

TejNEOS TJ1400P-H Enterprise 10.0.12.2 Hardware Description Guide

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Revision history

Version	Document ID and Issue Date	Updates
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Document overview

This document provides information on hardware configuration, limitations, and the physical characteristics of TJ1400P-H hardware platform.

Target audience

This document is intended for network operators and system engineers to help them understand the hardware of the system.

Additional resources

For more information, refer to the following guides.

Document Name and Version	Description
TejNEOS TJ1400P-H Enterprise 10.0.12.2 Installation and Commissioning Guide v1.0	The document details the procedures to install the product and to initially configure it to the point of verifying its proper operation in the network.
TejNEOS TJ1400P-H Enterprise 10.0.12.2 Command Line Interface Guide v1.0	This document describes command-line interface (CLI) commands you use to view and configure TejNEOS software.
TejNEOS TJ1400P-H Enterprise 10.0.12.2 Feature Description Guide v1.0	This document describes the functions, features, capabilities, and specification of TJ1400P-H.
TJ1400 Product Family 10.x Alarm Clearing Prodedure Guide V5.0	This document provides the list of alarms, causes, and the procedure to clear the alarm.

Chapter organization

This document is organized as follows:

Chapter	Scope
TJ1400P-H overview	Provides an overview of TJ1400P-H product.
TJ1400P-H system	Provides the chassis views, physical specifications, and field replaceable units of the product.
Optical interface specifications	Provides the optical carriers and bandwidth interface specifications for this release.
Regulatory standard compliance	Provides the regulatory standards complied by the system.
System availability and MTBF calculation	Provides system availability details and MTBF calculations.
Acronyms	Provides the expanded form of the acronyms mentioned in this document.

TJ1400P-H overview

The TJ1400P-H product model is an ultra-converged industry's packet access and aggregation platforms. This is suitable for mobile backhaul, enterprise, business, data center, cloud and infrastructure services. Supports efficient delivery of residential triple-play and video-on-demand services.

Following are the key features:

- High reliability: Increased network reliability by providing optional redundant switch fabrics and the ability to support protected UNIs and NNIs across interface cards.
- Flexible modular architecture: Supports network to meet stringent SLAs and decrease meantime to repair module (replace only affected module and not the entire unit). Supports to build the network best suited for all services.
- Advanced features: TJ1400P-H can build a flexible architecture best suited for all services. TJ1400P-H enables high-capacity backhaul through Packet data.
- System is fully solid state and adopts state of the art technology.
- Supports modular and centralized architecture for chassis based systems.
- Supports Store and Forward mode of Layer-2 switching model.

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TJ1400P-H system

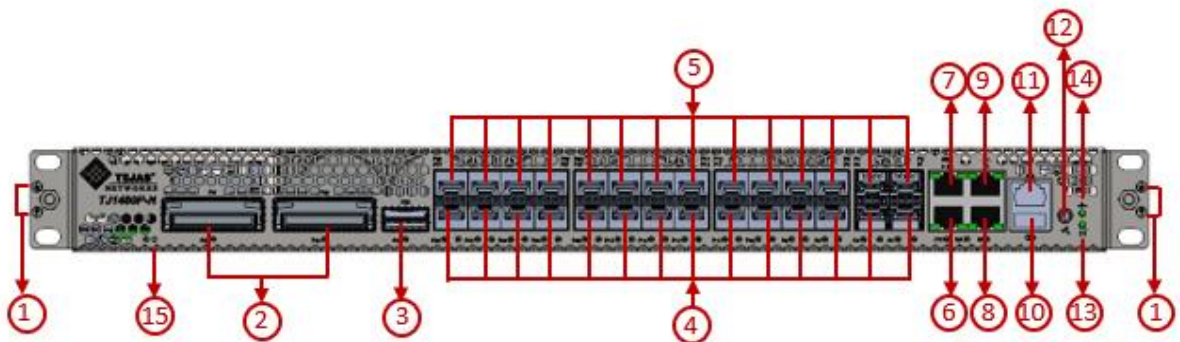
TJ1400P-H is a packet aggregation solution for edge and access applications in the network. With a full PTN feature set enabling end-to-end pseudowire and Ethernet multipoint services, the TJ1400P-H has the advanced features of mobile backhaul, enterprise, business, data center, cloud and infrastructure services.

TJ1400P-H equipment can be configured in various topologies such as Linear, Ring and Bus. TJ1400P-H supports up to 300Gbps bidirectional switching capacity.

Front panel view of TJ1400P-H chassis

The following figure shows the front panel view of the TJ1400P-H:

Figure 1: TJ1400P-H - Front panel view

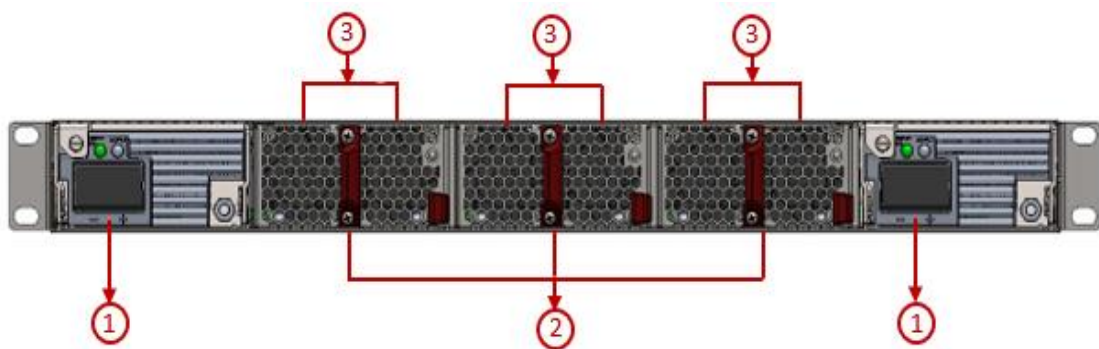


Numbering	Description	Numbering	Description
1	Chassis Grounding	9	BITS Data port
2	2XCFP2 100GE (P1 and P2)	10	USB port
3	1XQSFP28 100GE (P3)	11	NMS port/LAN
4	10GE/1GE Ports (P9-P31) 25G Ports (P5 and P7) All the bottom ports are odd numbered ports	12	DIAG port
5	10GE/1GE Ports(P8-P30) 25G Ports (P4 and P6) All the top ports are even numbered ports	13	Status LED
6	Alarm In	14	Active LED
7	Alarm Out	15	Power
8	ToD port		

Rear panel view of TJ1400P-H chassis

The following figure shows the rear panel view of TJ1400P-H:

Figure 2: Rear panel view of TJ1400P-H













Numbering	Description
1	Power supply unit
2	Fan Tray Unit (FTU)
3	Fans in Fan Tray Unit

Port symbols and its representation

The following table lists the port symbols present on the TJ1400P-H chassis and their representation.

Table 1: TJ1400P-H Port symbol representation

Symbol / Port Name	Port or Connector
	Active LED
	Status LED
	USB
	LAN
	Diag
	Bits
	Alarm in
	Alarm out
	TOD
	Power

LED indication details

The LED indications present on the front panel of TJ1400P-H include the following:

- Two LEDs namely Active and Status on the front panel that indicate chassis status
- Critical, Major and Minor alarm LEDs
- LED for each electrical/optical port (P1 to P31) to indicate the status of the port
- LEDs for optical interfaces (CFP2 and QSFP28) indicate admin status of the port. Each port has LED to indicate port status. The LED indication for the CFP2 ports using QSFP28 adapter is valid only when the module is inserted with the adapter.
- Power LED
- Fan status LED

The following table describes the Active and Status LEDs.

Table 2: Active and Status LED status indication

LED	Description	LED color	Significance/Condition
ACTIVE	Indicates the status of the power supply unit.	Green	Indicates System Power-up complete.
		Red	Indicates On-board voltage fault.
		Amber	Indicates that the power supply is on and node booting.
		Off	Indicates absence of Output voltage.
STATUS	Indicates the status of node	Green	Indicates that the node is functional.
		Red	Indicates any of the following circumstances: <ul style="list-style-type: none"> • Software crash • Node hangs • Node rebooting continuously
		Amber	Indicates that the power supply is on and node booting.

The following table describes the different alarm LED indications.

Table 3: Critical, Major and Minor alarm LED indications

LED	Color	LED Status
Critical LED	Red	Critical alarm detected by node.
	Off	Default State. No Critical alarm detected.

LED	Color	LED Status
Major LED	Red	Major alarm detected by node.
	Off	Default State. No Major alarm detected.
Minor LED	Amber	Minor alarm detected by node.
	Off	Default State. No Minor alarm detected.

The following table describes optical/electrical port LED indications.

Table 4: Optical/electrical port(CFP2/QSFP28/SFP/SFP+) LED indications

State	Green	Red
Module present + Port Enable + No LOS	Yes	No
Module present + Port Enable + LOS	No	Yes
Module absent or Port disable	No	No

The following table describes the power LED indications.

Table 5: Power status LED details

LED	Description	LED color	Significance/Condition
PWR (Power)	Indicates the status of the power supply.	Green	Indicates System Power-up complete.
		Red	Indicates On-board voltage fault
		Off	Indicates absence of Output voltage (no power to the node).

System specifications

This section describes the system specifications for TJ1400P-H. TJ1400P-H with DC PSU is a full-depth chassis.

Type	Parameter	Value	
Installation rack	Installation rack type	19 inch	
	Chassis installation rack height	1 Rack Unit (RU)	
	Air flow direction in the chassis	Front to rear	
Mechanical specifications	Height	44mm	
	Width	With mount angles	478mm
		Without mount angles	442mm

Type	Parameter		Value
	Depth	Excluding Air Filter latch handle	483mm
	Weight	Chassis with Mount angles, Backplane, one PSU, and PSU filler panel	9.5kgs
Electrical specifications	Power rating		290W (Typical), 360W (Maximum)
	Input voltage range		-40V to -60V DC 90V to 264V AC
Environmental specifications	Storage temperature range		-40°C to 70°C
	Operating temperature range		-40°C to 60°C
	Relative humidity		30% to 95% RH

Fan tray unit

TJ1400P-H with DC/AC PSU is provided with a Fan Tray Unit (FTU) at rear side of the chassis.

Functional description

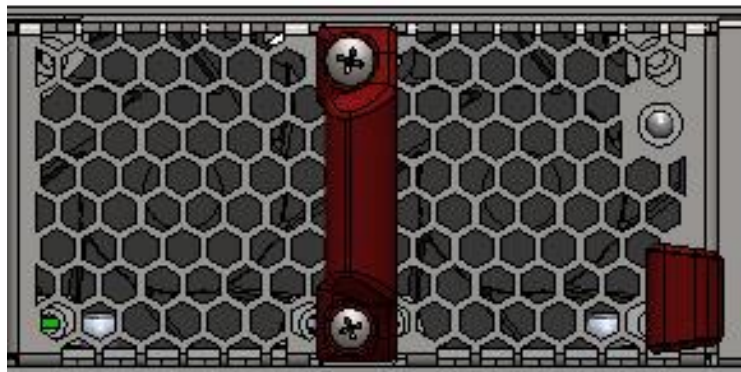
The following are the functional features of FTU:

- Each FTU contains of two fans to cool the equipment.
- The FTU is inserted from rear of the chassis.
- An Alarm is raised if the fan fails and the temperature of the equipment increases.
- Each fan power supply has a fuse to isolate any failed fans from other functional fans from other functional fans.
- Fan speed monitoring and control through software, based on the temperature sensed.
- Temperature monitoring on the air flow path.
- Hot-swap protection.
- The FTUs are designed to be replaceable at the field.
- Air-flow direction is from the front to the rear.

Rear panel

The following figure shows the FTU on the rear view of TJ1400P-H.

Figure 3: Fan Tray Unit of TJ1400P-H



LED indication details

There is one visual indicator present on TJ1400P-H FTU. The following table describes the LED color indications of the FTU.

Table 6: TJ1400P-H FTU LED status and their significance

LED	Description	LED color	Significance/Condition
Fan	Indicates the status of the FTU.	Off	Powered off.
		Amber	Card is powered-up, uninitialized
		Green	Card is up and initialized
		Red blinking	Fan fault
		Green blinking	Fan full speed set by software.
		Red-Green blinking	Fan full speed set due to OT alarm.

Power supply unit

TJ1400P-H supports both AC and DC power supply units. The PSU functions on a load-sharing basis to provide redundancy. That is, if one PSU fails, the other PSU becomes the active load driver and continues to supply stable power to the system.

DC PSU

The DC Power Supply Unit (PSU) is a part of the common unit of TJ1400P-H.

Front panel view

The following figure shows the front panel of TJ1400P-H DC PSU.

Figure 4: TJ1400P-H DC PSU



Functional description

The PSU consists of a single output DC-DC converter and supplies the necessary voltage to the system. The output of the PSU is isolated from the input.

LED indication details

There are two visual indicators present on DC PSU of TJ1400P-H, namely INPUT OK and DC/FLT.

Table 7: TJ1400P-H DC PSU LED status indication

Power Supply condition		LED Indicator	
		INPUT OK	DC/FLT
1	Normal Operation	Green	Green
2	Low or NO Input	Off	Red
3	OVP	Green	Red
4	Over Current	Green	Red
5	Temp Alarm Warning	Green	Amber
6	Fault Over Temp	Green	Red
7	Remote ON/OFF	Green	Red

Operational specification

The following table provides the operational specifications of TJ1400P-H DC PSU.

Table 8: TJ1400P-H DC PSU - Operational Specifications

Specification	Range
MTBF	46 years
PSU weight	1.1kg
Input voltage range	-40V to -60V DC
Output voltage	12V \pm 10% DC
Output Current	70.8 A
Output power	850 W

Specification	Range
Maximum Power consumption	360W
Input Specifications	Input Voltage: -40V to -60V DC Inrush Current: 40A, Pk Input Current: 27A, DC Efficiency: 89%
Output Specifications	Output Ripple & Noise on output: 120 mV, Pk-Pk
Environmental Specifications	Storage Temperature: -40°C to 85°C Operating Temperature: -40°C to 60°C Operating/Storage Humidity: 95%, Non-condensing
Under Voltage Protection	Recovery: -35V+/- 3V Shutdown: Recovery -3V
Protections	Input Under Voltage (Auto Retry Mode) Over-temperature (Auto-recovery) Output Over-Current Output Over-Voltage
EMI/EMC, Safety, Environment Compliance	<ul style="list-style-type: none"> • EN55022 Class A • EN 55032 Class A • IEC61000-4-2 (6.0kV contact discharge and 8.0kV Air Discharge) • IEC61000-4-3 (80-690MHz, level 2 (3V/m), 690-6Hz, level 3(10V/m) • IEC61000-4-4 (±1000V) • IEC61000-4-6, level 2(3V) (0.15MHz - 80MHz) • ETSI EN 300 386 • IEC 60950-1 /EN 60950-1 • UL 60950-1 • In-rush Current limiting as per ETSI EN 300 132-2 • ETSI EN 300 019 Part 1-1 • QM333
Hold-up Time (Interruption)	2ms at 54V Input
Power interface	Input: DINKLE DT-7C-B14W-02 Output: FCI Berg P/N: 51732-077LF

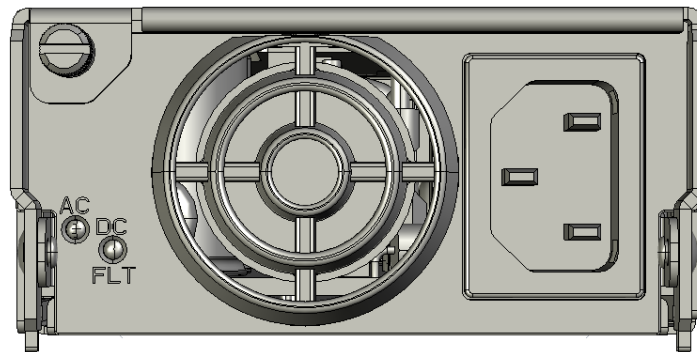
AC PSU

AC PSU converts the input AC to output DC to supply a stable power to other cards/units present in the TJ1400P-H chassis.

Front panel view

The following figure shows the front panel of TJ1400P-H AC PSU.

Figure 5: TJ1400P-H AC PSU



Functional description

The AC Power Supply Unit (PSU) is a part of the common unit of TJ1400P-H. The PSU functions on a load-sharing basis to provide redundancy. That is, if one PSU fails, the other PSU becomes the active load driver and continues to supply stable 12V DC power to the system.

LED Indication details

There are two visual indicators present on AC PSU of TJ1400P-H, namely AC and DC/FLT. The following table provides the LED color and its significance.

Table 9: TJ1400P-H AC PSU LED indications

Power Supply condition		LED Indicator	
		AC	DC/FLT
1	Normal Operation	Green	Green
2	Low or NO Input	Initially red and then becomes blank.	Initially red and then becomes blank.
3	OVP	Green	Red
4	Over Current	Green	Red
5	Temp Alarm Warning	Green	Amber
6	Fault Over Temp	Green	Red
7	Remote ON/OFF	Green	Red

Operational specification

The following table provides the operational specification for TJ1400P-H AC PSU.

Table 10: TJ1400P-H AC PSU operational specification

Specification	Range
MTBF	35 years
PSU weight	1.1kg
Input voltage range	90V to 264V AC, 50-60 Hz
Output voltage	12V \pm 10% DC
Output Current	70.8 A (max)
Output power	850 W
Input Specifications	Input Voltage: 90V to 260V AC, 50-60 Hz Inrush Current: 40A, Pk Input Current: 11A (Vin=100V), AC
Output Specifications	Output Ripple & Noise on output: 120 mV, Pk-Pk
Environmental Specifications	Storage Temperature: -40°C to 70°C Operating Temperature: -40°C to 60°C Operating/Storage Humidity: 95%, Non-condensing
Under Voltage Protection	Recovery: 85V+/- 3V Shutdown: Recovery -3V
Protections	Input Under Voltage (Auto Retry Mode) Over-temperature (Auto-recovery) Output Over-Current Output Over-Voltage

Specification	Range
EMI/EMC, Safety, Environment Compliance	<ul style="list-style-type: none"> • EN55022 Class A • EN 55032 Class A • IEC61000-4-2 (4.0kV contact discharge and 8.0kV Air Discharge) • IEC61000-4-3 (80-1000MHz, level 2 (3V/m), 690MHz-6GHz, level 3(10V/m) • IEC61000-4-4 ($\pm 2000V$) • IEC61000-4-6, level 2(3V) (0.15MHz - 80MHz) • IEC61000-4-5 • IEC61000-4-11 • IEC61000-3-2 • IEC61000-3-3 • ETSI EN 300 386 • IEC 60950-1 /EN 60950-1 • IEC62368-1 • UL 60950-1 • In-rush Current limiting as per ETSI EN 300 132-2 • ETSI EN 300 019 Part 1-1 • QM333
Hold-up Time (Interruption)	12ms at 12V Output with max output current
Power interface	<ul style="list-style-type: none"> • Input: IEC320, C13 type • Output: FCI Berg 51732 series

Interfaces

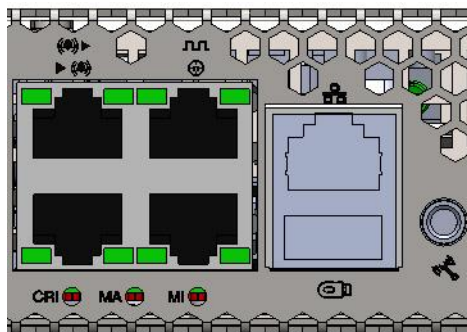
This section details the OAM interfaces and data interfaces supported on TJ1400P-H.

OAM interfaces

The OAM interface provides static user interfaces and visual indications for managing operations, administration and maintenance of the system. OAM block provides 10/100/1000 Base-T NMS, USB, Bits Data/clock squelches, DIAG/ToD Interface, Alarm In and Alarm Out interfaces.

The following figure shows the front panel of the OAM interface.

Figure 6: TJ1400P-H OAM interface



NMS Interface

The NMS interface provides a CSM A/CD based LAN transceiver of an Ethernet link. This is available through RJ45 connector and used to manage the product. The following table provides the details on NMS LED indications and its significance.

Table 11: TJ1400P-H - NMS LED status and their significance

Card Status	NMS LED (Green)	NMS LED (Amber)
Link Present (10/100/1000)	On	Blink
Link Absent	Off	Off

BITS Interface

A BITS DATA/CLK interface through a RJ45 connector is used for OAM.

- One RJ-45 interface with no LED indication.
- Supports one BITS data port and one BITS clock port.

When the BITS clock input is at 2.048 MHz, it can be nominated as a reference for node synchronization. LOS, LOF or AIS on the clock input triggers a changeover to the next synchronization reference. An alarm is raised on the node user interface for failed timing reference.

The timing reference can be synchronized from:

- Received line interfaces
- Clock derived from External BITS clock
- Clock derived from External BITS data

Alarm In/Out Interface

Alarm In: Four user configurable alarm inputs are provided. The alarm inputs connect external triggers for events (such as open door, high temperature in shelf or A/C failure, to the OAM.

When an event occurs that activates the trigger connected to the external alarm input, the network element raises an environmental alarm.

Alarm Out: The alarm outputs are used to trigger the operation of external equipment, such as a generator, fan or audible alarm. The alarm outputs are caused by alarms detected by the node.

The OAM faceplate has the following three LEDs for Alarm out:

- Critical alarm
- Major alarm
- Minor alarm

ToD Interface

1588v2 signals namely ToD IN, ToD OUT, 10 MHz Clock, and 1PPS signals are provided on an RJ45 connector.

USB Interface

TJ1400P-H provides a USB 2.0 port on the front panel. This interface is used by service personnel.

DIAG Interface

The DIAG interface offers a serial connection to the node which a user can launch a terminal session to the operating system. The DIAG is an audio-jack interface.

NOTE: The USB and DIAG interface is meant for use by authorized Tejas Networks personnel only.

Data interfaces

TJ1400P-H has the following data interfaces:

Table 12: TJ1400P-H port matrix

Feature	Description
System switching capacity	Up to 300Gbps
Maximum number of 1GE ports	28
Maximum number of 10 GE ports	28
Maximum number of 25G ports	4
Maximum number of 100 GE ports	3

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Optical interface specifications

This appendix provides the optical interface specifications.

1G optical interface specifications

Table 13: Specifications for 1 Gigabit (1G)

Specifications	1000BASE-SX	1000BASE-LX	1000BASE-LX10	1000BASE-EX	1000BASE-ZX
Minimum Output Power	-9 dBm	-9.5 dBm	-9 dBm	-5 dBm	-2 dBm
Maximum Output Power	-3 dBm	-3 dBm	-3 dBm	2 dBm	3 dBm
Receiver Sensitivity	-18 dBm	-20 dBm	-19.5 dBm	-23 dBm	-24 dBm
Receiver Overload	0 dBm	0 dBm	-3 dBm	-3 dBm	-3 dBm
Wavelength (nominal)	850 nm	1310 nm	1310 nm	1310 nm	1550 nm
Connector Type	Duplex LC	Duplex LC	Duplex LC	Duplex LC	Duplex LC
Optical pluggable slot-cage-packaging	SFP	SFP	SFP	SFP	SFP
Fiber Type	Multi mode	Single mode	Single mode	Single mode	Single mode

10G optical interface specifications

Table 14: Specifications for 10 Gigabit (10G)

Specifications	10GBASE-LR	10GBASE-ER	10GBASE-ZR
Minimum Output Power	-8.2 dBm	-4.7 dBm	0 dBm
Maximum Output Power	0.5 dBm	4 dBm	4 dBm
Receiver Sensitivity	-14.4 dBm	-15 dBm	-24 dBm
Receiver Overload	0.5 dBm	-1 dBm	-7 dBm
Wavelength (nominal)	1310 nm	1550 nm	1550 nm
Connector Type	Duplex LC	Duplex LC	Duplex LC
Optical pluggable slot-cage-packaging	SFP+	SFP+	SFP+
Fiber Type	Single mode	Single mode	Single mode

100G optical interface specifications

Table 15: Specifications for 100Gigabit (100GE)

Specifications	100GBase-LR4 (10km)		100GBase-ER4-Lite (25 km)	
	Minimum	Maximum	Minimum	Maximum
Average Launch Power, each lane	-4.3 dBm	4.5 dBm	-2.9 dBm	4.5 dBm
Total Average Launch Power	1.7 dBm	10.5 dBm	3.1 dBm	10.5 dBm
Average Receive Power, each lane	-10.6 dBm	4.5 dBm	-16.9 dBm	-4.5 dBm
Wavelength (nominal)	1294 to 1310 nm		1294 to 1310 nm	
Connector Type	LC		LC	
Optical pluggable slot-cage-packaging	QSFP28		QSFP28	
Fiber Type	Single mode		Single mode	

100G CFP2 optical interface specifications

Table 16: Specifications for the CFP2 (100G)

Specifications	100GBase-LR4 (10km)	CFP Coherent Metro DWDM
Data rate	103.125 Gbps-111.81 Gbps	103.125 Gbps-111.81 Gbps
Minimum Output Power	NA	-15 dBm
Maximum Output Power	10.5 dBm	+1 dBm
Receiver Sensitivity	-8.6 dBm	-18 dBm
Receiver Overload	4.5 dBm	0
Wavelength/Frequency	1294 to 1310 nm	1528.77 to 1566.72 nm @ 50 GHz Tuning
OSNR for BER 10e-15	NA	14 dB with SD-FEC
Chromatic dispersion tolerance	NA	± 22000 ps/nm (~1200 Km of G.652 fiber)
Connector Type	LC	LC
Fiber Type	Single mode	Single mode

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Regulatory standard compliance

The list of national and international electromagnetic compatibility, safety, reliability and RoHS standards in this chapter is not exhaustive. The standards listed are generally regarded as the primary applicable standards. The conformity status on additional national and international standards not listed in this section can be provided upon request.

Table 17: Regulatory standards compliance

Specification	Standard
EMI/EMC	<ul style="list-style-type: none"> • FCC Part-15, Subpart B, Class-A • ICES-003, Class-A • EN 55032 Class-A / CISPR-32 Class-A • EN 61000-3-2 and EN 61000-3-3 • EN 55035 / CISPR-35 • EN61000-4-2 • EN61000-4-3 • EN61000-4- 4 • EN61000-4-5 • EN 61000-4-6 • EN61000-4-8 • EN61000-4-11 • EN 61000-4-29
Safety	<ul style="list-style-type: none"> • Certified for CB – Scheme • IEC 62368-1 / EN 62368-1 • UL 62368-1
Laser Safety	<ul style="list-style-type: none"> • IEC 60825-1 / EN 60825-1 • IEC 60825-2 / EN 60825-2 • 21 Code of Federal Regulations (CFR)1040
Environment	<ul style="list-style-type: none"> • ETS 300 019-1-1, Class 1.2 Storage • ETS 300 019-1-2, Class 2.3 Transportation • ETS 300 019-1-3, Class 3.2 Operating stationary use • QM333 –Standard for Environmental Testing of Telecommunication Equipment.
RoHS compliant	Directive 2011/65/EU and Directive 2015/863/EU

System availability and MTBF calculation

System Availability

- Non-redundant configuration - 99.999082
- Redundant configuration - 99.999903 (Type-B protection across line cards)

MTBF calculation method

MTBF is the measure of failures of network elements.

$$\text{MTBF (Hours)} = 10^9/\text{FIT}$$

FIT (Failure in time) is the failure frequency in 10^9 hours. This value is derived adding FIT value of all components used in the circuit packs/line cards.

Availability (A) Calculation method

$A = \text{MTBF} / (\text{MTBF} + \text{MTTR})$ for a network element or circuit pack/Tributary card.

MTTR is Mean time to repair.

When two line cards x and y are connected in series (i.e. non-redundant configuration), then $A = A_x \times A_y$ (Product of individual line cards availability).

When a line card x is used in redundant configuration, then $A = 1 - (1 - A_x)^2$

Card	MTBF in years	MTBF in Hrs	MTTR in Hrs
STOLT-1H	22	192720	0.4
CEF8-1 (Cross connect card)	23	201480	0.4
DPU1250 (Power supply)	81	709560	0.2
FTU	68	595680	0.1
OAM	36	315360	0.2

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Acronyms

Acronym	Expansion
AC	Alternate Current
BITS	Building Integrated Timing Supply
CEM	Circuit Emulation
DC	Direct Current
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
LCT	Local Craft Terminal
LED	Light Emitting Diode
LOS	Loss Of Signal
MPN	Manufacturer Part Number
MTBF	Mean Time Between Failures
NMS	Network Management System
OAM	Operation, Administration and Management
PSU	Power Supply Unit
PTN	Packet Transmission Network
SFP	Small Form-factor Pluggable
ToD	Time of Day
TPN	Tejas Part Number