI interface command `speed`.

When the transceiver is provisioned with either the wavelength, frequency or channel value, the system will automatically select the associated values. For example, if the user provisions the transceiver ITU wavelength to 1556.50 nm, the system will automatically set the transmit and receive tunable channel number to 26 and the frequency to 192.60 THz.

The wavelength can be tuned up or down by 0.05nm. The tunable SFP+ will automatically align to the closest wavelength in the wavelength grid.

- Caution**
- The BP3AM6TL tunable DWDM SFP+ transceiver module should be provisioned in a bookend manner with the local and the remote transceiver being provisioned with the same channel, frequency and wavelength. The remote transceiver may be another BP3AM6TL or a tunable or fixed C-band transceiver
  - All optical transceivers should perform within the calibrated thresholds for temperature, voltage, current and power alarms
  - The power transmitted from the transceiver must be within the high and low transmit ranges. The power received on the transceiver must be within the high and low receive threshold and below the +3dBm maximum receiver input power.
  - Do not admin up or transmit or receive traffic on the transceiver until the local and remote transmit and receive signals are tested and the fibers attenuated with pads accordingly. Failure to test the power levels before installing the transceiver on the remote and local interfaces may result in permanent damage to the receiver or cause the laser to shutdown during provisioning.

The network optical power budget and the optical link budget should be calculated before beginning this procedure. The transceiver should be provisioned to meet the specifications defined in the network design.

If you are changing the wavelength, frequency or channel, the optical power budget / optical link budget does not require to be re-calculated. The attenuator/pad requirement should remain unchanged. There is no requirement to replace the transceiver when changing the wavelength, frequency or channel. However changing the wavelength, frequency or channel will disrupt traffic until the configuration is enabled. If required, re-route traffic when possible.

For additional information see

- [9.2.1, “BP3AM6TL 10G Multi-Rate / Multi-Protocol Tunable DWDM 80 km Transceiver Specifications”](#)
- [Appendix B, “ITU Wavelength Plan for C Band Tunable DWDM Transceiver”](#)

## 7.2.1 Example : Provisioning the Wavelength frequency on the 10G Multi-Rate / Multi-Protocol Tunable DWDM 80 km Transceiver

BTI SA-821 supports the transceiver on interfaces 25-28

This example shows how to provision the 10G Multi-Rate / Multi-Protocol Tunable DWDM 80 km Transceiver to 191.85 THz. See [Appendix C, “Wavelength Compatibility Table”](#).

**Step 1** Install the transceiver local and remote modules. See [5.1, “BTI SA-821 Carrier Ethernet Switch Optical Transceivers Installation and Removal”](#)

The following example shows the auto provisioning settings of the local transceiver when installed in eth-0-1.

```
BTI-SA-821191.85local # show transceiver detail
Port eth-0-1 transceiver info:
Transceiver Type: 10G Base-ER
  Transceiver Vendor Name : JDSU
  Transceiver PN          : JST01TMAC1CY5BTI
  Transceiver S/N         : FD4055780070
  Transceiver PEC Code    : BP3AM6TL
Transceiver Output Wavelength: N/A
Supported Link Type and Length:
  Link Length for 9/125um single mode fiber: 80 km
  Link Length for 9/125um single mode fiber: 25500 m
Transceiver Set for Tunable DWDM:
  Transceiver Lasers First Frequency : 191.350000
  Transceiver Lasers Last Frequency  : 196.100000
  Transceiver Lasers grid spacing    : 0.050000
    Tunable Wavelength Set : 1528.80 nm
    Tunable Channel No. Set : 96
      Wavelength           : 1528.77 nm
      Frequency            : 196.10 THz
```

-----

Transceiver is internally calibrated.

mA: milliamperes, dBm: decibels (milliwatts), NA or N/A: not applicable.

++ : high alarm, + : high warning, - : low warning, -- : low alarm.

The threshold values are calibrated.

```
-----
              High Alarm  High Warn  Low Warn  Low Alarm
              Threshold   Threshold Threshold Threshold
Port          (Celsius)   (Celsius) (Celsius) (Celsius)
-----
eth-0-1      41.77        72.00     70.00     -5.00     -7.00
-----
              High Alarm  High Warn  Low Warn  Low Alarm
```

Port	Voltage (Volts)		Threshold (Volts)	Threshold (Volts)	Threshold (Volts)	Threshold (Volts)
eth-0-1	3.30		3.63	3.46	3.13	2.97
-----						
Port	Current (milliamperes)		High Alarm Threshold (mA)	High Warn Threshold (mA)	Low Warn Threshold (mA)	Low Alarm Threshold (mA)
eth-0-1	0.00	--	110.00	95.00	25.00	15.00
-----						
Port	Optical Transmit Power (dBm)		High Alarm Threshold (dBm)	High Warn Threshold (dBm)	Low Warn Threshold (dBm)	Low Alarm Threshold (dBm)
eth-0-1	-40.00	--	3.00	2.00	-2.00	-3.00
-----						
Port	Optical Receive Power (dBm)		High Alarm Threshold (dBm)	High Warn Threshold (dBm)	Low Warn Threshold (dBm)	Low Alarm Threshold (dBm)
eth-0-1	-40.00	--	-4.00	-6.00	-27.21	-29.21
-----						

Port eth-0-3 transceiver info:

Transceiver Type: 1000BASE-LX

Transceiver Vendor Name : Optech

Transceiver PN : OP6E-S05-13-CM

Transceiver S/N : 8225259042

Transceiver PEC Code : EMELY COMPATIBLE

Transceiver Output Wavelength: 1310 nm

Supported Link Type and Length:

Link Length for 9/125um single mode fiber: 80 km

Link Length for 9/125um single mode fiber: 25500 m

The following example shows the auto provisioning settings of the remote transceiver when installed in eth-0-1.

BTI-SA-821191.85remote # show transceiver detail

Port eth-0-1 transceiver info:

Transceiver Type: 10G Base-ER

Transceiver Vendor Name : JDSU

Transceiver PN : JST01TMAC1CY5BTI

Transceiver S/N : FD4055780070

Transceiver PEC Code : BP3AM6TL

Transceiver Output Wavelength: N/A

Supported Link Type and Length:

Link Length for 9/125um single mode fiber: 80 km

Link Length for 9/125um single mode fiber: 25500 m

Transceiver Set for Tunable DWDM:

Transceiver Lasers First Frequency : 191.350000

Transceiver Lasers Last Frequency : 196.100000

Transceiver Lasers grid spacing : 0.050000

```

Tunable Wavelength Set : 1528.80 nm
Tunable Channel No. Set : 96
      Wavelength       : 1528.77 nm
      Frequency        : 196.10 THz

```

-----

Transceiver is internally calibrated.

mA: milliamperes, dBm: decibels (milliwatts), NA or N/A: not applicable.

++ : high alarm, + : high warning, - : low warning, -- : low alarm.

The threshold values are calibrated.

```

-----
Port      Temperature      High Alarm  High Warn  Low Warn  Low Alarm
          (Celsius)        Threshold  Threshold  Threshold Threshold
          (Celsius)        (Celsius) (Celsius) (Celsius) (Celsius)
-----
eth-0-1   41.77              72.00      70.00      -5.00     -7.00

```

```

-----
Port      Voltage          High Alarm  High Warn  Low Warn  Low Alarm
          (Volts)          Threshold  Threshold  Threshold Threshold
          (Volts)          (Volts)   (Volts)   (Volts)   (Volts)
-----
eth-0-1   3.30              3.63      3.46      3.13      2.97

```

```

-----
Port      Current          High Alarm  High Warn  Low Warn  Low Alarm
          (milliamperes)   Threshold  Threshold  Threshold Threshold
          (mA)              (mA)       (mA)       (mA)       (mA)
-----
eth-0-1   0.00      --      110.00    95.00     25.00     15.00

```

```

-----
Port      Optical          High Alarm  High Warn  Low Warn  Low Alarm
          Transmit Power   Threshold  Threshold  Threshold Threshold
          (dBm)             (dBm)     (dBm)     (dBm)     (dBm)
-----
eth-0-1   -40.00      --      3.00      2.00     -2.00     -3.00

```

```

-----
Port      Optical          High Alarm  High Warn  Low Warn  Low Alarm
          Receive Power    Threshold  Threshold  Threshold Threshold
          (dBm)             (dBm)     (dBm)     (dBm)     (dBm)
-----
eth-0-1   -40.00      --      -4.00     -6.00    -27.21    -29.21

```

Port eth-0-3 transceiver info:

Transceiver Type: 1000BASE-LX

Transceiver Vendor Name : Optech

Transceiver PN : OP6E-S05-13-CM

Transceiver S/N : 8225259042

Transceiver PEC Code : EMELY COMPATIBLE

Transceiver Output Wavelength: 1310 nm

Supported Link Type and Length:

Link Length for 9/125um single mode fiber: 80 km

Link Length for 9/125um single mode fiber: 25500 m

**Step 2** Verify transceiver interfaces are admin down during the provisioning procedure.

```
BTI-SA-821191.85local(config)# interface eth-0-1
BTI-SA-821191.85local(config-if)#shutdown

BTI-SA-821191.85remote(config)# interface eth-0-1
BTI-SA-821191.85local(config-if)#shutdown
```

**Step 3** Provision the speed of the local and remote transceiver interface.

The following example shows how to set the speed to 10G. (The media type will be auto provisioned if the default **auto** setting is provisioned in the interface media-type command.)

```
BTI-SA-821191.85local(config)# interface eth-0-1
BTI-SA-821191.85local(config-if)# speed 10G
BTI-SA-821191.85local(config-if)#exit
BTI-SA-821191.85local # show interface eth-0-1
```

```
Interface current state: down
  Hardware is Ethernet, address is 0014.d060.0012 (bia 0014.d060.0012)
  Description: UNI-0-1
  Bandwidth 10000000 kbits
  Index 1 , Metric 1 , Encapsulation ARPA
Speed - 10Gb/s , Duplex - Full , Media type is 10GBASE_ER
  Link speed type is force link, Link duplex type is force link
  Admin input flow-control is off, output flow-control is off
  Oper input flow-control is off, output flow-control is off
  The Maximum Frame Size is 1522 bytes
  VRF binding: not bound
  Label switching is disabled
  No Virtual private Wire service configured
  ARP timeout 01:00:00, ARP retry interval 1s
    0 packets input, 0 bytes
    Received 0 unicast, 0 broadcast, 0 multicast
    0 runs, 0 giants, 0 input errors, 0 CRC
    0 frame, 0 overrun, 0 pause input
    0 input packets with dribble condition detected
    0 packets output, 0 bytes
    Transmitted 0 unicast, 0 broadcast, 0 multicast
    0 underruns, 0 output errors, 0 pause output

BTI-SA-821191.85remote(config)# interface eth-0-1
BTI-SA-821191.85remote(config-if)# speed 10G
BTI-SA-821191.85remote(config-if)#exit
BTI-SA-821191.85remote # show interface eth-0-1
```

```
Interface current state: down
  Hardware is Ethernet, address is 0014.d060.0012 (bia 0014.d060.0012)
  Description: UNI-0-1
  Bandwidth 10000000 kbits
  Index 1 , Metric 1 , Encapsulation ARPA
Speed - 10Gb/s , Duplex - Full , Media type is 10GBASE_ER
  Link speed type is force link, Link duplex type is force link
```

```

Admin input flow-control is off, output flow-control is off
Oper input flow-control is off, output flow-control is off
The Maximum Frame Size is 1522 bytes
VRF binding: not bound
Label switching is disabled
No Virtual private Wire service configured
ARP timeout 01:00:00, ARP retry interval 1s
  0 packets input, 0 bytes
  Received 0 unicast, 0 broadcast, 0 multicast
  0 runs, 0 giants, 0 input errors, 0 CRC
  0 frame, 0 overrun, 0 pause input
  0 input packets with dribble condition detected
  0 packets output, 0 bytes
  Transmitted 0 unicast, 0 broadcast, 0 multicast
  0 underruns, 0 output errors, 0 pause output

```

**Step 4** Provision the frequency on the local and remote transceivers.

This example shows how to set the tunable SFP+ module to frequency 191.85. See also [Appendix C, “Wavelength Compatibility Table”](#).

```

BTI-SA-821191.85local(config)# interface eth-0-1
BTI-SA-821191.85local(config-if)# transceiver itu frequency 191.85
BTI-SA-821191.85local(config-if)# end
BTI-SA-821191.85local # show transceiver eth-0-1
Port eth-0-1 transceiver info:
Transceiver Type: 10G Base-ER
  Transceiver Vendor Name : JDSU
  Transceiver PN          : JST01TMAC1CY5BTI
  Transceiver S/N         : FD405578008F
  Transceiver PEC Code    : BP3AM6TL
Transceiver Output Wavelength: N/A
Supported Link Type and Length:
  Link Length for 9/125um single mode fiber: 80 km
  Link Length for 9/125um single mode fiber: 25500 m
Transceiver Set for Tunable DWDM:
  Transceiver Lasers First Frequency : 191.350000
  Transceiver Lasers Last Frequency  : 196.100000
  Transceiver Lasers grid spacing    : 0.050000
    Tunable Wavelength Set : wavelength 1562.64
    Tunable Channel No. Set : 11
      Wavelength           : 1562.64 nm
      Frequency             : 191.85 THz

```

**Step 5** At the remote transceiver admin up the transceiver interface. A Loss of Sync (LOS) alarm may be raised.

```

191.85remote(config)# interface eth-0-1
191.85remote(config-if)# no shutdown

```

**Step 6** At the local transceiver site perform the following checks. Use an optical power meter to test the fiber. Follow safety precautions when working with lasers. Clean all cable

and attenuator connectors using the appropriate fiber optic cleaning kits and to the manufactures cleaning process, before connecting the cables for test and for installation.

- Verify the power levels from the remote Tx transceiver port perform within the high and low transmit power specifications. The power received on the transceiver Rx port must be within the limits of the receiver sensitivity and below the +3 dBm receiver damage threshold
- If required attenuated optical fiber cables with pads accordingly
- If required test the signal from remote Tx transceiver port to verify the wavelength, frequency and channel are correct
- Connect optical cables on the transceiver.

**Step 7** At the local transceiver admin up the transceiver interface. A Loss of Sync (LOS) alarm may be raised.

```
191.85local(config)# interface eth-0-1
191.85local(config-if)# no shutdown
```

**Step 8** At the remote transceiver perform the following checks. Use an optical power meter to test the fiber. Follow safety precautions when working with lasers. Clean all cable and attenuator connectors using the appropriate fiber optic cleaning kits and to the manufactures cleaning process, before connecting the cables for test and for installation.

- Verify the power levels from the local Tx transceiver port perform within the high and low transmit power specifications. The power received on the remote Rx transceiver port must be within the limits of the receiver sensitivity and below the +3 dBm receiver damage threshold
- If required attenuated optical fiber cables with pads accordingly
- If required test the signal from the local transceiver to verify the wavelength, frequency and channel are correct.
- If required re-connect optical cables.

**Step 9** Verify the local to remote network connections are performing correctly and that the network is alarm free.



## 7.3 Configuring Ethernet Ring Protection Switching (G.8032)

G.8032 Ethernet Ring Protection Switching (ERPS) is set up between the nodes in a ring. As such, the procedures for doing so vary based on the particular equipment that makes up the individual nodes. For example, the nodes that comprise the ring may be all BTI SA-821 nodes or a mixture of BTI SA-821 and SA-810 nodes. Therefore, use the procedure listed below that most closely matches your ring configuration:

- [7.3.1, “Configuring G.8032 ERPS Between Two BTI SA-821 Nodes Using Linkscan”](#)
- [7.3.2, “Configuring G.8032 ERPS Between Two BTI SA-821 Nodes Using Y.1731”](#)
- [7.3.3, “Configuring G.8032 ERPS Between BTI SA-821 and SA-810 Nodes Using Linkscan”](#)
- [7.3.4, “Configuring G.8032 ERPS Between BTI SA-821 and SA-810 Nodes Using Y.1731”](#)
- [7.3.5, “Configuring G.8032 ERPS Between BTI SA-821 and PVX Nodes Using Linkscan”](#)

Each procedure covers setting up ERPS between two nodes. For rings with three or more nodes, repeat the procedure or use a different procedure for the next node pair.

ERPS (G.8032) is set up between the nodes in a ring, and the procedures for doing so vary based on the particular equipment that makes up the individual nodes. The procedures for configuring ERPS between nodes in a ring are provided in the *Installation and System Configuration Guide*.

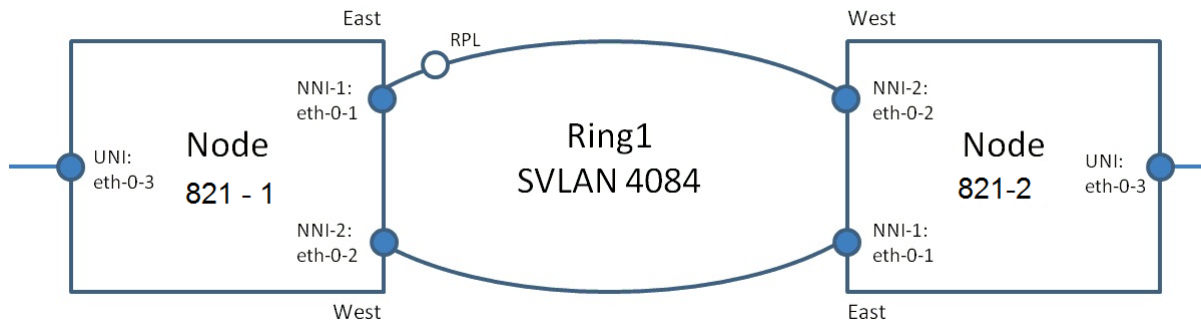
### 7.3.1 Configuring G.8032 ERPS Between Two BTI SA-821 Nodes Using Linkscan

Use this procedure to configure G.8032 ERPS between two BTI SA-821 nodes using linkscan.

#### Prerequisites

- Before ERPS is provisioned, no loop prevention mechanism should be operating on the network; therefore, the network operator must manually prevent the loop. This is typically performed by administratively disabling the designated RPL (ring protection link) interface in the ring. The nodes may be fibered in a closed loop, but it is imperative that one port be disabled if a loop is to be prevented.

In the steps and examples below, the two BTI SA-821 nodes are designated BTI SA-821-1 and BTI SA-821-2 as shown in the following example topology:

**Figure 7-1 Example Topology for ERPS Ring between BTI SA-821 and BTI SA-821 Nodes**

**Step 1** At node , disable the RPL (ring protection link) interface.

**Note** In these examples, the RPL interface is shown as part of node BTI SA-821-1 and BTI SA-821-2. In rings with more nodes, the RPL interface could be part of another node.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# shutdown
BTI-SA-821(config-if)# end
```

**Step 2** At both nodes ( BTI SA-821-1 and BTI SA-821-2 ), provision a VLAN.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# vlan database
BTI-SA-821(config-vlan)# vlan 4084,100
BTI-SA-821(config-vlan)# end
```

**Step 3** At both nodes ( BTI SA-821-1 and BTI SA-821-2), provision two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet nni add NNI-1
BTI-SA-821(config-nni)# map interface eth-0-1
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# exit
BTI-SA-821(config)# ethernet nni add NNI-2
BTI-SA-821(config-nni)# map interface eth-0-2
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# end
```

**Step 4** At both nodes ( BTI SA-821-1 and BTI SA-821-2), provision an EVC service for ERPS.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet evc add Ring1
BTI-SA-821(config-evc)# service type control-channel
BTI-SA-821(config-evc)# svlan 4084
BTI-SA-821(config-evc)# add nni NNI-1
BTI-SA-821(config-evc)# add nni NNI-2
BTI-SA-821(config-evc)# end
```

**Step 5** At node BTI SA-821-1, provision the ERPS ring.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# g8032 ring-id 1 east-interface eth-0-1 west-
interface eth-0-2
BTI-SA-821(config-switch)# raps vlan 4084
BTI-SA-821(config-switch)# raps mel 1
BTI-SA-821(config-switch)# rpl-node owner
BTI-SA-821(config-switch)# rpl east-interface
BTI-SA-821(config-switch)# traffic-channel 1
BTI-SA-821(config-switch)# timer wait-to-restore 1
BTI-SA-821(config-switch)# ring enable
BTI-SA-821(config-switch)# end
```

**Step 6** At node BTI SA-821-2, provision the ERPS ring. Do not just repeat the previous provisioning steps; they are slightly different for node BTI SA-821-1.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# g8032 ring-id 1 east-interface eth-0-1 west-
interface eth-0-2
BTI-SA-821(config-switch)# raps vlan 4084
BTI-SA-821(config-switch)# raps mel 1
BTI-SA-821(config-switch)# rpl-node neighbor
BTI-SA-821(config-switch)# rpl west-interface
BTI-SA-821(config-switch)# traffic-channel 1
BTI-SA-821(config-switch)# ring enable
BTI-SA-821(config-switch)# end
```

**Step 7** At node BTI SA-821-1, enable the two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
BTI-SA-821(config)# interface eth-0-2
BTI-SA-821(config-if)# no shutdown
```

**Step 8** At node BTI SA-821-2, enable the two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
BTI-SA-821(config)# interface eth-0-2
BTI-SA-821(config-if)# no shutdown
```

**Step 9** If not already done, enable the RPL interface.

**Note** In these examples, the RPL interface was already enabled in a previous step.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# end
```

### 7.3.2 Configuring G.8032 ERPS Between Two BTI SA-821 Nodes Using Y.1731

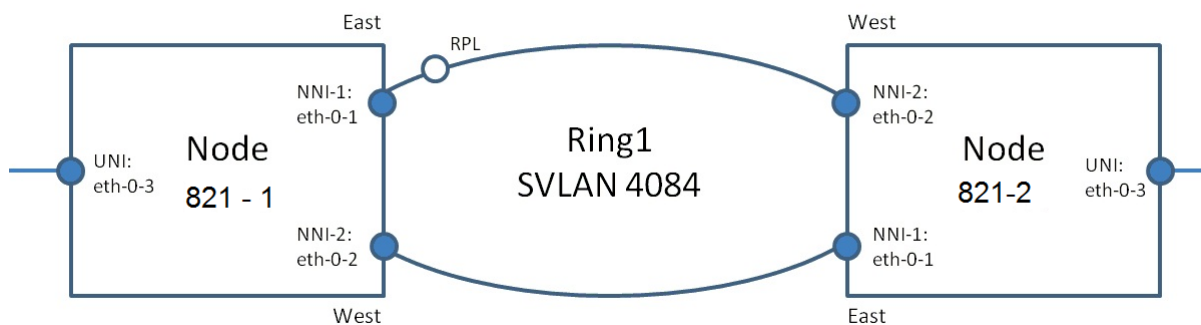
Use this procedure to configure G.8032 ERPS between two BTI SA-821 nodes using Y.1731.

#### Prerequisites

- Before ERPS is provisioned, no loop prevention mechanism should be operating on the network; therefore, the network operator must manually prevent the loop. This is typically performed by administratively disabling the designated RPL (ring protection link) interface in the ring. The nodes may be fibered in a closed loop, but it is imperative that one port be disabled if a loop is to be prevented.

In the steps and examples below, the two BTI SA-821 nodes are designated BTI SA-821-1 and BTI SA-821-2 as shown in the following example topology:

**Figure 7-2 Example Topology for ERPS Ring between Two BTI SA-821 Nodes**



**Step 1** At node BTI SA-821-1 , BTI SA-821-2, disable the RPL (ring protection link) interface.

**Note** In these examples, the RPL interface is shown as part of node BTI SA-821-1. In rings with more nodes, the RPL interface could be part of another node.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# shutdown
BTI-SA-821(config-if)# end
```

**Step 2** At both nodes ( BTI SA-821-1 and BTI SA-821-2), provision a VLAN.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# vlan database
BTI-SA-821(config-vlan)# vlan 4084,100
BTI-SA-821(config-vlan)# end
```

**Step 3** At both nodes ( BTI SA-821-1 and BTI SA-821-2), provision two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet nni add NNI-1
BTI-SA-821(config-nni)# map interface eth-0-1
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# exit
BTI-SA-821(config)# ethernet nni add NNI-2
BTI-SA-821(config-nni)# map interface eth-0-2
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# end
```

**Step 4** At both nodes ( BTI SA-821-1 and BTI SA-821-2), provision an EVC service for ERPS.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet evc add Ring1
BTI-SA-821(config-evc)# service type control-channel
BTI-SA-821(config-evc)# svlan 4084
BTI-SA-821(config-evc)# add nni NNI-1
BTI-SA-821(config-evc)# add nni NNI-2
BTI-SA-821(config-evc)# end
```

**Step 5** At node BTI SA-821-1 , provision the ERPS detection link status.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet soam meg megid domain1 meg-type icc-based
level 1 ccm-interval 300hz vlan 4084
```

```
BTI-SA-821(config-soam)# mep mepid 1000 interface eth-0-1 direction
down
BTI-SA-821(config-soam)# mep mepid 2000 interface eth-0-2 direction
down
BTI-SA-821(config-soam)# rmep rmepid 1001 mepid 1000 remote-mac
0014.d060.01a6
BTI-SA-821(config-soam)# rmep rmepid 2001 mepid 2000 remote-mac
0014.d060.01a6
BTI-SA-821(config-soam)# continuity-check enable mepid 1000
BTI-SA-821(config-soam)# continuity-check enable mepid 2000
BTI-SA-821(config-soam)# exit
BTI-SA-821(config)# ethernet soam enable
BTI-SA-821(config)# end
```

**Step 6** At node BTI SA-821-2, provision the ERPS detection link status.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet soam meg megid domain1 meg-type icc-based
level 1 ccm-interval 300hz vlan 4084
BTI-SA-821(config-soam)# mep mepid 1001 interface eth-0-2 direction
down
BTI-SA-821(config-soam)# mep mepid 2001 interface eth-0-1 direction
down
BTI-SA-821(config-soam)# rmep rmepid 1000 mepid 1001 remote-mac
0014.d060.010a
BTI-SA-821(config-soam)# rmep rmepid 2000 mepid 2001 remote-mac
0014.d060.010a
BTI-SA-821(config-soam)# continuity-check enable mepid 1001
BTI-SA-821(config-soam)# continuity-check enable mepid 2001
BTI-SA-821(config-soam)# exit
BTI-SA-821(config)# ethernet soam enable
BTI-SA-821(config)# end
```

**Step 7** At node BTI SA-821-1, provision the ERPS ring.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# g8032 ring-id 1 east-interface eth-0-1 west-
interface eth-0-2
BTI-SA-821(config-switch)# raps vlan 4084
BTI-SA-821(config-switch)# raps mel 2
BTI-SA-821(config-switch)# rpl-node owner
BTI-SA-821(config-switch)# rpl east-interface
BTI-SA-821(config-switch)# traffic-channel 1
BTI-SA-821(config-switch)# timer wait-to-restore 1
BTI-SA-821(config-switch)# eastmp mepid 1000 megid domain1
BTI-SA-821(config-switch)# westmp mepid 2000 megid domain1
BTI-SA-821(config-switch)# ring enable
BTI-SA-821(config-switch)# end
```

**Step 8** At node BTI SA-821-2, provision the ERPS ring. Do not just repeat the previous provisioning steps; they are slightly different for node BTI SA-821-1.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# g8032 ring-id 1 east-interface eth-0-1 west-
interface eth-0-2
BTI-SA-821(config-switch)# raps vlan 4084
BTI-SA-821(config-switch)# raps mel 2
BTI-SA-821(config-switch)# rpl-node neighbor
BTI-SA-821(config-switch)# rpl west-interface
BTI-SA-821(config-switch)# traffic-channel 1
BTI-SA-821(config-switch)# eastmp mepid 2001 megid domain1
BTI-SA-821(config-switch)# westmp mepid 1001 megid domain1
BTI-SA-821(config-switch)# ring enable
BTI-SA-821(config-switch)# end
```

**Step 9** At node BTI SA-821-1 , enable the two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
BTI-SA-821(config)# interface eth-0-2
BTI-SA-821(config-if)# no shutdown
```

**Step 10** At node BTI SA-821-2 , enable the two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
BTI-SA-821(config)# interface eth-0-2
BTI-SA-821(config-if)# no shutdown
```

**Step 11** If not already done, enable the RPL interface.

**Note** In these examples, the RPL interface was already enabled in a previous step.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# end
```

### 7.3.3 Configuring G.8032 ERPS Between BTI SA-821 and SA-810 Nodes Using Linkscan

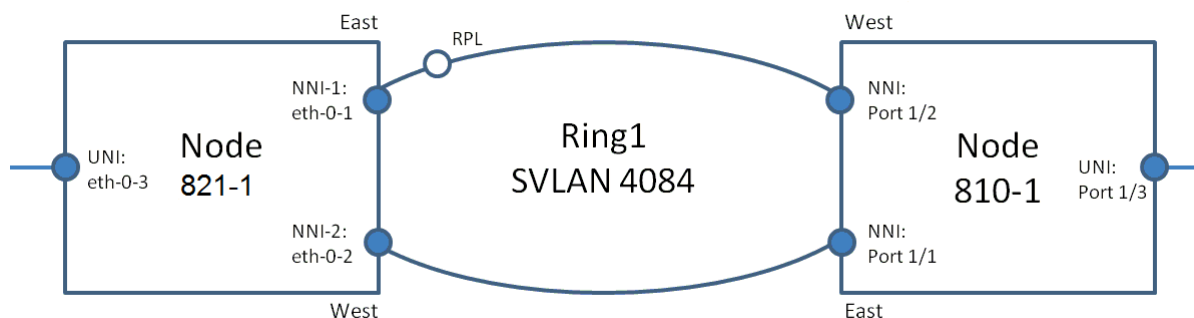
Use this procedure to configure G.8032 ERPS between BTI SA-821 and SA-810 nodes using Linkscan.

#### Prerequisites

- Before ERPS is provisioned, no loop prevention mechanism should be operating on the network; therefore, the network operator must manually prevent the loop. This is typically performed by administratively disabling the designated RPL (ring protection link) interface in the ring. The nodes may be fibered in a closed loop, but it is imperative that one port be disabled if a loop is to be prevented.

In the steps and examples below, the BTI SA-821 node is designated BTI SA-821-1 and the SA-810 node is designated SA-810-1 as shown in the following example topology:

**Figure 7-3 Example Topology for ERPS Ring between BTI SA-821 and SA-810 Nodes**



**Step 1** At node BTI SA-821-1, disable the RPL (ring protection link) interface.

**Note** In these examples, the RPL interface is shown as part of node BTI SA-821-1. In rings with more nodes, the RPL interface could be part of another node.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# shutdown
BTI-SA-821(config-if)# end
```

**Step 2** At node BTI SA-821-1, provision a VLAN.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# vlan database
BTI-SA-821(config-vlan)# vlan 4084,100
BTI-SA-821(config-vlan)# end
```



**Step 3** At node 810-1, provision the same VLAN provisioned at node BTI SA-821.

For example:

```
BTI-SA-810# configure vlan add 4084,100
```

**Step 4** At node BTI SA-821-1 , provision two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet nni add NNI-1
BTI-SA-821(config-nni)# map interface eth-0-1
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# exit
BTI-SA-821(config)# ethernet nni add NNI-2
BTI-SA-821(config-nni)# map interface eth-0-2
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# end
```

**Step 5** At node SA-810, provision two NNI ports identical to those provisioned at node BTI SA-821-1.

**Note** Setting the interface to NNI sets the TPID to 0x88a8.

For example:

```
BTI-SA-810# configure interface 1/1 network nni
BTI-SA-810# configure interface 1/1 mtu 9600
BTI-SA-810# configure interface 1/2 network nni
BTI-SA-810# configure interface 1/2 mtu 9600
```

**Step 6** At node BTI SA-821-1 , provision an EVC service for ERPS.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet evc add Ring1
BTI-SA-821(config-evc)# service type control-channel
BTI-SA-821(config-evc)# svlan 4084
BTI-SA-821(config-evc)# add nni NNI-1
BTI-SA-821(config-evc)# add nni NNI-2
BTI-SA-821(config-evc)# end
```

**Step 7** At node SA-810, provision an EVC service identical to the EVC service provisioned at node BTI SA-821.

For example:

```
BTI-SA-810# configure evc add Ring1
```

```
BTI-SA-810# configure evc Ring1 svlan 4084
BTI-SA-810# configure nni 1/1-1/2 add svlan 4084
```

**Step 8** At node BTI SA-821-1 , provision the ERPS ring.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# g8032 ring-id 1 east-interface eth-0-1 west-
interface eth-0-2
BTI-SA-821(config-switch)# raps vlan 4084
BTI-SA-821(config-switch)# raps mel 1
BTI-SA-821(config-switch)# rpl-node owner
BTI-SA-821(config-switch)# rpl east-interface
BTI-SA-821(config-switch)# traffic-channel 1
BTI-SA-821(config-switch)# timer wait-to-restore 1
BTI-SA-821(config-switch)# ring enable
BTI-SA-821(config-switch)# end
```

**Step 9** At node SA-810, provision the ERPS ring.

For example:

```
BTI-SA-810# configure erp 1 rpl-node neighbor
BTI-SA-810# configure erp 1 rpl west
BTI-SA-810# configure erp 1 raps vlan 4084
BTI-SA-810# configure erp 1 raps mel 1
BTI-SA-810# configure erp 1 east interface 1/1
BTI-SA-810# configure erp 1 west interface 1/2
BTI-SA-810# configure erp 1 start
```

**Step 10** At node BTI SA-821-1, enable the two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
BTI-SA-821(config)# interface eth-0-2
BTI-SA-821(config-if)# no shutdown
```

**Step 11** At node SA-810, enable the two NNI ports.

For example:

```
BTI-SA-810# configure interface 1/1 enable
BTI-SA-810# configure interface 1/2 enable
```

**Step 12** If not already done, enable the RPL interface.

**Note** In these examples, the RPL interface was already enabled in a previous step.

For example:

```

BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# end

```

### Related tasks

Task	Commands
Disabling ERP	configure erp disable
Displaying the ERP statistics	show erp <erp ring instance> statistics

## 7.3.4 Configuring G.8032 ERPS Between BTI SA-821 and SA-810 Nodes Using Y.1731

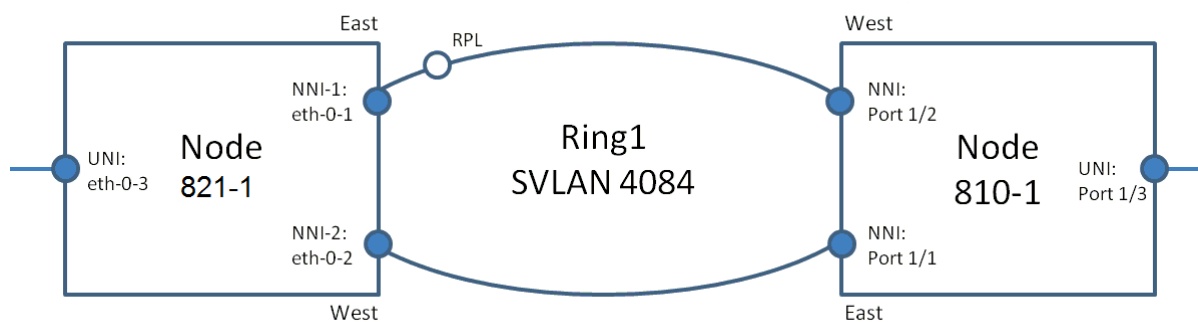
Use this procedure to configure G.8032 ERPS between BTI SA-821 and SA-810 nodes using Y.1731.

### Prerequisites

- Before ERPS is provisioned, no loop prevention mechanism should be operating on the network; therefore, the network operator must manually prevent the loop. This is typically performed by administratively disabling the designated RPL (ring protection link) interface in the ring. The nodes may be fibered in a closed loop, but it is imperative that one port be disabled if a loop is to be prevented.

In the steps and examples below, the BTI SA-821 node is designated BTI SA-821-1, and the SA-810 node is designated SA-810-1 as shown in the following example topology:

**Figure 7-4 Example Topology for ERPS Ring between BTI SA-821 and SA-810 Nodes**



**Step 1** At node BTI SA-821-1, disable the RPL (ring protection link) interface.

**Note** In these examples, the RPL interface is shown as part of node BTI SA-821-1. In rings with more nodes, the RPL interface could be part of another node.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# shutdown
BTI-SA-821(config-if)# end
```

**Step 2** At node BTI SA-821-1, provision a VLAN.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# vlan database
BTI-SA-821(config-vlan)# vlan 4084,100
BTI-SA-821(config-vlan)# end
```

**Step 3** At node SA-810, provision the same VLAN provisioned at node BTI SA-821-1.

For example:

```
BTI-SA-810# configure vlan add 4084,100
```

**Step 4** At node BTI SA-821-1, provision two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet nni add NNI-1
BTI-SA-821(config-nni)# map interface eth-0-1
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# exit
BTI-SA-821(config)# ethernet nni add NNI-2
BTI-SA-821(config-nni)# map interface eth-0-2
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# end
```

**Step 5** At node SA-810, provision two NNI ports identical to those provisioned at node BTI SA-821 .

**Note** Setting the interface to NNI sets the TPID to 0x88a8.

For example:

```
BTI-SA-810# configure interface 1/1 network nni
BTI-SA-810# configure interface 1/1 mtu 9600
BTI-SA-810# configure interface 1/2 network nni
BTI-SA-810# configure interface 1/2 mtu 9600
```

**Step 6** At node BTI SA-821-1, provision an EVC service for ERPS.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet evc add Ring1
BTI-SA-821(config-evc)# service type control-channel
BTI-SA-821(config-evc)# svlan 4084
BTI-SA-821(config-evc)# add nni NNI-1
BTI-SA-821(config-evc)# add nni NNI-2
BTI-SA-821(config-evc)# end
```

- Step 7** At node SA-810, provision an EVC service identical to the EVC service provisioned at node BTI SA-821.

For example:

```
BTI-SA-810# configure evc add Ring1
BTI-SA-810# configure evc Ring1 svlan 4084
BTI-SA-810# configure nni 1/1-1/2 add svlan 4084
```

- Step 8** At node BTI SA-821-1, provision the ERPS detection link status.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet soam meg megid domain1 meg-type icc-based
level 1 ccm-interval 300hz vlan 4084
BTI-SA-821(config-soam)# mep mepid 1000 interface eth-0-1 direction
down
BTI-SA-821(config-soam)# mep mepid 2000 interface eth-0-2 direction
down
BTI-SA-821(config-soam)# rmep rmepid 1001 mepid 1000 remote-mac
0014.d060.01a6
BTI-SA-821(config-soam)# rmep rmepid 2001 mepid 2000 remote-mac
0014.d060.01a6
BTI-SA-821(config-soam)# continuity-check enable mepid 1000
BTI-SA-821(config-soam)# continuity-check enable mepid 2000
BTI-SA-821(config-soam)# exit
BTI-SA-821(config)# ethernet soam enable
BTI-SA-821(config)# end
```

- Step 9** At node SA-810, provision the ERPS detection link status.

For example:

```
BTI-SA-810# configure oam domain link1 ccm-interval 3.3ms
BTI-SA-810# configure oam domain link1 outer-vid 4084
BTI-SA-810# configure oam domain link1 level 1
BTI-SA-810# configure oam domain link1 megid domain 1
BTI-SA-810# configure oam domain link1 enable
BTI-SA-810# configure oam localmp local1 interface 1/1
BTI-SA-810# configure oam localmp local1 mepid 2001
BTI-SA-810# configure oam localmp local1 enable
BTI-SA-810# configure oam eth-cc local1 ccm-db add 2000
```

```
BTI-SA-810# configure oam domain link2 ccm-interval 3.3ms
BTI-SA-810# configure oam domain link2 outer-vid 4084
BTI-SA-810# configure oam domain link2 level 1
BTI-SA-810# configure oam domain link2 megid domain 1
BTI-SA-810# configure oam domain link2 enable
BTI-SA-810# configure oam localmp local2 interface 1/2
BTI-SA-810# configure oam localmp local2 mepid 1001
BTI-SA-810# configure oam localmp local2 enable
BTI-SA-810# configure oam eth-cc local2 ccm-db add 1000
```

**Step 10** At node BTI SA-821-1, provision the ERPS ring.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# g8032 ring-id 1 east-interface eth-0-1 west-
interface eth-0-2
BTI-SA-821(config-switch)# raps vlan 4084
BTI-SA-821(config-switch)# raps mel 2
BTI-SA-821(config-switch)# rpl-node owner
BTI-SA-821(config-switch)# rpl east-interface
BTI-SA-821(config-switch)# traffic-channel 1
BTI-SA-821(config-switch)# timer wait-to-restore 1
BTI-SA-821(config-switch)# eastmp mepid 1000 megid domain1
BTI-SA-821(config-switch)# westmp mepid 2000 megid domain1
BTI-SA-821(config-switch)# ring enable
BTI-SA-821(config-switch)# end
```

**Step 11** At node SA-810, provision the ERPS ring.

For example:

```
BTI-SA-810# configure erp 1 rpl-node neighbor
BTI-SA-810# configure erp 1 rpl west
BTI-SA-810# configure erp 1 raps vlan 4084
BTI-SA-810# configure erp 1 raps mel 2
BTI-SA-810# configure erp 1 east interface 1/1
BTI-SA-810# configure erp 1 west interface 1/2
BTI-SA-810# configure erp 1 east mp local1
BTI-SA-810# configure erp 1 west mp local2
BTI-SA-810# configure erp 1 start
```

**Step 12** At node BTI SA-821-1, enable the two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
BTI-SA-821(config)# interface eth-0-2
BTI-SA-821(config-if)# no shutdown
```

**Step 13** At node SA-810, enable the two NNI ports.

For example:

```
BTI-SA-810# configure interface 1/1 enable
BTI-SA-810# configure interface 1/2 enable
```

**Step 14** If not already done, enable the RPL interface.

**Note** In these examples, the RPL interface was already enabled in a previous step.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# end
```

### 7.3.5 Configuring G.8032 ERPS Between BTI SA-821 and PVX Nodes Using Linkscan

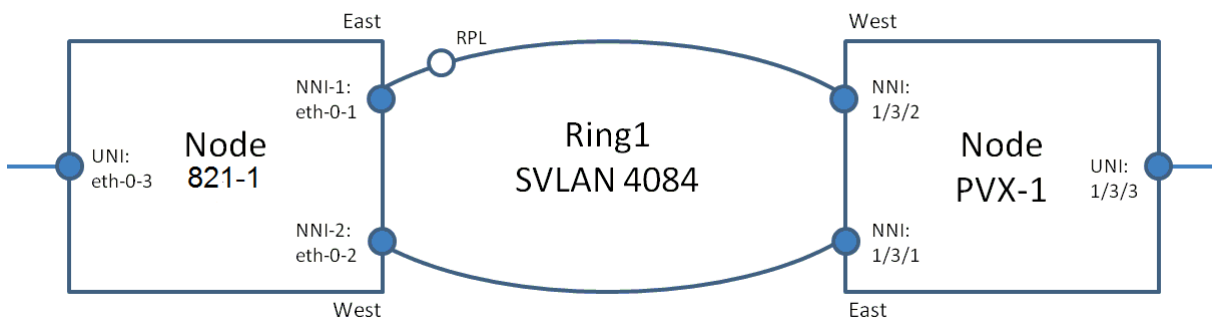
Use this procedure to configure G.8032 ERPS between BTI SA-821 and PVX nodes using Linkscan. The PVX refers to the packetVX, a component of the BTI 7000 Series.

#### Prerequisites

- Before ERPS is provisioned, no loop prevention mechanism should be operating on the network; therefore, the network operator must manually prevent the loop. This is typically performed by administratively disabling the designated RPL (ring protection link) interface in the ring. The nodes may be fibered in a closed loop, but it is imperative that one port be disabled if a loop is to be prevented.

In the steps and examples below, the BTI SA-821 node is designated BTI SA-821-1 and the PVX node is designated PVX-1 as shown in the following example topology:

**Figure 7-5 Example Topology for ERPS Ring between BTI SA-821 and PVX Nodes**



**Step 1** At node BTI SA-821-1, disable the RPL (ring protection link) interface.

**Note** In these examples, the RPL interface is shown as part of node BTI SA-821-1. In rings with more nodes, the RPL interface could be part of another node.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# shutdown
BTI-SA-821(config-if)# end
```

**Step 2** At node BTI SA-821-1, provision a VLAN.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# vlan database
BTI-SA-821(config-vlan)# vlan 4084,100
BTI-SA-821(config-vlan)# end
```

**Step 3** At node PVX-1, provision the same VLAN provisioned at node BTI SA-821-1.

For example:

```
BTI7000# configure terminal
BTI7000(config)# equipment 1/3 pec [insert partnumber]
BTI7000(config)# exit
BTI7000(config)# virtual-switch 1 name PVX-1
BTI7000(config)# bridge mode provider
BTI7000(config)# member 1/3
BTI7000(config)# exit
```

**Step 4** At node BTI SA-821-1, provision two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet nni add NNI-1
BTI-SA-821(config-nni)# map interface eth-0-1
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# exit
BTI-SA-821(config)# ethernet nni add NNI-2
BTI-SA-821(config-nni)# map interface eth-0-2
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# end
```

**Step 5** At node PVX-1, provision two NNI ports identical to those provisioned at node BTI SA-821-1.

**Note** Ports default to enabled.

For example:



```
BTI7000(config)# virtual-switch 1
BTI7000(config)# configure terminal
BTI7000(config)# nni gigabitEthernet 1/3/1
BTI7000(config-nni-GigE1/3/1)# exit
BTI7000(config)# nni gigabitEthernet 1/3/2
BTI7000(config-nni-GigE1/3/2)# exit
```

**Step 6** At node BTI SA-821-1, provision an EVC service for ERPS.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet evc add Ring1
BTI-SA-821(config-evc)# service type control-channel
BTI-SA-821(config-evc)# svlan 4084
BTI-SA-821(config-evc)# add nni NNI-1
BTI-SA-821(config-evc)# add nni NNI-2
BTI-SA-821(config-evc)# end
```

**Step 7** At node BTI SA-821-1, provision the ERPS ring.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# g8032 ring-id 1 east-interface eth-0-1 west-
interface eth-0-2
BTI-SA-821(config-switch)# raps vlan 4084
BTI-SA-821(config-switch)# raps mel 1
BTI-SA-821(config-switch)# rpl-node owner
BTI-SA-821(config-switch)# rpl east-interface
BTI-SA-821(config-switch)# traffic-channel 1
BTI-SA-821(config-switch)# timer wait-to-restore 1
BTI-SA-821(config-switch)# ring enable
BTI-SA-821(config-switch)# end
```

**Step 8** At node PVX-1, provision the ERPS ring.

For example:

```
BTI7000(config)# virtual-switch 1
BTI7000(config)# configure terminal
BTI7000(config e-service)# eservice Ring1 type ERPS
BTI7000(config e-service)# s-vlan 4084
BTI7000(config e-service)# meglevel-up 3
BTI7000(config e-service)# meglevel-down 1
BTI7000(config e-service)# wait-to-restore-timer short
BTI7000(config e-service)# nni gigabitEthernet 1/3/1
BTI7000(config-nni-eservice)# neighbor enable
BTI7000(config-nni-eservice)# ccm disable
BTI7000(config-nni-eservice)# exit
BTI7000(config e-service)# nni gigabitEthernet 1/3/2
BTI7000(config-nni-eservice)# neighbor enable
```

```
BTI7000(config-nni-eservice)# ccm disable
BTI7000(config-nni-eservice)# exit
BTI7000(config-eservice)# no shut
```

**Step 9** At node BTI SA-821-1, enable the two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
BTI-SA-821(config)# interface eth-0-2
BTI-SA-821(config-if)# no shutdown
```

**Step 10** If not already done, enable the RPL interface.

**Note** In these examples, the RPL interface was already enabled in a previous step.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# end
```

---

## 7.4 Configuring Ethernet Protection Switching (G.8031)

---

Ethernet Protection Switching (EPS) provides linear protection switching on a per-VLAN basis for a point-to-point Ethernet path.

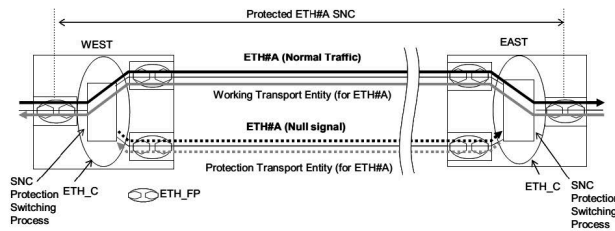
### 7.4.1 G.8031 Overview

Ethernet Protection Switching (EPS) is applicable to Point-to-Point VLAN-based Ethernet Subnetwork Connections (SNC) that provide connectivity between two Ethernet flow points in a flow domain. VLAN IDs (VIDs) are used to identify Point-to-Point VLAN-based Ethernet SNCs in Ethernet links.

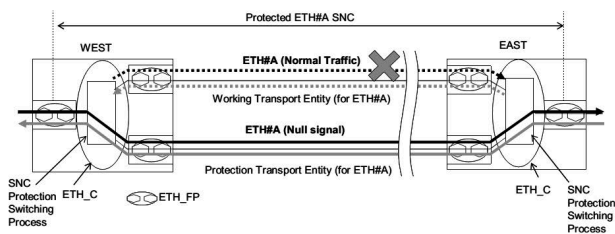
- One hundred percent of the impaired traffic in a protected domain is protected from a failure on a single working entity.
- Periodic monitoring of the Ethernet layer connectivity of the working transport entity and the protection transport entity is managed by the Connectivity Check Messaging (CCM) procedures defined in ITU-T Y.1731.
- Network operator options include revertive and non-revertive switching.
- Mismatches between the bridge or selector positions of the near end and the far end are detected and reported.
- Bridge/selector mismatches for the local network element are detected and reported, and can be cleared by the operator.
- Lockout of Protection (LoP), force switch and manual switch commands and other operator requests are supported.
- Prioritized protection between Signal Fail (SF) and operator requests is supported.
- A provisionable, generic hold-off function is available to delay the beginning of protection-switching actions.
- Protection switching is agnostic to the monitoring method used, as long as it can receive OK or SF information for the transport entity of each point-to-point linear Ethernet link.
- Both software-based and hardware-assisted working and protection path switching are supported.
- Transfer time is less than 50 ms when hardware-assisted APS is supported on the target platform.

### 7.4.2 1:1 Bidirectional Protection Switching

The following illustrates the 1:1 linear protection switching architecture, with the normal traffic (ETH#A) being transmitted via the working transport entity.

**Figure 7-6 Protection Switching Architecture**

The figure below illustrates a situation where a protection switch has occurred due to a signal fail condition on the working transport entity.

**Figure 7-7 Protection Switching Architecture—Signal fail condition for working transport entity**

- At the source node, the normal traffic (ETH#A) is forwarded to the protection transport entity.
- At the sink node, the normal traffic (ETH#A) is received from the protection transport entity.
- During the protection switching operation, transient mismatch between bridge/selector positions at both ends of the protected domain is possible.

However, misconnection between ETH\_CI for ETH#A and other ETH\_CI is not possible because traffic is always forwarded correctly through the ETH\_C, based on the VID. Note that in order to achieve this forwarding behaviour, different VIDs must be configured on the protection transport entity for the protected ETH#A and the non-protected ETH traffic.

The forwarding of traffic according to the VID in the ETH\_C function means that, for 1:1 architectures, traffic misconnections are never possible. This greatly simplifies the functionality of the protection switching protocol, enabling a 1-phase protocol to be used, with only a single information exchange being required between both ends to complete a bidirectional switching.

### 7.4.3 Preparation for Configuring G.8031

To enable G.8031 the following steps are required:

- **Create OAM domain for CCM:** Periodic monitoring of the Ethernet layer connectivity of the working transport entity and the protection transport entity is managed by the Connectivity Check Messaging (CCM) procedures. G.8031 uses CCM in its protection scheme, so CCM should be enabled before provisioning G.8031.
- **Create Traffic-channel:** A VLAN protection group should be enabled before provisioning G.8031.

## 7.4.4 Example Scenarios

Operation examples of 1-phase APS protocol (revertive, non-revertive, signal fail and forced switched) are described below:

### Revertive Mode

The following sequence of events occurs in revertive mode:

- The protected domain is operating without any defect (working entity is selected).
- Signal fail (SF) occurs in the west-to-east direction (switches to protection entity).
- This defect is repaired (enters WTR state, maintains to select protection entity).
- WTR timer expires (switches to working entity).

### Non-revertive Mode

The following sequence of events occurs in non-revertive mode:

- The protected domain is operating without any defect (working entity is selected).
- Signal fail (SF) occurs in the west-to-east direction (switches to protection entity).
- This defect is repaired (enters DNR state, maintains to select protection entity).

### Signal fail and forced switch

The following sequence of events occurs in :

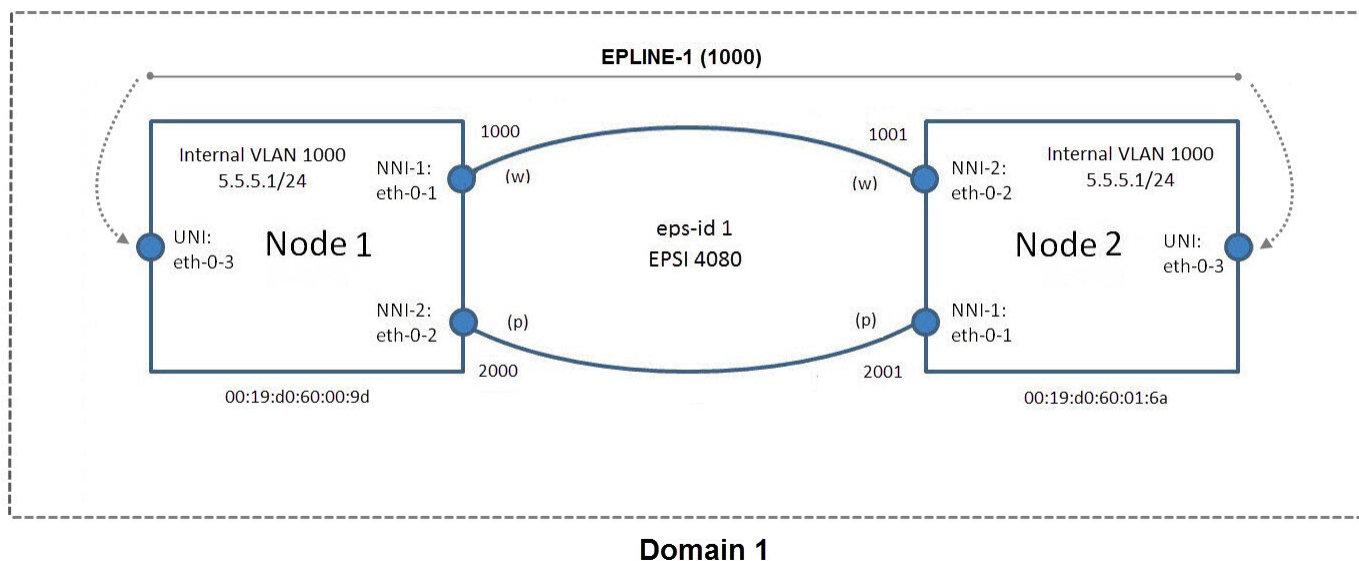
- Signal fail (SF) occurs in the west-to-east direction (switches to protection entity).
- Forced switch (FS) command is accepted at east (enters FS state).
- FS is cleared at east and SF is reasserted at east.

## 7.4.5 Configuring G.8031 Ethernet Linear Protection Switching Between Two BTI SA-821 Nodes Using Y.1731

Use this procedure to configure G.8031 protection between two BTI SA-821 nodes using Y.1731.

### Prerequisites

In the steps and examples below, the two BTI SA-821 nodes are designated Node 1 and Node 2 as shown in the following example topology:

**Figure 7-8 Example Topology for G.8031 Protection Between Two BTI SA-821 Nodes**

**Step 1** At Node 1, configure the vlan for the EPLINE, and for the svlan.

**Note** This example uses vlan 1000 and vlan 4080. Adjust the commands in the examples according to your configuration.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# vlan database
BTI-SA-821(config)# vlan 4080 name EPS1
BTI-SA-821(config)# vlan 1000 name EPLINE)1
BTI-SA-821(config)# end
```

**Step 2** At Node 1, configure the two ports you will use.

**Note** This example uses port 1 and port 2. Adjust the commands in the examples according to the ports you use.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet nni add NNI-1
BTI-SA-821(config-nni)# map interface eth-0-1
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# exit
BTI-SA-821(config)# ethernet nni add NNI-2
BTI-SA-821(config-nni)# map interface eth-0-2
BTI-SA-821(config-nni)# tpid 88a8
```

```
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# end
```

**Step 3** At Node 1, configure EVC for G.8031

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet evc add EPS1
BTI-SA-821(config-evc)# service type control-channel
BTI-SA-821(config-evc)# svlan 4080
BTI-SA-821(config-evc)# add nni NNI-1
BTI-SA-821(config-evc)# add nni NNI-2
BTI-SA-821(config)# end
```

**Step 4** At Node 1 , configure SOAM/Y.1731.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet soam enable
BTI-SA-821(config)# ethernet soam meg megid domain1 meg-type icc-based
level 1 ccm-interval 300hz vlan 4080
BTI-SA-821(config-soam-ma)# mep mepid 1000 interface eth-0-1 direction
down
BTI-SA-821(config-soam-ma)# mep mepid 2000 interface eth-0-2 direction
down
BTI-SA-821(config-soam-ma)# continuity-check rmep-learning enable
BTI-SA-821(config-soam-ma)# exit
```

**Step 5** At Node 1, configure G.8031 instance

For example:

```
BTI-SA-821(config)# g8031 eps-id 1 working-port eth-0-1 protection-
port eth-0-2
BTI-SA-821(g8031-config-switch)# mode revertive
BTI-SA-821(g8031-config-switch)# timer wait-to-restore 5
BTI-SA-821(g8031-config-switch)# working-path mepid 1000 megid domain1
BTI-SA-821(g8031-config-switch)# protection-path mepid 2000 megid
domain1
BTI-SA-821(g8031-config-switch)# traffic-channel 1
BTI-SA-821(g8031-config-switch)# eps enable
BTI-SA-821(g8031-config-switch)# end
```

**Step 6** At Node 1 , enable the two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# speed 1000
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
BTI-SA-821(config)# interface eth-0-2
```

```
BTI-SA-821(config-if)# speed 1000
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
```

**Step 7** At Node 1, configure a UNI for the EPLINE service.

For example:

```
BTI-SA-821(config)# ethernet uni add UNI-1
BTI-SA-821(config-uni)# map interface eth-0-3
BTI-SA-821(config-uni)# mtu 1522
BTI-SA-821(config-uni)# all-to-one-bundling enable
BTI-SA-821(config-uni)# multiplex disable
BTI-SA-821(config-uni)# bundling disable
BTI-SA-821(config-uni)# exit
```

**Step 8** At Node 1, configure an EVC for the EPLINE service.

For example:

```
BTI-SA-821(config)# ethernet evc add EPLINE_1
BTI-SA-821(config-evc)# service type epline
BTI-SA-821(config-evc)# svlan 1000
BTI-SA-821(config-evc)# add nni NNI-1
BTI-SA-821(config-evc)# add nni NNI-2
BTI-SA-821(config-evc)# add uni UNI-1
BTI-SA-821(config-evc)# end
```

**Step 9** At Node 1, create an interface VLAN for IPLINE\_1 to test path.

For example:

```
BTI-SA-821(config)# interface vlan 1
BTI-SA-821(config-if)# no ip address
BTI-SA-821(config-if)# interface vlan 1000
BTI-SA-821(config-if)# ip address 1.1.1.1/24
BTI-SA-821(config-if)# end
```

**Step 10** At Node 1, save the configuration.

For example:

```
BTI-SA-821# wr mem
```

**Step 11** At Node 2, configure the vlan for the EPLINE, and for the svlan.

<b>Note</b>	This example uses vlan 1000 and vlan 4080. Adjust the commands in the examples according to your configuration.
-------------	---

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# vlan database
BTI-SA-821(config)# vlan 4080 name EPS1
BTI-SA-821(config)# vlan 1000 name EPLINE)1
BTI-SA-821(config)# end
```



**Step 12** At Node 2, configure the two ports you will use.

**Note** This example uses port 1 and port 2. Adjust the commands in the examples according to the ports you use.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet nni add NNI-1
BTI-SA-821(config-nni)# map interface eth-0-1
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# exit
BTI-SA-821(config)# ethernet nni add NNI-2
BTI-SA-821(config-nni)# map interface eth-0-2
BTI-SA-821(config-nni)# tpid 88a8
BTI-SA-821(config-nni)# mtu 9600
BTI-SA-821(config-nni)# end
```

**Step 13** At Node 2, configure EVC for G.8031

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet evc add EPS1
BTI-SA-821(config-evc)# service type control-channel
BTI-SA-821(config-evc)# svlan 4080
BTI-SA-821(config-evc)# add nni NNI-1
BTI-SA-821(config-evc)# add nni NNI-2
BTI-SA-821(config)# end
```

**Step 14** At Node 2, configure SOAM/Y.1731.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# ethernet soam enable
BTI-SA-821(config)# ethernet soam megid domain1 meg-type icc-based
level 1 ccm-interval 300hz vlan 4080
BTI-SA-821(config-soam-ma)# mep mepid 1001 interface eth-0-2 direction
down
BTI-SA-821(config-soam-ma)# mep mepid 2001 interface eth-0-1 direction
down
BTI-SA-821(config-soam-ma)# continuity-check rmep-learning enable
BTI-SA-821(config-soam-ma)# exit
```

**Step 15** At Node 2, configure G.8031 instance

For example:

```
BTI-SA-821(config)# g8031 eps-id 1 working-port eth-0-2 protection-
port eth-0-1
BTI-SA-821(g8031-config-switch)# mode revertive
BTI-SA-821(g8031-config-switch)# timer wait-to-restore 5
BTI-SA-821(g8031-config-switch)# working-path mepid 1001 megid domain1
```

```
BTI-SA-821(g8031-config-switch)# protection-path mepid 2001 megid
domain1
BTI-SA-821(g8031-config-switch)# traffic-channel 1
BTI-SA-821(g8031-config-switch)# eps enable
BTI-SA-821(g8031-config-switch)# end
```

**Step 16** At Node 2 , enable the two NNI ports.

For example:

```
BTI-SA-821# configure terminal
BTI-SA-821(config)# interface eth-0-1
BTI-SA-821(config-if)# speed 1000
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
BTI-SA-821(config)# interface eth-0-2
BTI-SA-821(config-if)# speed 1000
BTI-SA-821(config-if)# no shutdown
BTI-SA-821(config-if)# exit
```

**Step 17** At Node 2, configure a UNI for the EPLINE service.

For example:

```
BTI-SA-821(config)# ethernet uni add UNI-1
BTI-SA-821(config-uni)# map interface eth-0-3
BTI-SA-821(config-uni)# mtu 1522
BTI-SA-821(config-uni)# all-to-one-bundling enable
BTI-SA-821(config-uni)# multiplex disable
BTI-SA-821(config-uni)# bundling disable
BTI-SA-821(config-uni)# exit
```

**Step 18** At Node 2, configure an EVC for the EPLINE service.

For example:

```
BTI-SA-821(config)# ethernet evc add EPLINE_1
BTI-SA-821(config-evc)# service type epline
BTI-SA-821(config-evc)# svlan 1000
BTI-SA-821(config-evc)# add nni NNI-1
BTI-SA-821(config-evc)# add nni NNI-2
BTI-SA-821(config-evc)# add uni UNI-1
BTI-SA-821(config-evc)# end
```

**Step 19** At Node 2, create an interface VLAN for IPLINE\_1 to test path.

For example:

```
BTI-SA-821(config)# interface vlan 1
BTI-SA-821(config-if)# no ip address
BTI-SA-821(config-if)# interface vlan 1000
BTI-SA-821(config-if)# ip address 1.1.1.2/24
BTI-SA-821(config-if)# end
```

**Step 20** At Node 2, save the configuration.

For example:

```
BTI-SA-821# wr mem
```

**Step 21** At Node 2, test path by pinging the UNI at the far end.

For example:

```
BTI-SA-821# ping 1.1.1.1
```

**Step 22** At Node 1, test path by pinging the UNI at the far end.

For example:

```
BTI-SA-821# ping 1.1.1.1
```

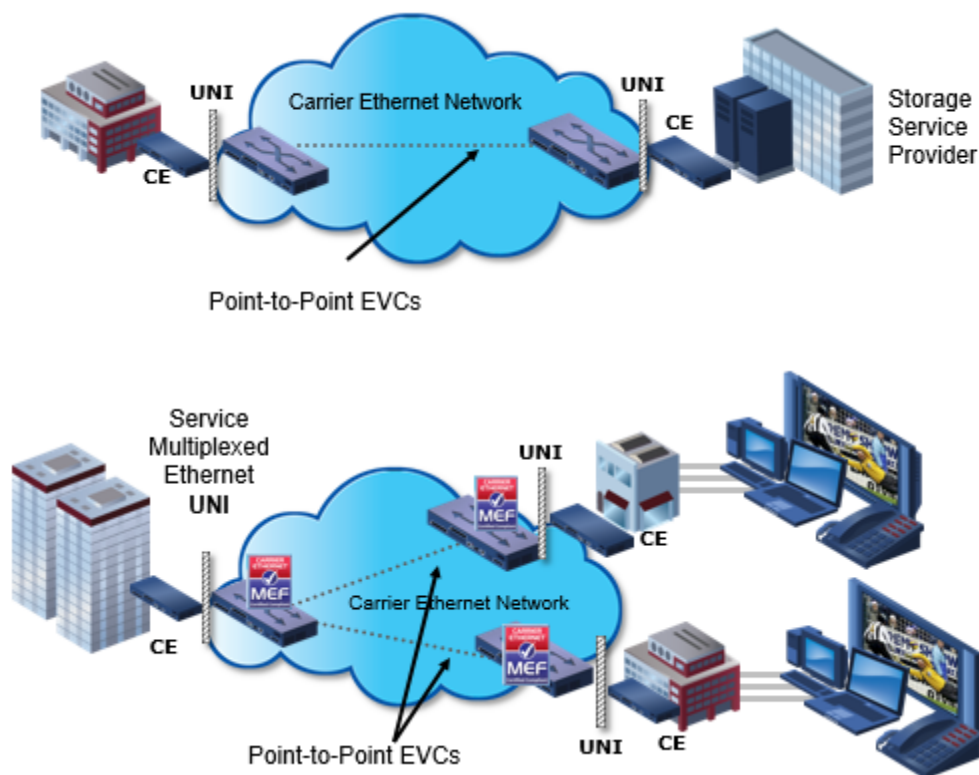
## 7.5 Provisioning MEF E-Service

Ethernet Service Types can be used to create a broad range of services. Each Ethernet Service Type has a set of Ethernet Service Attributes that define the service characteristics. These Ethernet Service Attributes in turn have a set of parameters associated with them that provide various options for the different Service Attributes.

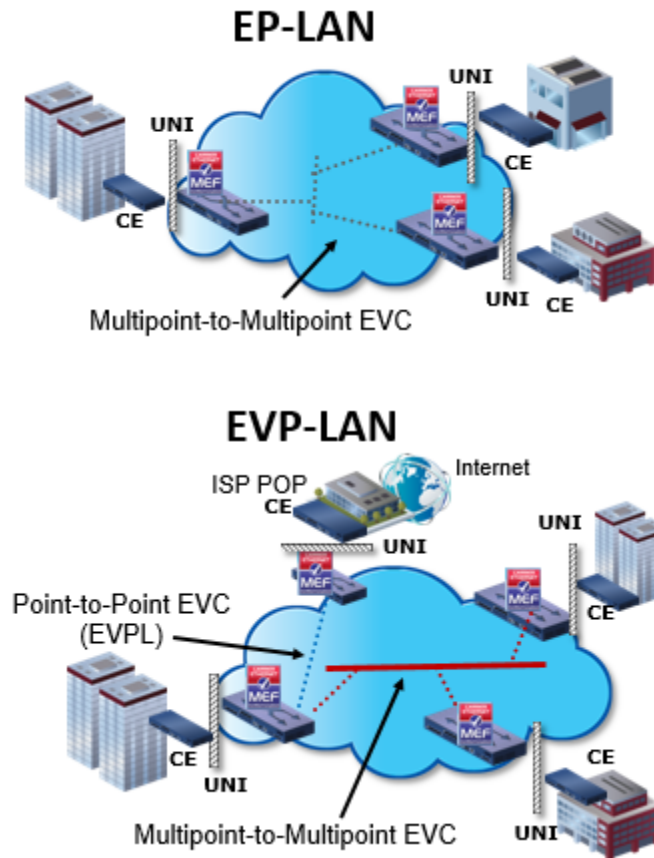
Two Ethernet Service Types have been defined. The first, Ethernet Line Service (E-Line Service), uses a Point-to-Point EVC. The second, Ethernet LAN Service (E-LAN Service), uses a Multipoint-to-Multipoint EVC.

This chapter will detail how to configure the following Ethernet service types

- Ethernet Private Line Service [epline]
- Ethernet Virtual Private Line Service [epvLine]



- Ethernet Private LAN Service [eplan]
- Ethernet Virtual Private LAN Service [evplan]



### Ethernet Virtual Connection (EVC)

A fundamental aspect of Ethernet Services is the Ethernet Virtual Connection (EVC). An EVC is an association of two or more UNIs that limit the exchange of Service Frames to UNIs in the Ethernet Virtual Connection. These UNIs are said to be "in the EVC." A given UNI can support more than one EVC via the Service Multiplexing attribute.

An ingress Service Frame that is mapped to the EVC can be delivered to one or more of the UNIs in the EVC other than the ingress UNI. It **MUST NOT** be delivered back to the ingress UNI. It **MUST NOT** be delivered to a UNI not in the EVC. An EVC is always bi-directional in the sense that ingress Service Frames can originate at any UNI in an EVC.

The EVC ID is an arbitrary string administered by the Service Provider that is used to identify an EVC within the MEN. The EVC ID **MUST** be unique across all EVCs in the MEN. It is intended for management and control purposes. The EVC ID is not carried in any field in the Service Frame.

### All to One Bundling

When a UNI has the All to One Bundling attribute set to TRUE, all CE-VLAN IDs **MUST** map to a single EVC at the UNI. The All to One Bundling service attribute is independent of the EVCs at the UNI. The EVC at the UNI **MUST** have the CE-VLAN ID Preservation Service

Attribute and the list of CE-VLAN IDs mapped to the EVC **MUST** include all CE-VLAN IDs and be the same at each UNI in the EVC. Therefore a UNI with bundling enabled

- Cannot have Service Multiplexing enabled
- All UNIs in the EVC must have the All to One Bundling Service Attribute

To support E-Service as EP-Line, EVP-Line, EP-LAN or EVP-LAN "all-to-one bundling" attribute should be configured properly. In the case of EP-LINE and EP-LAN service the attribute should be set to "enable" and EVP-LINE and EVP-LAN service should be set to "disable".

### **Bundling**

A UNI attribute in which more than one CE-VLAN ID can be associated with an EVC. When a UNI has the Bundling attribute, it **MUST** be configurable so that more than one CE-VLAN ID can map to a particular EVC at the UNI. The Bundling service attribute is independent of the EVCs at the UNI. An EVC with more than one CE-VLAN ID mapping to it **MUST** have the CE-VLAN ID Preservation Service Attribute and the list of CE-VLAN IDs mapped to the EVC **MUST** be the same at each UNI in the EVC. To support EVC with more than one CE-VLAN ID mapping this "bundling" attribute should be configured properly. In case of more than one CE-VLAN ID mapping should be set to "enable" and one CE-VLAN ID mapping should be set to "disable".

### **Service Multiplexing**

A UNI with the Service Multiplexing attribute **must** be configurable to support multiple EVCs. Point-to-Point EVCs and Multipoint EVCs **MAY** be multiplexed in any combination at a UNI. To support E-Service as EP-Line, EVP-Line, EP-LAN or EVP-LAN this "multiplex" attribute should be configured properly. In the case of EP-LINE and EP-LAN service should be set to "disable" and EVP-LINE and EVP-LAN service should be set to "enable".

**CE-VLAN ID Preservation** An EVC attribute in which the CE-VLAN ID of an egress Service Frame is identical in value to the CE-VLAN ID of the corresponding ingress Service Frame.

**CE-VLAN ID/EVC Map** An association of CE-VLAN IDs with EVCs at a UNI

In an EVC with CE-VLAN CoS Preservation, an egress Service Frame resulting from an ingress Service Frame that contains a CE-VLAN CoS **MUST** have the identical CE-VLAN CoS.

**Max-uni attribute** The Maximum Number of UNIs (MNU) service attribute specifies the maximum number of UNIs allowed in a EVC. max-uni <2-512>" To support E-Service as EP-Line, EVP-Line, EP-LAN or EVP-LAN this "multiplex" attribute should be configured properly. In case of EP-Line or EP-LAN, MNE **MUST** be one and EVP-Line or EVP-LAN, MNE **MUST** be two or greater.

Related Commands EVC Configuration ModePossible max-uni values by Service Multiplexing of UNI service type (epline|eplan|evpline|evplan)epline, evpline – 2 eplan, evplan – 2 or greater than 2

**Max-evc attribute** The Maximum Number of EVCs (MNE) service attribute specifies the maximum number of EVCs allowed in the UNI. To support E-Service as EP-Line, EVP-Line, EP-LAN or EVP-LAN this "multiplex" attribute should be configured properly. In case of EP-Line or EP-LAN, MNE **MUST** be one and EVP-Line or EVP-LAN, MNE **MUST** be two or greater.

## 7.5.1 Provisioning MEF E-Service General

This section describes the general provisioning steps required before provisioning the Ethernet EPLINE, EPVLINE, EPLAN and EVPLAN service .

- **Step 1.** Create a VLAN
- **Step 2.**Provision L2CP [optional]
- **Step 3.** Provision BW profile Provision [optional]

**Step 1** Register VLAN to the vlan database.

```
BTI-SA-821(config)# vlan database
BTI-SA-821(config-vlan)# vlan 1000,2000,3000
```

**Step 2** [Optional] Register the L2CP MAC address and create L2CP profile. [Discard this step if L2CP control is not used]

```
BTI-SA-821(config)# l2protocol mac 3 0180.c200.000e
BTI-SA-821(config)# l2protocol mac 4 0180.c200.000b

BTI-SA-821(config)# ethernet l2cp add uni-epl-option1
BTI-SA-821(config-l2cp)# action 3 pass-to-evc
BTI-SA-821(config-l2cp)# action 4 pass-to-evc
BTI-SA-821(config-l2cp)# exit
BTI-SA-821(config)# ethernet l2cp add evc-epl-option1
BTI-SA-821(config-l2cp)# action 4 tunnel
BTI-SA-821(config-l2cp)# end
BTI-SA-821# show ethernet l2cp
```

```
-----
L2CP Type: uni    Name: uni-epl-option1
  Index  PDU Address          MASK                Action
  -----
   3     0180.c200.000e      ffff.ffff.ffff    pass-to-evc
   4     0180.c200.000b      ffff.ffff.ffff    pass-to-evc
  11     stp                 ffff.ffff.ffff    discard
  12     slow-proto          ffff.ffff.ffff    discard
  13     dot1x               ffff.ffff.ffff    discard
  14     cfm                 ffff.ffff.ffff    discard
  -----
```

```
-----
L2CP Type: uni    Name: evc-epl-option1
  Index  PDU Address          MASK                Action
  -----
   3     0180.c200.000e      ffff.ffff.ffff    discard
   4     0180.c200.000b      ffff.ffff.ffff    tunnel
  11     stp                 ffff.ffff.ffff    discard
  12     slow-proto          ffff.ffff.ffff    discard
  13     dot1x               ffff.ffff.ffff    discard
  14     cfm                 ffff.ffff.ffff    discard
  -----
```

**Step 3 CoS Profile creation**

```
BTI-SA-821(config)# ethernet cos add gold-service
BTI-SA-821(config-cos)# add pcp 5-7
BTI-SA-821(config-cos)# exit
BTI-SA-821(config)# ethernet cos add silver-service
BTI-SA-821(config-cos)# add pcp 2-4
BTI-SA-821(config-cos)# exit
BTI-SA-821(config)# ethernet cos add bronz-service
BTI-SA-821(config-cos)# add pcp 0-1
BTI-SA-821(config-cos)# exit
BTI-SA-821(config)# ethernet cos add iron-service
BTI-SA-821(config-cos)# add pcp 1-2
BTI-SA-821(config-cos)# exit
BTI-SA-821(config)# ethernet cos add platinum-service
BTI-SA-821(config-cos)# add pcp 4-5
BTI-SA-821(config-cos)# end
BTI-SA-821# show ethernet cos
```

Index	Identifier	Type	Identifier-List
1	gold-service	pcp	5-7
2	silver-service	pcp	2-4
3	bronz-service	pcp	0-1
4	iron-service	pcp	1-2
5	platinum-service	pcp	4-5

**Step 6. Bandwidth profile creation**

```
BTI-SA-821(config)# ethernet bwp add bwp-uni
BTI-SA-821(config-bwp)# cir 35000 cbs 12176 eir 20000 ebs 12176 color
aware
BTI-SA-821(config-bwp)# exit
BTI-SA-821(config)# ethernet bwp add bwp-evc
BTI-SA-821(config-bwp)# cir 25000 cbs 12176 eir 10000 ebs 12176 color
aware
BTI-SA-821(config-bwp)# exit
BTI-SA-821(config)# ethernet bwp add bwp-cos cos gold-service
BTI-SA-821(config-bwp)# cir 25000 cbs 12176 eir 10000 ebs 12176 color
aware
BTI-SA-821(config-bwp)# exit
BTI-SA-821(config)# ethernet bwp add bwp-cos cos silver-service
BTI-SA-821(config-bwp)# cir 15000 cbs 12176 eir 10000 ebs 12176 color
aware
BTI-SA-821(config-bwp)# exit
BTI-SA-821(config)# ethernet bwp add bwp-cos cos bronz-service
BTI-SA-821(config-bwp)# cir 5000 cbs 12176 eir 5000 ebs 12176 color
aware
BTI-SA-821(config-bwp)# end
BTI-SA-821# show ethernet bwp
```

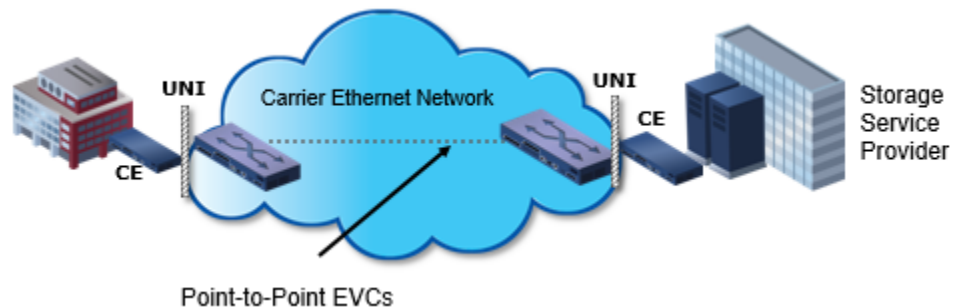
```
-----
Group: 0001, Name: bwp-uni
-- cir----- cbs----- eir----- ebs----- c f CoS-----
```



1	35000	12176	20000	12176	A	N	
-----							
Group: 0002, Name: bwp-evc							
--	cir-----	cbs-----	eir-----	ebs-----	c	f	CoS-----
1	25000	12176	10000	12176	A	N	
-----							
Group: 0003, Name: bwp-cos							
--	cir-----	cbs-----	eir-----	ebs-----	c	f	CoS-----
1	25000	12176	10000	12176	A	N	gold-service
2	15000	12176	10000	12176	A	N	silver-service
3	5000	12176	5000	12176	A	N	bronz-service
-----							

## 7.5.2 Provisioning Ethernet Private Line (EPL) Service

This section describes the steps required to create a Ethernet Private Line (EPL) Service.



### Step 1 EVC Creation

```
BTI-SA-821(config)# ethernet evc add EPLINE-TEST1
BTI-SA-821(config-evc)# service type epline
BTI-SA-821(config-evc)# svlan 1000
BTI-SA-821(config-evc)# end
BTI-SA-821# show ethernet evc
```

```
-----
EVC EPLINE-TEST1:
Service Type           : epline
EVC Type               : None
Outer SVLAN ID         : 100
CE-VLAN Preservation   : Yes
CoS Preservation       : Yes
Maximum Number of UNI  : 2
Number of UNI using this EVC : 0
MEG Level              : 0
-----
```

### Step 2 NNI creation and make association with Interface and EVC

```
BTI-SA-821(config)# ethernet nni add nn1
BTI-SA-821(config-nni)# map interface eth-0-3
```

```

BTI-SA-821(config-nni)# add evc EPLINE-TEST1
BTI-SA-821(config-nni)# end
BTI-SA-821# show ethernet nni
-----
NNI nn1:
Mapped Interface           : eth-0-3
Maximum Number of VC      : 400
Number of using this NNI  : 1
EVC List -----
EPLINE-TEST1,
-----

```

### Step 3 UNI creation and make association with Interface and EVC.

```

BTI-SA-821(config)# ethernet uni add uni1
BTI-SA-821(config-uni)# map interface eth-0-1
BTI-SA-821(config-uni)# add evc EPLINE-TEST1
BTI-SA-821(config-uni)# end
BTI-SA-821# show ethernet uni
-----
UNI uni1:
Mapped Interface           : eth-0-1
Default CVLANID           : 0
Default SVLAN Priority     : 0
All-to-One Bundling       : Yes
Bundling                   : No
Service Multiplexing       : No
Maximum Number of EVC     : 1
Number of EVC using this UNI : 1
EVC List
EPLINE-TEST1,
-----
BTI-SA-821# show ethernet epu
-----
E-Service uni1-EPLINE-TEST1:
CE-VLAN map : All to One Bundling
-----

```

### Step 4 Ensure All-to-One Bundling, Bundling and Service multiplexing are configured correctly.

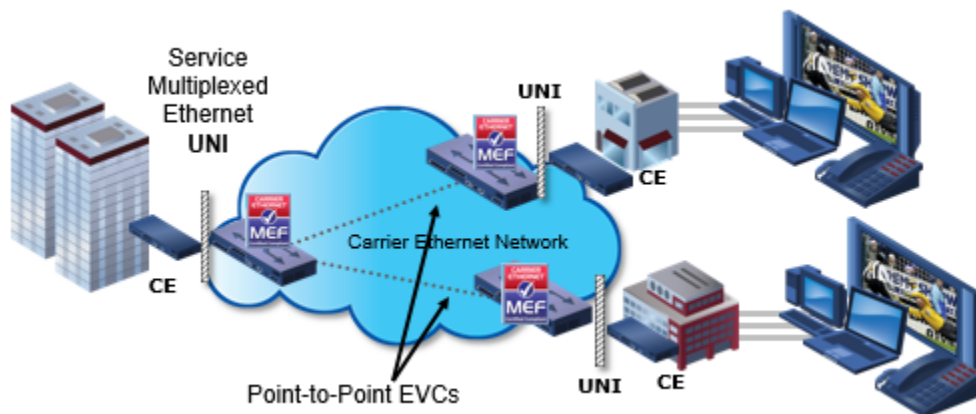
#### Additional Attributes

all-to-one-bundling (enable disable)	EP-LINE and EP-LAN service should be set to "enable"
BTI-SA-821(config-uni)# all-to-one-bundling enable	EVP-LINE and EVP-LAN service should be set to "disable"
bundling (enable disable)	More than one CE-VLAN ID mapping should be set to "enable"
	One CE-VLAN ID mapping should be set to "disable".

<hr/>	
BTI-SA-821(config-uni)# bundling enable	
"multiplex (enable disable)	EP-LINE and EP-LAN service should be set to "disable"
BTI-SA-821(config-uni)# multiplex enable	EVP-LINE and EVP-LAN service should be set to "enable".
max-evc <1-512>	multiplex attribute :maximum number of EVCs allowed in the UNI.
BTI-SA-821(config-uni)# max-evc 10	EP-Line or EP-LAN, MNE MUST be one EVP-Line or EVP-LAN, MNE MUST be two or greater.
default ce-vlan <0-4094>	The Default CE-VLAN ID service attribute specifies the default CE-VLAN ID for untagged packet at the UNI port.
BTI-SA-821(config-uni)# default ce-vlan 10	To support untagged packet at the UNI port this attribute MUST be set to none zero value. This value MUST be the same as one of the CE-VLAN ID mapping list
default priority <0-7>"	The Default Priority service attribute specifies the default priority of S-VLAN tag for untagged packet at the UNI port.
BTI-SA-821(config-uni)# default priority 6	
BTI-SA-821(config-uni)# add evc EPLINE-TEST1	E-Service instance is automatically created by command "add uni UNI-ID" of EVC configuration mode. E-Service instance ID is formed by the concatenation of the UNI ID and the EVC ID.
add vlan (VLAN-ID all-others)	VLAN-ID : 1-4095
BTI-SA-821(config)# ethernet epu CUSTOMER-A-EPLINE-test2-test1	all-others : all VLANs that is not mapped to other EVC in a UNI.
BTI-SA-821(config-epu)# add vlan 10	Except for All-to-One-bundling, E-Service MUST have one or more CE-VLAN ID mapped.
BTI-SA-821(config-epu)# add vlan 20	
BTI-SA-821 show ethernet epu	Show E Service
BTI-SA-821# show ethernet uni CUSTOMER-A	This example will show the following E Service provisioning on the UNI customer A
	UNI CUSTOMER-A:
	Mapped Interface : eth-0-2
	Default CVLANID : 0
	Default SVLAN Priority : 0
	All-to-One Bundling : No
	Bundling : No
	Service Multiplexing : No
	Maximum Number of EVC : 1
	Number of EVC using this UNI : 1
	EVC List
	EPLINE-INTERNET_SERVICE

## 7.5.3 Provisioning Ethernet Virtual Private Line (EVPL) Service

### Ethernet Virtual Private Line(EVPL) Service



#### Step 1 Create NNI and make association with interface

```
BTI-SA-821(config)# ethernet nni add Test2-RING-E
BTI-SA-821(config-nni)# map interface eth-0-3
BTI-SA-821(config-nni)# exit
BTI-SA-821(config)# ethernet nni add Test2-RING-W
BTI-SA-821(config-nni)# map interface eth-0-4
BTI-SA-821(config-nni)# end
BTI-SA-821# show ethernet nni
```

```
-----
NNI Test2-RING-E:
Mapped Interface           : eth-0-3
Maximum Number of VC      : 400
Number of using this NNI  : 0
-----
```

```
-----
NNI Test2-RING-W:
Mapped Interface           : eth-0-4
Maximum Number of VC      : 400
Number of using this NNI  : 0
-----
```

#### Step 2 Create UNI and make association with interface.

```
BTI-SA-821# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BTI-SA-821(config)# ethernet uni add unil
BTI-SA-821(config-uni)# all-to-one-bundling disable
BTI-SA-821(config-uni)# multiplex enable
BTI-SA-821(config-uni)# max-evc 10
BTI-SA-821(config-uni)# default ce-vlan 10
BTI-SA-821(config-uni)# map interface eth-0-1
BTI-SA-821(config-uni)# exit
```

```
BTI-SA-821(config)# ethernet uni add uni2
BTI-SA-821(config-uni)# all-to-one-bundling disable
BTI-SA-821(config-uni)# multiplex enable
BTI-SA-821(config-uni)# max-evc 10
BTI-SA-821(config-uni)# map interface eth-0-2
BTI-SA-821(config-uni)# end
BTI-SA-821# show ethernet uni
```

```
-----
UNI uni1:
Mapped Interface           : eth-0-1
Default CVLANID           : 10
Default SVLAN Priority     : 0
All-to-One Bundling       : No
Bundling                   : No
Service Multiplexing       : Yes
Maximum Number of EVC     : 10
Number of EVC using this UNI : 0
-----
```

```
UNI uni2:
Mapped Interface           : eth-0-2
Default CVLANID           : 0
Default SVLAN Priority     : 0
All-to-One Bundling       : No
Bundling                   : No
Service Multiplexing       : Yes
Maximum Number of EVC     : 10
Number of EVC using this UNI : 0
-----
```

### Step 3 Create EVC and make association with UNI and NNI

```
BTI-SA-821# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BTI-SA-821(config)# ethernet evc add EVPLINE-test1
BTI-SA-821(config-evc)# svlan 1000
BTI-SA-821(config-evc)# service type evpline
BTI-SA-821(config-evc)# vlan-preservation disable
BTI-SA-821(config-evc)# add uni uni1
BTI-SA-821(config-evc)# add nni Test2-RING-E
BTI-SA-821(config-evc)# add nni Test2-RING-W
BTI-SA-821(config-evc)# exit
BTI-SA-821(config)# ethernet evc add EVPLINE-test2
BTI-SA-821(config-evc)# svlan 2000
BTI-SA-821(config-evc)# service type evpline
BTI-SA-821(config-evc)# vlan-preservation disable
BTI-SA-821(config-evc)# add uni uni1
BTI-SA-821(config-evc)# add nni Test2-RING-E
BTI-SA-821(config-evc)# add nni Test2-RING-W
BTI-SA-821(config-evc)# end
BTI-SA-821# show ethernet evc
-----
EVC EVPLINE-test1:
```

```
Service Type           : evpline
EVC Type               : Point-to-Point
Outer SVLAN ID         : 1000
CE-VLAN Preservation   : No
CoS Preservation       : Yes
Maximum Number of UNI  : 2
Number of UNI using this EVC : 1
MEG Level              : 0
UNI List
```

```
-----
  unil,
NNI List
  Test2-RING-E, Test2-RING-W,
-----
```

```
EVC EVPLINE-test2:
Service Type           : evpline
EVC Type               : Point-to-Point
Outer SVLAN ID         : 2000
CE-VLAN Preservation   : No
CoS Preservation       : Yes
Maximum Number of UNI  : 2
Number of UNI using this EVC : 1
MEG Level              : 0
UNI List
  unil,
NNI List
  Test2-RING-E, Test2-RING-W,
-----
```

#### **Step 4** Add CE-VLAN mapping to the service instance

```
BTI-SA-821(config)# ethernet epu unil-EVPLINE-test1
BTI-SA-821(config-epu)# add vlan 10
BTI-SA-821(config-epu)# exit
BTI-SA-821(config)# ethernet epu unil-EVPLINE-test2
BTI-SA-821(config-epu)# add vlan 20
BTI-SA-821(config-epu)# end
BTI-SA-821# show ethernet epu
```

```
-----
E-Service unil-EVPLINE-test1:
  CE-VLAN map : untagged(10),10
-----
```

```
E-Service uni2-EVPLINE-test1:
  CE-VLAN map : 20
-----
```

#### **Step 5** Ensure All-to-One Bundling, Bundling and Service multiplexing are configured correctly.

Additional Attributes

all-to-one-bundling (enable disable) BTI-SA-821(config-uni)# all-to-one-bundling enable	EP-LINE and EP-LAN service should be set to "enable" EVP-LINE and EVP-LAN service should be set to "disable"
bundling (enable disable) BTI-SA-821(config-uni)# bundling enable	More than one CE-VLAN ID mapping should be set to "enable" One CE-VLAN ID mapping should be set to "disable".
"multiplex (enable disable) BTI-SA-821(config-uni)# multiplex enable	EP-LINE and EP-LAN service should be set to "disable" EVP-LINE and EVP-LAN service should be set to "enable".
max-evc <1-512> BTI-SA-821(config-uni)# max-evc 10	multiplex attribute :maximum number of EVCs allowed in the UNI. EP-Line or EP-LAN, MNE MUST be one EVP-Line or EVP-LAN, MNE MUST be two or greater.
default ce-vlan <0-4094> BTI-SA-821(config-uni)# default ce-vlan 10	The Default CE-VLAN ID service attribute specifies the default CE-VLAN ID for untagged packet at the UNI port. To support untagged packet at the UNI port this attribute MUST be set to none zero value. This value MUST be the same as one of the CE-VLAN ID mapping list
default priority <0-7> BTI-SA-821(config-uni)# default priority 6	The Default Priority service attribute specifies the default priority of S-VLAN tag for untagged packet at the UNI port.
BTI-SA-821(config-uni)# add evc EPLINE-TEST1	E-Service instance is automatically created by command "add uni UNI-ID" of EVC configuration mode. E-Service instance ID is formed by the concatenation of the UNI ID and the EVC ID.
add vlan (VLAN-ID all-others) BTI-SA-821(config)# ethernet epu CUSTOMER-A-EPLINE-Test2-Test1 BTI-SA-821(config-epu)# add vlan 10 BTI-SA-821(config-epu)# add vlan 20	VLAN-ID : 1-4095 all-others : all VLANs that is not mapped to other EVC in a UNI. Except for All-to-One-bundling, E-Service MUST have one or more CE-VLAN ID mapped.
BTI-SA-821 show ethernet epu	Show E Service
BTI-SA-821# show ethernet uni CUSTOMER-A	This example will show the following E Service provisioning on the UNI customer A  UNI CUSTOMER-A: Mapped Interface : eth-0-2 Default CVLANID : 0 Default SVLAN Priority : 0 All-to-One Bundling : No Bundling : No

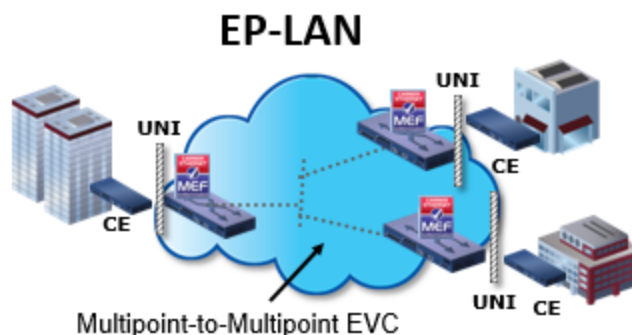
---

Service Multiplexing	: No
Maximum Number of EVC	: 1
Number of EVC using this UNI	: 1
EVC List	
EPLINE-INTERNET_SERVICE	

---

## 7.5.4 Provisioning Ethernet Private LAN (EPLAN) Service

This section details the steps required to create a Ethernet Private LAN (EPLAN) Service



### Step 1 . Create NNI and make association with interface

```
BTI-SA-821(config)# ethernet nni add nni1
BTI-SA-821(config-nni)# map interface eth-0-3
BTI-SA-821(config-nni)# exit
BTI-SA-821(config)# ethernet nni add nni2
BTI-SA-821(config-nni)# map interface eth-0-4
BTI-SA-821(config-nni)# end
BTI-SA-821# show ethernet nni
```

```
-----
NNI nni1:
Mapped Interface           : eth-0-3
Maximum Number of VC      : 400
Number of using this NNI  : 0
-----
```

```
-----
NNI nni2:
Mapped Interface           : eth-0-4
Maximum Number of VC      : 400
Number of using this NNI  : 0
-----
```

### Step 2 Create UNI and make association with interface

```
BTI-SA-821# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
BTI-SA-821(config)# ethernet uni add uni1
BTI-SA-821(config-uni)# map interface eth-0-1
```



```
BTI-SA-821(config-uni)# exit
BTI-SA-821(config)# ethernet uni add uni2
BTI-SA-821(config-uni)# map interface eth-0-2
BTI-SA-821(config-uni)# end
BTI-SA-821# show ethernet uni
```

```
-----
UNI uni1:
Mapped Interface           : eth-0-1
Default CVLANID           : 0
Default SVLAN Priority     : 0
All-to-One Bundling       : Yes
Bundling                   : No
Service Multiplexing       : No
Maximum Number of EVC     : 1
Number of EVC using this UNI : 0
-----
```

```
UNI uni2:
Mapped Interface           : eth-0-2
Default CVLANID           : 0
Default SVLAN Priority     : 0
All-to-One Bundling       : Yes
Bundling                   : No
Service Multiplexing       : No
Maximum Number of EVC     : 1
Number of EVC using this UNI : 0
```

### Step 3 Create EVC and make association with UNI and NNI

```
BTI-SA-821# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
BTI-SA-821(config)#
BTI-SA-821(config)# ethernet evc add EPLAN-test1
BTI-SA-821(config-evc)# svlan 1000
BTI-SA-821(config-evc)# service type eplan
BTI-SA-821(config-evc)# !Make a association with uni1 and uni2
BTI-SA-821(config-evc)# add uni uni1
BTI-SA-821(config-evc)# add uni uni2
BTI-SA-821(config-evc)# !Make a association with nni1 and nni2
BTI-SA-821(config-evc)# add nni nni1
BTI-SA-821(config-evc)# add nni nni2
BTI-SA-821(config-evc)# end
BTI-SA-821# show ethernet epu
```

```
-----
E-Service uni1-EPLAN-test1:
CE-VLAN map : All to One Bundling
-----
```

```
E-Service uni2-EPLAN-test1:
CE-VLAN map : All to One Bundling
-----
```

### Step 4 Ensure All-to-One Bundling, Bundling and Service multiplexing are configured correctly.

## Additional Attributes

all-to-one-bundling (enable disable) BTI-SA-821(config-uni)# all-to-one-bundling enable	EP-LINE and EP-LAN service should be set to "enable" EVP-LINE and EVP-LAN service should be set to "disable"
bundling (enable disable) BTI-SA-821(config-uni)# bundling enable	More than one CE-VLAN ID mapping should be set to "enable" One CE-VLAN ID mapping should be set to "disable".
"multiplex (enable disable) BTI-SA-821(config-uni)# multiplex enable	EP-LINE and EP-LAN service should be set to "disable" EVP-LINE and EVP-LAN service should be set to "enable".
max-evc <1-512> BTI-SA-821(config-uni)# max-evc 10	multiplex attribute :maximum number of EVCs allowed in the UNI. EP-Line or EP-LAN, MNE MUST be one EVP-Line or EVP-LAN, MNE MUST be two or greater.
default ce-vlan <0-4094> BTI-SA-821(config-uni)# default ce-vlan 10	The Default CE-VLAN ID service attribute specifies the default CE-VLAN ID for untagged packet at the UNI port. To support untagged packet at the UNI port this attribute MUST be set to none zero value. This value MUST be the same as one of the CE-VLAN ID mapping list
default priority <0-7>" BTI-SA-821(config-uni)# default priority 6	The Default Priority service attribute specifies the default priority of S-VLAN tag for untagged packet at the UNI port.
BTI-SA-821 # add evc EPLINE-TEST1	E-Service instance is automatically created by command "add uni UNI-ID" of EVC configuration mode. E-Service instance ID is formed by the concatenation of the UNI ID and the EVC ID.
add vlan (VLAN-ID all-others) BTI-SA-821(config)# ethernet epu CUSTOMER-A-EPLINE-Test2-Test1 BTI-SA-821(config-epu)# add vlan 10 BTI-SA-821(config-epu)# add vlan 20	VLAN-ID : 1-4095 all-others : all VLANs that is not mapped to other EVC in a UNI. Except for All-to-One-bundling, E-Service MUST have one or more CE-VLAN ID mapped.
BTI-SA-821 show ethernet epu	Show E Service
BTI-SA-821# show ethernet uni CUSTOMER-A	This example will show the following E Service provisioning on the UNI customer A  UNI CUSTOMER-A: Mapped Interface : eth-0-2 Default CVLANID : 0 Default SVLAN Priority : 0

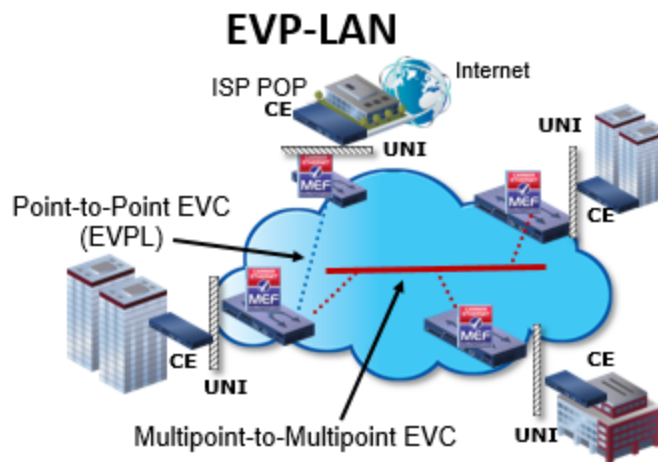
---

All-to-One Bundling	: No
Bundling	: No
Service Multiplexing	: No
Maximum Number of EVC	: 1
Number of EVC using this UNI	: 1
EVC List	
EPLINE-INTERNET_SERVICE	

---

## 7.5.5 Provisioning Ethernet Virtual Private LAN (EVPLAN) Service

This section details the steps required to create a Ethernet Virtual Private LAN(EVPLAN) Service



### Step 1 VLAN Database configure

```
BTI-SA-821(config)# vlan database
BTI-SA-821(config-vlan)#  vlan 1000,2000,3000
BTI-SA-821(config-vlan)#  end
BTI-SA-821# show vlan all
```

VLAN ID	Name	State	STP ID	Member ports (u)-Untagged, (t)-Tagged
1	default	ACTIVE	0	eth-0-1(u) eth-0-2(u) eth-0-3(u) eth-0-4(u)
1000	VLAN1000	ACTIVE	0	
2000	VLAN2000	ACTIVE	0	
3000	VLAN3000	ACTIVE	0	

### Step 2 NNI creation and Make association with Interface

```
BTI-SA-821(config)# ethernet nni add Test3-RING-E
BTI-SA-821(config-nni)#  map interface eth-0-1
BTI-SA-821(config-nni)#  exit
BTI-SA-821(config)# ethernet nni add Test3-RING-W
BTI-SA-821(config-nni)#  map interface eth-0-2
```

```
BTI-SA-821(config-nni)# end
BTI-SA-821# show ethernet nni
```

```
-----
NNI Test3-RING-E:
  Mapped Interface           : eth-0-1
  Maximum Number of VC      : 400
  Number of using this NNI   : 0
-----
```

```
NNI Test3-RING-W:
  Mapped Interface           : eth-0-2
  Maximum Number of VC      : 400
  Number of using this NNI   : 0
```

### **Step 3 . UNI Creation and make association with Interface**

```
BTI-SA-821(config)# ethernet uni add 6F-618
BTI-SA-821(config-uni)# all-to-one-bundling disable
BTI-SA-821(config-uni)# multiplex enable
BTI-SA-821(config-uni)# max-evc 10
BTI-SA-821(config-uni)# default ce-vlan 10
BTI-SA-821(config-uni)# map interface eth-0-3
BTI-SA-821(config-uni)# exit
BTI-SA-821(config)# ethernet uni add 7F-719
BTI-SA-821(config-uni)# all-to-one-bundling disable
BTI-SA-821(config-uni)# multiplex enable
BTI-SA-821(config-uni)# max-evc 10
BTI-SA-821(config-uni)# map interface eth-0-4
BTI-SA-821(config-uni)# end
BTI-SA-821# show ethernet uni
```

```
-----
UNI 6F-618:
  Mapped Interface           : eth-0-3
  Default CVLANID           : 10
  Default SVLAN Priority     : 0
  All-to-One Bundling       : No
  Bundling                   : No
  Service Multiplexing       : Yes
  Maximum Number of EVC     : 10
  Number of EVC using this UNI : 0
-----
```

```
UNI 7F-719:
  Mapped Interface           : eth-0-4
  Default CVLANID           : 0
  Default SVLAN Priority     : 0
  All-to-One Bundling       : No
  Bundling                   : No
  Service Multiplexing       : Yes
  Maximum Number of EVC     : 10
  Number of EVC using this UNI : 0
```

### **Step 4 Create EVC and Make association with UNI and NNI**

```

BTI-SA-821(config)# ethernet evc add EVPLAN-Test1
BTI-SA-821(config-evc)# svlan 1000
BTI-SA-821(config-evc)# service type evplan
BTI-SA-821(config-evc)# vlan-preservation disable
BTI-SA-821(config-evc)# add uni 6F-618
BTI-SA-821(config-evc)# add uni 7F-719
BTI-SA-821(config-evc)# add nni Test3-RING-E
BTI-SA-821(config-evc)# add nni Test3-RING-W
BTI-SA-821(config-evc)# exit
BTI-SA-821(config)# ethernet evc add EVPLAN-Test2
BTI-SA-821(config-evc)# svlan 2000
BTI-SA-821(config-evc)# service type evplan
BTI-SA-821(config-evc)# vlan-preservation disable
BTI-SA-821(config-evc)# add uni 6F-618
BTI-SA-821(config-evc)# add uni 7F-719
BTI-SA-821(config-evc)# add nni Test3-RING-E
BTI-SA-821(config-evc)# add nni Test3-RING-W
BTI-SA-821(config-evc)# end
BTI-SA-821# show ethernet evc
-----
EVC EVPLAN-Test1:
  Service Type           : evplan
  EVC Type               : Multipoint-to-Multipoint
  Outer SVLAN ID         : 1000
  CE-VLAN Preservation    : No
  CoS Preservation       : Yes
  Maximum Number of UNI   : 2
  Number of UNI using this EVC : 2
  MEG Level              : 0
  Associated NNI List     : Test3-RING-E, Test3-RING-W,
  Associated UNI list     : 6F-618, 7F-719,
-----
EVC EVPLAN-Test2:
  Service Type           : evplan
  EVC Type               : Multipoint-to-Multipoint
  Outer SVLAN ID         : 2000
  CE-VLAN Preservation    : No
  CoS Preservation       : Yes
  Maximum Number of UNI   : 2
  Number of UNI using this EVC : 2
  MEG Level              : 0
  Associated NNI List     : Test3-RING-E, Test3-RING-W,
  Associated UNI list     : 6F-618, 7F-719,

```

### Step 5 Add CE-VLAN mapping and BWP information to the Service Instance

```

BTI-SA-821(config)# ethernet evc add EVPLAN-Test1
BTI-SA-821(config-evc)# svlan 1000
BTI-SA-821(config-evc)# service type evplan
BTI-SA-821(config-evc)# vlan-preservation disable
BTI-SA-821(config-evc)# add uni 6F-618
BTI-SA-821(config-evc)# add uni 7F-719

```

```
BTI-SA-821(config-evc)# add nni Test3-RING-E
BTI-SA-821(config-evc)# add nni Test3-RING-W
BTI-SA-821(config-evc)# exit
BTI-SA-821(config)# ethernet evc add EVPLAN-Test2
BTI-SA-821(config-evc)# svlan 2000
BTI-SA-821(config-evc)# service type evplan
BTI-SA-821(config-evc)# vlan-preservation disable
BTI-SA-821(config-evc)# add uni 6F-618
BTI-SA-821(config-evc)# add uni 7F-719
BTI-SA-821(config-evc)# add nni Test3-RING-E
BTI-SA-821(config-evc)# add nni Test3-RING-W
BTI-SA-821(config-evc)# end
BTI-SA-821# show ethernet evc
-----
EVC EVPLAN-Test1:
  Service Type           : evplan
  EVC Type               : Multipoint-to-Multipoint
  Outer SVLAN ID         : 1000
  CE-VLAN Preservation    : No
  CoS Preservation       : Yes
  Maximum Number of UNI   : 2
  Number of UNI using this EVC : 2
  MEG Level              : 0
  Associated NNI List     : Test3-RING-E, Test3-RING-W,
  Associated UNI list     : 6F-618, 7F-719,
-----
EVC EVPLAN-Test2:
  Service Type           : evplan
  EVC Type               : Multipoint-to-Multipoint
  Outer SVLAN ID         : 2000
  CE-VLAN Preservation    : No
  CoS Preservation       : Yes
  Maximum Number of UNI   : 2
  Number of UNI using this EVC : 2
  MEG Level              : 0
  Associated NNI List     : Test3-RING-E, Test3-RING-W,
  Associated UNI list     : 6F-618, 7F-719,
```

Step 5. Add CE-VLAN mapping and BWP information to the Service Instance

```
BTI-SA-821(config)# ethernet epu 6F-618-EVPLAN-Test1
BTI-SA-821(config-epu)# add vlan 10
BTI-SA-821(config-epu)# ethernet epu 6F-618-EVPLAN-Test2
BTI-SA-821(config-epu)# add vlan 20
BTI-SA-821(config-epu)# exit
BTI-SA-821(config)# ethernet epu 7F-719-EVPLAN-Test1
BTI-SA-821(config-epu)# bandwidth-profile ingress bwp-cos
BTI-SA-821(config-epu)# add vlan 10
BTI-SA-821(config-epu)# exit
BTI-SA-821(config)# ethernet epu 7F-719-EVPLAN-Test2
BTI-SA-821(config-epu)# bandwidth-profile ingress bwp-evc
```

```
BTI-SA-821(config-epu)# add vlan 20
BTI-SA-821(config-epu)# end
BTI-SA-821# show ethernet epu
```

```
-----
E-Service 6F-618-EVPLAN-Test1:
CE-VLAN map : untagged(10),10
-----
```

```
-----
E-Service 7F-719-EVPLAN-Test1:
Ingress BWP : bwp-cos
CE-VLAN map : 10
-----
```

```
-----
E-Service 6F-618-EVPLAN-Test2:
CE-VLAN map : 20
-----
```

```
-----
E-Service 7F-719-EVPLAN-Test2:
Ingress BWP : bwp-evc
CE-VLAN map : 20
-----
```

**Step 6** Ensure All-to-One Bundling, Bundling and Service multiplexing are configured correctly.

Additional Attributes

all-to-one-bundling (enable disable) BTI-SA-821(config-uni)# all-to-one-bundling enable	EP-LINE and EP-LAN service should be set to "enable" EVP-LINE and EVP-LAN service should be set to "disable"
bundling (enable disable) BTI-SA-821(config-uni)# bundling enable	More than one CE-VLAN ID mapping should be set to "enable" One CE-VLAN ID mapping should be set to "disable".
"multiplex (enable disable) BTI-SA-821(config-uni)# multiplex enable	EP-LINE and EP-LAN service should be set to "disable" EVP-LINE and EVP-LAN service should be set to "enable".
max-evc <1-512> BTI-SA-821(config-uni)# max-evc 10	multiplex attribute :maximum number of EVCs allowed in the UNI. EP-Line or EP-LAN, MNE MUST be one EVP-Line or EVP-LAN, MNE MUST be two or greater.
default ce-vlan <0-4094> BTI-SA-821(config-uni)# default ce-vlan 10	The Default CE-VLAN ID service attribute specifies the default CE-VLAN ID for untagged packet at the UNI port. To support untagged packet at the UNI port this attribute MUST be set to none zero value. This value MUST be the same as one of the CE-VLAN ID mapping list
default priority <0-7>	The Default Priority service attribute specifies the default priority of S-VLAN tag for untagged packet at the UNI port.

---

```
BTI-SA-821(config-uni)# default
priority 6
```

```
BTI-SA-821(config-uni)# add evc
EPLINE-TEST1
```

E-Service instance is automatically created by command "add uni UNI-ID" of EVC configuration mode. E-Service instance ID is formed by the concatenation of the UNI ID and the EVC ID.

```
add vlan (VLAN-ID|all-others)
```

VLAN-ID : 1-4095

```
BTI-SA-821(config)# ethernet epu
CUSTOMER-A-EPLINE-test2-test1
BTI-SA-821(config-epu)# add vlan 10
BTI-SA-821(config-epu)# add vlan 20
```

all-others : all VLANs that is not mapped to other EVC in a UNI.

Except for All-to-One-bundling, E-Service MUST have one or more CE-VLAN ID mapped.

```
BTI-SA-821 show ethernet epu
```

Show E Service

```
BTI-SA-821# show ethernet uni
CUSTOMER-A
```

This example will show the following E Service provisioning on the UNI customer A

```
UNI CUSTOMER-A:
  Mapped Interface           :
eth-0-2
  Default CVLANID           : 0
  Default SVLAN Priority     : 0
  All-to-One Bundling       : No
  Bundling                   : No
  Service Multiplexing      : No
  Maximum Number of EVC     : 1
  Number of EVC using this UNI : 1
  EVC List
    EPLINE-INTERNET_SERVICE
```

---



## 8.0 BTI SA-821 Carrier Ethernet Switch Backing Up, Restoring and Upgrading System Software

---

This section covers the following topics :

- 8.1, “Uploading a Configuration File”
- 8.2, “Restoring a Configuration File”
- 8.3, “Upgrading the System Software”
- 8.4, “Upgrade Method One: The User Specifies Which Bank to Download the Image File”
- 8.5, “Upgrade Method Two : The User Does Not Specify Which Image Bank to Download the Image File ”

## 8.1 Uploading a Configuration File

---

Use this procedure to back up a configuration file from the BTI SA-821 Ethernet switch to a server.

### Prerequisites:

- You must have access to the FTP/SFTP/TFTP server where the configuration file is to be uploaded.

The configuration is stored in one file (tarred and gzipped with a `.tar.gz` file extension).

### Step 1 Save the current configuration to system memory.

```
BTI-SA-821# write memory
```

### Step 2 Upload the configuration file to the server.

Out-Of-Band upload command is :

- ```
BTI-SA-821# update ftp config mgmt-if <ftp_server_ip_addr>  
<ftp_server_userid> <ftp_server_password> <configuration_file_name>  
upload
```

In-Band upload command is :

- ```
BTI-SA-821# update ftp config <ftp_server_ip_addr>  
<ftp_server_userid> <ftp_server_password> <configuration_file_name>  
upload
```

For example: This command uploads the saved configuration to server 132.25.7.23 and stores it with file name ConfigBackup. The server username is Server1 and the Server password is ntw3.

```
BTI-SA-821# update ftp config 132.25.7.23 Server1 ntw3 ConfigBackup  
upload
```

Send file to `ftp://132.25.7.23/ConfigBackup.tar.gz`

```
Sent 466 bytes in 0.1 seconds  
UPGRADE FTP Config upload Success.
```

## 8.2 Restoring a Configuration File

Use this procedure to restore a configuration file from a server to the BTI SA-821 .

### Prerequisites:

- You must have access to the FTP/SFTP/TFTP server where the configuration file resides.
- The configuration file must be tarred and gzipped, and have a file extension `.tar.gz` (not `.tgz`).

Configuration for the main system, slot1, and slot2 is stored in one file (tarred and gzipped with a `.tar.gz` file extension).

**Note** You do not need to specify file extensions when referring to the filename in the commands. The update command assumes the package has a file extension of `.tar.gz`.

### Step 1 Download and restore the configuration file from the server.

Out-Of-Band download command is :

- BTI-SA-821# update ftp config mgmt-if <ftp\_server\_ip\_addr>  
<ftp\_server\_userid> <ftp\_server\_password> <configuration\_file\_name>  
download

In-Band download command is :

- BTI-SA-821# update ftp config <ftp\_server\_ip\_addr>  
<ftp\_server\_userid> <ftp\_server\_password> <configuration\_file\_name>  
download

This downloads the specified configuration file from the specified server. For example :  
Using FTP in the OOB, this commands downloads a file named ConfigBackup from server 132.25.7.23 to the switch. The server username is Server1 and the Server password is ntw3.

```
BTI-SA-821# update ftp config mgmt-if 132.25.7.23 Server1 ntw3
ConfigBackup download
```

Download from URL to temporary file.

```
Get file from tftp://132.25.7.23/ConfigBackup.tar.gz
```

```
.
```

```
Received 466 bytes in 0.1 seconds
```

```
Copy the temporary file to its destination.
```

```
.
```

```
466 bytes in 0.0 seconds, inf kbytes/second
```

```
UPGRADE FTP Config download Success.
```

### Step 2 Reboot the system to load the downloaded configuration file.

```
BTI-SA-821# reboot
```

## 8.3 Upgrading the System Software

---

The BTI SA-821 upgrade software is contained in an image file. The file name will contain the version and the build number and will have a .img extension.

For example : The following example shows the BTI SA-821 upgrade image file for version 1.1.1, Build 9.

```
ha821_v1.1.1Build9.img
```

Image files are downloaded and stored on the BTI SA-821 . The new software version is initialized only when the switch is rebooted.

The image files are stored in a partitioned flash memory, known as the primary image bank and the secondary image bank. The **show image** command displays the status of the primary and secondary image banks.

**For example :** The following screen displays the status before a new software file has been downloaded .

It shows that version 1.1.1 Build 8 is stored in the primary image bank and version 1.1.1 Build 7 is stored in the secondary image bank.

The Current Image tells us that the switch was last booted from primary image bank and the Next Image tells us that on the next reboot, the switch will boot up using software loaded in the primary bank. The **image set <pri | sec >** is used to set the Next Image field.

The created field shows the date the software file was created. (It does not show the date the software was installed on the switch.)

The Data \_Size shows the size of the software file.

```
BTI-SA-821# show image
```

```
-----  
                        Image Information  
-----  
                        Primary Image  
-----  
Image_Version  : HA80x v1.1.1Build8  
Created       : Tue Sep  2 15:51:22 2014  
Data_Size     : 13542321 Bytes = 13224.92 kB = 12.91 MB  
-----  
                        Secondary Image  
-----  
Image_Version  : HA80x v1.1.1Build7  
Created       : Tue May 20 20:05:50 2014  
Data_Size     : 12936093 Bytes = 12632.90 kB = 12.34 MB  
-----  
Current Image  : Primary  
-----  
Next Image    : Primary  
-----
```

After a new software load is downloaded (and before a reboot) the files stored in each bank will show the software stored in the banks.

For Example : The following screen now shows that software version 1.1.1 Build 8 is stored in the secondary image bank and a new software version 1.1.1 Build 9 is now stored in the primary image bank. The system has not been rebooted and the upgrade has not been initialized. Therefore the software running on the system is version 1.1.1 build 8. The **show version** command displays the software running on the switch.

```
BTI-SA-821# show image
```

```
-----  
                        Image Information  
-----  
                        Primary Image  
-----  
Image_Version  : HA80x v1.1.1Build9  
Created       : Tue Sep  2 15:51:22 2014  
Data_Size    : 13542321 Bytes = 13224.92 kB = 12.91 MB  
-----  
                        Secondary Image  
-----  
Image_Version  : HA80x v1.1.1Build8  
Created       : Tue May 20 20:05:50 2014  
Data_Size    : 12936093 Bytes = 12632.90 kB = 12.34 MB  
-----  
Current Image  : Primary  
-----  
Next Image    : Primary  
-----
```

```
BTI-SA-821# show version
```

**The current running image is 1.1.1Build8**BTI-SA-821 uptime is 30 days, 11 hours, 21 minutes

```
Hardware Type is Standalone NID/EAD  
Hardware Version is 1.0  
SDRAM size 512M  
Flash size 128M  
EPLD Version is 2.3  
BootRom Version is 0.7
```

After the switch has been rebooted, the show image display shows that the switch has rebooted using the new software stored in the primary image bank . The system will be therefore be running on software version 1.1.1 Build 9. The **show version** command will verify this.

```
BTI-SA-821# show image
```

```
-----  
                        Image Information  
-----  
                        Primary Image  
-----  
Image_Version  : HA80x v1.1.1Build9  
-----
```

```
Created       : Tue Sep  2 15:51:22 2014
Data_Size     : 13542321 Bytes = 13224.92 kB = 12.91 MB
```

---

Secondary Image

---

```
Image_Version : HA80x v1.1.1Build8
Created       : Tue May 20 20:05:50 2014
Data_Size     : 12936093 Bytes = 12632.90 kB = 12.34 MB
```

---

```
Current Image : Primary
```

---

```
Next Image    : Primary
```

---

BTI-SA-821# show version

**The current running image is 1.1.1Build9**BTI SA-821 uptime is 0 days, 0 hours, 21 minutes

Hardware Type is Standalone NID/EAD  
Hardware Version is 1.0  
SDRAM size 512M  
Flash size 128M  
EPLD Version is 2.3  
BootRom Version is 0.7

## BTI SA-821 Supported Upgrade Methods

The BTI SA-821 can be upgraded using either of the following methods :

- **Upgrade method 1: The user specifies which bank to download the image file :** The user backs up the running image to the secondary bank using the command **image backup** and then downloads the new image file to the primary bank. To initialize the new upgrade the user sets the **next image** to primary using the **image set pri** command and then reboots the switch. The switch will reboot using the image file stored in the primary bank.
- **Upgrade method 2: The user does not specify which bank to download the image file :** The user downloads the new image file and the system stores it to a local temporary file location. The user performs the **upgrade image** command. The upgrade image command copies the image file stored in the primary bank and transfers it to the secondary bank and then copies the image file from the temporary file to the primary image bank. The user then sets the next image to primary, using the **image set pri** command and reboots the switch. When the switch reboots the new image file stored in the temporary file is automatically copied into the primary bank.

## 8.4 Upgrade Method One: The User Specifies Which Bank to Download the Image File

**Note** This is a general upgrade procedure to store the latest version of software in the primary image bank and the older software version in the secondary image bank as a back up. There are various methods to store and back up software. For instance both banks may contain the latest software load. You should use this procedure to familiarize yourself with the upgrade process then customize it to your upgrade policy.



- Failure to re-route traffic, when replacing the BTI SA-821 can result in loss of data.
- You should not turn the BTI SA-821 power OFF/ON during an upgrade procedure
- Although in theory you can provision / configure the switch between downloading the software file and the reboot, it is best practice to perform the upgrade procedure as a standalone procedure.
- While the switch is rebooting, traffic on the switch will be down for approximately 4 minutes.

### Prerequisites:

- You must have access to the FTP/SFTP/TFTP server where the software package resides
- you must know the FTP/SFTP/TFTP server username and password
- You must use the correct image file name with the correct version and build number and .img extension
- The upgrade procedure includes an option which will allow you to reboot on the old software version should you change you mind about rebooting with the new version
- The Out Of Band (OOB) command to download the software file and the In Band command to download software are different. The OOB command will contain the additional text shown in bold **update ftp image < mgmt-if**
- If you are in a telnet or SSH session, the session will terminate after you use the **reboot** command. You cannot telnet or SSH into the switch while it is rebooting.
  - Therefore it is recommended, you wait until the telnet / SSH pop message informs you that the session has ended and then log back into the switch. Alternatively you can open use the use the **ping [switch ip address] -t** command in the ms dos command of your computer before you use the CLI reboot command. This will ping the switch continuously and let you see when the switch comes back on line.
- If you can see the switch you can verify the boot has completed by looking at the status of the **RUN LED** on the front panel of the switch

RUN LED	Description
LED OFF	The switch did not boot
Green ON	The switch is booting

Green Blinking	Booting Success and the switch is in normal operation mode
Green ON then changes state to OFF	Booting success but the switch is not in normal operation mode

**Step 1** Show the current image on the system.

**Tip** The image actually running on the system is identified by the line in the show version command response that says, "The current running image is \_\_\_\_". This line is highlighted in bold in the example below.

For example:

```
BTI-SA-821# show image
```

```
-----
                        Image Information
-----
                        Primary Image
-----
Image_Version : HA80x v1.1.1Build8
Created       : Tue Sep  2 15:51:22 2014
Data_Size     : 13542321 Bytes = 13224.92 kB = 12.91 MB
-----
                        Secondary Image
-----
Image_Version : HA80x v1.1.1Build7
Created       : Tue May 20 20:05:50 2014
Data_Size     : 12936093 Bytes = 12632.90 kB = 12.34 MB
-----
Current Image : Primary
-----
Next Image    : Primary
-----
```

```
BTI-SA-821# show version
```

**The current running image is 1.1.1Build8**BTI-SA-821 uptime is 0 days, 0 hours, 21 minutes

```
Hardware Type is Standalone NID/EAD
Hardware Version is 1.0
SDRAM size 512M
Flash size 128M
EPLD Version is 2.3
BootRom Version is 0.7
```

**Step 2** Backup the image in the primary image bank to the secondary image bank

```
BTI-SA-821# image back up
```

When the command prompt returns, the backup is complete.



**Step 3** Download the software image from the FTP/SFTP/TFTP server to the primary image bank.

```
BTI-SA-821# update ftp image mgmt-if <ftp_server_ip_addr>
<ftp_server_userid> <ftp_server_password> <image_file_name> [pri |
sec]
```

For example:

```
BTI-SA-821# update ftp image mgmt-if 10.1.1.30 userid password
ha8XX_v1.1.1Build9.img pri
```

In response to this command, the BTI SA-821 downloads the image file into the primary image bank

**Step 4** Make the next boot up run the software stored in the primary bank

```
BTI-SA-821# image set pri
```

- If you no longer want to upgrade the system, make the next reboot run the software stored in the secondary bank. Remember the new software will be loaded into the primary image bank after reboot.

```
BTI-SA-821# image set sec
```

**Step 5** Save the current configuration to system memory.

```
BTI-SA-821# write mem
```

**Step 6** Reboot the system.

```
BTI-SA-821# reboot
```

You will be prompted to enter "y" es to reboot.

**Step 7** Verify that the software version loaded successfully.

**Tip** The image actually running on the system is identified by the line in the show version command response that says, "The current running image is \_\_\_\_". This line is highlighted in bold in the example below.

For example:

```
BTI-SA-821# show image
```

```
-----
                        Image Information
-----
                        Primary Image
-----
Image_Version  : HA80x v1.1.1Build9
Created       : Tue Sep  2 15:51:22 2014
Data_Size     : 13542321 Bytes = 13224.92 kB = 12.91 MB
-----
                        Secondary Image
-----
Image_Version  : HA80x v1.1.1Build8
```

Created : Tue May 20 20:05:50 2014  
Data\_Size : 12936093 Bytes = 12632.90 kB = 12.34 MB

-----  
Current Image : Primary

-----  
Next Image : Primary  
-----

BTI-SA-821# show version

**The current running image is 1.1.1Build9**BTI-SA-821 uptime is 0 days, 0 hours, 4 minutes

Hardware Type is Standalone NID/EAD  
Hardware Version is 1.0  
SDRAM size 512M  
Flash size 128M  
EPLD Version is 2.3  
BootRom Version is 0.7

## 8.5 Upgrade Method Two : The User Does Not Specify Which Image Bank to Download the Image File

**Note** This is a general upgrade procedure to store the latest version of software in the primary image bank and the older software version in the secondary image bank as a back up. There are various methods to store and back up software. For instance both banks may contain the latest software load. You should use this procedure to familiarize yourself with the upgrade process then customize to your upgrade policy.



- Failure to re-route traffic, when replacing BTI SA-821 can result in loss of data.
- You should not turn the BTI SA-821 power OFF/ON during an upgrade procedure
- Although in theory you can provision / configure the switch between downloading the software file and the reboot, it is best practice to perform the upgrade procedure as a standalone procedure.
- While the switch is rebooting, traffic on the switch will be down for approximately 4 minutes.

### Prerequisites:

- You must have access to the FTP/SFTP/TFTP server where the software package resides
- you must know the FTP/SFTP/TFTP server username and password
- You must use the correct image file name with the correct version and build number and .img extension
- The upgrade procedure includes an option which will allow you to reboot on the old software version should you change your mind about rebooting with the new version
- The Out Of Band (OOB) command to download the software file and the In Band command to download software are different. The OOB command will contain the additional text shown in bold **update ftp image < mgmt-if**
- If you are in a telnet or SSH session, the session will terminate after you use the **reboot** command. You cannot telnet or SSH into the switch while it is rebooting.
  - Therefore it is recommended, you wait until the telnet / SSH pop message informs you that the session has ended and then log back into the switch. Alternatively you can open use the use the **ping [switch ip address] -t** command in the ms dos command of your computer before you use the CLI reboot command. This will ping the switch continuously and let you see when the switch comes back on line.
- If you can see the switch you can verify the boot has completed by looking at the status of the **RUN LED** on the front panel of the switch

RUN LED	Description
LED OFF	The switch did not boot
Blue ON	The switch is booting

Blue Blinking	Booting Success and the switch is in normal operation mode
Solid ON/OFF	Booting success but the switch is not in normal operation mode

### Step 1 Show the current image on the system.

**Tip** The image actually running on the system is identified by the line in the show version command response that says, "The current running image is \_\_\_\_". This line is highlighted in bold in the example below.

For example:

```
BTI-SA-821# show image
```

```
-----
                        Image Information
-----
                        Primary Image
-----
Image_Version : HA80x v1.1.1Build8
Created       : Tue Sep  2 15:51:22 2014
Data_Size    : 13542321 Bytes = 13224.92 kB = 12.91 MB
-----
                        Secondary Image
-----
Image_Version : HA80x v1.1.1Build7
Created       : Tue May 20 20:05:50 2014
Data_Size    : 12936093 Bytes = 12632.90 kB = 12.34 MB
-----
Current Image : Primary
-----
Next Image    : Primary
-----
```

```
BTI-SA-821# show version
```

**The current running image is 1.1.1Build8**BTI SA-821 uptime is 0 days, 0 hours, 21 minutes

```
Hardware Type is Standalone NID/EAD
Hardware Version is 1.0
SDRAM size 512M
Flash size 128M
EPLD Version is 2.3
BootRom Version is 0.7
```

### Step 2 Download the software image from the FTP/SFTP/TFTP server to the device.

```
BTI-SA-821# update ftp image mgmt-if <ftp_server_ip_addr>
<ftp_server_userid> <ftp_server_password> <image_file_name>
```

For example:

```
BTI-SA-821# update ftp image mgmt-if 10.1.1.30 userid password
ha80x_v1.1.1.1Build9.img
```

In response to this command, the BTI SA-821 downloads the image file and stores it in a local temporary file location. You should see a message on the display telling you the file has transferred successfully.

**Step 3** Upgrade the image

```
BTI-SA-821# upgrade image
```

In response to this command, the BTI SA-821 transfers the image file stored in the primary image bank to the secondary image bank and copies the file from the temporary file to the primary image bank.

**Step 4** Make the next boot up use the software stored in the primary bank

```
BTI-SA-821# image set pri
```

- If you no longer want to upgrade the system, make the next reboot use the software stored in the secondary bank. Remember the new software will be loaded into the primary image bank after reboot.

```
BTI-SA-821# image set sec
```

**Step 5** Save the current configuration to system memory.

```
BTI-SA-821# write memory
```

**Step 6** Reboot the system.

```
BTI-SA-821# reboot
```

You will be prompted to enter "y" es to reboot.

**Step 7** Verify that the software version loaded successfully.

**Tip** The image actually running on the system is identified by the line in the show version command response that says, "The current running image is \_\_\_\_". This line is highlighted in bold in the example below.

For example:

```
BTI-SA-821# show image
```

```
-----
                        Image Information
-----
                        Primary Image
-----
Image_Version  : HA80x v1.1.1Build9
Created       : Tue Sep  2 15:51:22 2014
Data_Size     : 13542321 Bytes = 13224.92 kB = 12.91 MB
-----
                        Secondary Image
-----
```

```
Image_Version : HA80x v1.1.1Build8
Created       : Tue May 20 20:05:50 2014
Data_Size    : 12936093 Bytes = 12632.90 kB = 12.34 MB
```

```
-----
Current Image : Primary
```

```
-----
Next Image    : Primary
-----
```

```
BTI-SA-821# show version
```

```
The current running image is 1.1.1Build9BTI SA-821 uptime is 0 days, 0
hours, 4 minutes
```

```
Hardware Type is Standalone NID/EAD
Hardware Version is 1.0
SDRAM size 512M
Flash size 128M
EPLD Version is 2.3
BootRom Version is 0.7
```

## 9.0 BTI SA-821 Carrier Ethernet Switch Specifications

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This section covers the following topics:

- [9.1, “BTI SA-821 Carrier Ethernet Switch System Specifications”](#)
- [9.2, “BTI SA-821 Carrier Ethernet Switch Transceiver Specifications”](#)

## 9.1 BTI SA-821 Carrier Ethernet Switch System Specifications

---

**Table 9-1 Environmental specifications**

Parameter	Specification
Storage temperature	-40 to 70 °C -49 to 158 °F
Operating temperature	-40 to 65 °C -40 to 149 °F
Operating humidity (non-condensing)	Up to 85% non-condensing
Shock	Earthquake Zone 4
Safety	IEC/UL/CSA 60950-1
RoHS 6/6	Directive 2011/65/EU

### Alarm interface

**Table 9-2 Alarms interface connector pin numbering scheme**

Pin	Name	Definition
1	Major Line Input A	Isolated input A
2	Major Line Input B	Isolated input B
3	Major_C	Major, common contact
4	Major_NO Each of the dry relay contacts on the interface is rated to support a switching current of 1 A @ 30V DC.	Major, normally open contact
5	Minor_C	Minor, common contact
6	Minor_NO	Minor, normally open contact
7	Minor Line Input A	Isolated input A
8	Minor Line Input B	Isolated input B
9	Not connected	

Each of the dry relay contacts on the interface is rated to support a switching current of 1 A @ 30V DC.



## DC power distribution and protection requirements

Verify that the installation site meets the power distribution and protection requirements of the equipment. Power distribution panels are recommended to ensure that there is proper power filtering for battery noise and sufficient circuit breaker or fuse protection for all installed equipment.

**Table 9-3 DC power distribution and power protection requirements**

Power Feeds A and B			
Nominal Voltage	Input Voltage Tolerance	Copper Wire Gauge AWG	Circuit Breaker/Fuse
-48 VDC	-60 VDC (max.)	16 recommended - Wire gauge should be determined based on local engineering standards and practices.	5A
24 VDC	21 VDC (min.)	16 recommended - Wire gauge should be determined based on local engineering standards and practices.	5A

**Important** Each installed switch must be grounded. For information

- Notes**
- All power measurements are taken at the -48 VDC terminal block.
  - The minimum start-up voltage is 19 VDC.
  - BTI Service Access 800 Series devices are to be powered by a Limited Power Source (LPS) per IEC 60950-1 Table 2C.

## MAC address allocation

The following table lists the entities for which MAC addresses are allocated.

The address offsets represent decimal values that are offset from the OOB MAC. For example, if the OOB MAC address is 00:19:6d:01:22:f0, then the in-band MAC address is 00:19:6d:01:22:f1, and so forth.

**Table 9-4 MAC address allocation**

Address Offset	Allocated to:
0	OOB MAC / In-band MAC
1	Port 1 (base system)
2	Port 2 (base system)
3	Port 3 (base system)
4	Port 4 (base system)
5	Port 5 (base system)
6	Port 6 (base system)
7	Port 7 (base system)
8	Port 8 (base system)
9	Port 9 (base system)
10	Port 10 (base system)
11	Port 11 (base system)
12	Port 12 (base system)
13	Port 13 (base system)
14	Port 14 (base system)
15	Port 15 (base system)
16	Port 16 (base system)
17	Port 17 (base system)
18	Port 18 (base system)
19	Port 19 (base system)
20	Port 20 (base system)
21	Port 21 (base system)
22	Port 22 (base system)
23	Port 23 (base system)
24	Port 24 (base system)
25	Port 25 (base system)
26	Port 26 (base system)
27	Port 27 (base system)
28	Port 28 (base system)
29	LACP /LAG
30	LACP /LAG
31	LACP /LAG

**Table 9-4 MAC address allocation (Continued)**

<b>Address Offset</b>	<b>Allocated to:</b>
32	LACP /LAG
33	LACP /LAG
34	LACP /LAG
35	LACP /LAG
36	LACP /LAG
37	LACP /LAG
38	LACP /LAG
39	LACP /LAG
40	LACP /LAG
41	LACP /LAG
42	LACP /LAG
43	Reserved
44	Reserved
45	Reserved
46	Reserved
47	Reserved

## 9.2 BTI SA-821 Carrier Ethernet Switch Transceiver Specifications

**Table 9-5 Standard Compliance**

RoHS Compliance	RoHS 6/6 compliant per Directive 2011/65/EU
Laser Safety	IEC 60825-2: Class 1
Mechanical, Shock and Vibration	GR-63-CORE (in system qualified to NEBS level 3)
Flammability Rating	UL 94V-0
ESD Immunity	IEC 61000-4-2
Radiated Immunity	IEC 61000-4-3
Electromagnetic Emissions	FCC CFR47 Part15, EN 55022

**Table 9-6 SFP Power Consumption**

SFP Type	PEC	Power Consumption
SFP: 10/100/1000BT Copper	BP3AD3ES	1.3 W
SFP: 1000BT Copper	BP3AE2ES	1.3 W
SFP: 850nm SX	BP3AD1SS	1.0 W
SFP: 1310nm SR	BP3AM1MS	1.0 W
SFP: 1310nm IR	BP3AM1MI	1.3 W
SFP: 100BX, GE, SR, bidi 1310tx/ 1490nm (20km)	BP3AM5PB	1.3 W
SFP: 100BX, GE, SR, bidi 1490tx/ 1310nm (20km)	BP3AM5QB	1.3 W
SFP: 100BX, GE, IR, bidi 1310T/ 1490R (40km)	BP3AM5PI	1.3 W
SFP: 100BX, GE, IR, bidi 1490T/ 1310R (40km)	BP3AM5QI	1.3 W
SFP: CWDM LR	BP3AM1CL-xx xx = [01-16] [01-08, 09-16]	1.3 W
SFP: DWDM ER	BP3AM1DE-xx xx = [01-32, E1-E8] [01-08, 09-32, E1-E8]	1.3 W

**Table 9-7 SFP+ Power Consumption**

SFP+ Type	PEC	Power Consumption
SFP+ 850nm 200m dual-rate 10.3 10.5Gbps	BP3AD6SS	1.0 W
SFP+ 1310nm 10km multi-rate 9.9 to 11.1Gbps	BP3AM6MS	1.0 W
SFP+DWDM fixed 80km multi-rate 9.9 to 11.1Gbps	BP3AM6DL-xx [01-32, E1-E8]	1.2 W
SFP+ 1550nm IR 40km 10GE 10.3Gbps (I-temp)	BP3AM8LI	1.5W
SFP+: Tunable 96 Channel DWDM 80km 10G Multi-Rate / Multi-Protocol	BP3AM6TL	1.5 W

**Table 9-8 Environmental Conditions**

Parameter	Minimum	Maximum	Unit
Operating Case Temperature See Table Supported Transceiver Modules and Operating Temperatures	-05	+70	° C
Storage Temperature	-40	+80	° C
Humidity, Operating	05	85	%RH
Humidity Short Term	05	85	%RH

**Table 9-9 Supported Transceiver Modules and Operating Temperatures**

Transceiver	Grade	PEC	Supported and Non Supported Temperatures		
			0C to +40C	-5C to +55C	-40C to +65C
SFP: 10/100/1000BT Copper	C-Temp -5C to +70C	BP3AD3ES	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 850nm SX	C-Temp -5C to +70C	BP3AD1SS	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 1310nm SR	C-Temp -5C to +70C	BP3AM1MS	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 1310nm IR	C-Temp -5C to +70C	BP3AM1MI	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 100BX GE, SR, bidi	C-Temp -5C to +70C	BP3AM5PB	Supported Mandatory	Supported Mandatory	Not Supported

**Table 9-9 Supported Transceiver Modules and Operating Temperatures (Continued)**

Transceiver	Grade	PEC	Supported and Non Supported Temperatures		
			0C to +40C	-5C to +55C	-40C to +65C
1310tx/1490nm (20km)					
SFP: 100BX GE, SR, bidi 1490tx/1310nm (20km)	C-Temp -5C to +70C	BP3AM5QB	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 100BX GE, IR, bidi 1310T/1490R (40km)	C-Temp -5C to +70C	BP3AM5PI	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 100BX GE, IR, bidi 1490T/1310R (40km)	C-Temp -5C to +70C	BP3AM5QI	Supported Mandatory	Supported Mandatory	Not Supported
SFP: CWDM LR Channel xx	C-Temp -5C to +70C	BP3AM1CL-xx xx = [01-16]	Supported Mandatory	Supported Mandatory	Not Supported
SFP: DWDM ER Channel xx	C-Temp -5C to +70C	BP3AM1DE-xx xx = [01-32, E1-E8]	Supported Mandatory	Supported Mandatory	Not Supported
SFP: 10/100/1000BT Copper (I-temp)	I-Temp -40C to +85C	BP3AD7ES	Supported Not Mandatory	Supported Not Mandatory	Supported Mandatory
SFP: 850nm SX (I-temp)	I-Temp -40C to +85C	BP3AD7SS	Supported Not Mandatory	Supported Not Mandatory	Supported Mandatory
SFP: 1310nm SR (I-temp)	I-Temp -40C to +85C	BP3AD7MS	Supported Not Mandatory	Supported Not Mandatory	Supported Mandatory
SFP+: 850nm 200m, dual-rate 10.3 and 10.5Gbps	C-Temp -5C to +70C	BP3AD6SS	Supported Mandatory	Supported Mandatory	Not Supported
SFP+: 1310nm 10km, multi-rate 9.9 to 11.1Gbps	C-Temp -5C to +70C	BP3AM6MS	Supported Mandatory	Supported Mandatory	Not Supported
SFP+: DWDM fixed 80km, multi-rate, 9.9 to 11.1Gbps	C-Temp -5C to +70C	BP3AM6DL-xx	Supported Mandatory	Supported Mandatory	Not Supported
SFP+: 850nm 200m, 10GE 10.3Gbps (I-temp)	I-Temp -40C to +85C	BP3AD8SS	Supported Not Mandatory	Supported Not Mandatory	Supported Mandatory

**Table 9-9 Supported Transceiver Modules and Operating Temperatures (Continued)**

Transceiver	Grade	PEC	Supported and Non Supported Temperatures		
			0C to +40C	-5C to +55C	-40C to +65C
SFP+: 1310nm 10km, 10GE 10.3Gbps (I-temp)	I-Temp -40C to +85C	BP3AM8MS	Supported Not Mandatory	Supported Not Mandatory	Supported Mandatory
SFP+: 1550nm IR 40km, 10GE 10. 3Gbps (I-temp)	I-Temp -40C to +85C	BP3AM8LI	Supported Mandatory	Supported Mandatory	Supported Mandatory
SFP+: DWDM fixed 80km, 10GE 10.3Gbps (I-temp)	I-Temp -40C to +85C	BP3AM8DL-xx	Supported Not Mandatory	Supported Not Mandatory	Supported Mandatory
SFP+: Tunable 96 Channel DWDM 80km, 10G Multi-Rate / Multi-Protocol	C-Temp -5 to +75C	BP3AM6TL	Supported Not Mandatory	Not Supported	Not Supported

## 9.2.1 BP3AM6TL 10G Multi-Rate / Multi-Protocol Tunable DWDM 80 km Transceiver Specifications

**Table 9-10 BP3AM6TL 10G Multi-Rate / Multi-Protocol Tunable DWDM 80 km single mode SFP+ transceiver specifications**

Parameter	Min	Typical	Max	Units
Wavelength, Channel and Frequency	ITU 96 Channel, Wavelength and Frequency Plan for C Band Tunable DWDM Transceiver. See <a href="#">Appendix B, “ITU Wavelength Plan for C Band Tunable DWDM Transceiver”</a> Wavelength, Channel and Frequency are provisionable using the CLI command <code>transceiver itu</code>			
Bit rates and protocols	9.95/10.3 Gbps 10GE LAN PHY			
Supported Equipment	BTI SA-805 - Line interface			
Connector/Latch type	LC/Bail			
Supported Link Type and Length:	<ul style="list-style-type: none"> <li>Transceiver link Length for 9/125um single mode fiber: 80 km</li> </ul> A shorter link/span length may require an in-line attenuator.			
Monitoring	Monitoring and digital diagnostics for all provisioned channels and bit rates. LOS Signaling on Average Received Power Level			
<b>Internally Calibrated Alarm Thresholds</b>	High Alarm	High Warning	Low Warning	Low Alarm
Temperature (°C)	+72.00	+70.00	-05.00	-07.00
Voltage (v)	+03.63	+03.46	+03.13	+02.97
Current (mA)	+110.00	+95.00	+25.00	+15.00
Optical Transmit Power (dBm)	+03.00	+02.00	-02.00	-03.00
Optical Receive Power (dBm)	-04.00	-06.00	-27.21	-29.21
Transmitter	-00.10		+00.30	dBm
Average Output Power Variation			+00.25	dB
Frequency Range	191.35		196.10	THz
Number of Channels	+96.00			
Nominal Channel Spacing	+50.00			GHz
Frequency Deviation Referenced to ITU Grid Frequency (BOL)	-01.50			
Frequency Deviation Referenced to ITU Grid Frequency (EOL)	-02.50		+02.50	GHz
Spectral Width (-20dB)	-		0.3	nm
Side Mode Suppression Ratio	+30.00	-	-	dB
Extinction Ratio	+08.20	-	-	dB
Optical Return Loss Tolerance	-	-	+27.00	dB
SBS Threshold when Dither is on	+16.00	-	-	dBm
SBS Threshold when Dither is off	+10.00	-	-	dBm
Average Launch Power of OFF Transmitter	-	-	-30.00	dBm



**Table 9-10 BP3AM6TL 10G Multi-Rate / Multi-Protocol Tunable DWDM 80 km single mode SFP+ transceiver specifications (Continued)**

Parameter	Min	Typical	Max	Units
<b>Receiver</b>				
Bit Rate	+09.95	-	+11.09	Gb/s
Rx operating wavelength	+1260	-	+1600	nm
Maximum Receiver Input Power (Damage Threshold)	+03.00	-	-	dBm
Receiver Reflectance	-	-	-27.00	dB
Standard Compliance	IEEE 802.3 Clause 52 (10Gb/s LAN PHY) ITU.T G 709 ITU-T G 8251, G.Sup43			

### 9.2.1.1 BP3AM6TL Polarization Mode Dispersion Tolerance

There can be a significant amount of Polarization Mode Dispersion (PMD) generated when the transceiver operates over a great distance and through many components. The degradation in the performance of the receiver caused by the accumulation of PMD is specified in the table below. The PMD penalty is applied applied as an Optical Signal to Noise Ratio (OSNR) penalty.

**Table 9-11 BP3AM6TL Polarization Mode Dispersion (PMD) penalty**

Differential Group Delay (DGD) (ps)	Maximum Addition Required OSNR Penalty (dB)
≤10	1.0
≤20	1.5
≤30	2.0



# Appendix A: Regulatory information

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The following sections indicate the primary standards and protocols to which BTI Service Access 800 Series Ethernet Switches have been tested.

- A.1, “Canada and U.S. standards”
- A.2, “Telcordia physical requirements”
- A.3, “European Telecommunications Standards Institute”

## **A.1 Canada and U.S. standards**

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BTI Service Access 800 Series equipment is fully compliant to the following Canadian and U.S. standards:

- CSA22.2 No. 60950-00/UL 60950 Third Edition, 2000-12

## A.2 Telcordia physical requirements

The following table lists the Telcordia physical specifications to which the BTI Service Access 800 Series Ethernet Switched has been designed to meet.

**Table A- 1 Telcordia physical standards**

<b>Standard</b>	<b>Description</b>
GR-63-CORE	Physical Protection; identifies minimum generic spatial and environmental criteria
GR-1089-CORE	Electromagnetic Compatibility and Electrical Safety Generic Criteria for Network Telecommunications Equipment; identifies the minimum generic criteria for Electromagnetic Compatibility (EMC) and electrical safety

## A.3 European Telecommunications Standards Institute

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The following are the European Telecommunications Standards Institute (ETSI) standards to which BTI Service Access 800 Series Ethernet Switches have been tested.

- ETSI EN 300 386 - Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements
- ETSI EN 300 019 - Equipment Engineering (EE); Environmental Conditions and Environmental Tests for Telecommunications Equipment: 2-1, Class T1.2-Storage; 2-2, Class T2.3-Public Storage; 2-3, Class T3.1&3.1E
  - IEC 60068-2-1: Storage, Air Temperature Low - covered by NEBS testing
  - IEC 60068-2-1: Storage, Air Temperature High - covered by NEBS testing
  - IEC 60068-2-56: Storage, Humidity, High - covered by NEBS testing
  - IEC 60068-2-6: Storage, Sinusoidal Vibration - covered by NEBS testing
  - IEC 60068-2-64: Storage, Random Vibration - covered by Public Transportation testing
- ETSI 300 019-2-2:1994 - Transportation (Class T2.3 Public Transportation)
  - IEC 60068-2-1: Public Transportation, Temperature Low
  - IEC 60068-2-2: Public Transportation, Air Temperature High
  - IEC 60068-2-56: Public Transportation, Humidity, High
  - IEC 60068-2-14 - Public Transportation, Air Temperature, Change
  - IEC 60068-2-30: Public Transportation, Rapid Temperature Change
  - IEC 60068-2-64: Public Transportation, Random Vibration
  - IEC 60068-2-29: Public Transportation, Shocks
  - IEC 60068-2-32: Public Transportation, Free Fall
- ETSI 300 019-2-3:1994 - In use Weather Protected (Class T3.IE Temperature Controlled)
  - IEC 60068-2-1: Stationary Use, Air Temperature Low - IEC 60068-2-2: Stationary Use, Air Temperature High
  - IEC 60068-2-14: Stationary Use, Air Temperature Change
  - IEC 60068-2-14: Stationary Use, Air Temperature Change
  - IEC 60068-2-56: Stationary Use, High Humidity
  - IEC 60068-2-27: Stationary Use, Mechanical Tests, Shocks

## Appendix B: ITU Wavelength Plan for C Band Tunable DWDM Transceiver

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This wavelength plan is supported on the following:

- BP3AM6TL 10G Multi-Rate / Multi-Protocol Tunable DWDM single mode SFP+ transceiver on BTI SA-805, BTI SA-821, BTI SA-822 systems with the following rates, protocols and link length:
  - 9.95/10.3 Gbps 10GE LAN PHY
  - Link Length for 9/125um single mode fiber: 80 km

Additional information is located at the following:

- `transceiver itu` command in Chapter 3, Command Line Reference Guide.

**Table B- 1 ITU Wavelength Plan for C Band Tunable DWDM Transceiver**

<b>Wavelength nm</b>	<b>Frequency THz</b>	<b>Channel No.</b>	<b>Wavelength nm</b>	<b>Frequency THz</b>	<b>Channel No.</b>
1528.77	196.10	96	1547.72	193.70	48
1529.16	196.05	95	1548.11	193.65	47
1529.55	196.00	94	1548.51	193.60	46
1529.94	195.95	93	1548.91	193.55	45
1530.33	195.90	92	1549.32	193.50	44
1530.72	195.85	91	1549.72	193.45	43
1531.12	195.80	90	1550.12	193.40	42
1531.51	195.75	89	1550.52	193.35	41
1531.90	195.70	88	1550.92	193.30	40
1532.29	195.65	87	1551.32	193.25	39
1532.68	195.60	86	1551.72	193.20	38
1533.07	195.55	85	1552.12	193.15	37
1533.47	195.50	84	1552.52	193.10	36
1533.86	195.45	83	1552.93	193.05	35
1534.25	195.40	82	1553.33	193.00	34
1534.64	195.35	81	1553.73	192.95	33
1535.04	195.30	80	1554.13	192.90	32
1535.43	195.25	79	1554.54	192.85	31
1535.82	195.20	78	1554.94	192.80	30
1536.22	195.15	77	1555.34	192.75	29
1536.61	195.10	76	1555.75	192.70	28
1537.00	195.05	75	1556.15	192.65	27
1537.40	195.00	74	1556.55	192.60	26
1537.79	194.95	73	1556.96	192.55	25
1538.19	194.90	72	1557.36	192.50	24
1538.58	194.85	71	1557.77	192.45	23
1538.98	194.80	70	1558.17	192.40	22
1539.37	194.75	69	1558.58	192.35	21
1539.77	194.70	68	1558.98	192.30	20
1540.16	194.65	67	1559.39	192.25	19
1540.56	194.60	66	1559.79	192.20	18
1540.95	194.55	65	1560.20	192.15	17
1541.35	194.50	64	1560.61	192.10	16
1541.75	194.45	63	1561.01	192.05	15
1542.14	194.40	62	1561.42	192.00	14
1542.54	194.35	61	1561.83	191.95	13
1542.94	194.30	60	1562.23	191.90	12



**Table B- 1 ITU Wavelength Plan for C Band Tunable DWDM Transceiver**

<b>Wavelength nm</b>	<b>Frequency THz</b>	<b>Channel No.</b>	<b>Wavelength nm</b>	<b>Frequency THz</b>	<b>Channel No.</b>
1543.33	194.25	59	1562.64	191.85	11
1543.73	194.20	58	1563.05	191.80	10
1544.13	194.15	57	1563.45	191.75	9
1544.53	194.10	56	1563.86	191.70	8
1544.92	194.05	55	1564.27	191.65	7
1545.32	194.00	54	1564.68	191.60	6
1545.72	193.95	53	1565.09	191.55	5
1546.12	193.90	52	1565.50	191.50	4
1546.52	193.85	51	1565.90	191.45	3
1546.92	193.80	50	1566.31	191.40	2
1547.32	193.75	49	1566.72	191.35	1



# Appendix C: Wavelength Compatibility Table

Table C- 1 Wavelength Compatibility Table

BTI 7000 - 32+8 Channel	BTI 7000 Legacy 44 Channel	BTI 7000 ROADM 96 Channel	MUX/ DEMUX 96 Channel	BP3AM6TL Transceiver 96 Channel	Wavelength nm	Freq. THz
N/A	N/A	610	C96	96	1528.77	196.10
N/A	N/A	605	C95	95	1529.16	196.05
E8	600	600	C94	94	1529.55	196.00
N/A	N/A	595	C93	93	1529.94	195.95
32	590	590	C92	92	1530.33	195.90
N/A	N/A	585	C91	91	1530.72	195.85
31	580	580	C90	90	1531.12	195.80
N/A	N/A	575	C89	89	1531.51	195.75
30	570	570	C88	88	1531.90	195.70
N/A	N/A	565	C87	87	1532.29	195.65
29	560	560	C86	86	1532.68	195.60
N/A	N/A	555	C85	85	1533.07	195.55
28	550	550	C84	84	1533.47	195.50
N/A	N/A	545	C83	83	1533.86	195.45
27	540	540	C82	82	1534.25	195.40
N/A	N/A	535	C81	81	1534.64	195.35
26	530	530	C80	80	1535.04	195.30
N/A	N/A	525	C79	79	1535.43	195.25
25	520	520	C78	78	1535.82	195.20
N/A	N/A	515	C77	77	1536.22	195.15

**Table C- 1 Wavelength Compatibility Table**

<b>BTI 7000 - 32+8 Channel</b>	<b>BTI 7000 Legacy 44 Channel</b>	<b>BTI 7000 ROADM 96 Channel</b>	<b>MUX/ DEMUX 96 Channel</b>	<b>BP3AM6TL Transceiver 96 Channel</b>	<b>Wavelength nm</b>	<b>Freq. THz</b>
E7	510	510	C76	76	1536.61	195.10
N/A	N/A	505	C75	75	1537.00	195.05
E6	500	500	C74	74	1537.40	195.00
N/A	N/A	495	C73	73	1537.79	194.95
24	490	490	C72	72	1538.19	194.90
N/A	N/A	485	C71	71	1538.58	194.85
23	480	480	C70	70	1538.98	194.80
N/A	N/A	475	C69	69	1539.37	194.75
22	470	470	C68	68	1539.77	194.70
N/A	N/A	465	C67	67	1540.16	194.65
21	460	460	C66	66	1540.56	194.60
N/A	N/A	455	C65	65	1540.95	194.55
20	450	450	C64	64	1541.35	194.50
N/A	N/A	445	C63	63	1541.75	194.45
19	440	440	C62	62	1542.14	194.40
N/A	N/A	435	C61	61	1542.54	194.35
18	430	430	C60	60	1542.94	194.30
N/A	N/A	425	C59	59	1543.33	194.25
17	420	420	C58	58	1543.73	194.20
17	N/A	415	C57	57	1544.13	194.15
E5	410	410	C56	56	1544.53	194.10
N/A	N/A	405	C55	55	1544.92	194.05
E4	400	400	C54	54	1545.32	194.00
N/A	N/A	395	C53	53	1545.72	193.95
16	390	390	C52	52	1546.12	193.90
N/A	N/A	385	C51	51	1546.52	193.85
15	380	380	C50	50	1546.92	193.80
N/A	N/A	375	C49	49	1547.32	193.75
14	370	370	C48	48	1547.72	193.70
N/A	N/A	365	C47	47	1548.11	193.65
13	360	360	C46	46	1548.51	193.60
N/A	N/A	355	C45	45	1548.91	193.55
12	350	350	C44	44	1549.32	193.50
N/A	N/A	345	C43	43	1549.72	193.45
11	340	340	C42	42	1550.12	193.40
N/A	N/A	335	C41	41	1550.52	193.35

Table C- 1 Wavelength Compatibility Table

<b>BTI 7000 - 32+8 Channel</b>	<b>BTI 7000 Legacy 44 Channel</b>	<b>BTI 7000 ROADM 96 Channel</b>	<b>MUX/ DEMUX 96 Channel</b>	<b>BP3AM6TL Transceiver 96 Channel</b>	<b>Wavelength nm</b>	<b>Freq. THz</b>
10	330	330	C40	40	1550.92	193.30
N/A	N/A	325	C39	39	1551.32	193.25
9	320	320	C38	38	1551.72	193.20
N/A	N/A	315	C37	37	1552.12	193.15
E3	310	310	C36	36	1552.52	193.10
N/A	N/A	305	C35	35	1552.93	193.05
E2	300	300	C34	34	1553.33	193.00
N/A	N/A	295	C33	33	1553.73	192.95
8	290	290	C32	32	1554.13	192.90
N/A	N/A	285	C31	31	1554.54	192.85
7	280	280	C30	30	1554.94	192.80
N/A	N/A	275	C29	29	1555.34	192.75
6	270	270	C28	28	1555.75	192.70
N/A	N/A	265	C27	27	1556.15	192.65
5	260	260	C26	26	1556.55	192.60
N/A	N/A	255	C25	25	1556.96	192.55
4	250	250	C24	24	1557.36	192.50
N/A	N/A	245	C23	23	1557.77	192.45
3	240	240	C22	22	1558.17	192.40
N/A	N/A	235	C21	21	1558.58	192.35
2	230	230	C20	20	1558.98	192.30
N/A	N/A	225	C19	19	1559.39	192.25
1	220	220	C18	18	1559.79	192.20
N/A	N/A	215	C17	17	1560.20	192.15
E1	210	210	C16	16	1560.61	192.10
N/A	N/A	205	C15	15	1561.01	192.05
N/A	N/A	200	C14	14	1561.42	192.00
N/A	N/A	195	C13	13	1561.83	191.95
N/A	N/A	190	C12	12	1562.23	191.90
N/A	N/A	185	C11	11	1562.64	191.85
N/A	N/A	180	C10	10	1563.05	191.80
N/A	N/A	175	C9	9	1563.45	191.75
ROADM	N/A	170 (ext)	C8	8	1563.86	191.70
ROADM	N/A	165 (ext)	C7	7	1564.27	191.65
ROADM	N/A	160 (ext)	C6	6	1564.68	191.60
ROADM	N/A	155 (ext)	C5	5	1565.09	191.55

**Table C- 1 Wavelength Compatibility Table**

<b>BTI 7000 - 32+8 Channel</b>	<b>BTI 7000 Legacy 44 Channel</b>	<b>BTI 7000 ROADM 96 Channel</b>	<b>MUX/ DEMUX 96 Channel</b>	<b>BP3AM6TL Transceiver 96 Channel</b>	<b>Wavelength nm</b>	<b>Freq. THz</b>
ROADM	N/A	150 (ext)	C4	4	1565.50	191.50
ROADM	N/A	145 (ext)	C3	3	1565.90	191.45
ROADM	N/A	140 (ext)	C2	2	1566.31	191.40
ROADM	N/A	135 (ext)	C1	1	1566.72	191.35





*Part Number:*  
*Document Version:*  
*Published:*  
*Type:*

*BT7D21PD0011*  
*02*  
*January 2017*  
*STANDARD*

***product release 2.2.1***