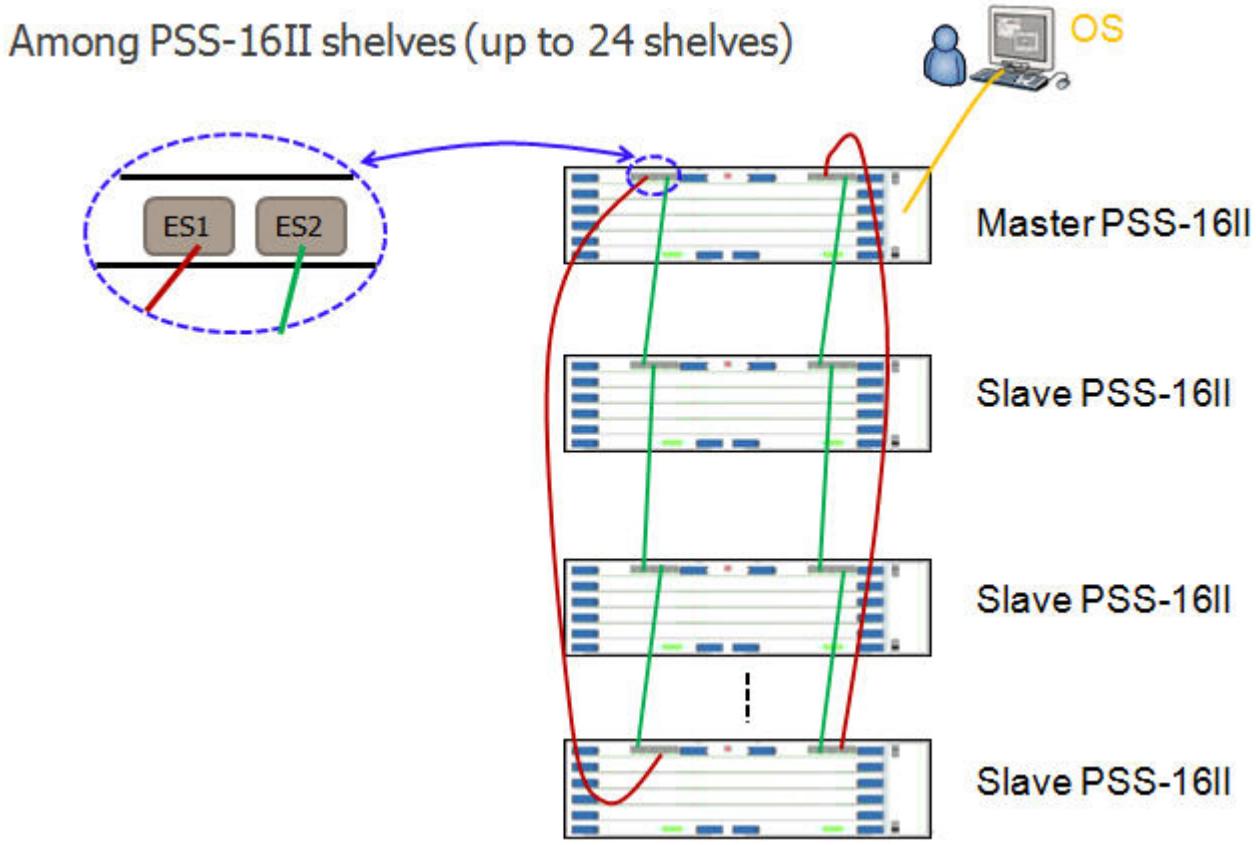
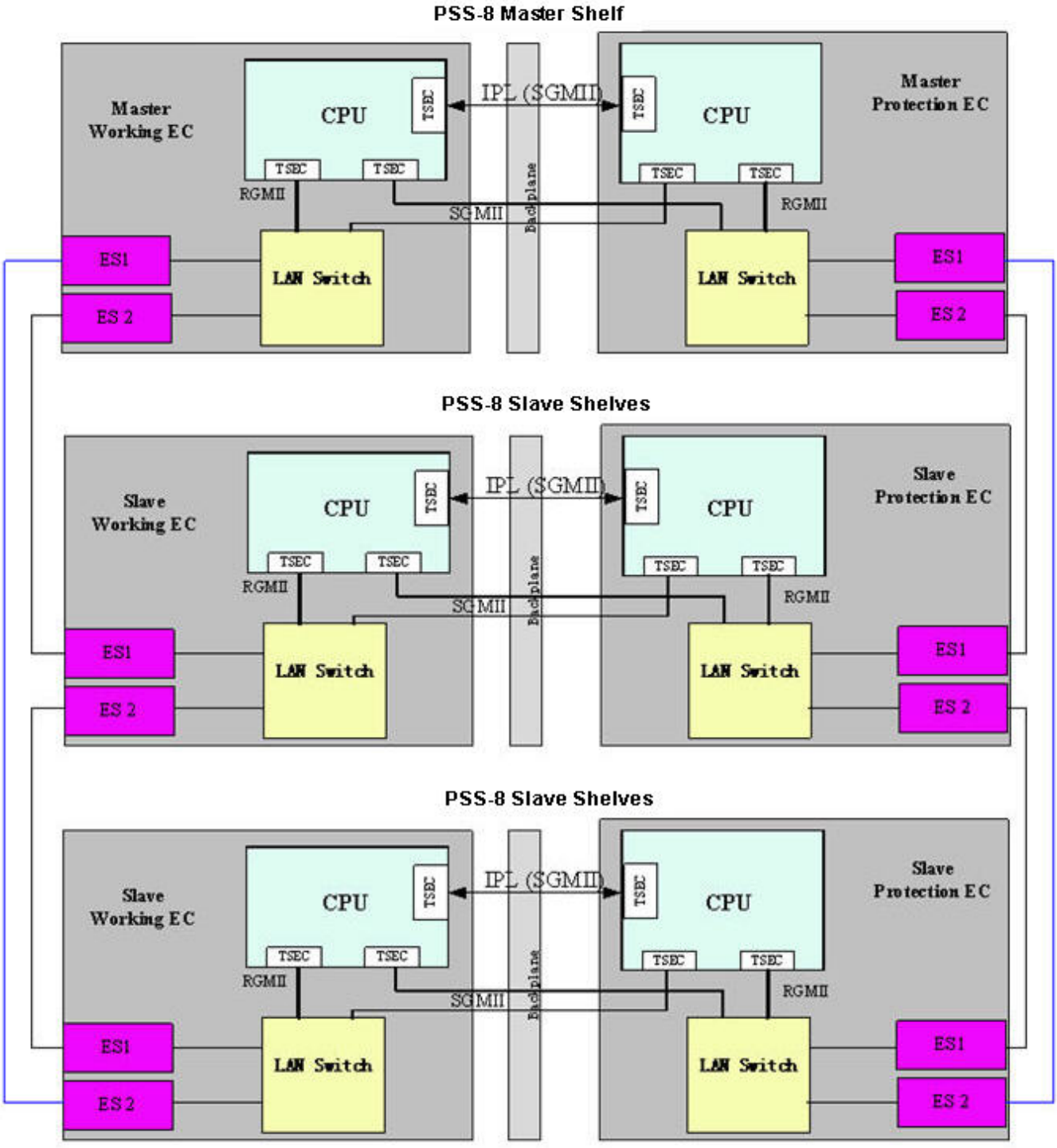
Figure 20-3 Sample multi-shelf 1830 PSS-16II NE cascading



Note: A maximum of 24 PSS-16II shelves can be supported.

Figure 20-4 Sample multi-shelf 1830 PSS-8 NE cascading



Controller redundancy

The following table describes support for redundant controllers between Alcatel-Lucent 1830 PSS shelves in WDM applications.

Table 20-2 Controller redundancy with mixed main/subtending shelves

Main shelf	Main shelf controllers	PSS-8 subtending shelf controllers	PSS-16 subtending shelf controllers	PSS-16II subtending shelf controllers	PSS-32 subtending shelf controllers
PSS-16	1 EC	-	1 EC	-	1 EC
	2 EC	-	2 EC	-	2 EC
PSS-32	1 EC	1 EC	1 EC	1 EC	1 EC
	2 EC	2 EC	2 EC	2 EC	2 EC
PSS-8	1 EC	1 EC	-	-	-
	2 EC	2 EC	-	-	-
PSS-16II	1 EC	-	-	1 EC	-
	2 EC	-	-	2 EC	-

Common Alcatel-Lucent 1830 PSS wired equipment

The following information describes wired equipment that is available to support the Alcatel-Lucent 1830 PSS-16 and Alcatel-Lucent 1830 PSS-32 shelves.

Fiber storage tray (FST)

The Fiber Storage Tray is rack-mountable and is used for managing excess cable lengths within the boundaries of the rack.

DCM shelf (DCMSHFxx)

The DCM shelf is a rack-mountable tray used for holding multiple DCM modules. There is one version that is mountable in 19-inch racks (DCMSHF19) and one in ETSI and ANSI (23-inch) racks (DCMSHF23). The number of DCMs that a shelf can house depends on the rack type and DCM type (length).

Attenuator drawer (ATTNDRW)

The attenuator drawer is a 1 RU-high rack-mountable tray for storage of up to 24 attenuators of any size, if/when attenuators are needed for FOADM nodes.

Flex shelf (FLEXxxxx)

The Flex Shelf is a mounting kit with cover that accepts the rack-mountable SFD44, DCMSHFxx, ATTNHDRW, ITLB, and FST. It occupies 6 RU of rack space (10.5 in. [266.7 mm]), and comes in the following three variants:

- FLEX19 for 19-inch racks
- FLEX23 for 23-inch racks
- FLEXETSI for 300 mm ETSI racks

Use cases for Z25 cover in 1830 PSS Shelf

The Z25 extended cover provides an additional 25 mm of space in the cabling and fiber area of the subrack. This additional space is useful when routing fibers in situations where there are faceplate attenuators, electrical SFP's, CFP's, and OT's with flush mounted pluggables (introduced in R7 and later). The extended cover is also required when using MPO fiber jumpers and if an electrical SFP is required on the faceplate of a circuit pack to give additional space by the electrical SFP. The Z25 cover is backwards compatible and makes use of the existing mounting hardware. It is available in an installation kit or as a separate Z25 cover kit.

The Z25 cover has to be installed when the following OTs, SFP/CFPs are plugged in the Shelf.

Table 20-3 List of OTs, SFP/CFPs

APN	Part description
1AB402160017	C113S10
8DG62446AA	112SDX11
8DG62184xx	260SCX2
8DG62185xx	
8DG62186xx	
8DG62538AA	D5X500

Alcatel-Lucent Engineering and Planning Tool

Overview

The Alcatel-Lucent 1830 PSS Engineering Tool (EPT) is used to design the networks composed of Alcatel-Lucent 1830 PSS-1, 1830 PSS-4, 1830 PSS-16 and 1830 PSS-32 and network elements (NEs). It supports initial designs as well as incremental additions to existing networks. Through its interface with the Network Management System, design information produced by the EPT is downloaded to individual NEs to facilitate system turn-up.

The EPT is a standalone Windows™ application with a Graphical User Interface (GUI) capable of capturing network requirements and synthesizing network solutions. A built-in design optimizer produces the lowest cost network requirements.

Given the complex nature of capturing network requirements, the EPT is capable of operating in the following ways:

- Fully automatic network design synthesis
- Automatic design synthesis with manual override
- Fully manual design synthesis
- Phased design that enforces in-service upgrades from one phase to another
- “What-if” scenarios to quantify how future traffic patterns operate in the design

The EPT examines thousands of network alternatives, taking into account various optical parameters including fiber attenuation, end- of-life attenuation margin, connector losses, chromatic dispersion, and polarization mode dispersion. It calculates transmission characteristics including typical and worst-case optical signal-to-noise ratio (OSNR), residual dispersion, and nonlinear phase shift. The EPT also takes into account optical penalties due to PMD, PDL, filter penalty, cross talk penalty, and nonlinear transmission penalty.

The EPT is able to model Alcatel-Lucent 1830 PSS-1, 1830 PSS-4, 1830 PSS-16 and 1830 PSS-32, and combinations of 1830 PSS-1, 1830 PSS-4, 1830 PSS-16 and 1830 PSS-32 networks. Tunable OADM (TOADM), fixed OADM (FOADM), and CWDM configurations can be modeled in the EPT according to the NE configuration capabilities. Maximum channel counts and optional utilization of the Fiber Storage Tray and Flex shelf can be specified in the EPT to accommodate cost/performance trade-offs as well.

The EPT produces a set of reports that can be used to order, install, and configure Alcatel-Lucent 1830 PSS networks. These reports include Bill of Materials, Amplifier and DCM Placement, Optical Transmission Characteristics, Card Placement (both tabular and graphical Bay Layout), Fiber Characteristics, and general network assumptions. The EPT also produces a design file for the Network Management System that works in conjunction with WaveTracker™ to define alarm thresholds specific to each design for preventive network maintenance.

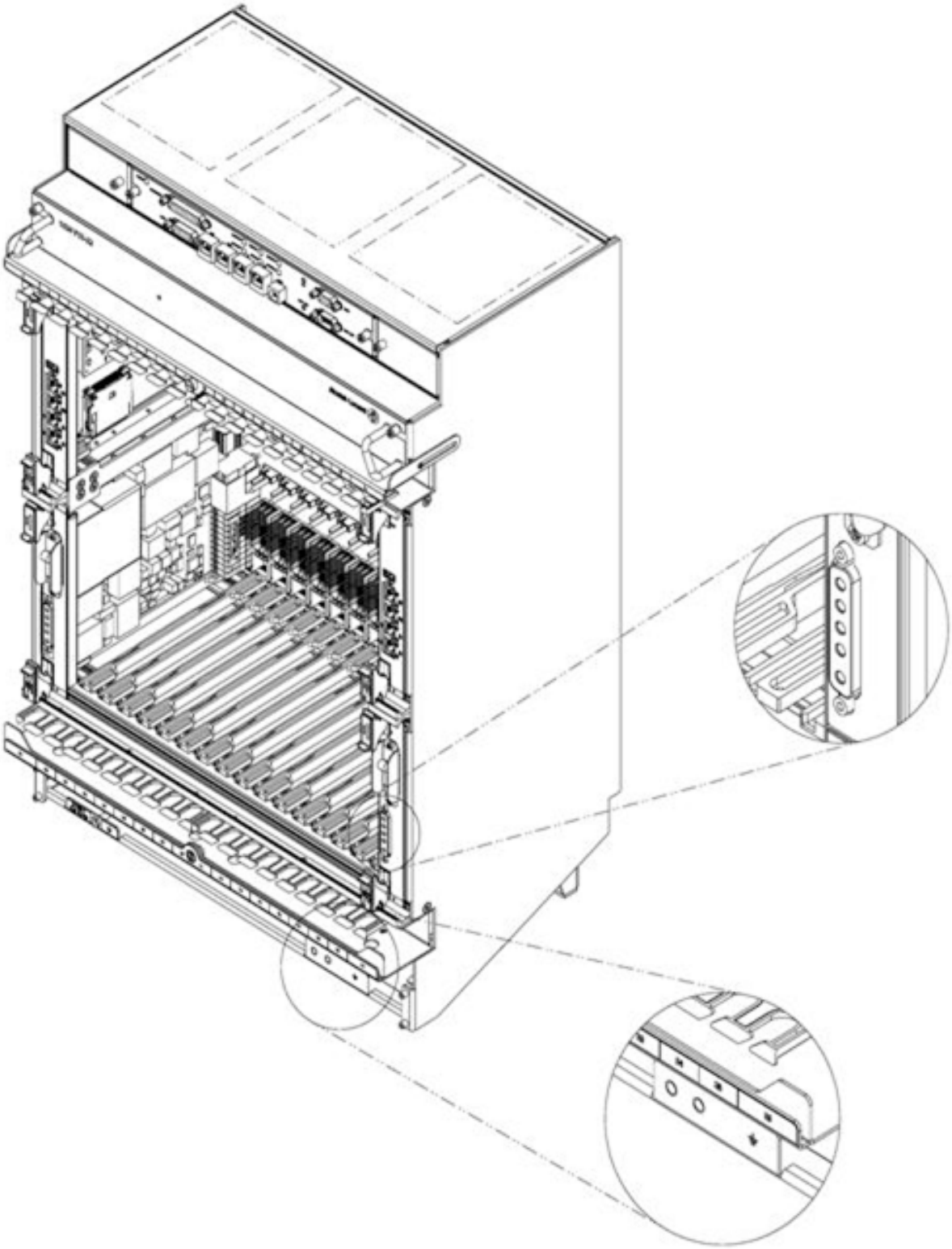
Power and grounding

Overview

Each shelf has independent power connections and is powered independently from the other shelves in the network element. Power is provided to the front of the shelf via two power filter modules: one on the right side of the shelf and one on the left. The shelf is designed for redundant power – it will fully operate with only one power filter/supply although two are always recommended.

Each shelf can be grounded two separate ways. Grounding can be accomplished through the screws that mount the shelf to the rack or through specific grounding lugs. The grounding lug connection point is located in the bottom right corner of the shelf. Power is connected to the power input modules.

Figure 20-5 1830 PSS-32 Shelf view showing power and ground connectors



Shelf power and thermal budgets

See, Table 22-80, "Weight and power consumption for Alcatel-Lucent 1830 PSS" (p. 22-106) a listing of the power consumption (watts) and weight (kg) information for Alcatel-Lucent 1830 PSS components.

Power redundancy and reliability

Shelf power distribution is fully redundant, with two circuits, A and B, able to supply power to the shelf. Redundant power feeds (A and B) are connected to the power modules in the power module slots (slots 1 and 11 in 1830 PSS-16, slots 19 and 36 in 1830 PSS-32). Power is fed into the shelf over two redundant power rails (A and B) that feed all components in the shelf.

Power filters for the 1830 PSS-16 are available with 20A and 35A capacity. Power filters for the 1830 PSS-32 are available with 20A, 30A, 50A, 60A, and 70A capacity.

Power filter selection

For 1830 PSS-16 and 1830 PSS-32 shelves, determine the total power used by all components of the shelf and verify that this is less than or equal to the power of the power filter that will be installed. For example:

- Select a 20A power filter if the power consumption of the packs in the shelf is less than or equal to 20A.
- Select a 30A power filter if the power consumption of the packs in the shelf is less than or equal to 30A.
- Select a 35A power filter (only for use on PSS-16 shelves) if the power consumption of the packs in the shelf is less than or equal to 35A.
- Select a 50A power filter if the power consumption of the packs in the shelf is less than or equal to 50A.
- Select a 70A power filter if the power consumption of the packs in the shelf is less than or equal to 70A.

Power sources

Shelves operates fault-free in a voltage range of -40V DC to -72V DC (-48V DC or -60 V DC nominal). You can supply power from standard -48V DC or -60 V DC battery feeds, as is typical in a central office, or you can use an AC rectifier with battery backup.

DC power system requirements

The DC source for the Alcatel-Lucent 1830 PSS must meet the requirements of a safety extra low voltage (SELV) source.

In order to avoid oscillation in the system, maximum source inductance to the DC power source is 15µH, with a nominal value of 8µH, assuming a maximum loop of 100 meters (50 m feed and 50 m return).

Battery feeds

In a typical deployment, the shelves are installed in a central office (CO) or similar environment that is equipped with its own power distribution center. In this environment, power is distributed to the shelves from standard 48V DC battery feeds that are equipped with fuses or circuit breakers.

AC rectifier feeds

In remote or controlled vault deployments, where the primary power source is an AC utility line, a rectifier is required to convert the power from AC to DC, with a nominal output voltage of 48 V DC. The rectifier must be capable of generating output power that equals or exceeds the maximum input DC power requirement from the system, plus 20 percent for battery charging.

To ensure that the shelf has a reliable power source, it is recommended that the rectifier be N + 1 redundant and have battery backup. The power system in this environment typically consists of a power rack to hold the rectifier, batteries, and power distribution panel, and cable feeds that provide DC power to each shelf.

Power monitoring

The shelf controller monitors the status of the A and/or B direct current (DC) input voltages. When a battery voltage decreases below 45V ±1.5V, the Low Battery Voltage alarm for that feed is triggered. When both power feeds are present and the A and B Low Battery Alarms are raised, traffic may soon become interrupted. When both the A and B power modules agree that their input power voltage has fallen below 38.5V ± 1.5V, they will turn power OFF to all circuit cards on the shelf, with the exception of the EC and the SFC/Dx filters.

Operating environment

Introduction

Alcatel-Lucent 1830 PSS shelves are designed to operate in environmentally controlled locations or enclosures, such as central offices, commercial buildings, and controlled environment vaults. The environmental operational limits for the Alcatel-Lucent 1830 PSS are listed in Table 20-4, “Ambient temperature and humidity limits” (p. 20-17).

Table 20-4 Ambient temperature and humidity limits

Factor	Condition	Limits
Temperature	Normal operation	5°C to 40°C (41°F to 104°F)
	Short-term (2)	-5°C to 50°C (23°F to 122°F)
	Rate of temperature change	30°C/hour (54°F/hour)
Humidity	Normal operation	5% to 85%
	Short-term (2)	5% to 90% but not to exceed 0.024 kg of water per kg of dry air

Notes:

1. Ambient temperature refers to conditions at a location of 1.5 m (59 in) above the floor and 400 mm (15.8 in) in front of the equipment.
2. Short-term operation is a period of not more than 96 consecutive hours and a total of not more than 15 days in one year. (This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that one-year period.)
3. The use of 1UD200 in PSS-8 mounted in 19" racks is restricted to environments where the ambient temperature is limited to 40 degrees C or lower.
4. The use of 20P200 in PSS-8 mounted in 19" racks is restricted to environments where the ambient temperature is limited to 45 degrees C or lower.

Recommended environmental limits

Guidance on recommended environmental limits to minimize creep corrosion and its effects on service life is provided in the table below. These recommended values are derived from the industry standards written to define the operating environment for equipments to be used in the data centers and telecommunications rooms. For more information regarding these values, contact your Alcatel-Lucent representative.

Although Alcatel-Lucent equipment is designed to operate throughout the operating limits stated below, staying within the recommended limits ensures that the product reliability standards are met.

Table 20-5 Environmental limits

Recommended versus operational environmental limits		
Environmental variable	**Recommended limits**	**Operating limits**
Temperature	18°C - 27°C	5°C - 40°C
Humidity	25% RH - 60% RH	5% RH - 85% RH
Dust	< 0.001 mg/m^3	< 0.2 mg/m^3
Corrosive gases		
H_2S	< 3 ppb	< 75 ppb
SO_2	< 10 ppb	<110 ppb
Cl_2	<1 ppb	<34 ppb

Standards stating recommended operating conditions specify the corrosion rates as follows to minimize the effect on the equipment operating life. The concentrations stated in the “Recommended limits” column in the table above are estimates of concentrations that would provide an environment yielding the specified corrosion rates.

- Cu Corrosion Rate: <360 nm/yr (Copper)
- Ag Corrosion Rate: <240 nm/yr (Silver)

Reference: “iNEMI Position Statement on the Limits of Temperature, Humidity and Gaseous Contamination in Data Centers and Telecommunication Rooms to Avoid Creep Corrosion on Printed Circuit Boards”, April 21, 2012

Operating environment for PSS-8 temp-harden application

PSS-8 systems support "temperature hardened" to operate in Extended Temperature Range (ETR) environments from -40°C to +65°C according to temperature and humidity cycling requirements listed in GR-3108-CORE Class2. However, the LD will not be hardened due to the operational temperature ranges of the VGOAM.

Following are the hardware changes made to support ETR operation:

- Hardened cards
- Variable-speed fan
- Hardened SFP/XFP pluggables

Non-hardened PSS-8 cards and pluggables will be automatically alarmed if detected in a chassis which is provisioned for ETR operation. However, the display of the ETR inventory data is supported regardless of whether the node is provisioned for ETR or

non-ETR operation. User provisioning of a node-level ETR attribute is required because PSS-8 can be deployed either in a central office (ETR parts are not necessary), or in an outside plant (ETR parts are necessary). Alarming is important because non-ETR parts installed in an outside plant may work fine for several months, but may fail when there is a change in the weather conditions.

Below is the list of temp-harden supported cards on PSS-8:

Table 20-6 Temp-hardened card list for PSS-8

Packs	Hardened
8EC2	Yes
8DC30	Yes
8FAN	Yes
11DPM12	Yes
8AC7	Yes
11QCE12X	Yes
11DPE12A (B0) (8DG59340AD)	Yes
1830 VWM	Yes
11DPM8	Yes
4DPA4	Yes

Notes:

1. 1830 VWM can be cascaded with PSS-8 to provide wavelength Multiplexing/Demultiplexing; it is also supported in a hardened environment.

Cooling

1830 PSS-32/PSS-16

The shelf is cooled by a fan unit with variable-speed fans. Fan units for the 1830 PSS-32 shelf have three fan motors, and the unit for the 1830 PSS-16 shelf has five fan motors. Fan units are hot-swappable in the event of a failure in the unit. If a single fan motor fails, the remaining fan motors will increase speed to compensate. The expected time frame to replace a failed fan unit is 24 hours.

The fan unit is located near the bottom of the 1830 PSS-16 shelf and near the top of the 1830 PSS-32 shelf. The fans draw cool air up through the bottom of the shelf. Incoming air is filtered through a replaceable air filter. Exhaust of heated air is on the left side of the 1830 PSS-16 shelf and through the top of the 1830 PSS-32 shelf. In both cases baffles direct exhaust air toward the rear of the rack in accordance with Telcordia GR-63.

Figure 20-6 Airflow through 1830 PSS-16 shelf

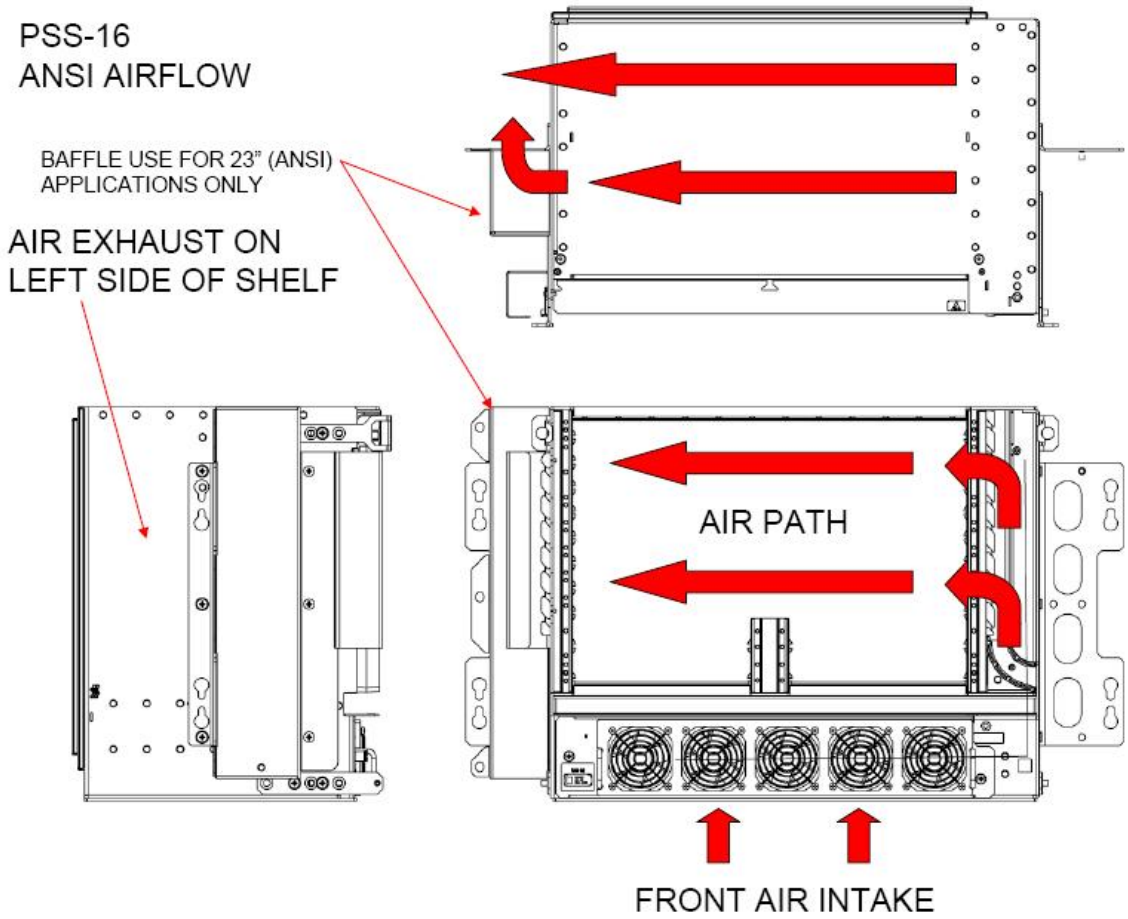
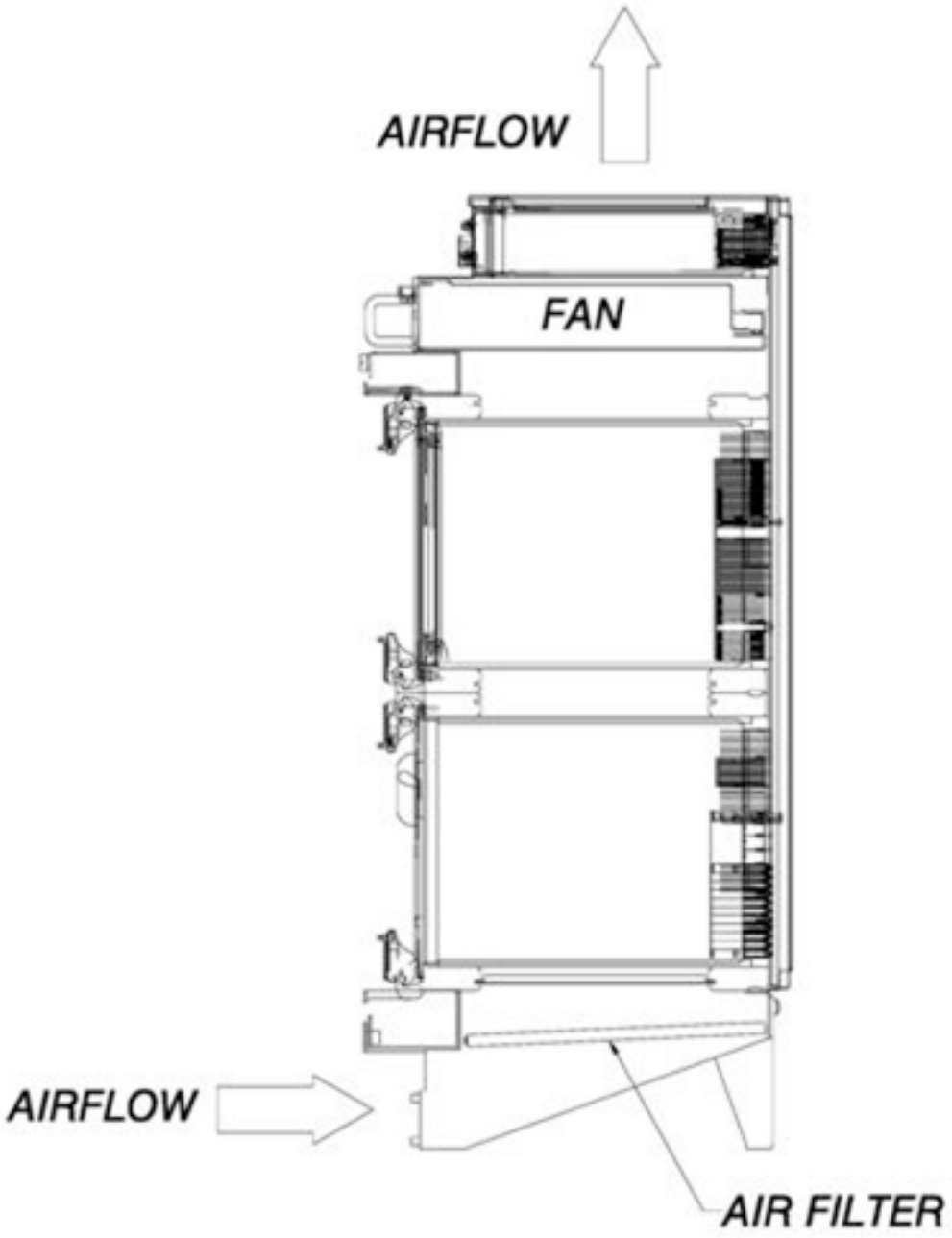


Figure 20-7 Airflow through 1830 PSS-32 shelf



Cooling redundancy and reliability

The cooling system provides full carrier class redundancy. In the event of any single failure the cooling system continues to operate, up to the maximum long-term operational temperature limit defined in NEBS (40°C).

Fan operation

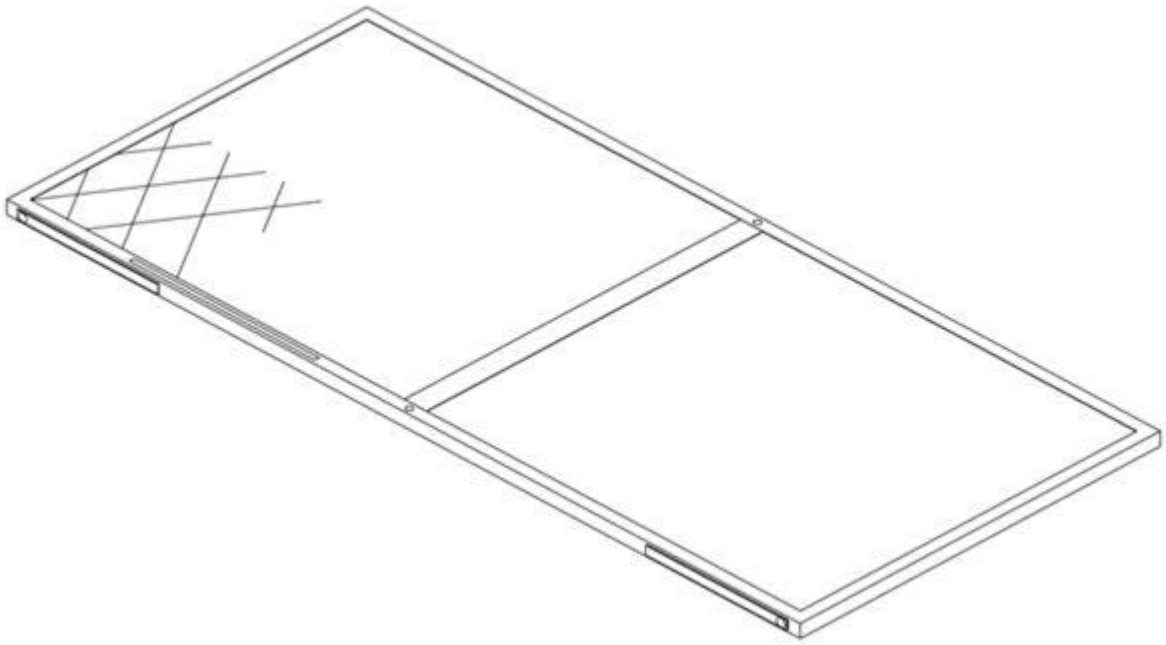
In order to ensure the quietest possible operation, the speed of the fans is adjusted automatically. Fan speed is increased to maximum in case of fault or fan unit removal.

Air filtering

For the 1830 PSS-16 air is drawn through fans at the bottom of the shelf, passed through an air filter on the right side of the shelf, across any installed cards, and exhausted on the left side of the chassis. The air filter on the right side of the chassis is replaceable from the front of the shelf.

Air for cooling the 1830 PSS-32 is drawn through an air filter as it enters the bottom of the shelf. The air filter is located below the fiber tray and is replaceable from the front of the shelf.

Figure 20-8 Air filter



1830 PSS-16II

In the PSS-16II shelf, cooling is done by a fan unit located at the bottom of the shelf. The PSS-16II fan card contains five 80mm*80mm fan motors.

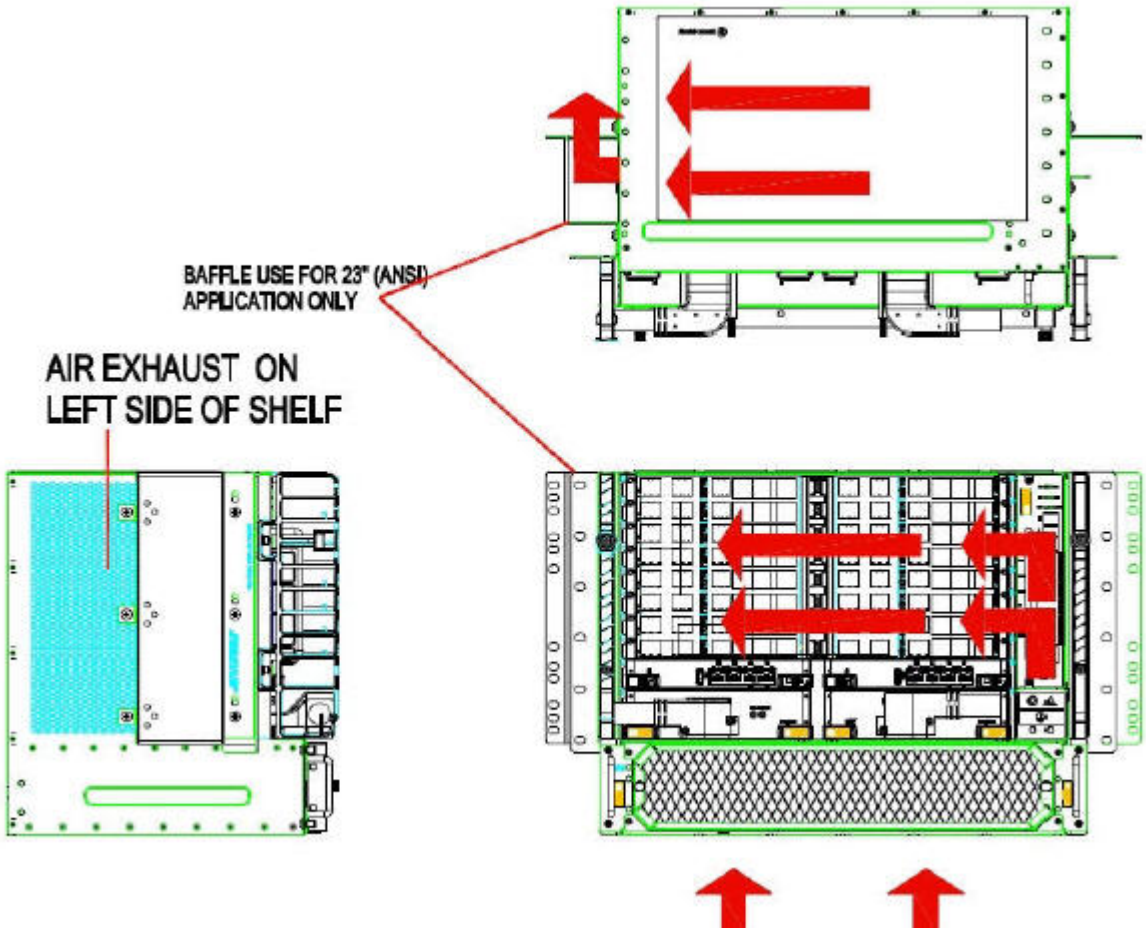
Note: Airflow considerations

If a subrack is to be installed in an enclosed cabinet, ensure that the cabinet design does not impede the airflow or direct exhaust air from one subrack to the intake of another. To understand the airflow through PSS-16II, see Figure 20-9, “Airflow diagram” (p. 20-23).

Important! If a rack level front door is used, it needs to provide adequate openings for equipment cooling. The minimum open area of the front cover is 70% or greater for the section in front of the subrack inlet to provide proper airflow to the PSS-16II subracks.

Some enclosed cabinets are equipped with top-mounted exhaust fans. It is recommended to replace those with a top-mounted screen to provide adequate ventilation in the cabinet which will avoid air flow restrictions for the exhaust air.

Figure 20-9 Airflow diagram



Note: The diagram in Figure 20-9, “Airflow diagram” (p. 20-23) shows the airflow configuration in an ANSI (23 inch) bay frame as an example. Baffles shown may not be used in an EIA or ETSI bay frame.

Air filtering

The PSS-16II air flow is similar to that of PSS-16. For the 1830 PSS-16II, air is drawn from front through fans at the bottom of the shelf, passed through on the right side of the shelf, across any installed cards, and exhausted on the left side of the chassis.

1830 PSS-8

The 1830 PSS-8 shelf has one fan unit and it is located in slot 14 of the shelf. The 1830 PSS-8 fan unit contains twelve powerful fan modules, each individually monitored and speed-controlled by the Network Element (NE) software.

The fan unit which is used in the PSS-8 subrack is controlled by the active Equipment Controller (EC) through backplane links. The EC provisions the speed of the fan motors on the fan unit. A local microcontroller configures and monitors its associated fan motor.

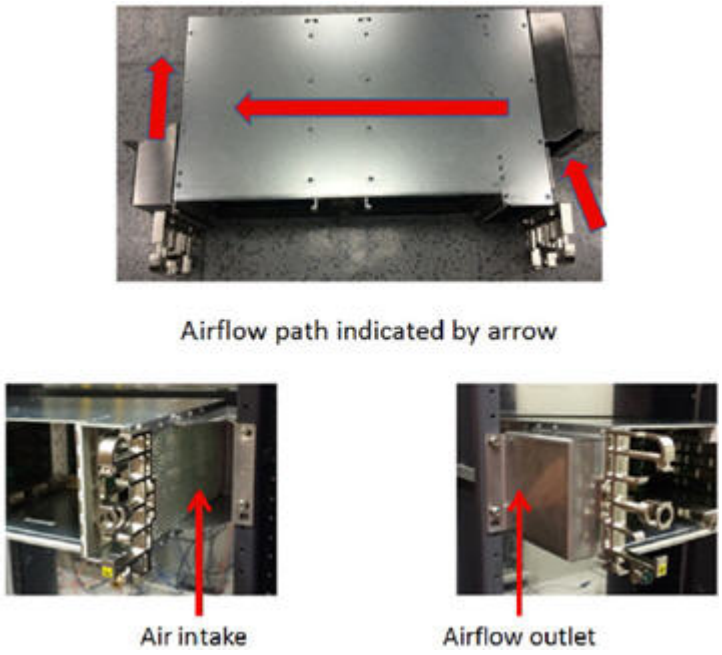
Note: Airflow considerations

If a subrack is to be installed in an enclosed cabinet, ensure that the cabinet design does not impede the airflow or direct exhaust air from one subrack to the intake of another. To understand the airflow through PSS-8, see Figure 20-10, “Airflow diagram - ANSI application” (p. 20-25) and Figure 20-11, “Airflow diagram - EIA (19 inch) and ETSI applications” (p. 20-25).

Important! If a rack level front door is used, it needs to provide adequate openings for equipment cooling. The minimum open area of the front cover is 70% or greater for the section in front of the subrack inlet to provide proper airflow to the PSS-8 subracks.

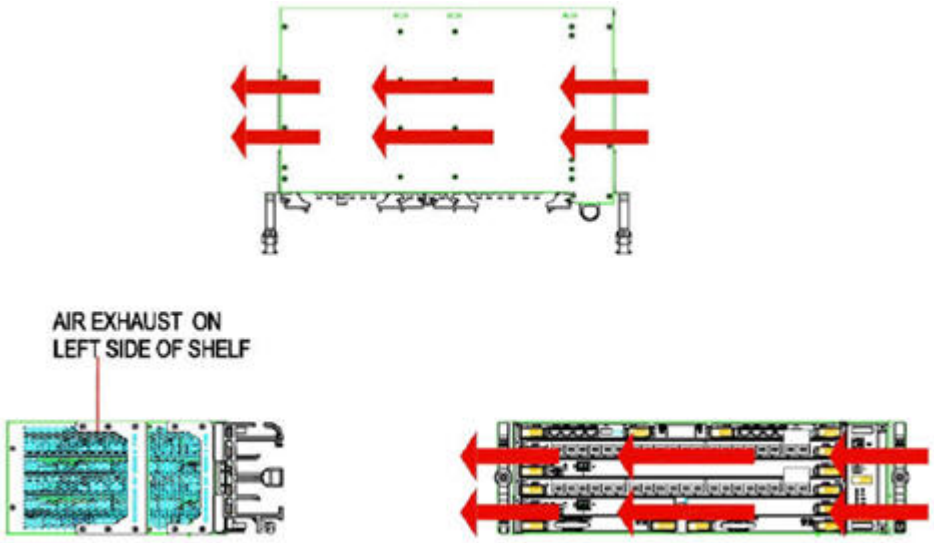
Some enclosed cabinets are equipped with top-mounted exhaust fans. It is recommended to replace those with a top-mounted screen to provide adequate ventilation in the cabinet which will avoid air flow restrictions for exhaust air.

Figure 20-10 Airflow diagram - ANSI application



Note: The diagram in Figure 20-10, “Airflow diagram - ANSI application” (p. 20-25) shows the airflow configuration in an ANSI (23 inch) bay frame as an example. Baffles shown may not be used in an EIA or ETSI bay frame.

Figure 20-11 Airflow diagram - EIA (19 inch) and ETSI applications



Air filtering

Air for cooling the PSS-8 is drawn through fans at the side of the shelf, passed through an air filter on the right side of the shelf across any installed cards, and exhausted on the left side of the chassis. The air filter on the right side of the chassis is replaceable from the front of the shelf.

21 WDM ordering information

Overview

Purpose

This chapter provides an overview of the ordering process and the current software and license ordering information for Alcatel-Lucent 1830 Photonic Service Switch (PSS).

Contents

Ordering information	21-2

Ordering information

Introduction

Alcatel-Lucent 1830 Photonic Service Switch (PSS) has been carefully engineered and all equipment kitted to simplify the ordering process. In this chapter the software and license items, and the test service items shown are available as of the issue date of this document.

For ordering information on customer documentation, see "Related information" (p. lxxvi).

Mechanical items and hardware

Ordering information for mechanical items and other hardware can be found in: "Parts list and ordering information" (p. 18-5).

Software and license items

Table 21-1 Ordering information for WDM software and license items

Acronym	Item description	Part number	1830 PSS-8/16/16II/32	1830 PSS-4
Software				
NA	ACI-1830PSS DIR.SHIP.STAN-DARD	8DG60227AAAA	X	—
SWP-1830 PSS R8.0.0	SWP 1830 PSS R8.0.0 Software and Customer Release Notes on DVD (Supports 1830 PSS-16/32; does not support L0 GMPLS nor the following circuit packs: 112SDX11, 11OPE8, 11QCE12X, WR20-TFM, WTOCM-F, OTDR, MCS8-16, ASWG, A4PSWG, AAR-8A, MSH8-FSM; 4 or 16 GB EC is supported)	8DG63166AAAA	X	—
SWP-1830 PSSECX R8.0.0	SWP 1830 PSSECX R8.0.0 Software and Customer Release Notes on DVD. (Supports 1830 PSS-16/32 including L0 GMPLS functionality; 16 GB EC is required)	8DG63168AAAA	X	—
SWP 1830PSS R8.1-0	SWP 1830PSS R8.1.0 4/16G EC PSS16/32	8DG63475AAAA	X	—
SWP 1830PSSECX R8.1-0	SWP 1830 PSS SWDM R8.1.0 PSS-8/16II/16/32	8DG63477AAAA	X	—
SWP 1830 PSS SWDM R8.2.0	SWP 1830 PSS SWDM R8.2.0 PSS-8/16II/16/32	8DG63606AAAA	X	—

Table 21-1 Ordering information for WDM software and license items (continued)

Acronym	Item description	Part number	1830 PSS-8/16/16II/32	1830 PSS-4
SWP-1830 PSS R7.0.0	SWP 1830 PSS R7.0.0 Software and Customer Release Notes on DVD (Supports 1830 PSS-16/32 without L0 GMPLS; 4 or 16 GB EC is supported)	8DG62694AAAA	X	—
SWP-1830 PSSECX R7.0.0	SWP 1830 PSSECX R7.0.0 Software and Customer Release Notes on DVD. (Supports 1830 PSS-16/32 including L0 GMPLS functionality; 16 GB EC is required)	8DG62696AAAA	X	—
SWP-1830 PSS R7.0.1	SWP 1830 PSS R7.0.1 Software and Customer Release Notes on DVD (Supports 1830 PSS-16/32 without L0 GMPLS functionality, 11OPE8 or 112SDX11; 4 or 16 GB EC is supported)	8DG62791AAAA	X	—
SWP-1830 PSSECX R7.0.1	SWP 1830 PSSECX R7.0.1 Software and Customer Release Notes on DVD. (Supports 1830 PSS-16/32 including L0 GMPLS functionality, 11OPE8 and 112SDX11; 16 GB EC is required).	8DG62793AAAA	X	—
SWP-1830 PSS R7.0.2	SWP 1830 PSS R7.0.2 Software and Customer Release Notes on DVD (Supports 1830 PSS-16/32 without L0 GMPLS functionality. This software load does not support 112SDX11, 11OPE8, , WTOCM-F, OTDR, WR20-TFM, MCS8-16, A4PSWG, ASWG, AAR-8A, or MSH8-FSM. 4 or 16 GB EC is supported)	8DG62929AAAA	X	—
SWP-1830 PSSECX R7.0.2	SWP 1830 PSSECX R7.0.2 Software and Customer Release Notes on DVD. (Supports 1830 PSS-16/32 including L0 GMPLS functionality. This software load supports 112SDX11, 11OPE8, 11QCE12X, WR20-TFM, WTOCM-F, OTDR, MCS8-16, ASWG, A4PSWG, AAR-8A, and MSH8-FSM. 16 GB EC is required).	8DG62931AAAA	X	—

Table 21-1 Ordering information for WDM software and license items (continued)

Acronym	Item description	Part number	1830 PSS-8/16/16II/32	1830 PSS-4
SWP-1830 PSSECX R7.0.3	SWP 1830 PSSECX R7.0.3 Software and Customer Release Notes on DVD. (Supports 1830 PSS-16/32 including L0 GMPLS functionality. This software load supports 112SDX11, 11OPE8, 11QCE12X, WR20-TFM, WTOCM-F, OTDR, MCS8-16, ASWG, A4PSWG, AAR-8A and MSH8-FSM. 16 GB EC is required).	8DG63047AAAA	X	—
SWP-1830 PSS R7.0.4	SWP 1830 PSS R7.0.4 Software and Customer Release Notes on DVD. (Supports 1830 PSS-16/32 without L0 GMPLS functionality).	8DG63107AAAA	X	—
SWP-1830 PSSECX R7.0.4	SWP 1830 PSSECX R7.0.4 Software and Customer Release Notes on DVD. (Supports 1830 PSS-16/32 including L0 GMPLS functionality).	8DG63109AAAA	X	—
SWP-1830 PSS-4 R7.0.0	SWP 1830PSS-4 R7.0.0 CDROM	3KC13387AAAA	—	X
SWPL-1830 PSS-4 R7.0.0	Software license 1830PSS-4	3KC13389AAAA	—	X
SWP-1830 PSS-4 R7.0.1	SWP 1830PSS-4 R7.0.1 CDROM	3KC13456AAAA	—	X
SWPL-1830 PSS-4 R7.0.1	Software license 1830PSS-4	3KC13458AAAA	—	X
SWP-1830 PSS-4 R7.0.2	SWP 1830PSS-4 R7.0.2 CDROM	3KC13462AAAA	—	X
SWPL-1830 PSS-4 R7.0.2	Software license 1830PSS-4	3KC13464AAAA	—	X
SWP-1830 PSS-4 R7.0.4	SWP 1830PSS-4 R7.0.4 CDROM	3KC13476AAAA	—	X
SWPL-1830 PSS-4 R7.0.4	Software license 1830PSS-4	3KC13473AAAA	—	X
SWP-1830 PSS-4 R8.0.0	SWP 1830PSS-4 R8.0.0 CDROM	3KC13479AAAA	—	X
SWPL-1830 PSS-4 R8.0.0	Software license 1830PSS-4	3KC13482AAAA	—	X
SWP-1830 PSS-4 R8.1.0	SWP 1830PSS-4 R8.1.0 CDROM	3KC13496AAAA	—	X
SWPL-1830PSS-4 R8.1.0	Software license 1830PSS-4	3KC13498AAAA	—	X
SWP-1830PSS-4 R8.2.0	SWP 1830PSS-4 R8.2.0 CDROM	3KC13501AAAA	—	X

Table 21-1 Ordering information for WDM software and license items (continued)

Acronym	Item description	Part number	1830 PSS-8/16/16II/32	1830 PSS-4
SWPL-1830PSS-4 R8.2.0	Software license 1830PSS-4	3KC13503AAAA	—	X
Software Licenses				
ESWL - 1830 PSS APPLICATION WDM GMPLS	ESWL - 1830 PSS APPLICATION WDM GMPLS	8DG60953AAAA	X	—
NA	SWPL-1830PSSECX R8.0 16G EC GMPLS N-E	8DG63243AAAA	X	—
NA	ESWL-RCT 1830 PSS LICENSE FEE N-E	8DG60953ABAA	X	—
ESWL - 1830 PSS ENC	ESWL - Encryption License per Port (11QPEN4)	8DG61457AAAA	X	X
SWL-1830PSS WLT	1830 PSS Wavelength Tracker Software License Fee	8DG60207AAAA	X	—
SWL- Photonics VERS “A” WDM LP	WDM Blade License Point Fee	3AL75117AAAA	X	—
SWL- Photonics VERS “A” TDM LP	TDM Blade License Point Fee	3AL75118AAAA	X	—
SWL- Photonics VERS “A” ETH LP	Ethernet Blade License Point Fee	8DG59727AAAA	X	—
ESWL - KMT License per Wavelength	ESWL - KMT License per Wavelength	8DG61416AAAA	X	—
ESWL - RTU 260SCX2 200G Mode	ESWL - RTU 260SCX2 200G Mode	8DG62665AAAA	X	—
ESWL - RTU 260SCX2 100G Mode	ESWL - RTU 260SCX2 100G Mode	8DG62666AAAA	X	—
ESWL - RTU 1UD200 200G Mode	ESWL - RTU 1UD200 200G Mode	8DG63582AAAA	X	—
Other management software tools				
SWP 1830PSS-EPT R7.0.0	SWP 1830PSS-EPT R7.0.0 CDROM	8DG62699AAAA	X	X
SWP 1830PSS-EPT R7.0.2	SWP 1830PSS-EPT R7.0.2 CDROM	8DG62796AAAA	X	X
SWP 1830PSS-EPT R7.0.4	SWP 1830PSS-EPT R7.0.4 CDROM	8DG63112AAAA	X	X
SWP 1830PSS-EPT R8.0.0	SWP 1830PSS-EPT R8.0.0 CDROM	8DG63171AAAA	X	X
SWP 1830PSS-EPT R8.1.0	SWP 1830PSS-EPT R8.1.0 CDROM	8DG63480AAAA	X	X

Table 21-1 Ordering information for WDM software and license items (continued)

Acronym	Item description	Part number	1830 PSS-8/16/16II/32	1830 PSS-4
SWP 1830PSS-EPT R8.2.0	SWP 1830PSS-EPT R8.2.0 CDROM	8DG63609AAAA	X	X
SWP 1830PSS-KMT R7.0.0	SWP 1830PSS-KMT R7.0.0 CDROM	8DG62702AAAA	X	X
SWP 1830PSS-KMT R7.1.0	SWP 1830PSS-KMT R7.1.0 CDROM	8DG62799AAAA	X	X
SWP 1830PSS-CPB R7.0.0	SWP 1830PSS-CPB R7.0.0 CDROM	8DG62712AAAA	X	X
SWP 1830PSS-CPB R7.1.0	SWP 1830PSS-CPB R7.1.0 CDROM	8DG62839AAAA	X	X
SWP 1830PSS-CPB R7.2.0	SWP 1830PSS-CPB R7.2.0 CDROM	8DG62945AAAA	X	X
SWP 1830PSS-CPB R8.1.0	SWP 1830PSS-CPB R8.1.0 CDROM	8DG63485AAAA	X	X
SWP 1830PSS-CPB R8.2.0	SWP 1830PSS-CPB R8.2.0 CDROM	8DG63576AAAA	X	X

Test services

Table 21-2 Ordering information for test services

Item description	Part number
ACI-1830PSS DIR.SHIP.STANDARD	8DG60227AAAA
ACI-1830PSS DIR.SHIP.EXTRA TEST	8DG60227ABAA
ACI-1830PSS DIR.SHIP.EXTRA TEMP.	8DG60227ACAA
ACI-1830PSS DIR.SHIP.EXTRA TIME	8DG60227ADAA
ACI-1830PSS FAT STANDARD	8DG60228AAAA
1830 PSS OCS - FAT STANDARD	3AG33544AAAA
1830 PSS OCS - DIRECT SHIPMENT EXTRA TEMPERATURE	3AG33543ABAA
1830 PSS OCS - DIRECT SHIPMENT STANDARD	3AG33543AAAA
1830 PSS OCS - DIRECT SHIPMENT EXTRA TEST IN DURATION	3AG33543ADAA
ACI-1830PSS1 FAT STANDARD	3KC25552AAAA
ACI-1830PSS1 DIR.SHIP.STANDARD	3KC25553AAAA
ACI-1830PSS1 DIR.SHIP.EXTRA TEST	3KC25549AAAA
ACI-1830PSS1 DIR.SHIP.EXTRA TEMP.	3KC25550AAAA

Table 21-2 Ordering information for test services (continued)

Item description	Part number
ACI-1830PSS1 DIR.SHIP.EXTRA TIME	3KC25551AAAA

Contact and further information

For all questions concerning ordering of Alcatel-Lucent 1830 PSS, for any information about the marketable items and their part numbers, and for ordering the equipment, please contact your Account Executive for Alcatel-Lucent 1830 PSS or your Alcatel-Lucent local customer team.

22 WDM technical specifications

Overview

Purpose

This chapter provides the technical specifications for components used primarily in WDM applications of the Alcatel-Lucent 1830 PSS-16 and PSS-32.

Contents

WDM Physical design	22-2
Interfaces	22-6
Optical filter and router insertion loss specifications	22-7
Summarized specifications for optical transponders and components	22-12
Summarized specifications for 40G and 100G optical transponders	22-17
Detailed specifications for optical transponders and components	22-20
Performance	22-102
FEC support	22-103
Weight and power consumption	22-106
WDM channel plan	22-116
Amplifier (LD) specifications	22-120
Supported LD combinations for OADM and ILA configurations	22-128
Interleaver specifications	22-136
External filter shelf specifications	22-141
Wavelength router specifications	22-142

WDM Physical design

Specifications overview

The following specifications apply to the physical design of the Alcatel-Lucent 1830 PSS-8:

Rack dimensions	300-mm ETSI One Rack: 2200 mm (7.2 ft) × 600 mm (23.6 in) × 300 mm (11.8 in) (H × W × D)
	7-feet Seismic Network Bay Frame rack: 2133.6 mm (7 ft) × 584.2 mm (23 in) × 304.8 mm (12 in) (H × W × D)
Subrack dimensions	438.9mm (W) x 133.0mm (H) x 259.0mm (D)
Connectors optical	LC connectors on all optical interfaces and MPO
Available slots	There are 14 slots. It can support up to 4 full-height or up to 8 half-height universal I/O cards. Slot 12 can also be used for User Panel card when the protection EC is not installed in the master shelf. The electrical shelf-ID for UP is 40. There are eight half-slots (2-5, 8-11) capable of supporting the universal I/O cards. Two half-slots (left and right) can be combined into a single full-height slot by removing the removable divider that separates the left slot from the right slot. Slot 13 is for Shelf Panel. Slot 14 is for the FAN.
Power supply and distribution	Both in-shelf AC and DC are supported; AC power unit will occupy additional 2 and 8 service slots.
Cooling	1 fan unit and dust filter
Connectors Electrical	RJ-45 for control network connections, timing and alarms USB for Flash
Power consumption:	Maximum 1200W The power consumption above is for DC power. **Note:** PSS8 also supports AC power of maximum 810W.

The following table shows the dimension details of the common parts of PSS-8:

APN	Description	Dimension HxWxD (mm)	Weight (kg)
3KC48810AA	Shelf	133x439x259	5.6
3KC48820AA	8EC2	18x159.7x251	0.428
3KC48830AA	8SP	18x87x239	0.15
3KC48840AA	8UP	18x159.7x251	0.3
3KC48850AA	8FAN	128x47.3x263.9	1.304
3KC48870AA	8DC30	21.2x187.8x251	0.6
3KC48880AA	8AC7	43.7x187.8x251	1.45
3KC49926AA	8AF	128x10x248	0.08

The following specifications apply to the physical design of the Alcatel-Lucent 1830 PSS-16II:

Rack dimensions	300-mm ETSI One Rack: 2200 mm (7.2 ft) × 600 mm (23.6 in) × 300 mm (11.8 in) (H × W × D)
	7-feet Seismic Network Bay Frame rack: 2133.6 mm (7 ft) × 584.2 mm (23 in) × 304.8 mm (12 in) (H × W × D)
Subrack dimensions	440.0mm (W) x 354.8mm (H) x 292.0mm (D)
Connectors optical	LC connectors on all optical interfaces and MPO
Available slots	There are 22 slots. Two slots (1 and 11) are dedicated for Power Filter modules, and two slots (2 and 12) are dedicated for Integrated Shelf Controllers (EC). There are sixteen half-slots (3-10,13-20) capable of supporting universal I/O cards. Two half-slots (left and right) can be combined into a single full-height slot by removing the removable divider that separates the left slot from the right slot. Slot 21 is for FAN and Slot 22 is for User panel.
Power supply and distribution	Only in-shelf DC is supported. Maximum power of each slot is 240W. **Note:** Each slot can only support up to 230W power due to power cable restriction. Current power cable 3KC50021** and 3KC50022** can only support up to 63A.
Cooling	1 fan unit with dust filter

Connectors Electrical	RJ-45 for control network connections, timing and alarms USB for Flash
Power consumption:	Maximum 2450W The power consumption above is for DC power.

The following table shows the dimension details of the common parts of PSS-16II:

APN	Description	Dimension HxWxD (mm)	Weight (kg)
3KC48960AA	Shelf	354.8x440x293	10.6
3KC48980AA	16UP2	210.2x46.8x271.2	0.95
3KC48990AA	16FAN2	86.5x462.2x303.3	6.1
3KC49010AA	16DC65	51x187.7x251.6	0.7
8DG62635AA	32EC2	29.5x187.7x251.6	0.7

The following specifications apply to the physical design of the Alcatel-Lucent 1830 PSS-32:

Rack dimensions	300-mm ETSI One Rack: 2200 mm (7.2 ft) × 600 mm (23.6 in) × 300 mm (11.8 in) (H × W × D)
	7-feet Seismic Network Bay Frame rack: 2133.6 mm (7 ft) × 584.2 mm (23 in) × 304.8 mm (12 in) (H × W × D)
Subrack dimensions	621.75 mm (2.039 ft) × 438.9 mm (1.43 ft) × 279.5 mm (11.003 in) (H × W × D)
Connectors optical	LC connectors on all optical interfaces and MPO
Available slots	• 16 slots for 16 full-slot I/O cards or, in future releases, for 32 half-slot I/O cards • 2 slots for redundant controller cards (EC)
Power supply and distribution	2 slots for redundant power supply filter cards (PFDCxx)
Cooling	Single three motor high reliability fan unit
Connectors Electrical	• D-Sub on Alarm • RJ-45 for control network connections • USB for Flash

Power consumption:	typical < 2500 W **Note:** Certain configurations above 2500 W are permitted but need further thermal analysis.

Interfaces

Robustness

All electrical transmission and synchronization interfaces conform to overvoltage and signal immunity levels as laid down in *ITU-T Recommendation G.703* and Telcordia® *Requirement GR-1089-CORE*.

Optical and Ethernet interfaces

See "Detailed specifications for optical transponders and components" (p. 22-20).

Timing interfaces

See "Timing interfaces" (p. 6-7).

Alcatel-Lucent 1830 PSS provides one physical interface for timing input on each of the two PSF3T8 units or the two PSS-36 Power filter card (PFC).

The interface is realized as a D-Sub9 connector. Using specific adapters, different electrical and mechanical characteristics are supported.

The following interface types are available:

- Direct access to the D-Sub9 connector: 120 Ω, balanced, used for twisted-pair cables
- 75 Ω (unbalanced) on micro coaxial connectors according to *ITU-T Recommendation G.703* using the Coax Timing Adapter 1.0/2.3 (ETSI)
- 100 Ω (unbalanced) using the Wrap Timing Adapter (ANSI)

One visual indicator is available per PSF3T8 to indicate the status of the local timing interface, see "LEDs of the Power Supply, Filter, and Clock Interface Card (PSF3T8)" (p. 9-8).

One visual indicator is available per PFC to indicate the status of the local timing interface, see "LEDs of the Power Filter Card (PFC)" (p. 9-10).

Optical filter and router insertion loss specifications

SFD Insertion loss

Table 22-1 SFD8 Optical Insertion Loss

SFD5 Loss	OMD In	OMD Out
	Max (dB)	Max (dB)
Ch1	3.35	2.15
Ch2	3.05	2.45
Ch3	2.75	2.75
Ch4	2.45	3.05
Ch5	3.05	2.45
Ch6	2.75	2.75
Ch7	2.45	3.05
Ch8	2.15	3.35
Exp	1.1	1.1

Table 22-2 SFD5 Optical Insertion Loss

SFD5 Loss	OMD In	OMD Out
	Max (dB)	Max (dB)
Ch1	4.2	2.8
Ch2	3.9	3.2
Ch3	3.5	3.5
Ch4	3.2	3.9
Ch5	2.8	4.2
Exp	2	1.4
MON	14.1	14.1

SFC Insertion loss

Table 22-3 SFC2 Insertion Loss

Insertion Loss	Max (dB)
OMD-In ⇒ Ch i _OUT (i=1, 2)	1.8

Table 22-3 SFC2 Insertion Loss (continued)

Insertion Loss	Max (dB)
OMD-In ⇒ Exp_OUT	1.5
Exp-In ⇒ OMD-OUT	1.0
Ch i_In ⇒ OMD-OUT (i=1, 2)	1.3

Table 22-4 SFC4 Insertion Loss

Insertion Loss	Max (dB)
OMD-In ⇒ Ch 4/8 _OUT	1.4
OMD-In ⇒ Ch 3/7 _OUT	1.7
OMD-In ⇒ Ch 2/6 _OUT	2.0
OMD-In ⇒ Ch 1/5 _OUT	2.3
OMD-In ⇒ Exp_OUT	2.2
Exp-In ⇒ OMD-OUT	1.7
Ch 4/8_In ⇒ OMD-OUT	1.8
Ch 3/7_In ⇒ OMD-OUT	1.5
Ch 2/6_In ⇒ OMD-OUT	1.2
Ch 1/5_In ⇒ OMD-OUT	0.9

Table 22-5 SFC8 Insertion Loss

Insertion Loss	Max (dB)
OMD-In ⇒ Ch 1 _OUT	1.4
OMD-In ⇒ Ch 2_OUT	3.5
OMD-In ⇒ Ch 3_OUT	3.2
OMD-In ⇒ Ch 4_OUT	2.9
OMD-In ⇒ Ch 5_OUT	2.6
OMD-In ⇒ Ch 6_OUT	2.3
OMD-In ⇒ Ch 7_OUT	2.0
OMD-In ⇒ Ch 8_OUT	1.7
Ch 1_In ⇒ OMD-OUT	0.9
Ch 2_In ⇒ OMD-OUT	1.2
Ch 3_In ⇒ OMD-OUT	1.5

Table 22-5 SFC8 Insertion Loss (continued)

Insertion Loss	Max (dB)
Ch 4_In ⇒ OMD-OUT	1.8
Ch 5_In ⇒ OMD-OUT	2.1
Ch 6_In ⇒ OMD-OUT	2.4
Ch 7_In ⇒ OMD-OUT	2.7
Ch 8_In ⇒ OMD-OUT	3.0

CWR Insertion loss

Table 22-6 CWR8/CWR8B insertion loss

Description	Maximum Insertion Loss (dB)
SIG IN to THRU OUT	6.7
SIG IN to OMD OUT	10.0
SIG IN to CLS(1-8) OUT	6.5
THRU IN to SIG OUT	2.1
CLS(1-8) (Add) IN to Amp IN	11.0
OMD (Add) IN to Amp IN	8.0
VOA OUT to SIG OUT	7.8
TEST IN to OMD OUT	2.5
TEST IN to THRU OUT	16.8
TEST IN to CLS(1-8) OUT	16.3

Table 22-7 CWR8-88 specifications

Description	Loss (dB)		
	Typ	Min	Max
SIG IN to THRU OUT	6.6	4.0	8.7
SIG IN to OMD OUT	6.9	6.0	7.7
SIG IN to CLS(1-8) OUT	6.1	3.8	7.8
THRU IN to SIG OUT	1.8	1.6	2.1
CLS(1-8) IN to AMP IN	10.6	10.0	11.0

Table 22-7 CWR8-88 specifications (continued)

Description	Loss (dB)		
	Typ	Min	Max
OMD ADD IN to AMP IN[1] (Internal loss)	7.3	6.8	7.6
VOA OUT[1] to SIG OUT (Internal loss)	6.0	5.2	7.8

Notes:

1. Internal reference point within the pack.

WR Insertion loss

Table 22-8 WR8-88A(F) specifications

Location	Loss (dB)		
	Typ	Min	Max
SIG IN to THRU OUT	8.6	7.8	9.4
SIG IN to MESH OUT	8.6	7.8	9.4
SIG IN to DROP OUT	6.2	5.6	6.8
THRU IN to SIG OUT[1]	5.2	2.3	7.6
ADD IN 2-8 to SIG OUT[1]	4.9	2.0	7.4
ADD IN 1 to SIG OUT[1]	5.5	2.5	8.2

Notes:

1. WSS at minimum attenuation

Table 22-9 WR2-88

Location	Loss (dB)		
	Typ	Min	Max
SIG IN to THRU OUT	3.2	2.8	3.8
SIG IN to DROP OUT	3.7	3.0	4.5
THRU IN to SIG OUT[1]	5.2	2.5	7.7
ADD IN to SIG OUT[1]	4.7	2.3	7.0

Notes:

1. WSS at minimum attenuation

OPSA specifications

Table 22-10 OPSA specifications

Location	Item	Loss (dB)
Switch direction	SW loss	1.7
Splitter direction	SP loss	5.6

Summarized specifications for optical transponders and components

Description

This section contains a summary of specifications for optical transponders and components commonly needed for deployment of the Alcatel-Lucent 1830 Photonic Service Switch (PSS). Complete and detailed specifications can be found in, "Detailed specifications for optical interfaces" (p. 12-3).

Optical transponder line-side specifications

Table 22-11 OT line-side specifications

Acronym	Mean launch power (dBm)		Input power range (dBm)	
	Min	Max	Min	Max (overload)
11STAR1/ 11STAR1A	–0.6	+1.9	–22	+8
11STGE12	–0.6	+1.9	–22	+8
11STMM10	–0.6	+1.9	–22	+8
11DPE12(E)	See Table 22-13, "SFP/XFP specifications" (p. 22-15)			
11QPA4				
11QPA4A				
11QPEN4				
11QPE24				
11DPM12				
4DPA4				
4DPA2				
43STX4/ 43STX4P	–20	+2	–17	+5
43STA1P/ 43STA1PB	–20	+2	–17	+5
43SCA1	–1.3	+8.1	–21	+2
43SCGE1	–20	+1	–21	+2
43SCX4	–1.3	+8.1	–21	+2
43SCX4E	–1.3	+8.1	–18/–21	+2
43SCUP	-1.3	+8.1	–18/–21	+2

Table 22-11 OT line-side specifications (continued)

Acronym	Mean launch power (dBm)		Input power range (dBm)	
	Min	Max	Min	Max (overload)
112SCX10 112SNX10 112SCA1 112SNA1	–21	+1	–21	+2
112SDX11	0	3	0	-10
130SCX10 130SCUP 130SCA1	–18	–3	–21	+2
130SNX10 130SCUPB 130SCUPC	–14	+3	–21	+2
260SCX2 1UD200	–14	+3	–21	+2
D5X500	–19	+6	–21	+2

PTM optics (optical modules) specifications

This section provides a summary of specifications for OSC SFPs, WDM SFPs, and XFPs.

Table 22-12 OSC SFP specifications

APN	Acronym	Interface type	Transmit		Receive		Receiver overload (dBm)
			BOL (dBm)	EOL (dBm)	BOL (dBm)	EOL (dBm)	
1AB373110001	OSC1510 PIN CWP151DDMB	SS-16.20	+4	+5	–20.5	–18.5	0
1AB373120001	OSC1510 APD CWA151DDMB	SL-16.20	+4	+5	–30	–28	–8
1AB373120002	OSC 1510 APD ULH	SUL-1.20	+4	+5	–38	–37	–10

Table 22-12 OSC SFP specifications (continued)

1AB373120004	OSC 1510 APD EULH	SEU-1.20	+6	+7	–43	–42	–10

The figure below explains how to decipher SFP naming conventions. The figure is only a reference, and may not include all pluggable module types.

Figure 22-1 SFP naming conventions

SFP/XFP	Optics Reach (S=Short, I=Intermediate, L=Long, UL=Ultralong, EUL=Enhanced Ultralong)	STM Level (STM1/OC3, STM4/OC12, STM16/OC48, STM64/OC192)	Wavelength (1=1310nm, 2=1550nm, 20=1510nm)			
S	S	1	1	Short reach	STM1/OC3	1310nm
S	L	1	1	Long reach	STM1/OC3	1310nm
S	S	16	1	Short reach	STM16/OC48	1310nm
S	I	16	1	Intermediate reach	STM16/OC48	1310nm
S	L	16	1	Long reach	STM16/OC48	1310nm
S	L	16	2	Long reach	STM16/OC48	1550nm
X	I	64	1	Intermediate reach	STM64/OC192	1310nm
X	L	64	2	Long reach	STM64/OC192	1550nm
S	S	16	20	Short reach	STM16/OC48	1550nm
S	L	16	20	Long reach	STM16/OC48	1550nm
S	UL	1	20	UltraLong reach	STM1/OC3	1550nm
S	EU	1	20	Enhanced ultraLong reach	STM1/OC3	1550nm

Table 22-13 SFP/XFP specifications

Description	APN	Mean Launch Power (dBm)	Input power range (dBm)	
		Min / Max	Min	Max (overload)
XFP				
10G CWDM XFP 40km (1471nm -thru- 1611nm)	1AB379240001 -thru- 1AB379240008	+1 / +5	–15 or –18[1]	–1
10G CWDM XFP 40km (-40/85) (1471nm -thru-1551nm)	1AB379240009 -thru- 1AB379240013	+1 / +5	–15 or –18[1]	–1
10G CWDM XFP 70km (1471nm-thru-1611nm) (non-ETR)	1AB378370001 -thru- 1AB378370008	+1 / +5	–24	–8
DWDM XFP 80km CH60 (196.0) - DWDM XFP 80km CH17 (191.7)	1AB375650001 -thru- 1AB375650044	–0.5 / +3	–26	–9
50 GHz wide tunable STM-64 DWDM XFP	1AB375650046	0 / +4	–27	–8
SFP				
SFP DWDM	1AB377220003 -thru- 1AB377220046	0 / +4	–34 with FEC	–8
OE-TRX-SFP STM16/ CWDM	1AB155070001 -thru- 1AB155070008	+2 / +4	–26	–8
ALU SFP 4FC DWDM	1AB383360003 -thru- 1AB383360046	+2.5 / +4.5	–27	–8

Table 22-13 SFP/XFP specifications (continued)

Description	APN	Mean Launch Power (dBm)	Input power range (dBm)	
		Min / Max	Min	Max (overload)
CWDM SFP SL-16.2C/LR-2	1AB377200001 -thru- 1AB377200008	–2 / +2	–28	–8

Notes:

1. Values reflect minimum input power with FEC disabled or enabled respectively.

Summarized specifications for 40G and 100G optical transponders

Overview

This section contains a summary of receiver and transmitter specifications for 40G and 100G coherent optical transponders. Complete and detailed interface specifications can be found in, "Detailed specifications for optical interfaces" (p. 12-3).

40G transmitter specifications

Table 22-14 Transmitter specifications - 40G

Specification	43SCX4	43SCA1	43SCUP	43SCX4E
FEC overhead	7%	7%	7%	7%
FEC (Coding Gain E^{-15})	8 dB	8 dB	8 dB	8 dB
Line rate	43.018 Gb/s	43.018 Gb/s	43.018 Gb/s	43.018 Gb/s
Wavelength range	1529.16 to 1568.36	1529.16 to 1568.36	1529.16 to 1568.36	1529.16 to 1568.36
Output power	−1 dBm to −20 dBm	−1 dBm to −20 dBm	−1 dBm to −20 dBm	−1 dBm to −20 dBm

40G receiver specifications

Table 22-15 Receiver specifications - 40G

Specification	43SCX4	43SCA1	43SCUP	43SCX4E
Chromatic Dispersion Tolerance	±42,000 ps	±42,000 ps	±42,000 ps	±42,000 ps
PMD Tolerance	30 ps	30 ps	30 ps	30 ps
FEC Limit BER	3.80E-03	3.80E-03	3.80E-03	3.80E-03
Receiver Overload	+2 dBm	+2 dBm	+2 dBm	+2 dBm
Receiver Sensitivity	−21 dBm	−21 dBm	−21 dBm	−21 dBm
Receive $OSNR_{[.1\ nm]}$ (BER = $1E^{-15}$, Max CD, Max PMD, End of Life)	11.2 dB	11.2 dB	11.2 dB	11.7 dB

100G/200G transmitter specifications

Table 22-16 Transmitter specifications - 100G/200G

Specification	D5X500	260SCX2 1UD200	130SNX10 130SCUPB 130SCUPC	130SCX10 130SCA1 130SCUP	112SCX10 112SCA1 112SNX10 112SNA1
FEC overhead	23%	23%	23%	23%	7%
FEC (Coding Gain E^{-15})	11.7 dB	11.2 dB[1] 9.2 dB[2]	11.2 dB[1] 9.2 dB[2]	11.2 dB[1] 9.2 dB[2]	9.2 dB
Line rate	269 Gb/s (DP-8QAM)	129.28 Gb/s (100G)[1] 111.81 Gb/s (100G)[2] 258.56 Gb/s (200G)	129.28 Gb/s[1] 111.81 Gb/s[2]	129.28 Gb/s[1] 111.81 Gb/s[2]	111.81 Gb/s
Wavelength range	1528.773 to 1567.952	1529.16 to 1568.36	1529.16 to 1568.36	1529.16 to 1568.36	1529.16 to 1568.36
Output power	+6 dBm to -19 dBm	+3 dBm to −14 dBm	+3 dBm to −14 dBm	−3 dBm to −18 dBm	+1 dBm to −21 dBm
Pulse format	DP-8QAM	DP-QPSK DP-16QAM	DP-QPSK	DP-QPSK	DP-QPSK

Notes:

1. SDFEC
2. AFEC

100G/200G receiver specifications

Table 22-17 Receiver specifications - 100G/200G

Specification	D5X500	260SCX2 1UD200	130SNX10 130SCUPB 130SCUPC	130SCX10 130SCA1 130SCUP	112SCX10 112SCA1	112SNX10 112SNA1
Chromatic Dispersion Tolerance	+/- 150 ns (DP-8QAM)	±80,000 ps (100G) ±30,000 ps (200G)	±80,000 ps	±80,000 ps	±30,000 ps	±30,000 ps

Table 22-17 Receiver specifications - 100G/200G (continued)

Specification	D5X500	260SCX2 1UD200	130SNX10 130SCUPB 130SCUPC	130SCX10 130SCA1 130SCUP	112SCX10 112SCA1	112SNX10 112SNA1
PMD Tolerance	33 ps	40 ps[1] 45 ps[2]	40 ps[1] 45 ps[2]	33 ps[1] 38 ps[2]	18 ps[1]	30 ps[1]
FEC Limit BER	3.5E-02	3.80E-02 (100G) 2.5E-02 (200G)	3.80E-02	3.80E-02	3.80E-03	3.80E-03
Receiver Overload	+2 dBm	+2 dBm	+2 dBm	+2 dBm	+2 dBm	+2 dBm
Receiver Sensitivity	-21 dBm	−21 dBm	−21 dBm	−21 dBm	−21 dBm	−21 dBm
Receive $OSNR_{[.1\ nm]}$ (BER = $1E^{-15}$, Max CD, Max PMD, End of Life)				13.5 dBm	16.2	15.2

Notes:

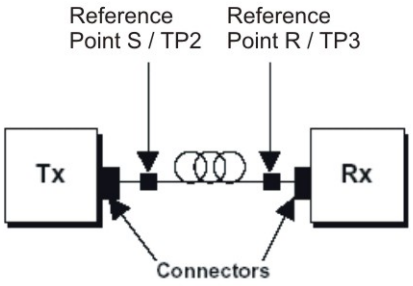
1. SDFEC
2. AFEC

Detailed specifications for optical transponders and components

Reference points

The transmission parameters in this section make reference to Optical Test Reference Points R and S, at locations illustrated in the following figure.

Figure 22-2 Test reference point locations



Optical interfaces (TDM)

Alcatel-Lucent 1830 PSS supports the optical TDM interfaces STM-1 / OC-3, STM-4 / OC-12, STM-16 / OC-48 / OTM-0.1, STM-64 / OC-192 / OTU2, and STM-256 / OC-768.

STM-1 / OC-3 optical interfaces

The following table lists the optical modules providing STM-1 / OC-3 optical interfaces and the cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-18 Optical STM-1 / OC-3 modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
S155S15I	1AB376350001	SS-1.1	STM-1 S-1.1 / OC-3 IR-1, temperature range: –5 to +85 °C (23 to 185 °F)	4DPA4 (FlexMux), 11DPM12
S155S40I	1AB376350002	SL-1.1	STM-1 L-1.1 / OC-3 LR-1, temperature range: –5 to +85 °C (23 to 185 °F)	4DPA4 (FlexMux), 11DPM12, 11STMM10
S155S80I	1AB376350003	SL-1.2	STM-1 L-1.2 / OC-3 LR-2, temperature range: –5 to +85 °C (23 to 185 °F)	4DPA4 (FlexMux), 11DPM12

Table 22-19 Parameters specified for STM-1 / OC-3 optical interfaces

Parameter	ETSI	STM-1 S-1.1	STM-1 L-1.1	STM-1 L-1.2
	ANSI	OC-3 IR-1	OC-3 LR-1	OC-3 LR-2
Digital signal		STM-1 according to *ITU-T Recommendations G.707, G.958*		
Nominal bit rate		155520 kb/s		
Laser type		DFB	DFB	DFB
Target distance		15 km	40 km	80 km
Operating wavelength range		1261 to 1360 nm	1280 to 1335 nm	1480 to 1580 nm
Transmitter at reference point S				
Source type		MLM	MLM	SLM
Spectral characteristics:				
– maximum RMS width		7.7 nm	4 nm	-
– maximum –20 dB width		-	-	1 nm
– minimum side mode suppression ratio		-	-	30 dB
Mean launch power:				
– maximum		–8 dBm	0 dBm	0 dBm
– minimum		–15 dBm	–5 dBm	–5 dBm
Minimum extinction ratio		8.2 dB	10 dB	10 dB
Optical path between S and R				
Attenuation range		0 to 12 dB	10 to 28 dB	10 to 28 dB
Maximum dispersion		100 ps/nm	250 ps/nm	1900 ps/nm
Minimum ORL at S (including connectors)		NA	NA	20 dB
Maximum discrete reflectance between S and R		NA	NA	–25 dB
Receiver at reference point R				
Type of detector		In Ga As PIN		
Mean received power (@ BER = 10^{-10}):				
– minimum (sensitivity)		–28 dBm	–34 dBm	–34 dBm
– maximum (overload)		–8 dBm	–10 dBm	–10 dBm
Maximum optical path penalty		1 dB	1 dB	1 dB
Maximum reflectance of receiver measured at R		–14 dB	–14 dB	–25 dB

STM-4 / OC-12 optical interfaces

The following table lists the optical modules providing STM-4 / OC-12 optical interfaces and the cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-20 Optical STM-4 / OC-12 modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
S622S15I	1AB376360001	SS-4.1	STM-4 S-4.1 / OC-12 IR-1, temperature range: –5 to +85 °C (23 to 185 °F)	4DPA4 (FlexMux), 11DPM12, 11STMM10
S622S40I	1AB376360002	SL-4.1	STM-4 L-4.1 / OC-12 LR-1, temperature range: –5 to +85 °C (23 to 185 °F)	4DPA4 (FlexMux), 11DPM12, 11STMM10
S622S80I	1AB376360003	SL-4.2	STM-4 L-4.2 / OC-12 LR-2, temperature range: –5 to +85 °C (23 to 185 °F)	4DPA4 (FlexMux), 11DPM12

Table 22-21 Parameters specified for STM-4 / OC-12 optical interfaces

Parameter	ETSI	STM-4 S-4.1	STM-4 L-4.1	STM-4 L-4.2
	ANSI	OC-12 IR-1	OC-12 LR-1	OC-12 LR-2
Digital signal		STM-1 according to *ITU-T Recommendations G.707, G.958*		
Nominal bit rate		622080 kb/s		
Laser type		DFB	DFB	DFB
Target distance		15 km	40 km	80 km
Operating wavelength range		1274 to 1356 nm	1280 to 1335 nm	1480 to 1580 nm
Transmitter at reference point S				
Source type		MLM	SLM	SLM
Spectral characteristics:				
– maximum RMS width		2.5 nm	-	-
– maximum –20 dB width		-	1 nm	1 nm
– minimum side mode suppression ratio		-	30 dB	30 dB
Mean launch power:				
– maximum		–8 dBm	+2 dBm	+2 dBm
– minimum		–15 dBm	–3 dBm	–3 dBm
Minimum extinction ratio		8.2 dB	10 dB	10 dB
Optical path between S and R				

Table 22-21 Parameters specified for STM-4 / OC-12 optical interfaces (continued)

Parameter	ETSI	STM-4 S-4.1	STM-4 L-4.1	STM-4 L-4.2
	ANSI	OC-12 IR-1	OC-12 LR-1	OC-12 LR-2
Attenuation range Maximum dispersion		0 to 12 dB 84 ps/nm	10 to 24 dB 250 ps/nm	10 to 24 dB 1900 ps/nm
Minimum ORL at S (including connectors)		14 dB	20 dB	24 dB
Maximum discrete reflectance between S and R		–20 dB	–25 dB	–27 dB
Receiver at reference point R				
Type of detector		In Ga As PIN		
Mean received power (@ BER = 10^{-10}):				
– minimum (sensitivity) – maximum (overload)		–28 dBm –8 dBm	–28 dBm –8 dBm	–28 dBm –8 dBm
Maximum optical path penalty		1 dB	1 dB	1 dB
Maximum reflectance of receiver measured at R		–20 dB	–20 dB	–27 dB

STM-16 / OC-48 / OTM-0.1 optical interfaces

The following table lists the optical modules providing STM-16 / OC-48 / OTM-0.1 optical interfaces and the cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-22 Optical STM-16 / OC-48 / OTM-0.1 modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
S2G7D2I	1AB376370001	SI-16.1	STM-16 I-16.1 / OC-48 SR-1 / OTM-0.1 P1I1-1D1, 1310 nm, temperature range: –5 to +85 °C (23 to 185 °F)	4DPA4 (FlexMux), 11DPM12, 11STMM10
S2G7D40E	1AB376370003	SL-16.1	STM-16 L-16.1 / OC-48 LR-1 / OTM-0.1 P1L1-1D1, 1310 nm, temperature range: –5 to +85 °C (23 to 185 °F)	4DPA2, 4DPA4 (FlexMux), 11DPM12, 11STMM10
S2G7D80E	1AB376370004	SL-16.2	STM-16 L-16.2 / OC-48 LR-2 / OTM-0.1 P1L1-1D2, 1550 nm, temperature range: –5 to +85 °C (23 to 185 °F)	4DPA4 (FlexMux), 11DPM12, 11STMM10

Table 22-22 Optical STM-16 / OC-48 / OTM-0.1 modules (continued)

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
S2G7M15I	1AB376370005	SS-16.1A	STM-16 S-16.1 / OC-48 IR-1 / OTM-0.1 P1S1-1D1 / GbE 1000BASE-LX, 1310 nm, temperature range: –5 to +85 °C (23 to 185 °F)	PTPCTL, 4DPA2, 4DPA4 (FlexMux), 11DPM12, 11STMM10, 11DPE12/E/A, 11STGE12,

Table 22-23 Parameters specified for STM-16 / OC-48 / OTM-0.1 optical interfaces

Parameter	ETSI	STM-16 I-16.1	STM-16 S-16.1	STM-16 L-16.1	STM-16 L-16.2
	ANSI	OC-48 SR-1	OC-48 IR-1	OC-48 LR-1	OC-48 LR-2
	OTN	OTM-0.1 P1I1-1D1	OTM-0.1 P1S1-1D1	OTM-0.1 P1L1-1D1	OTM-0.1 P1L1-1D2
Digital signal		STM-16 according to *ITU-T Recommendations G.707, G957*			
Nominal bit rate		2488320 kb/s			
Laser type		DFB	DFB	DFB	DFB
Target distance		2 km	15 km	40 km	80 km
Operating wavelength range		1270 to 1360 nm	1270 to 1360 nm	1280 to 1335 nm	1500 to 1580 nm
Transmitter at reference point S					
Source type		MLM	SLM	SLM	SLM
Spectral characteristics:					
– maximum RMS width		4 nm	-	-	-
– maximum –20 dB width		-	1 nm	1 nm	1 nm
– minimum side mode suppression ratio		-	30 dB	30 dB	30 dB
Mean launch power:					
– maximum		–3 dBm	0 dBm	+2 dBm	+2 dBm
– minimum		–10 dBm	–5 dBm	–2 dBm	–2 dBm
Minimum extinction ratio		8.2 dB	8.2 dB	8.2 dB	8.2 dB
Optical path between S and R					
Attenuation range		0 to 7 dB	0 to 12 dB	10 to 24 dB	10 to 24 dB
Maximum dispersion		12 ps/nm	100 ps/nm	250 ps/nm	1600 ps/nm
Minimum ORL at S (including connectors)		24 dB	24 dB	24 dB	24 dB

Table 22-23 Parameters specified for STM-16 / OC-48 / OTM-0.1 optical interfaces (continued)

Parameter					
	ETSI	STM-16 I-16.1	STM-16 S-16.1	STM-16 L-16.1	STM-16 L-16.2
	ANSI	OC-48 SR-1	OC-48 IR-1	OC-48 LR-1	OC-48 LR-2
	OTN	OTM-0.1 P1I1-1D1	OTM-0.1 P1S1-1D1	OTM-0.1 P1L1-1D1	OTM-0.1 P1L1-1D2
Maximum discrete reflectance between S and R		–27 dB	–27 dB	–27 dB	-27 dB
Receiver at reference point R					
Type of detector		In Ga As PIN		In Ga As APD	
Mean received power (@ BER = 10^{-10}):					
– minimum (sensitivity) – maximum (overload)		–18 dBm –3 dBm	–18 dBm 0 dBm	–27 dBm –8 dBm	–28 dBm –8 dBm
Maximum optical path penalty		1 dB	1 dB	1 dB	2 dB
Maximum reflectance of receiver measured at R		–27 dB	–27 dB	–27 dB	–27 dB

STM-64 / OC-192 / OTU2 optical interfaces

The following table lists the optical modules providing STM-64 / OC-192 / OTU2 optical interfaces and the cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-24 Optical STM-64 / OC-192 / OTU2 modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
X11M10I	1AB375380007	XI-64.1	STM-64 I-64.1 / OC-192 SR-1 / OTM-0.2 P1I1-2D1 / 10GbE 10GBASE-LR/LW, 1310 nm, temperature range: –5 to +85 °C (23 to 185 °F)	11DPM12, 11DPE12/E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4,
X11M40I	1AB375380005	XS-64.2b	STM-64 S-64.2b / OC-192 IR-2 / OTM-0.2 P1S1-2D2b / 10GbE 10GBASE-ER/EW, 1550 nm, temperature range: –5 to +85 °C (23 to 185 °F)	11DPM12, 11DPE12/E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4,
X11M80E	1AB375380008	10GB-ZR	STM-64 L-64.2b / OC-192 LR-2 / OTM-0.2 P1L1-2D2 /10GbE 10GBASE-ZR/ZW, 1550 nm, temperature range: –5 to +85 °C (23 to 185 °F)	11DPM12, 11QPA4/A, 11QPEN4,

Notes:

1. 1AB375380007 has been replaced by a compatible pluggable 3AL82045AA.

Table 22-25 Parameters specified for STM-64 / OC-192 / OTU2 optical interfaces

Parameter	ETSI	STM-64 I-64.1	STM-64 S-64.2b	STM-64 P1L1-2D2
	ANSI	OC-192 SR-1	OC-192 IR-2	OC-192 P1L1-2D2
	OTN	OTU2 P1I1-2D1	OTU2 P1S1-2D2b	OTU2 P1L1-2D2
Digital signal		STM-64 according to *ITU-T Recommendations G.707, G.959.1, G.691*		
Nominal bit rate		9953280kb/s		
Laser type		DFB	DFB	DFB
Target distance		2 km for OTN/SONET/SDH 10 km for Ethernet	40 km	80 km
Operating wavelength range		1290 to 1330 nm	1530 to 1565 nm	1530 to 1565 nm
Transmitter at reference point S				

Table 22-25 Parameters specified for STM-64 / OC-192 / OTU2 optical interfaces (continued)

Parameter	ETSI	STM-64 I-64.1	STM-64 S-64.2b	STM-64 P1L1-2D2
	ANSI	OC-192 SR-1	OC-192 IR-2	OC-192 P1L1-2D2
	OTN	OTU2 P1I1-2D1	OTU2 P1S1-2D2b	OTU2 P1L1-2D2
Source type		SLM	EA-ILM	SLM
Spectral characteristics:				
– maximum -20 dB width		1 nm	*n.a.* [1]	*n.a.* [3]
– minimum side mode suppression ratio		30 dB	30 dB	30dB
Mean launch power:				
– maximum		–1 dBm	+2 dBm	12 dBm
– minimum		–6 dBm	–1 dBm	10 dBm
Minimum extinction ratio		6 dB	8.2 dB	9 dB
Optical path between S and R				
Attenuation range		0 to 4 dB	3 to 11 dB	11 to 22 dB
Maximm chromatic dispersion:		6.6 ps/nm	800 ps/nm	1600 ps/nm
Maximum DGD		30 ps	30 ps	30 ps
Minimum ORL at S (including connectors)		14 dB	24 dB	24 dB
Maxim. discrete reflectance between S and R		–27 dB	–27 dB	–27 dB
Receiver at reference point R				
Type of detector		PIN	PIN	PIN
Mean received power: (@ BER = 10^{-12} and OSNR=19 dB/0.1 nm)				
– minimum (sensitivity)		–11 dBm	–14 dBm	–24 dBm
– minimum (overload)		0.5 dBm	–1 dBm	–7 dBm
Maximum optical path penalty		1 dB	2 dB	2 dB[2]
Maxim. reflectance of receiver measured at R		–14 dB	–27 dB	–27 dB

Notes:

1. *n.a.* = not applicable
2. With 10 dB attenuation

3. Maximum -20dB spectral width (in nm) of an SLM laser is specified by the maximum full width of the central wavelength peak, measured 20dB down from the maximum amplitude of the central wavelength under standard operating conditions.

Optical interfaces (DWDM)

The following table lists the optical modules that provide DWDM optical interfaces and the cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-26 Optical DWDM modules

Optical module			Optical interface	Card name
Item mnemonic	APN	S/W mnemonic		
X11MDTNC	1AB375650046	XL-64TU	50 GHz wide tunable DWDM XFP: STM-64/OC-192/OTU2/OTU2E (DN50U-2AxC[F]), temperature range: –5 to +70 °C (23 to 158 °F)	11DPM12, 11DPE12/E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4
X11MDTNC	1AB375650047	XL-64TU	T-XFP Low latency (FEC on/off option)	11DPM12, 11DPE12A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4, 130SCX10, 130SNX10, 12P120
X11MDTSZC	1AB394040003	XL-64TCW	ALU XFP DWDM Tunable Z-Chirp −5/+70 (DN50C-2AxC[F])	11DPE12A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4
X11MDxxLC	1AB375650001 -to- 1AB375650044	XL-64.2D	XFP DW100U (DWDM (1600 ps/nm) DDM) (DW100U-2AxC[F]), fixed OTM-n.2e DWDM optics (XFP) with 44 colors, temperature range: –5 to +70 °C (23 to 158 °F)	11DPM12, 11DPE12/E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4
X11MDxxSI	3AL82001AA -to- 3AL82001AR	XS-64.2D	XFP DWDM (40 km) 10G (100 GHz) spacing) (-40/+85)	11DPM12, 11DPE12E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4

Table 22-27 Parameters specified for STM-64/OC-192/OTU2 uncompensated tunable full C+ DWDM optical interface (DN50U-2AxC[F])

Parameter	DN50U-2A2C(F)	DN50U-2A5C(F)
Digital signal	STM-64, OC-192, OTU2	
Nominal bit rates	9.95328Gbps, 10.709225Gbps (±20ppm) 10.3125Gbps, 10.51875Gbps, 11.0957Gbps, 11.3176Gbps (±100ppm)	
Laser type	DFB	
Operating wavelength range	1568.3623 to 1529.1633 nm	
Transmitter at reference point MPI-S		
Source type	SLM	
Spectral characteristics:		
– maximum spectral excursion	±10 GHz	
– maximum –15 dB width	15 GHz	
– minimum side mode suppression ratio	30 dB	
– chirp parameter α	—	
Mean launch power:		
– maximum	+3 dBm	
– minimum	-0.5 dBm	
– minium extinction ratio	10.5 dB	
Main optical path, MPI-S to MPI-R		
Chromatic dispersion		
– maximum	1600 ps/nm	
– minimum	0 ps/nm	
Maxim. discrete reflectance between MPI-S and MPI-R	–27	
Receiver at reference point MPI-R		
Minimum sensitivity (BER of 1 × 10^{-12})	–26	
Minimum overload	–9	
Maximum optical path penalty	2	
Maxim. reflectance of receiver measured at MPI-R	–27	

Table 22-28 Parameters for STM-64/OC-192 Un-chirped/Compensated tunable full C+ DWDM optical interface (DN50C-2AxC[F])

Parameter	Values	
Fiber type	G.652, G.655	
Operating wavelength range	191.15-196.05 THz	
Frequency spacing	50 GHz	
Addressable channels	99	
FEC type	According to ITU-T G.709	
Line coding of optical tributary signals	NRZ	
Minimum bit-rate	9.95 GB/s	
Maximum bit-rate	11.3 GB/s	
	BOL	**EOL**
Transmitter at reference Point S		
Source type[1]	SLM (CW Laser + MZM)	
Maximum frequency deviation		±20 pm[3]
Spectral characteristics:		
maximum –15dB width		15 GHz
minimum side mode suppression ratio		30 dB
maximum spectral excursion		±10 GHz
Mean launched power:		
Maximum		+4 dB
Minimum	+1.5 dB	+1 dB
Output power accuracy (over wavelength range included)		±0.25 dB
Output power stability (over operating temp./bias supplies ranges and ageing)		±0.3 dB
Overall Optical Output Power Accuracy wrt to Set Target		±0.55 dB
Maximum overshoot		1 dB[4]
Maximum mean launched in case Tx_Dis and/or P_Down are high		-40 dBm
Output OSNR		40 dB/0.1nm
SBS Threshold	+19 dBm	
Minimum extinction ratio	13.5 dB	13 dB
Maximum optical Rise / Fall Time (20-80%)		35 ps
Eye mask margin	10%	

Table 22-28 Parameters for STM-64/OC-192 Un-chirped/Compensated tunable full C+ DWDM optical interface (DN50C-2AxC[F]) (continued)

Parameter	Values	
Transmitter Parameter at reference Point S (option B)		
Min Average optical output power at VOA min attenuation		+1 dBm
Min optical output power dynamic range		10 dB
Average optical output power tuning step	0.1 dB	
Output power accuracy (over wavelength range included)		±0.25 dB
Output power stability (over operating temp./bias supplies ranges and ageing)		±0.3 dB
Overall Optical Output Power Accuracy wrt to Set Target		±0.55 dB
Maximum overshoot		1 dB[4]
Maximum mean launched in case Tx_Dis and/or P_Down are high		-40 dBm
Output OSNR		40 dB
SBS Threshold	+19 dBm	
Minimum extinction ratio	13.5 dB	13 dB
Maximum optical Rise / Fall Time (20-80%)		35 ps
Eye mask margin	10%	
Optical path between Point S and Point R		
Maximum (residual) chromatic dispersion		+800 ps/nm
Minimum (residual) chromatic dispersion		-800 ps/nm
Maximum PMD		10ps
Minimum optical return loss of cable plant at Point S, including any connectors		24 dB
Maximum discrete reflectance between Point S and Point R		-27 dB
Receiver at reference Point R		
Conditions	Optical filter 0.3nm (channel net Bandwidth @ -3dB)	
	Without crosstalk effects (only one channel equipped)	
Maximum mean input power	-6 dBm	-7 dBm
Minimum mean input power for OSNR limited operation		-22 dBm
OSNR Tol. w/ 0 ps/nm		
@ BER=2E-3	9.6 dB[6]	10.1 dB[6]

Table 22-28 Parameters for STM-64/OC-192 Un-chirped/Compensated tunable full C+ DWDM optical interface (DN50C-2AxC[F]) (continued)

Parameter	Values	
@ BER=1E-4	12 dB[6]	12.5 dB[6]
@ BER=1E-7	15.7 dB[6]	16.2 dB[6]
@ BER=1E-10	18.5dB[6]	19.0 dB[6]
OSNR Tol. w/ +/-800 ps/nm		
@ BER=2E-3	10.9 dB[6]	11.4 dB[6]
@ BER=1E-4	13.3 dB[6]	13.8dB[6]
@ BER=1E-7	17.0dB[6]	17.5 dB[6]
Sensitivity w/ 0 ps/nm w/ OSNR > 30dB		
@ BER=1E-10	-26 dBm[7]	-24 dBm[7]
RX_LOS assert level		-30 to -35 dBm[5]
Hysteresis for RX_LOS, assert-deassert		0.5 to 2.0 dB
Maximum reflectance of receiver, measured at Point R		-27 dB

Notes:

1. SLM = Single-longitudinal mode laser
2. Variation with respect to BOL power at 25°C and no minimal power supply voltages.
3. Deviation related to ITU standardized wavelength. The transmit wavelength shall be within the EOL range as soon as the output average power is above 10% of the steady-state power.
4. Defined as Peak power – Steady-state power (in dBm) when Tx_dis is de-asserted or when the module is hot plugged with Tx_dis in low state (Tx enabled)
5. RX_LOS is pin 14 of the XFP's electrical connector. This alarm shall be based upon total optical power received at the photodiode. The assert level shall occur at an optical input power that corresponds to an equivalent BER higher than 2x10-3.
6. With variable decision threshold set to optimized value
7. With variable decision threshold set to 50%

Table 22-29 Parameters for STM-64/OC-192 Chirped/Uncompensated DWDM optical interface (DW100U-2AxC[F])

Parameter	BOL	EOL
Fiber type	G.652, G.655	
Operating wavelength range	1529-1564 nm	
Frequency spacing	100 GHz	
Target distance	80 km	

Table 22-29 Parameters for STM-64/OC-192 Chirped/Uncompensated DWDM optical interface (DW100U-2AxC[F]) (continued)

Parameter	BOL		EOL	
FEC type	According to ITU-T G.709			
Line coding of optical tributary signals	NRZ FEC disabled	NRZ FEC enabled	NRZ FEC disabled	NRZ FEC enabled
Minimum bit-rate	9.9 Gbit/s	10.7 Gbit/s	9.9 Gbit/s	10.7 Gbit/s
Maximum bit-rate	10.7 Gbit/s	11.3 Gbit/s	10.7 Gbit/s	11.3 Gbit/s
Transmitter at reference point S				
Source type[1]	SLM			
Maximum frequency deviation	+/- 50 pm		+/- 100 pm[3]	
Spectral characteristics:				
– maximum –15 dB width[9]			15 GHz	
– minimum side mode suppression ratio			30 dB	
– maximum spectral excursion			+/- 20 GHz	
Mean launched power:				
– maximum	+2.5 dBm		+3 dBm	
– minimum	0 dBm		–1 dBm	
Maximum overshoot[4]			1 dB	
Maximum mean launched power variation			+/- 1 dB[2]	
Max. mean launched power in case Tx_Dis and/or P_Down are high			–40 dBm	
Minimum extinction ratio	10 dB		9 dB	
Maximum optical Rise / Fall Time (20-80%)			35 ps	
Eye mask margin	10 %			
Optical path between Point S and Point R				
Maximum chromatic dispersion			1300 ps/nm	1600 ps/nm
Minimum chromatic dispersion			0 ps/nm	
Maximum PMD			10 ps	
Minimum optical return loss of cable plant at Point S, including any connectors			24 dB	
Maximum discrete reflectance between Point S and R			-27 dB	
Receiver at reference point R				
Conditions	Optical filter 0.6nm (channel net bandwidth @ -3dB)			
	Without crosstalk effects (only one channel equipped)			
	Power into the fiber < +3dBm (linear regime)			

Table 22-29 Parameters for STM-64/OC-192 Chirped/Uncompensated DWDM optical interface (DW100U-2AxC[F]) (continued)

Parameter	BOL		EOL	
Maximum mean input power	–7 dBm		–8 dBm	
Minimum mean input power for OSNR limited operation			–17 dBm	–20 dBm
Minimum receiver sensitivity with 0 ps/nm	–26 dBm[7]	–29 dBm[8]	–24 dBm[7]	–27 dBm[8]
Minimum receiver sensitivity with 1300 ps/nm			–22 dBm[7]	–26 dBm[8]
Minimum receiver sensitivity with 1600 ps/nm				–25 dBm[8]
Minimum required OSNR with 0 ps/nm	22.5 dB/0.1nm[7]		23 dB/0.1nm[7]	
Minimum required OSNR with 1300 ps/nm			25 dB/0.1nm[7]	
Minimum required OSNR with from 0 to 1300 ps/nm[10]				17.5 dB/0.1nm[8]
Minimum required OSNR with from 1300 to 1600 ps/nm[10]				19.5 dB/0.1nm[8]
Maximum OSNR penalty due to PMD (10ps)			1 dB	
Maximum OSNR penalty due to chromatic dispersion			2 dB	
RX_LOS assert level			–28 dBm to –35 dBm [5]	
Hysteresis for RX_LOS, assert-deassert			0.5 – 2.0 dB	
Maximum optical path sensitivity penalty[6]	2.3 dB		2.5 dB	
Maximum reflectance of receiver, measured at Point R			-27 dB	

Notes:

1. SLM = Single-Longitudinal Mode laser.
2. Variation respect to BOL power at 25°C and nominal power supply voltages.
3. Deviation related to ITU standardized wavelength. The transmit wavelength shall be within the EOL range as soon as the output average power is above 10% of the steady-state power.
4. Defined as Peak power – Steady-state power (in dBm) when Tx_dis is de-asserted or when the module is hot plugged with Tx_dis in low state (Tx enabled).
5. RX_LOS is pin 14 of the XFP's electrical connector. This alarm shall be based upon total optical power received at the photodiode. The assert level shall occur at an optical input power that corresponds to an equivalent BER higher than $2x10^{-3}$.
6. Due to chromatic dispersion + PMD + optical reflections.
7. With variable decision threshold set to 50%
8. With variable decision threshold set to optimized value. This means that, at module level (before FEC), the BER must be lower of $1e^{-4}$ for the indicated value of sensitivity.
9. Full spectral width (RBW=0.01nm) measured 15 dB down from the maximum of center wavelength peak under full modulation condition.

10. For OSNR values at different bitrates see Table 22-31, “OSNR tolerance with ASE noise” (p. 22-37).

Table 22-30 Parameters for STM-64/OC-192 Chirped/Uncompensated DWDM optical interface (DW100U-2AxC[F]-S)

Parameter	BOL		EOL	
Fiber type	G.652, G.655			
Operating wavelength range	1529-1564 nm			
Frequency spacing	100 GHz			
FEC type	According to ITU-T G.709 [12]			
Line coding of optical tributary signals	NRZ FEC disabled	NRZ FEC enabled	NRZ FEC disabled	NRZ FEC enabled
Minimum bit-rate	9.9 Gbit/s	10.7 Gbit/s	9.9 Gbit/s	10.7 Gbit/s
Maximum bit-rate	11.3 Gbit/s	11.3 Gbit/s	11.3 Gbit/s	11.3 Gbit/s
Transmitter at reference point S				
Source type [1]	SLM			
Maximum frequency deviation	+/- 50 pm		+/- 100 pm [3]	
Spectral characteristics:				
– maximum –15 dB width [9]			15 GHz	
– minimum side mode suppression ratio			30 dB	
– maximum spectral excursion			+/- 20 GHz	
Mean launched power:				
– maximum	+2.5 dBm		+3 dBm	
– minimum	0 dBm		–1 dBm	
Maximum overshoot [4]			1 dB	
Maximum mean launched power variation			+/- 1 dB[2]	
Max. mean launched power in case Tx_Dis and/or P_Down are high			–40 dBm	
Minimum extinction ratio	9.5 dB		9 dB	
Maximum optical Rise / Fall Time (20-80%)			35 ps	
Eye mask margin	10 %			
Optical path between Point S and Point R				
Maximum chromatic dispersion			800 ps/nm	
Minimum chromatic dispersion			0 ps/nm	
Maximum PMD			10 ps	
Minimum optical return loss of cable plant at Point S, including any connectors			24 dB	

Table 22-30 Parameters for STM-64/OC-192 Chirped/Uncompensated DWDM optical interface (DW100U-2AxC[F]-S) (continued)

Parameter	BOL	EOL	
Maximum discrete reflectance between Point S and R		-27 dB	
Receiver at reference point R			
Conditions	Optical filter 0.6nm (channel net bandwidth @ -3 dB)		
	Without crosstalk effects (only one channel equipped)		
	Power into the fiber < +3dBm (linear regime)		
Maximum mean input power	0 dBm	–1 dBm	
Minimum mean input power for OSNR limited operation		–10 dBm	–12 dBm
Minimum receiver sensitivity with 0 ps/nm		–16 dBm[7]	–19 dBm[8]
Minimum receiver sensitivity with 800 ps/nm with OSNR [gnE] 25 dB		–22 dBm[7]	–26 dBm[7]
Minimum required OSNR with 0 ps/nm		22 dB/0.1nm[7]	15 dB/0.1nm[7]
Minimum required OSNR with 800 ps/nm		24 dB/0.1nm[7]	16.5 dB/0.1nm[7]
Maximum OSNR penalty due to PMD (10ps)		1 dB	
Maximum OSNR penalty due to chromatic dispersion		2 dB	
RX_LOS assert level		–21 dBm to –28 dBm[5]	
Hysteresis for RX_LOS, assert-deassert		0.5 – 2.0 dB	
Maximum optical path sensitivity penalty[10]		2 dB	
Maximum reflectance of receiver, measured at Point R		-27 dB	

Notes:

1. SLM = Single-Longitudinal Mode laser.
2. Variation respect to BOL power at 25°C and nominal power supply voltages.
3. Deviation related to ITU standardized wavelength. The transmit wavelength shall be within the EOL range as soon as the output average power is above 10% of the steady-state power.
4. Defined as Peak power – Steady-state power (in dBm) when Tx_dis is de-asserted or when the module is hot plugged with Tx_dis in low state (Tx enabled).
5. RX_LOS is pin 14 of the XFP's electrical connector. This alarm shall be based upon total optical power received at the photodiode. The assert level shall occur at an optical input power that corresponds to an equivalent BER higher than $2x10^{-3}$.
6. Due to chromatic dispersion + PMD + optical reflections.
7. With variable decision threshold set to 50%. This means that, at module level, the BER must be lower of $1e^{-12}$ for the indicated value of sensitivity
8. With variable decision threshold set to optimized value. This means that, at module level (before FEC), the BER must be lower of $1e^{-4}$ for the indicated value of sensitivity.

9. Full spectral width (RBW=0.01nm) measured 15 dB down from the maximum of center wavelength peak under full modulation condition.
10. For OSNR values at different bit rates see Table 22-31, “OSNR tolerance with ASE noise” (p. 22-37).

Table 22-31 OSNR tolerance with ASE noise

Minimum required OSNR	0 to 1300 ps/nm up to 10.7 Gbps	dB/0.1 nm	16.5
	0 to 1300 ps/nm up to 11.1 Gbps	dB/0.1 nm	17
	0 to 1300 ps/nm up to 11.3 Gbps	dB/0.1 nm	17.5
	1300 to 1600 ps/nm up to 10.7 Gbps	dB/0.1 nm	18.5
	1300 to 1600 ps/nm up to 11.1 Gbps	dB/0.1 nm	19
	1300 to 1600 ps/nm up to 11.3 Gbps	dB/0.1 nm	19.5

Optical interfaces (CWDM)

The following table lists the optical modules providing CWDM optical interfaces and the cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-32 Optical CWDM 10 GbE/OTU2 modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
X11MCxxLC	1AB378370001 -to- 1AB378370008	XL-64.2C	Long haul CWDM XFP: Fixed OTM-n.2e long haul CWDM optics (XFP) with 8 colors, temperature range –5 to +70 °C (23 to 158 °F)	11STAR1, 11STAR1A, 11DPM12, 11DPE12/E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4, 43STX4/P, 43SCX4/E, 112SCX10, 112SNX10, 130SCX10, 130SNX10

Table 22-32 Optical CWDM 10 GbE/OTU2 modules (continued)

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
X11MCxxLI	1AB378370009 -to- 1AB378370016	XL-64.2C	Long haul CWDM XFP with industrial temperature range: Fixed OTM-n.2e long haul CWDM optics (XFP) with 8 colors and industrial temperature range, that is, –40°C to +85°C (–40 to 185 °F)	11STAR1, 11STAR1A, 11DPM12, 11DPE12/E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4, 43STX4/P, 43SCX4/E, 112SCX10, 112SNX10, 130SCX10, 130SNX10
X11MCxxSC	1AB379240001 -to- 1AB379240008	XS-64.2C	Short haul CWDM XFP: Fixed OTM-n.2e CWDM optics (XFP) with 8 colors, temperature range –5 to +70 °C (23 to 158 °F)	11STAR1, 11STAR1A, 11DPM12, 11DPE12/E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4, 43STX4/P, 43SCX4/E, 112SCX10, 112SNX10, 130SCX10, 130SNX10
X11MCxxSI	1AB379240009 -to- 1AB379240013	XS-64.2C	Short haul CWDM XFP with industrial temperature range: Fixed OTM-n.2e CWDM optics (XFP) with 5 colors and industrial temperature range with respect to operation, that is, –40°C to +85°C (–40 to 185 °F)	11DPM12, 11DPE12/E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4, 43SCX4, 112SCX10, 112SNX10, 130SCX10, 130SNX10

Table 22-33 Parameters specified for STM-64/OC-192/OTU2 CWDM long haul (LH) optical interfaces

Parameter	BOL	EOL
Fiber type	G.652, G.655	
Operating wavelength range	1471-1611 nm	
Center wavelengths	1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm	

Table 22-33 Parameters specified for STM-64/OC-192/OTU2 CWDM long haul (LH) optical interfaces (continued)

Parameter	BOL		EOL	
Wavelength spacing	20 nm			
FEC type	According to ITU-T G.709			
Line coding of optical tributary signals	NRZ FEC disabled	NRZ FEC enabled	NRZ FEC disabled	NRZ FEC enabled
Minimum bit-rate	9.9 Gbit/s	10.7 Gbit/s	9.9 Gbit/s	10.7 Gbit/s
Maximum bit-rate	10.7 Gbit/s	11.3 Gbit/s	10.7 Gbit/s	11.3 Gbit/s
Transmitter at reference point S				
Source type[1]	SLM			
Maximum wavelength deviation	+/- 5.5 nm		+/- 6.5 nm	
Spectral characteristics:				
– maximum –20 dB width			0.25 nm	
– minimum side mode suppression ratio			30 dB	
Mean launched power:				
– maximum	+4 dBm		+5 dBm	
– minimum	+2 dBm		+1 dBm	
Max. mean launched power in case Tx_Dis and/or P_Down are high			–40 dBm	
Minimum extinction ratio	10 dB		9 dB	
Eye mask margin	10 %			
Optical path between Point S and Point R				
Maximum chromatic dispersion				
1471 nm channel			841 ps/nm	962 ps/nm
1491 nm channel			921 ps/nm	1052 ps/nm
1511 nm channel			1000 ps/nm	1142 ps/nm
1531 nm channel			1079 ps/nm	1233 ps/nm
1551 nm channel			1159 ps/nm	1324 ps/nm
1571 nm channel			1238 ps/nm	1415 ps/nm
1591 nm channel			1319 ps/nm	1508 ps/nm
1611 nm channel			1400 ps/nm	1600 ps/nm
Minimum chromatic dispersion			0 ps/nm	
Maximum PMD			10 ps	
Minimum optical return loss of cable plant at Point S, including any connectors			24 dB	

Table 22-33 Parameters specified for STM-64/OC-192/OTU2 CWDM long haul (LH) optical interfaces (continued)

Parameter	BOL		EOL	
Maximum discrete reflectance between Point S and R			-27 dB	
Receiver at reference point R				
Maximum mean input power	–7 dBm		–8 dBm	
Minimum receiver sensitivity btb	–26 dBm[5]	–29 dBm[4]	–24 dBm[5]	–27 dBm[4]
RX_LOS assert level			[2]	
Hysteresis for RX_LOS, assert-deassert			0.5 – 2.0 dB	
Maximum optical path penalty[3]	2.3 dB		2.5 dB	
Maximum reflectance of receiver, measured at Point R			-27 dB	

Notes:

1. SLM = single-longitudinal mode laser
2. RX_LOS is pin 14 of the XFP's electrical connector. This alarm is based upon total optical power received at the photodiode . The assert level occurs at an optical input power that corresponds to an equivalent BER higher than $2x10^{-3}$
3. Due to chromatic dispersion + PMD + optical reflections
4. With variable decision threshold set to optimized value. This means that, at module level (before FEC), the BER must be lower of $1e^{-4}$ for the indicated value of sensitivity
5. With variable decision threshold set to 50%

Table 22-34 Parameters specified for STM-64/OC-192/OTU2 CWDM short haul (SH) optical interfaces

Parameter	BOL		EOL	
Fiber type	G.652, G.655			
Operating wavelength range	1471-1611 nm			
Center wavelengths	1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm			
Wavelength spacing	20 nm			
FEC type	According to ITU-T G.709			
Line coding of optical tributary signals	NRZ FEC disabled	NRZ FEC enabled	NRZ FEC disabled	NRZ FEC enabled
Minimum bit-rate	9.9 Gbit/s	10.7 Gbit/s	9.9 Gbit/s	10.7 Gbit/s
Maximum bit-rate	10.7 Gbit/s	11.3 Gbit/s	10.7 Gbit/s	11.3 Gbit/s
Transmitter at reference point S				
Source type[1]	SLM			

Table 22-34 Parameters specified for STM-64/OC-192/OTU2 CWDM short haul (SH) optical interfaces (continued)

Parameter	BOL	EOL	
Maximum wavelength deviation	+/- 5.5 nm	+/- 6.5 nm	
Spectral characteristics:			
– maximum –20 dB width		0.25 nm	
– minimum side mode suppression ratio		30 dB	
Mean launched power:			
– maximum	+4 dBm	+5 dBm	
– minimum	+2 dBm	+1 dBm	
Max. mean launched power in case Tx_Dis and/or P_Down are high		–40 dBm	
Minimum extinction ratio	10 dB	9 dB	
Eye mask margin	10 %		
Optical path between Point S and Point R			
Maximum chromatic dispersion			
1471 nm channel		481 ps/nm	601 ps/nm
1491 nm channel		526 ps/nm	657 ps/nm
1511 nm channel		571 ps/nm	714 ps/nm
1531 nm channel		617 ps/nm	771 ps/nm
1551 nm channel		662 ps/nm	828 ps/nm
1571 nm channel		708 ps/nm	885 ps/nm
1591 nm channel		754 ps/nm	942 ps/nm
1611 nm channel		800 ps/nm	1000 ps/nm
Minimum chromatic dispersion		0 ps/nm	
Maximum PMD		10 ps	
Minimum optical return loss of cable plant at Point S, including any connectors		24 dB	
Maximum discrete reflectance between Point S and R		-27 dB	
Receiver at reference point R			
Maximum mean input power	0 dBm	–1 dBm	
Minimum receiver sensitivity btb	–17 dBm[5]	–20 dBm[4]	–15 dBm[5]	–18 dBm[4]
RX_LOS assert level		[2]	
Hysteresis for RX_LOS, assert-deassert		0.5 – 2.0 dB	
Maximum optical path penalty[3]	1.8 dB	2 dB	
Maximum reflectance of receiver, measured at Point R		-27 dB	

Notes:

1. SLM = single-longitudinal mode laser
2. RX_LOS is pin 14 of the XFP's electrical connector. This alarm is based upon total optical power received at the photodiode . The assert level occurs at an optical input power that corresponds to an equivalent BER higher than $2x10^{-3}$
3. Due to chromatic dispersion + PMD + optical reflections
4. With variable decision threshold set to optimized value. This means that, at module level (before FEC), the BER must be lower of $1e^{-4}$ for the indicated value of sensitivity
5. With variable decision threshold set to 50%

Table 22-35 Optical CWDM 1 GbE modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
S2G7CxxSC	1AB377160001 -to- 1AB377160008	SS-16.2C	Short haul CWDM SFP: CWDM-SH (CWDM 2.5G Multirate PIN (<2.7G) DDM)	4DPA2, 4DPA4, 11DPM12, 11DPE12, E/A, 11QPE24, 11QCE12X
S2G7CxxLI	1AB377200009 -to- 1AB377200016	SL-16.2C	Long haul CWDM SFP: ALU SFP CWDM-LH (CWDM 2.5G Multirate APD (<2.7G) DDM) CT	4DPA4, 11DPM12, 11DPE12E/A, 11QPE24, 11QCE12X

Table 22-36 Parameters specified for standard CWDM 1510 SFP optical interface

Parameter	Values			
Applicationcode (ITU-TG.695)	S-C8S1-1D2 S-C8S1-1D5		S-C8L1-1D2 S-C8L1-1D5	
Application	Short-haul (S)		Long-haul (L)	
Data rate and reference pattern	Bit rate: 155 Mb/s ± 20ppm to 2.66 Gb/s ± 20ppm[1] Line code: NRZ PRBS 2E23-1 and CID according to ITU-T G.957 and G.783. In addition the module operates @ 2.048 Mb/s with PRBS 2E7-1 CMI coded			
	BOL	**EOL**	**BOL**	**EOL**
Transmitter at reference point S				
Source type	SLM		SLM	
Nominal center wavelength[2]	1471 to 1611nm		1471 to 1611nm	
Center wavelength deviation[2]	±5.5nm	±6.5nm	±5.5nm	±6.5nm
Spectral characteristics:				
maximum –20 dB width		1nm		1nm

Table 22-36 Parameters specified for standard CWDM 1510 SFP optical interface (continued)

Parameter	Values			
minimum side mode suppression ratio		30dB		30dB
Mean launched power:				
– maximum	+4 dBm	+5 dBm	+4 dBm	+5 dBm
– minimum	+1 dBm	0 dBm	+1 dBm	0 dBm
Maximum mean launched power for Tx disabled		-40dBm		-40dBm
Minimum extinction ratio	10dB	8.2dB	10dB	8.2dB
Eye mask definition	ITU-T G.957 [27], Telcordia GR-253-CORE [35]			
Eye mask margin	10%		10%	
Max Opt. Power Overshoot vs. shutdown deactivation		3dB		3dB
Optical path between S and R				
Attenuation range[3]		5dB to 17.0dB[7]		13dB to 25.5dB[7]
Minimum dispersion[8]		-200ps/nm		-300ps/nm
Maximum dispersion		1000ps/nm		1640ps/nm[7]
Maximum differential group delay		120ps		120ps
Minimum optical return loss of cable plant at S, including any connectors		24dB		24dB
Maximum discrete reflectance between S and R		–27dB		–27dB
Receiver at reference point R				
Operating wavelength range	1464 to 1618nm		1464 to 1618nm	
Minimum sensitivity[4]	-20.5dBm	-18.5dBm[7]	-30dBm	-28dBm
Minimum overload	+1dBm	0dBm	-7dBm	-8dBm[7]
Maximum optical path penalty for 1000 ps/nm[5]		1.5dB		1.5dB
Maximum optical path penalty for 1640 ps/nm[5]		NA		2.5dB
Maximum reflectance of receiver, measured at R		-27dB		-27dB
LOS assert level[6 8]		-30to —24dBm		-40to —34dBm
LOS hysteresis[8]		-30to —24dBm		-30to —24dBm

Notes:

1. The optical specifications apply over the entire 155 Mb/s to 2.66 Gb/s bit rate range unless a specific bit rate is noted in the requirement.
2. The center wavelength grid is 20nm.
3. Attenuation assumed to be worst-case values including losses due to splices, connectors, optical attenuators (if used) or other passive optical devices (such as CWDM MUX and DMUX), and any additional cable margin.
4. Receiver sensitivity is defined as the minimum acceptable value of average received power at point R to achieve a 1 x 10^{-12} BER. It takes into account power penalties caused by use of a transmitter under all operating conditions with worst-case values of extinction ratio, pulse rise and fall times, optical return loss at point S, receiver connector degradations and measurement tolerances.
5. Optionally, the path penalty can be measured without optical filters, i.e. MUX/DMUX, and crosstalk. In this case 0.3 dB shall be reserved for those effects and the path penalty is required to be maximum 1.2dB for C8S1 applications or 2.2dB for C8L1 applications, respectively. The test should be performed for the lower 7 channels with a fiber length resulting in 1000 ps/nm at 1591 nm for C8S1 applications and 1640 ps/nm at 1591 nm for C8L1 applications. The highest channel is measured with a fiber length providing 1000 ps/nm or 1640 ps/nm @ 1611 nm, respectively.
6. It is expected that the LOS assert level shall always occur at power levels below that of the receiver sensitivity power level. LOS shall not be asserted at power levels where there is error-free transmission.
7. Not according to ITU-T G.695.
8. Not defined in ITU-T G.695.

Optical interfaces: BiDi (bi-directional)

Table 22-37 Optical BiDi modules

Optical module			Optical interface	Card name
Abbreviation	APN	Item (mnemonic)		
SB1GEU20I	1AB393080005	GE-BX20U	SFP 1000BX / STM-4 20Km Upstream	4DPA4, 11DPM12, 11DPE12A, 11QPE24, 11QCE12X
SB1GED20I	1AB393080006	GE-BX20D	SFP 1000BX / STM-4 20Km Downstream	4DPA4, 11DPM12, 11DPE12A, 11QPE24, 11QCE12X
SB1GEU40I	1AB393080009	GE-BX40U	SFP 1000BX / STM-4 40Km Upstream	4DPA4, 11DPM12, 11DPE12A, 11QPE24, 11QCE12X

Table 22-37 Optical BiDi modules (continued)

Optical module			Optical interface	Card name
Abbreviation	APN	Item (mnemonic)		
SB1GED40I	1AB393080010	GE-BX40D	SFP 1000BX / STM-4 40Km Downstream	4DPA4, 11DPM12, 11DPE12A, 11QPE24, 11QCE12X
	3AL81920AA	2C-BX10U	1000BASE-BX10 2CH BiDi CSFP (upstream, 1310nm)	11QCE12X
	3AL81921AA	2C-BX10D	1000BASE-BX10 2CH BiDi CSFP (downstream, 1490nm)	11QCE12X

Table 22-38 Parameters specified for 1000BASE-BX40/STM-4 40km BiDi interfaces

Parameter	Values			
Application code IEEE	1000BASE-BX40-D		1000BASE-BX40-U	
Application code ITU-T	STM-4 40km Downstream		STM-4 40km Upstream	
Target distance	40km		40km	
Baud rate and reference pattern	Bit rate: 1250 Mbps ± 100 ppm, 622 Mbps ± 20 ppm Line code: NRZ PRBS 2E7-1 and patterns according to IEEE P802.3ah NRZ PRBS 2E23-1 and CID according to ITU-T G.957 and G.783.			
	BOL	**EOL**	**BOL**	**EOL**
Transmitter at reference point TP2				
Source type	SLM		SLM	
Nominal center wavelength	1480 to 1500		1260 to 1360	
Spectral characteristics:				
- maximum -20dB width		1nm		1nm
Mean launched power:				
- maximum	+1 dBm	+2 dBm	+1 dBm	+2 dBm
- minimum	-2 dBm	-3 dBm	-2 dBm	-3 dBm
Maximum mean launched power for Tx disabled		-45 dBm		-45 dBm
Max Opt. Power Overshoot vs. shutdown deactivation		3 dB		3 dB
Minimum extinction ratio	10 dB	9 dB	10 dB	9 dB
Eye mask definition	IEEE802.3ah-2004 ITU-T G.957 Telecordia GR-253-CORE			
Mask margin	10%		10%	
Maximum total transmitter jitter		267ps		267ps

Table 22-38 Parameters specified for 1000BASE-BX40/STM-4 40km BiDi interfaces (continued)

Parameter	Values			
Optical return loss tolerance		12 dB		12 dB
Optical path between TP2 and TP3				
Maximum dispersion		700ps/nm		|256|ps/nm
Optical path penalty		1dB		1dB
Attenuation range [1]	5 to 21 dB		5 to 21 dB	
Maximum discrete reflectance between TP2 and TP3		-12 dB		-12 dB
Receiver at reference point TP3				
Operating wavelength range	1260 to 1360 nm		1480 to 1500 nm	
Minimum receiver sensitivity[2] @ BER-1E-12	-27 dBm	-25 dBm	-27 dBm	-25 dBm
Minimum overload	-2 dBm	-3 dBm	-2 dBm	-3 dBm
Minimum acceptable jitter		408ps		408ps
Maximum reflectance of receiver, measured at TP3		-12 dB		-12 dB
LOS assert level[3]		-43 to -31 dBm		-43 to -31 dBm
LOS hysterisis		0.5 to 5 dB		0.5 to 5 dB

Notes:

1. Attenuation assumed to be worst-case values including losses due to splices, connectors, optical attenuators (if used) and any additional cable margin.
2. Receiver sensitivity is defined as the minimum acceptable value of average received power at point TP3 to achieve 1E-12 BER using a test pattern as defined in the applicable standard. It takes into account power penalties caused by use of a transmitter under all operating conditions with worst-case values of extinction ratio, pulse rise and fall times, optical return loss at point TP2, receiver connector degradations and measurement tolerances.
3. It is expected that the LOS assert level shall always occur at power levels below that of the receiver sensitivity power level. LOS shall not be asserted at power levels where there is errorfree transmission.

Table 22-39 Parameters specified for 1000BASE-BX20/STM-4 15km BiDi interfaces

Parameter	Values	
Application code IEEE	1000BASE-BX20-D	1000BASE-BX20-U
Application code ITU-T	STM-4 15km Downstream	STM-4 15km Upstream
Target distance	20km	20km

Table 22-39 Parameters specified for 1000BASE-BX20/STM-4 15km BiDi interfaces (continued)

Parameter	Values			
Baud rate and reference pattern	Bit rate: 1250 Mbps ± 100 ppm, 622 Mbps ± 20 ppm Line code: NRZ PRBS 2E7-1 and patterns according to IEEE P802.3ah NRZ PRBS 2E23-1 and CID according to ITU-T G.957 and G.783.			
	BOL	**EOL**	**BOL**	**EOL**
Transmitter at reference point TP2				
Source type	SLM		MLM/SLM	
Nominal center wavelength	1480 to 1500		1260 to 1360	
Spectral characteristics:				
- maximum RMS width (σ)		NA		3nm / NA
- maximum -20dB width		1nm		NA / 1nm
Mean launched power:				
- maximum	-3 dBm	-2 dBm	-3 dBm	-2 dBm
- minimum	-6 dBm	-7 dBm	-6 dBm	-7 dBm
Maximum mean launched power for Tx disabled		-45 dBm		-45 dBm
Max Opt. Power Overshoot vs. shutdown deactivation		3 dB		3 dB
Minimum extinction ratio	10 dB	9 dB	10 dB	9 dB
Eye mask definition	IEEE802.3ah-2004 ITU-T G.957 Telecordia GR-253-CORE			
Mask margin	10%	9%	10%	9%
Maximum total transmitter jitter		267ps		267ps
Optical return loss tolerance		12 dB		12 dB
Optical path between TP2 and TP3				
Maximum dispersion		350ps/nm		|128|ps/nm
Optical path penalty		1dB		1dB
Attenuation range [1]	0 to 15 dB		0 to 15 dB	
Maximum discrete reflectance between TP2 and TP3		-12 dB		-12 dB
Receiver at reference point TP3				
Operating wavelength range	1260 to 1360 nm		1480 to 1500 nm	
Minimum receiver sensitivity[2] @ BER-1E-12	-25 dBm	-23 dBm	-25 dBm	-23 dBm
Minimum overload	-2 dBm	-3 dBm	-2 dBm	-3 dBm
Minimum acceptable jitter		408ps		408ps
Maximum reflectance of receiver, measured at TP3		-12 dB		-12 dB

Table 22-39 Parameters specified for 1000BASE-BX20/STM-4 15km BiDi interfaces (continued)

Parameter	Values			
LOS assert level[3]		-42 to -29 dBm		-42 to -29 dBm
LOS hysterisis		0.5 to 5 dB		0.5 to 5 dB

Notes:

1. Attenuation assumed to be worst-case values including losses due to splices, connectors, optical attenuators (if used) and any additional cable margin.
2. Receiver sensitivity is defined as the minimum acceptable value of average received power at point TP3 to achieve 1E-12 BER using a test pattern as defined in the applicable standard. It takes into account power penalties caused by use of a transmitter under all operating conditions with worst-case values of extinction ratio, pulse rise and fall times, optical return loss at point TP2, receiver connector degradations and measurement tolerances.
3. It is expected that the LOS assert level shall always occur at power levels below that of the receiver sensitivity power level. LOS shall not be asserted at power levels where there is errorfree transmission.

Optical interfaces for SFP+

The following table lists the optical parameters specified for 400 MX-SN-I:

Table 22-40 Optical parameters specified for 400 MX-SN-I

Parameter	BOL	EOL
Fiber type	MMF	
Target distance	up to 380m (OM3 fiber)	
Nominal Bit Rate	4250Mb/x	
Wavelength range		830–860nm
Transmitter at reference TP2		
Source type	VCSEL[1]	
Spectral characteristics:		
- maximum RMS width (σ)		0.65nm
Mean launched power:		
- maximum	-1 dBm	0 dBm
- minimum	-8 dBm	-9 dBm
Minimum launch power in OMA	-5.1 dBm	-6.1 dBm
Maximum mean launched in case Tx_Dis and/or P_Down are high		-30 dBm
$RIN_{12}OMA$ (max)		-120 dB/Hz
Optical Return Loss Tolerance (max)		12 dB
Encircled Flux		Note[2]
Rise/Fall time (20%-80%)		90ps
Eye mask margin	10%	
Receiver at reference Point TP3		
Minimum receiver sensitivity in OMA	-13.1 dBm	-12.1 dBm
Stressed receiver sensitivity in OMA	-10.0 dBm	-9.0 dBm
Maximum average receiver power at Point TP3	+1 dBm	0 dBm
RX LOS assert levele)	≤ -30dBm	≤ -30dBm
Hysteresis for RX_LOS assert-deassert		0.5-3 dB
Maximum reflectance of receiver, measured at Point TP3		-12dB

Notes:

1. VCSEL = vertical cavity surface emitting laser
2. Encircled flux specifications in accordance with TIA-492AAAC-A and IEC60793-2-10 or IEEE802.3 clause 52.

3. OMA = Optical Modulation Amplitude

Table 22-41 Optical parameters specified for 400 SM-LC-L

Parameter	BOL	EOL
Fiber type	SMF	
Target distance	10 Km	
Nominal Bit Rate	4250Mb/x	
Wavelength range		1260-1370nm
Transmitter at reference TP2		
Source type	SLM	
Spectral characteristics:		
- maximum RMS width (σ)		See Figure 22-3, "4GFC 10Km link" (p. 22-51)
Mean launched power:		
- maximum	-2 dBm	-1 dBm
- minimum	-7.4 dBm	-8.4 dBm
Minimum launch power in OMA	-4.4 dBm	-5.4 dBm
Maximum mean launched in case Tx_Dis and/or P_Down are high		-30 dBm
$RIN_{12}OMA$ (max)		-118 dB/Hz
Optical Return Loss Tolerance (max)		12 dB
Rise/Fall time (20%-80%)		90ps
Eye mask margin	10%	
Receiver at reference Point TP3		
Unstressed receiver sensitivity in OMA	-16.4 dBm	-15.4 dBm
Maximum receiver power at Point TP3	-0 dBm	-1 dBm
RX LOS assert levele)	≤ -30dBm	≤ -30dBm
Hysteresis for RX_LOS assert-deassert		0.5-3 dB
Maximum reflectance of receiver, measured at Point TP3		-12dB

Notes:

1. SLM = single-longitudinal mode laser.
2. OMA = Optical Modulation Amplitude

Figure 22-3 4GFC 10Km link

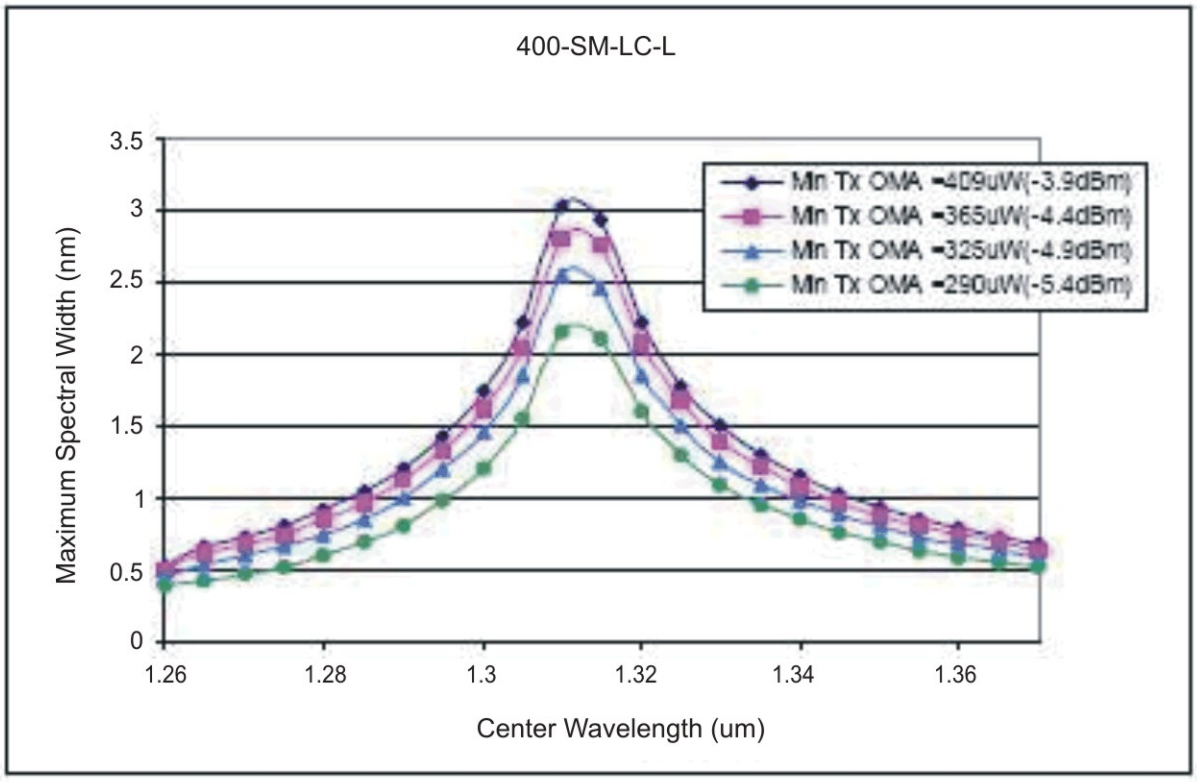


Table 22-42 Optical parameters specified for 800 MX-SN-I

Parameter	BOL	EOL
Fiber type	MMF	
Target distance	up to 150m (OM3 fiber)	
Nominal Bit Rate	8500Mb/x	
Wavelength range		840–860nm
Transmitter at reference TP2		
Source type	VCSEL[1]	
Spectral characteristics:		
- maximum RMS width (σ)		0.65nm
Mean launched power:		
- maximum	-1 dBm	0 dBm
- minimum	-7.2 dBm	-8.2 dBm
Minimum launch power in OMA	-4.2 dBm	-5.2 dBm

Table 22-42 Optical parameters specified for 800 MX-SN-I (continued)

Parameter	BOL	EOL
Maximum mean launched in case Tx_Dis and/or P_Down are high		-30 dBm
$RIN_{12}OMA$ (max)		-128 dB/Hz
Optical Return Loss Tolerance (max)		12 dB
Encircled Flux		Note[2]
Transmission waveform and distortion penalty		4.3 dB
Eye mask margin	10%	
Receiver at reference Point TP3		
Minimum receiver sensitivity in OMA	-12.2 dBm	-11.2 dBm
Stressed receiver sensitivity in OMA	-9.2 dBm	-8.2 dBm
Maximum average receiver power at Point TP3	+1 dBm	0 dBm
RX LOS assert levele)	≤ -30dBm	≤ -30dBm
Hysteresis for RX_LOS assert-deassert		0.5-3 dB
Maximum reflectance of receiver, measured at Point TP3		-12dB

Notes:

1. VCSEL = vertical cavity surface emitting laser
2. Encircled flux specifications in accordance with TIA-492AAAC-A and IEC60793-2-10 or IEEE802.3 clause 52.
3. OMA = Optical Modulation Amplitude

Table 22-43 Optical parameters specified for 800 SM-LC-L

Parameter	BOL	EOL
Fiber type	SMF	
Target distance	10 Km	
Nominal Bit Rate	8500Mb/x	
Wavelength range		1260-1360nm
Transmitter at reference TP2		
Source type	SLM	
Spectral characteristics:		
- maximum RMS width (σ)		1nm
Mean launched power:		
- maximum	-1 dBm	0 dBm

Table 22-43 Optical parameters specified for 800 SM-LC-L (continued)

Parameter	BOL	EOL
- minimum	-7.4 dBm	-8.4 dBm
Minimum launch power in OMA	-4.4 dBm	-5.4 dBm
Maximum mean launched in case Tx_Dis and/or P_Down are high		-30 dBm
$RIN_{12}OMA$ (max)		-128 dB/Hz
Minimum extinction ratio	4.0 dB	3.5 dB
Optical Return Loss Tolerance (max)		12 dB
Eye mask margin	10%	
Receiver at reference Point TP3		
Unstressed receiver sensitivity in OMA	-14.8 dBm	-13.8 dBm
Maximum receiver power at Point TP3	-+1.5 dBm	+0.5 dBm
RX LOS assert levele)	≤ -30dBm	≤ -30dBm
Hysteresis for RX_LOS assert-deassert		0.5-3 dB
Maximum reflectance of receiver, measured at Point TP3		-12dB

Notes:

1. SLM = single-longitudinal mode laser.
2. OMA = Optical Modulation Amplitude

Table 22-44 Optical parameters specified for 1600 MX-SN-I

Parameter	BOL	EOL
Fiber type	MMF	
Target distance	up to 100m (OM3 fiber)	
Nominal Bit Rate	14025Mb/x	
Wavelength range		840–860nm
Transmitter at reference TP2		
Source type	VCSEL[1]	
Spectral characteristics:		
- maximum RMS width (σ)		0.59nm
Mean launched power:		
- maximum	-1 dBm	0 dBm
- minimum	-6.8 dBm	-7.8 dBm
Minimum launch power in OMA		-4.8 dBm

Table 22-44 Optical parameters specified for 1600 MX-SN-I (continued)

Parameter	BOL	EOL
Maximum mean launched in case Tx_Dis and/or P_Down are high		-30 dBm
$RIN_{12}OMA$ (max)		-128 dB/Hz
Optical Return Loss Tolerance (max)		12 dB
Encircled Flux		Note[2]
Vertical Eye Closure Penalty (VECP), max		2.56 dB
Eye mask margin	10%	
Receiver at reference Point TP3		
Minimum receiver sensitivity in OMA	-11.5 dBm	10.5 dBm
Stressed receiver sensitivity in OMA	-8.7 dBm	-7.7 dBm
Maximum average receiver power at Point TP3	+1 dBm	0 dBm
RX LOS assert level	≤ -30dBm	≤ -30dBm
Hysteresis for RX_LOS assert-deassert		0.5-3 dB
Maximum reflectance of receiver, measured at Point TP3		-12dB

Notes:

1. VCSEL = vertical cavity surface emitting laser
2. Encircled flux specifications in accordance with TIA-492AAAC-A and IEC60793-2-10 or IEEE802.3 clause 52.
3. OMA = Optical Modulation Amplitude

Table 22-45 Optical parameters specified for 1600 SM-LC-L

Parameter	BOL	EOL
Fiber type	SMF	
Target distance	10 Km	
Nominal Bit Rate	14025Mb/x	
Wavelength range		1295-1325nm
Transmitter at reference TP2		
Source type	SLM	
Spectral characteristics:		
- maximum RMS width (σ)		1nm
Mean launched power:		
- maximum	+1 dBm	+2 dBm

Table 22-45 Optical parameters specified for 1600 SM-LC-L (continued)

Parameter	BOL	EOL
- minimum	-6.0 dBm	-5.0 dBm
Minimum launch power in OMA	-1.0 dBm	-2.0 dBm
Maximum mean launched in case Tx_Dis and/or P_Down are high		-30 dBm
$RIN_{12}OMA$ (max)		-130 dB/Hz
Minimum extinction ratio	4.0 dB	3.5 dB
Optical Return Loss Tolerance (max)		12 dB
Maximum transmitter dispersion penalty		4.4 dB
Eye mask margin	10%	
Receiver at reference Point TP3		
Unstressed receiver sensitivity in OMA	-13.0 dBm	-12.0 dBm
Maximum receiver power at Point TP3	-+2.5 dBm	+2.0 dBm
RX LOS assert levele)	≤ -30dBm	≤ -30dBm
Hysteresis for RX_LOS assert-deassert		0.5-3 dB
Maximum reflectance of receiver, measured at Point TP3		-12dB

Notes:

1. SLM = Single-longitudinal mode laser
2. OMA = Optical Modulation Amplitude

The following table lists the optical modules providing optical 10 Gb SFP+ interfaces and the cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-46 Optical SFP+ 10 GbE/OTU2e modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
S16FCM01E	1AB390930010	16FCSN-I	SFP+ 4/8/16G FC MMF -5/+85	112SDX11
S16FCM10E	1AB390930009	16FCLC-L	SFP+ 4/8/16G FC 10KM SMF -5/+85	112SDX11
S11M10E	1AB390930013	SXI64.1	SFP+ P1I1-2D1/SR1/10GBASE-LR(W) /10GFC SMF -5/85	11OPE8, 112SDX11, 12P120, 20P200
S11M03E	1AB390930007	S8FCLC-L	SFP+ 2/4/8G FC 10KM SMF IB SDR/DDR -5/+85	11OPE8, 112SDX11

Table 22-46 Optical SFP+ 10 GbE/OTU2e modules (continued)

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
S11MCxxSE	3AL82018AA to 3AL82018AH	SXS64.2C	SFP+ 10GBASE-CWDM-OTM-0.2/e/f SH (-5/+85)	11OPE8, 12P120, 20P200
S11M40E	1AB390930014	SXS64.2B	SFP+10GBASE-ER/P1S1-2D2b/ SMF 40km (-5/+85)	11OPE8, 20P200

Table 22-47 Optical parameters specified for 1200 MX-SN-I

Parameter	BOL	EOL
Fiber type	MMF	
Target distance	up to 300m	
Nominal Bit Rate	14025Mb/x	
Wavelength range		840-860nm
Transmitter at reference TP2		
Source type	VCSEL	
Mean launched power:		
- maximum	-2 dBm	-1 dBm
- minimum	-6.3 dBm	-7.3 dBm
Maximum mean launched in case Tx_Dis and/or P_Down are high		-30 dBm
$RIN_{12}OMA$ (max)		-128 dB/Hz
Optical Return Loss Tolerance (max)		12 dB
Encircled Flux		See Note[3]
Minimum extinction ratio	3.5dB	3 dB
Maximum transmitter dispersion penalty		3.9 dB
Eye mask margin	10%	
Receiver at reference Point TP3		
Unstressed receiver sensitivity in OMA	-12.1 dBm	-11.1 dBm
Stressed receiver sensitivity in OMA	--8.5 dBm	-7.5 dBm
Maximum average receiver power at Point R		
RX LOS assert levele)	≤ -30dBm	≤ -30dBm
Hysteresis for RX_LOS assert-deassert		0.5-3 dB
Maximum reflectance of receiver, measured at Point TP3		-12dB

Notes:

1. VCSEL = vertical cavity surface emitting laser
2. OMA = Optical Modulation Amplitude
3. The encircled flux at 19 µm shall be greater than or equal to 86% and the encircled flux at 4.5 µm shall be less than or equal to 30% when measured into Type A1a (50/125 µm multimode) fiber per ANSI/TIA/EIA-455-203-2001.

Table 22-48 Optical parameters specified for 1200 SM-LL-L

Parameter	BOL	EOL
Fiber type	G.652	
Target distance	10km	
Wavelength range		1260-1355nm
Transmitter at reference TP2		
Source type	SLM	
Spectral characteristics:		
- maximum –20 dB width		1nm
- minimum side mode suppression ratio		30 dB
Mean launched power:		
- maximum	-0.5 dBm	+0.5 dBm
- minimum	-7.2 dBm	-8.2 dBm
Maximum mean launched in case Tx_Dis and/or P_Down are high		-30 dBm
Minimum extinction ratio	4.0 dB	3.5 dB
Minimum Optical modulation Amplitude (OMA)	-4.2 dBm	-5.2 dBm 12 dB
Maximum Optical return Loss Tolerance		12 dB
Minimum extinction ratio	3.5dB	3 dB
RIN_{12O} OMA dB/Hz -128		-128 dB/Hz
Receiver at reference Point TP3		
Maximum Average receive power at Point TP3	1.5 dBm	0.5 dBm
Minimum Average receive power at Point TP3	-15.5 dBm	-14.4 dBm
Minimum receiver sensitivity in OMA	-13.6 dBm	-12.6 dBm
Stressed receiver sensitivity in OMA	-11.3 dBm	-10.3 dBm
RX LOS assert level	≤ -30dBm	≤ -30dBm
Hysteresis for RX-LOS, assert-deassert		0.5–3.0 dB

Table 22-48 Optical parameters specified for 1200 SM-LL-L (continued)

Parameter	BOL	EOL
Maximum reflectance of receiver, measured at Point TP3		-12 dB

Optical interfaces (Fast Ethernet)

The following table lists the optical module providing Fast Ethernet optical interface and the cards that support these optical module in Alcatel-Lucent 1830 PSS.

Table 22-49 Optical Fast Ethernet modules

Optical module			Optical interface	Card name
Abbreviation	APN	Item (mnemonic)		
100BLX10	1AB382180001	SFE10I	SFP 100BASE-LX10	PTPCTL, PTPIO, 4QPA8, 4DPA4, 11DPM12, 11DPE12E/A, 11QPE24, 11QCE12X

Table 22-50 Parameters specified for FE optical interface 100BASE-LX10

Parameter	100BASE-LX10	
	BOL	EOL
Application code	100BASE-LX10	
Baud rate and reference pattern	Bit rate: 125+/- 50 ppm Line code: NRZ PRBS 2E7-1, CID and relevant patterns according to IEEE 802 [14] and ANSI X3-184, 1993 (FDDI) [18]	
Target distance	10	
Transmitter at reference point TP2		
Source type	MLM	
Nominal center wavelength	1260 to 1360 nm	
Spectral characteristics:		
– maximum FWHM width		NA See [2]
– maximum RMS width (σ) See [1]		7.7 nm
Mean launched power:		
– maximum	-9 dBm	-8 dBm
– minimum	-14 dBm	-15 dBm
Maximum mean launched power for Tx disabled		–45 dBm

Table 22-50 Parameters specified for FE optical interface 100BASE-LX10 (continued)

Parameter	100BASE-LX10	
	BOL	EOL
Minimum extinction ratio	6 dB	5 dB
Eye mask definition	IEEE 802.3ah-2004 [14]	
Mask margin	10 %	
Max opt. power overshoot vs. shutdown deactivation		3 dB
Rise and fall time (unfiltered 10%/90%)		NA
Maximum total transmitter jitter		3.2 ns
Optical return loss tolerance		12 dB
Optical path between TP2 and TP3		
Attenuation range (See [3])		0 to 11 dB
Maximum dispersion		NA
Minimum modal bandwidth (-3 dB optical)		
– (for 62.5 µm MMF)		NA
– (for 50 µm MMF)		NA
Transmitter and dispersion penalty		4.5
Receiver at reference point TP3		
Optical wavelength range	1260 to 1580 nm	
Minimum sensitivity (See [4]) with fiber @ BER 1E-10	–28 dBm	–26 dBm
Minimum sensitivity (See [4]) with fiber @ BER 1E-12	–27 dBm	–25 dBm
Stressed receiver sensitivity		–20.1
Minimum overload	–7 dBm	–8 dBm
Minimum total acceptable jitter		3.5 ns
Maximum reflectance of receiver, measured at TP3		–12 dB
LOS assert level (See [5])		–40 to –32 dBm
LOS hysteresis		0.5 to 5 dB

Notes:

1. The relationship between FWHM and RMS values for spectral width is derived from the assumption of a Gaussian shaped spectrum, which results in a 2.35 AddPublicationAccessLog AddPublicationAccess-Log_8070 AddPublicationAccessLog_8090 AuxFiles Check-templ.html Check-templ_end.txt Check-templ_end.txt_R14 Check-templ_end.txt_R15 Check-templ_end_R15_2.txt Check-templ_end_final.htm Check-templ_start.txt Check-templ_start.txt_2014_12_01 Check-templ_start.txt_R14 Check-templ_start.txt_R15 Check-templ_start_R15_2.txt Check-templ_start_final.htm CreatePubPage.sh CreatePubPage.sh_2014_12_01 CreatePubPage.sh_2015_01_20 CreatePubPage.sh_2015_11_14

CreatePubPage.sh_backup CreatePubPage.sh_backup_2015_01_24 CreatePubPage_8070.sh DebugXhivePublishTE.sh FragmentReplaceList.sed Lang.log MSPTE.sh MSproef.txt MakeProdOptions.xsl MakeResourceList.xsl MartinPublishTE.sh NewCreatePubPage.sh New_XhivePublishTE.sh OLD OneDocListID.xsl Post.log PubScriptLocation.txt ResourceListTree.sh TEMPLATES TestPubPage.sh TestXhivePublishTE.sh TestXhiveReviewPub.sh XhivePostProcessPub.sh XhivePublishTE.sh XhivePublishTE.sh_13946 XhiveRemComments XhiveRemRevTags XhiveReviewPub.sh cron library ttt.19652 RMS = FWHM relationship.

2. Instead of rise time and fall time a transmitter eye mask is defined in IEEE 802.3ah-2004 [14], Table 58-3.
3. Attenuation assumed to be worst-case values including losses due to splices, connectors, optical attenuators (if used) and any additional cable margin.
4. Receiver sensitivity is defined as the minimum acceptable value of average received power at point TP3 to achieve a specific BER at 125 Mbps or 155 Mbps both using a test pattern as defined in the applicable standard. It takes into account power penalties caused by use of a transmitter under all operating conditions with worst-case values of extinction ratio, pulse rise and fall times, optical return loss at point TP2, receiver connector degradations and measurement tolerances.
5. It is expected that the LOS assert level shall always occur at power levels below that of the receiver sensitivity power level. LOS shall not be asserted at power levels where there is error-free transmission.

Optical interfaces (Ethernet)

The following table lists the optical modules providing Ethernet optical interfaces and the client port cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-51 Optical Ethernet modules (1Gb/s Ethernet)

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
S1GE05I	1AB376720001	1000B-SX	1000BASE-SX, temperature range: –5 to +85 °C (23 to 185 °F)	PTPCTL, 4DPA2, 4DPA4 (FlexMux), 11STMM10, 11DPM12, 11DPE12/E/A, 11QPE24, 11QCE12X, 11STGE12
S1GE10I	1AB376720002	1000B-LX	1000BASE-LX, temperature range: –5 to +85 °C (23 to 185 °F)	PTPCTL, 4DPA2, 4DPA4 (FlexMux), 11STMM10, 11DPM12, 11DPE12/E/A, 11QPE24, 11QCE12X, 11STGE12

Table 22-51 Optical Ethernet modules (1Gb/s Ethernet) (continued)

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
S1GE80I	1AB376720003	1000B-ZX	1000BASE-ZX, temperature range: –5 to +85 °C (23 to 185 °F)	PTPCTL, 4DPA4 (FlexMux), 11STMM10, 11DPM12, 11DPE12/E/A, 11QPE24, 11QCE12X, 11STGE12

Table 22-52 Parameters specified for 1 GbE optical interfaces 1000BASE-SX/-LX/-ZX

Parameter	1000BASE-SX		1000BASE-LX		1000BASE-ZX ([1])	
	BOL	EOL	BOL	EOL	BOL	EOL
Digital signal	1 GbE according to IEEE 802.3					
Baud rate and reference pattern	Bit rate: 1.25 GBd ± 100 ppm Line code: PRBS 2^{23-1}, K28.5 characters					
Laser type	VCSEL		FP		DFB	
Target distance	550 m ([2])		10 km over SMF (550 m ([3], [4])		80 km	
Transmitter at reference point TP2						
Source type	MLM		MLM		SLM	
Nominal center wavelength	770 to 860 nm		1270 to 1355 nm		1500 to 1580 nm	
Spectral characteristics:						
– maximum RMS width (σ)		0.85 nm		3.5 nm		NA
– maximum –20 dB width						1 nm
– minimum side mode suppression ration						30 dB
Mean launched power:						
– maximum	–1 dBm	0 dBm	–4 dBm	–3 dBm	+4 dBm	+5 dBm
– minimum	–8.5 dBm	–9.5 dBm	–8 dBm	–9 dBm	+1 dBm	0 dBm
Maximum mean launched power for Tx disabled		–40 dBm		–40 dBm		–40 dBm
Minimum extinction ratio	10 dB	9 dB	10 dB	9 dB	10.0 dB	9.0 dB
Eye mask definition	IEEE 802.3		IEEE 802.3ah - 2004		IEEE 802.3	
Mask margin	10 %		10 %		10 %	
Max opt. power overshoot vs. shutdown deactivation		3 dB		3 dB		3 dB

Table 22-52 Parameters specified for 1 GbE optical interfaces 1000BASE-SX/-LX/-ZX (continued)

Parameter	1000BASE-SX		1000BASE-LX		1000BASE-ZX ([1])	
	BOL	EOL	BOL	EOL	BOL	EOL
Rise and fall time (unfiltered 20%/80%)		210 ps ([5])		260 ps		260 ps
Maximum relative intensity noise		–117 db/Hz		–120 db/Hz		–120 db/Hz
Maximum total transmitter jitter		345 ps		345 ps		345 ps
Optical return loss tolerance		12 dB		12 dB		20 dB
Optical path between TP2 and TP3						
Attenuation range ([6])		0 to 7.5 dB		0 to 10.5 dB ([7])		5 to 21 dB
Maximum dispersion						1600 ps/nm
Optical path penalty						2 dB
Maximum discrete reflectance between TP2 and TP3						–25 dB
Receiver at reference point TP3						
Optical wavelength range	770 to 860 nm		1270 to 1355 nm		1500 to 1580 nm	
Minimum sensitivity ([8]) with fiber	–19 dBm	–17 dBm	–21.5 dBm	–19.5 dBm	–26 dBm	–24 dBm
Stressed receiver sensitivity ([9])		–13.5 dBm ([10])		–15.4 dBm		
Minimum overload	1 dBm	0 dBm	–2 dBm	–3 dBm	+1 dBm	0 dBm
Minimum acceptable jitter		408 ps		408 ps		408 ps
Maximum reflectance of receiver, measured at TP3		12 dB		12 dB		12 dB
LOS assert level ([11])		–30 to –23 dBm		–33 to –25.5 dBm		–39 to –30 dBm
LOS hysteresis		0.5 to 5 dB		0.5 to 5 dB		0.5 to 5 dB

Notes:

1. The 1 GbE long reach device, 1000BASE-ZX, is based upon the 1000BASE-LX devices in the IEEE 802.3 standard. However, wavelength and reach were re-defined supporting an 80 km interface.
2. For a modal bandwidth of 500 MHz × km @ 850 nm (min. overfilled launch). Summary of reaches vs. BL product: 550 m MMF 50 mm (500 MHz × km @ 850 nm); 500 m MMF 50 mm (400 MHz × km @ 850 nm); 275 m MMF 62.5 mm (200 MHz × km @ 850 nm); 220 m MMF 62.5 mm (160 MHz × km @ 850 nm)
3. For a modal bandwidth of 500 MHz × km @ 1310 nm (min. overfilled launch) using a singlemode fiber offset-launch mode-conditioning patch cord. Summary of reaches vs. BL product: 550 m MMF 50 mm (400 MHz × km @ 1300 nm); 550 m MMF 62.5 mm (500 MHz × km @ 1300 nm)
4. Values in brackets deviate from the SMF interface specifications and apply to MMF operation using a single-mode fiber offset-launch mode-conditioning patch cord.

5. $T_{rise}/T_{fall} \leq 0.26$ ns for wavelengths > 830 nm.
6. Attenuation assumed to be worst-case values including losses due to splices, connectors, optical attenuators (if used) and any additional cable margin.
7. Link power budget for 50 µm and 62.5 µm MMF is 7.5 dB using a single-mode fiber offset-launch mode-conditioning patch cord.
8. Receiver sensitivity is defined as the minimum acceptable value of average received power at point TP3 to achieve a 1×10^{-12} BER at 1.25 Gb/s both with a PRBS 2^{23-1} and repetitive K28.5 characters. It takes into account power penalties caused by use of a transmitter under all operating conditions with worst-case values of extinction ratio, pulse rise and fall times, optical return loss at point TP2, receiver connector degradations and measurement tolerances.
9. Measured with a conformance test signal as defined in the applicable standard.
10. Stressed receiver sensitivity ≤ –12.5 dBm for 62.5 µm MMF.
11. It is expected that the LOS assert level always occurs at power levels below that of the receiver sensitivity power level. LOS is not asserted at power levels where there is error-free transmission.

Table 22-53 Parameters specified for 10 GbE optical interface 10GBASE-SR

Parameter	Values		Unit
Fiber type	MMF		
Target distance	up to 300[1]		m
Optical performance parameters	BOL	EOL	
Wavelength range		840-860	nm
Transmitter at reference point S			
Source type	VCSEL[2]		
Spectral Characteristics: - maximum RMS width		Table 22-54, "Minimum 10GBASE-S optical modulation amplitude (center wavelength: spectral width)" (p. 22-65)	nm
Mean launched power: - maximum - minimum	-2 -6.3	-1 -7.3	dBm dBm
Miniimum launch power in OMA		Table 22-54, "Minimum 10GBASE-S optical modulation amplitude (center wavelength: spectral width)" (p. 22-65)	dBm

Table 22-53 Parameters specified for 10 GbE optical interface 10GBASE-SR (continued)

Parameter	Values		Unit
Maximum mean launched in case TX_Dis and/or P_Down		-30	dBm
$RIN_{12}OMA$ (max)		-128	dB/Hz
Optical Return Loss tolerance (max)		12	dB
Encircled flux		See footnote[3]	
Minimum extinction ratio	3.5	3	dB
Maximum transmitter dispersion penalty		3.9	dB
Eye mask margin	10		%
Maximum total transmitter jitter		comply with IEEE802.3 Section 38.5	
Receiver at reference Point R			
Minimum receiver sensitivity in OMA[4]	-12.1	-11.1	dBm
Stressed receiver sensitivity in OMA	-8.5	-7.5	dBm
Sensitivity with fiber[6]	-10.9	-9.9	dBm
Maximum receiver power at Point R		-1.0	dBm
RX LOS assert level[5]	[lE]-30	[lE]-30	dBm
Hysteresis for RX_LOS assert-deassert		0.5-3	dB
Maximum reflectance of receiver, measured at Point R		–12.6 dBm -12	dB

Notes:

1. See Table 22-55, “10GBASE-S link power budgets” (p. 22-65) for maximum link distances as a function of the fiber type
2. VCSEL = vertical cavity surface emitting laser
3. The encircled flux at 19 µm shall be greater than or equal to 86% and the encircled flux at 4.5 µm shall be less than or equal to 30% when measured into Type A1a (50/125 µm multimode) fiber per ANSI/TIA/EIA-455-203-2001.
4. OMA = Optical Modulation Amplitude
5. Asserted according to the definition of “signal Detect,” as defined in IEEE 802.3-2005

6. Information purposes only

Table 22-54 Minimum 10GBASE-S optical modulation amplitude (center wavelength: spectral width)

Center Wave-length (nm)	RMS Spectral Width (nm)								
	Up to 0.05	0.05 to 0.1	o.1 to 0.15	0.15 to 0.2	0.2 to 0.25	0.25 to 0.3	0.3 to 0.35	0.35 to 0.4	0.4 to 0.45
840 to 842	-4.2	-4.2	-4.1	-4.1	-3.9	-3.8	-3.5	-3.2	2.8
842 to 844	-4.2	-4.2	-4.2	-4.1	-3.9	-3.8	-3.6	-3.3	2.9
844 to 846	-4.2	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	2.9
846 to 848	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	2.9
848 to 850	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-3.0
850 to 852	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.4	-3.0
852. to 854	-4.3	-4.2	-4.2	-4.1	-4.0	-3.9	-3.7	-3.4	-3.1
854 to 856	-4.3	-4.3	-4.2	-4.1	-4.0	-3.9	-3.7	-3.4	-3.1
856 to 858	-4.3	-4.3	-4.2	-4.1	-4.0	-3.9	-3.7	-3.5	-3.1
858 to 860	-4.3	-4.3	-4.2	-4.2	-4.1	-3.9	-3.7	-3.5	-3.2

Table 22-55 10GBASE-S link power budgets

Parameter	Unit	63.5 µm MMF		50 µm MMF		
Modal bandwidth measured at 850 nm	MHz*km	160	200	400	500	2000
Power budget[1]	dB	7.3	7.3	7.3	7.3	7.3
Operating distance	m	26	33	66	82	300
Channel insertion loss	dB	1.6	1.6	1.7	1.8	2.6
Allocation for penalties	dB	4.7	4.8	5.1	5.0	4.7
Additional insertion loss allowed	dB	1.0	0.8	0.5	0.5	0.0

Notes:

1. Overall power budget, including penalties and additional insertion loss.

Optical interfaces (10G multi-rate)

The following table lists the optical modules providing 10G multi-rate optical interfaces and the client port cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-56 Optical multi-rate modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
X11M10I	1AB375380007 1AB375380013 (non-ETR)	XI-64.1	STM-64 I-64.1 / OC-192 SR-1 / OTM-0.2 P1I1-2D1 / 10GbE 10GBASE-LR/LW	11DPM12, 11DPE12/E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4
X11M40I	1AB375380005 1AB375380003 (non-ETR)	XS-64.2b	STM-64 S-64.2b / OC-192 IR-2 / OTM-0.2 P1S1-2D2b / 10GbE 10GBASE-ER/EW	11DPM12, 11DPE12/E/A, 11QPE24, 11OPE8, 11QCE12X, 11QPA4/A, 11QPEN4
X11M80E	1AB375380008 See [1] 1AB375380004 (non-ETR)	10GB-ZR	STM-64 L-64.2b / OC-192 LR-2 / OTM-0.2 P1L1-2D2 /10GbE 10GBASE-ZR/ZW	11DPM12, 11QPA4/A, 11OPE8, 11QCE12X, 11QPEN4, 11QPE24
X11M03C	1AB375380001	10GB-SR	XFP 10BASE-SR (B&W 10G-BASE-SR DDM)	11STAR1, 11STAR1A, 11DPE12/E/A, 11QPE24, 11QCE12X, 11OPE8, 11QPA4, 11QPA4A, 11QPEN4, 43STX4, 43STX4P, 43SCX4, 43SCX4E, 112SCX10, 112SNX10

Notes:

1. 1AB375380008 is not supported by SROS L2 cards.
2. 1AB375380007 has been replaced by a compatible pluggable 3AL82045AA.

Table 22-57 Parameters specified for 10 GbE optical interfaces 10GBASE-LR/LW, 10GBASE-ER/EW, 10GBASE-ZR/ZW

Parameter	10GBASE-LR/LW		10GBASE-ER/EW		10GBASE-ZR/ZW	
	BOL	EOL	BOL	EOL	BOL	EOL
Digital signal	10 GbE according to *IEEE 802.3*					

Table 22-57 Parameters specified for 10 GbE optical interfaces 10GBASE-LR/LW, 10GBASE-ER/EW, 10GBASE-ZR/ZW (continued)

Parameter	10GBASE-LR/LW		10GBASE-ER/EW		10GBASE-ZR/ZW	
	BOL	EOL	BOL	EOL	BOL	EOL
Laser type	DFB		DFB		DFB	
Target distance	2/10 km		40 km		80 km	
Fiber type	G.652		G.652		G.652	
Transmitter at reference point S						
Source type	Single longitudinal mode laser (SLM)		Single longitudinal mode laser (SLM)		Single longitudinal mode laser (SLM)	
Nominal center wavelength	1290 to 1330 nm		1530 to 1565 nm		1530 to 1565 nm	
Spectral characteristics:						
– maximum –20 dB width		1 nm		0.5 nm		0.25 nm
– minimum side mode suppression ration		30 dB		30 dB		30 dB
– chirp parameter (α)	rad	rad	rad	for further study	rad	negative chirp
– maximum spectral power density		0.1 mW/MHz		0.1 mW/MHz		0.1 mW/MHz
Mean launched power:						
– maximum	–2 dBm	–1 dBm	+1.5 dBm	+2 dBm	+3.5 dBm	+4 dBm
– minimum	–4 dBm	–6 dBm	0 dBm	–1 dBm	+1 dBm	0 dBm
Maximum mean launched in case Tx_Dis and/or P_Down are high		–30 dBm		–40 dBm		–40 dBm
Minimum extinction ratio	6.5 dB	6 dB	9.0 dB	8.2 dB	10 dB	9 dB
Eye mask margin	10 %		10 %		10 %	
Optical modulation amplitude (OMA)	–4.2 dBm	–5.2 dBm	–0.7 dBm	–1.7 dBm	–0.7 dBm	–1.7 dBm
RIN_{12} OMA		–128 dB/Hz		–128 dB/Hz		
Maximum total transmitter jitter		comply with IEEE802.3 Section 38.5		comply with IEEE802.3 Section 38.5		comply with IEEE802.3 Section 38.5
Optical path between point S and point R						
Attenuation range (@ BER = 1×10^{-12})		0 to 4 dB		3 to 11 dB		11 to 22 dB
Maximum dispersion		60 ps/nm		800 ps/nm		1600 ps/nm
Maximum PMD		10 ps		10 ps		10 ps
Minimum optical return loss of cable plant at point S, including any connectors		14 dB		24 dB		24 dB

Table 22-57 Parameters specified for 10 GbE optical interfaces 10GBASE-LR/LW, 10GBASE-ER/EW, 10GBASE-ZR/ZW (continued)

Parameter	10GBASE-LR/LW		10GBASE-ER/EW		10GBASE-ZR/ZW	
	BOL	EOL	BOL	EOL	BOL	EOL
Maximum discrete reflectance between point S and point R		–27 dB		–27 dB		–27 dB
Receiver at reference point TP3						
Optical wavelength range	1260 to 1360 nm/ 1530 to 1565 nm ([5])		1530 to 1565 nm		1530 to 1565 nm	
Minimum receiver sensitivity	–13 dBm	–11 dBm	–16 dBm	–14 dBm	–26 dBm	–24 dBm
Minimum overload	1.5 dBm	0.5 dBm	0 dBm	–1 dBm	0 dBm	–7 dBm
Minimum receiver sensitivity in OMA	–13.6 dBm	–12.6 dBm	–15.1 dBm	–14.1 dBm		
Stressed receiver sensitivity in OMA	–11.3 dBm	–10.3 dBm	–12.3 dBm	–11.3 dBm		
Maximum reflectance of receiver, measured at TP3		12 dB				
RX-LOS assert level	(see [3])					
Hysteresis for RX-LOS, assert deassert		0.5 to 2.0 dB		0.5 to 2.0 dB		0.5 to 2.0 dB
Maximum optical path penalty ([4])		1 dB	1.8 dB	2 dB	1.8 dB	2 dB
Maximum reflectance of receiver, measured at point R		–14 dB		–27 dB		–27 dB

Notes:

1. The receiver is specified for the 1550 nm window; in the 1310 nm window, the receiver will have comparable performance to I-64.1, SR-1.
2. The receiver is specified for the 1550 nm window; in the 1310 nm window, the receiver will have sensitivity degradation lower than 1 dB.
3. RX_LOS is pin 14 of the XFP's electrical connector. This alarm is based upon total optical power received at the photodiode. The assert level occurs at the optical input power that corresponds to an equivalent BER of 1 × 10^{-2} to 1 × 10^{-4}. LOS will not be asserted at power levels where there is error-free transmission.
4. Due to chromatic dispersion + PMD + optical reflections.
5. To be guaranteed by design, no testing in production is required.

Optical interface (OSC)

Parameters for Short-haul (SS) and Long-haul (SL) OSCs are identical to standard 1510nm CWDM SFP specificatons. See Table 12-28, "Parameters specified for standard CWDM 1510 SFP optical interface" (p. 12-40).

Table 22-58 Parameters specified for OSC optical interface ULH OSC.

Parameter	Values	
Application code	ULH OSC	
Application code	Ultra Long-haul (ULH)	
Data rate and reference pattern	Bit rate: 100Mb/s and 155Mb/s with 20ppm Line code: NRZ PRBS 2E23-1 and CID according to ITU-T G.957 and G.783.	
	BOL	**EOL**
Transmitter at reference point S		
Source type	SLM	
Nominal center wavelength[1]	1510nm	
Center wavelength deviation[1]	±5.5nm	±6.5nm
Spectral characteristics: — maximum -20 dB width — minimum side mode suppression ratio		1nm 30dB
Mean launched power: — maximum — minimum	+4dBm +1dBm	+5dBm 0dBm
Maximum mean launched power for Tx disabled		-40dBm
Minimum extinction ratio	10dB	8.2dB
Eye mask definition	Meets ITU-T G.957, Telcordia GR-253-CORE	
Eye mask margin	10%	
Max Opt. Power Overshoot vs. shutdown deactivation		3dB
Jitter Generation	Meets ITU-T G.783, G.813 and Telcordia GR-253-CORE	
Optical path between S and R		
Attenuation range[2]		15dB - 34.5dB[6]
Minimum dispersion[7]		-300ps/nm
Maximum dispersion		3000px/nm[6]
Maximum differential group delay		120ps
Minimum optical return loss of cable plant at S, including any connectors		24dB
Maximum discrete reflectance between S and R		-27dB
Receiver at reference point R		
Operating wavelength range	1504.5nm – 1516.5nm	
Minimum sensitivity[3]	-38dBm[6]	-37dBm[6]
Minimum overload	-9dBm[6]	-10dBm[6]
Maximum optical path penalty for 1000 ps/nm[4]		1.51dB

Table 22-58 Parameters specified for OSC optical interface ULH OSC. (continued)

Parameter	Values	
Maximum optical path penalty for 1640 ps/nm[4]		2.5dB
Maximum reflectance at R		-27dB
LOS assert level[5] [7]		-48 to -42dBm
LOS hysteresis		0.5 to 3dB
Jitter Tolerance and Transfer	ITU-T G.783, G.813, G.825 compliant	

Notes:

1. The center wavelength grid is 20nm.
2. Attenuation assumed to be worst-case values including losses due to splices, connectors, optical attenuators (if used) or other passive optical devices (such as CWDM MUX and DMUX), and any additional cable margin.
3. Receiver sensitivity is defined as the minimum acceptable value of average received power at point R to achieve a 1×10^{-12} BER. It takes into account power penalties caused by use of a transmitter under all operating conditions with worst-case values of extinction ratio, pulse rise and fall times, optical return loss at point S, receiver connector degradations and measurement tolerances.
4. Optionally, the path penalty can be measured without optical filters, i.e. MUX/DMUX, and crosstalk. In this case 0.3 dB shall be reserved for those effects and the path penalty is required to be maximum 2.2dB.
5. It is expected that the LOS assert level shall always occur at power levels below that of the receiver sensitivity power level. LOS shall not be asserted at power levels where there is error-free transmission.
6. Not according to ITU-T G.695.
7. Not defined in ITU-T G.695

Table 22-59 Parameters specified for OSC optical interface EULH OSC.

Parameter	Values	
Application code	EULH OSC	
Application code	Enhanced Ultra Long-haul (EULH)	
Data rate and reference pattern	Bit rate: 100Mb/s and 155Mb/s with 20ppm Line code: NRZ PRBS 2E23-1 and CID according to ITU-T G.957 and G.783.	
	BOL	**EOL**
Transmitter at reference point S		
Source type	SLM	
Nominal center wavelength[1]	1510nm	
Center wavelength deviation[1]	±5.5nm	±6.5nm

Table 22-59 Parameters specified for OSC optical interface EULH OSC. (continued)

Parameter	Values	
Spectral characteristics: — maximum -20 dB width — minimum side mode suppression ratio		1nm 30dB
Mean launched power: — maximum — minimum	+6dBm +3dBm	+7dBm +2dBm
Maximum mean launched power for Tx disabled		-40dBm
Minimum extinction ratio	10dB	8.2dB
Eye mask definition	Meets ITU-T G.957, Telcordia GR-253-CORE	
Eye mask margin	10%	
Max Opt. Power Overshoot vs. shutdown deactivation		3dB
Jitter Generation	Meets ITU-T G.783, G.813 and Telcordia GR-253-CORE	
Optical path between S and R		
Attenuation range[2]		17-43dB[6]
Minimum dispersion[7]		-300ps/nm
Maximum dispersion		3600px/nm[6]
Maximum differential group delay		120ps
Minimum optical return loss of cable plant at S, including any connectors		24dB
Maximum discrete reflectance between S and R		-27dB
Receiver at reference point R		
Operating wavelength range	1504.5nm – 1516.5nm	
Minimum sensitivity[3]	-43dBm[6]	-42dBm[6]
Minimum overload	-9dBm[6]	-10dBm[6]
Maximum optical path penalty for 3600 ps/nm[4]		1dB
Maximum reflectance at R		-27dB
LOS assert level[5 7]		-51 to -46dBm
LOS hysteresis		0.5 to 3dB
Jitter Tolerance and Transfer	ITU-T G.783, G.813, G.825 compliant	

Notes:

1. The center wavelength grid is 20nm.
2. Attenuation assumed to be worst-case values including losses due to splices, connectors, optical attenuators (if used) or other passive optical devices (such as CWDM MUX and DMUX), and any additional cable margin.

3. Receiver sensitivity is defined as the minimum acceptable value of average received power at point R to achieve a 1×10^{-12} BER. It takes into account power penalties caused by use of a transmitter under all operating conditions with worst-case values of extinction ratio, pulse rise and fall times, optical return loss at point S, receiver connector degradations and measurement tolerances.
4. Optionally, the path penalty can be measured without optical filters, i.e. MUX/DMUX, and crosstalk. In this case 0.3 dB shall be reserved for those effects and the path penalty is required to be maximum 2.2dB.
5. It is expected that the LOS assert level shall always occur at power levels below that of the receiver sensitivity power level. LOS shall not be asserted at power levels where there is error-free transmission.
6. Not according to ITU-T G.695.
7. Not defined in ITU-T G.695

Optical fixed line-side WDM OT interfaces

The following table shows the fixed line-side parameters for the 11STAR1, 11STAR1A, and 11STMM10 OTs.

Table 22-60 Line-side parameters for 11G tunable interfaces (11STAR1, 11STAR1A, 11STMM10)

Parameter	Specification
Digital signal	OTU2 or PRBS=2^{31}-1
Bit rate	10.709225316 ±20ppm 11.095728 ±20ppm 11.317642 ±20ppm
Fiber type	SMF (LC connectors)
Transmitter	
Center wavelength range	1529.15 to 1568.36 nm
Average optical power	-0.6 to 1.9 dBm
Optical Output Power In Shutdown Condition	-40 dBm
Tuning response time	30s
Side Mode Suppression Ratio	35dB
Average Relative Intensity Noise	140 dB/Hz
Output OSNR	35 dB/0.1 nm
SBS Threshold	19 dBm
Extinction ratio	13 dB
Optical Return Loss	-24 dB
Receiver	
Operating range	1529 to 1569 nm
Full optical power range	-22 to 8 dBm

Table 22-60 Line-side parameters for 11G tunable interfaces (11STAR1, 11STAR1A, 11STMM10) (continued)

Parameter	Specification
Limited optical power range	-19 to 8 dBm
Back-to-back sensitivity BER=1.1^{-10}	- 24 dBm
OSNR @BER=2.10^{-3} (10.709Gb/s)	10 dB/0.1nm[1] 9.7 dB/0.1nm[2] 9.4 dB/0.1nm[3]
OSNR @BER=1.10^{-7} (10.709Gb/s)	15.5 dB/0.1nm[1] 15.2 dB/0.1nm[2] [3]
OSNR @BER=1.10^{-10} (10.709Gb/s)	18.3 dB/0.1nm[1] 17.5 dB/0.1nm[2] 17.8 dB/0.1nm[3]
OSNR @BER=2.10^{-3} (11.09Gb/s)	10.1 dB/0.1nm[1] 10.0 dB/0.1nm[2] 9.6 dB/0.1nm[3]
OSNR @BER=1.10^{-7} (11.09Gb/s)	16.2 dB/0.1nm[1] 15.7 dB/0.1nm[2] [3]
OSNR @BER=1.10^{-10} (11.09Gb/s)	19 dB/0.1nm[1] 18.3 dB/0.1nm[2] 18.5 dB/0.1nm[3]
OSNR @BER=2.10^{-3} (11.3Gb/s)	10.3 dB/0.1nm[1]
OSNR @BER=1.10^{-7} (11.3Gb/s)	16.7 dB/0.1nm[1]
OSNR @BER=1.10^{-10} (11.3Gb/s)	19.5 dB/0.1nm[1]
OSNR @BER=1.10^{-7} with high CD (10.709Gb/s)	17.5 dB/0.1nm[4]
OSNR @BER=1.10^{-7} with high CD (11.09Gb/s)	18.1 dB/0.1nm[4]
OSNR @BER=1.10^{-7} with high CD (11.3Gb/s)	18.5 dB/0.1nm[4]
OSNR @ CDR locking limit	8 dB/0.1nm
Optical return loss	27 dB
Transient OSNR penalty	1 dB[5]
Non-error free recovery time	1 ms

Notes:

1. Pin within Pin_frge, CD ≤ 100ps/nm
2. Pin within Pin_lrge, CD ≤ 100ps/nm
3. BOL Pin within Pin_frge CD ≤ 100ps/nm
4. Pin within Pin_frge, CD ≤ 700ps/nm
5. Difference between the OSNR after the transient and the OSNR before the transient for any given BER value lower than 2E-3 and any residual chromatic dispersion value within the +/- 700 ps/nm range. The transient is a +/- 3 dB change of average power at point Porx within a range of –22 to –10 dBm. RxDTV voltage is optimized for the conditions before the transient and is kept constant after the transient.

The following table shows the fixed line-side parameters for the 43G Coherent OTs. Note that the receive parameters for OTs that do not contain an optical amplifier (43SCUP and 43SCX4E) and those do contain the amplifier (43SCX4 and 43SCA1) are grouped separately below.

Table 22-61 Line-side parameters for 43G Coherent interfaces (43SCUP, 43SCX4E, 43SCX4, 43SCA1)

Parameter	Specification	
	BOL	EOL
Digital signal	OTU3 per ITU-T G.709 OTU3e2 per ITU-T G.sup43	
Bit rate	OTU3 Bit rate: 43.018413 Gbit/s ± 20 ppm OTU3e2 Bit rate: 44.583355 Gbit/s ± 20 ppm	
Fiber type	SMF (LC connectors)	
Transmitter		
Nominal center wavelength (50GHz grid)	191.150 to 196.05 THz (1568 to 1529 nm)	
Laser frequency accuracy	±1.5 GHZ	
Operating Optical Power		-1.3 to +8.1 dBm
Optical Power in Shutdown Condition		-40 dBm
Tuning Response Time	30s	
Side Mode Suppression Ratio	40 dB	
Average Relative Intensity Noise	-145 dB/Hz (10MHz to 40GHz)	
Output OSNR NRZ	40 dB/0.1nm	
Optical Return Loss	-24 dB	
Receiver without amplifier (43SCUP & 43SCX4E)		

Table 22-61 Line-side parameters for 43G Coherent interfaces (43SCUP, 43SCX4E, 43SCX4, 43SCA1) (continued)

Parameter	Specification	
	BOL	EOL
Operating Wavelength Range Extended C-Band, 50GHz ITU-T-grid.	191.150 to 196.05 THz (1568 to 1529 nm)	
Optical Input Power Range	-18 to 2 dBM (std.) -21 to 2 dBM (ext.)	
Optical Return Loss	-27 dB	
	40 dB	
Laser CW Linewidth	500 KHz	
Temperature Dependency	0.5 dB	
Receiver with amplifier (43SCX4 & 43SCA1)		
Operating Wavelength Range Extended C-Band, 50GHz ITU-T-grid.	191.150 to 196.05 THz (1568 to 1529 nm)	
Optical Power Range	-21 to 2 dBM	
Optical Return Loss	-27 dB	
Temperature Dependency	0.5 dB	

The following table shows the fixed line-side parameters for the 43G DPSK/p-DPSK OTs.

Table 22-62 Line-side parameters for 43G DPSK/p-DPSK interfaces (43STX4/43STX4P, 43STA1P/43STA1PB)

Parameter	Specification	
	BOL	EOL
Digital signal	OTU3 per ITU-T G.709	
Baud rate	OTU3 Bit rate: 43.018413 Gbit/s ± 20 ppm	
Fiber type	SMF (LC connectors)	
Transmitter		
Operating frequency range (ITU-T 100 GHz grid)	191.200 to 196.000 THz	
Outpur OSNR	40 dB	
Optical output power		+2 dBm
Optical output power in shutdown condition	-30 dBm	
Laser tuning response time	30s	

Table 22-62 Line-side parameters for 43G DPSK/p-DPSK interfaces (43STX4/43STX4P, 43STA1P/43STA1PB) (continued)

Parameter	Specification	
	BOL	EOL
Laser frequency accuracy	±1.5 GHz	
Side mode suppression ratio	35 dB	
Average relative intensity noise	-145 dB	
Optical return loss	-24 dB	
OSNR @BER=10^{-3}	13.5 dB/0.1nm	
OSNR @BER=10^{-7}	18.3 dB/0.1nm	
OSNR @BER=10^{-10}	21.0 dB/0.1nm	
Receiver		
Operating frequency range	191.200 to 196.000 THz	
Optical input power range	-17 to 5 dBm	
OSNR @ BER=10^{-3}	13.5 dB/0.1nm[1]	
OSNR @ BER=1.10^{-7}	18.3 dB/0.1nm[1]	
OSNR @ BER=10^{-10}	21.0 dB/0.1nm[1]	
OSNR @ BER=10^{-3} with high CD	14.0 dB/0.1nm[2]	14.5 dB/0.1nm[2]
OSNR @ BER=1.10^{-7} with high CD	18.8 dB/0.1nm[2]	19.3 dB/0.1nm[2]
OSNR @ BER=10^{-10} with high CD		22.0 dB/0.1nm[2]
OSNR @ BER=10^{-5} with DGD	18.2 dB[3]	
OSNR @ CDR locking limit	12.0 dB (automatic mode)[2] 9.0 dB(manual mode)[2]	
TDC spectral bandwidth	65 GHz	
Dispersion tolerance range	±500 ps/nm	
Optical return loss	-27 dB	

Notes:

1. Pin within Porx_rg, CD=0 ps/nm 0.1nm bandwidth
2. Pin within Porx_rg, CD ≤ 400 ps/nm 0.1nm bandwidth
3. Pin within Porx_rg, CD ≤ 400 ps/nm, DGD ≤ 8.4ps 0.1nm bandwidth

The following interface specifications are identical for 43SCGE1 and 112SCA1 packs.

Table 22-63 Line side parameters for 43SCGE1

Parameter	Condition	Min.	Typ.	Max.	Unit
Transmit specifications:					
Bit Rate	±20 ppm of exact bit rate per ITU-TG.709	111.809973			Gb/s
Pattern		OTU4 or PRBS = 2^{31} - 1			
Pulse format		DP-QPSK			
Operating Wavelength Range	50 GHz ITU grid	1529.2		1568.4	nm
Operating Frequency Range	50 GHz ITU grid	191.15		196.05	THz
Channel Spacing	50 GHz ITU grid		50		GHz
Min. adjustable optical output power range	At VOA output	–21		+1	dBm
Step size for the setting of the optical output power	At VOA output			0.5	dB
Setting accuracy of the optical output power	At VOA output	–0.25		+0.25	dB
Optical Power stability	At VOA output	–0.1		+0.1	dB
Optical Output Power in Shutdown Condition and wavelength switching	At VOA output			-40	dBm
Laser frequency accuracy		–1.5		+1.5	GHz
Laser Side Mode Suppression		40			dB
Average Relative Intensity Noise				–145	dB/Hz
Output OSNR	In 0.1 nm bandwidth	40			dB
Laser CW line width	3 dB from peak power			300	KHz
Optical Return Loss	At Potx			–24	dBm
Modulator Chirp Parameter		–0.1		+0.1	
High band jitter generation	-			0.1	UIpp

Table 22-63 Line side parameters for 43SCGE1 (continued)

Parameter	Condition	Min.	Typ.	Max.	Unit
Laser tuning response time				30	ms
Receive specifications:					
Bit Rate	20 ppm of exact bit rate per ITU G.709	111.809973			Gb/s
Operating Wavelength Range	50 GHz grid	1529.2		1568.4	nm
Operating Frequency Range	50 GHz grid	191.15		196.05	THz
Operating optical input power range	Mono channel	-21		+2	dBm
Admissible optical input power range		-21		+11	dBm
Optical Return Loss				-27	dB

Table 22-64 Line-side parameters for tunable 4x28G CFP (C113G4T) interfaces in 112SDX11

Parameter	Specification	
Fiber type	G.652, G.655	
Central frequency range	191.70 - 196.05 THz	
Nominal central wavelengths	See Table Table 22-83, “DWDM wavelengths (50 GHz spacing)” (p. 22-118)	
Frequency grid Addressable channels	50 GHz	
Addressable channels	88	
Test Pattern	PRBS31	
Target BER	2E-3, 1E-4, 1E-12	
DWDM link	Unamplified and amplified	
Data Rate	25.753123Gb/s ± 100 ppm 27.95225Gb/s ± 20 ppm	
	BOL	**EOL**
Transmitter at S		
Source type	Tunable CW Laser + MZM	
Maximum frequency deviation		±2.5 Ghz
Spectral characteristics:		

Table 22-64 Line-side parameters for tunable 4x28G CFP (C113G4T) interfaces in 112SDX11 (continued)

Parameter	Specification	
– maximum –15 dB width		15 Ghz
– minimum side mode suppression ratio		30 dB
Mean output power:		
- Maximum	2.5 dBm	3 dBm
- Minimum	0.5 dBm	0 dBm
Mean output power variation across tuning range	± 0.25 dB	
Mean output power variation due to environmental and aging	± 0.3 dB	
Maximum overshoot in mean output power		1 dB
Mean launch power: minimum		0 dBm
Mean launch power: maximum		+5.5 dBm
Maximum mean launched power when Tx_Dis is asserted		-40 dBm
SBS Threshold		19 dBm
Minimum extinction ratio	9.5 dB	8.5 dB
Eye mask margin	10%	
Optical path between S and R Unamplified link		
Minimum attenuation		0 dB
Maximum attenuation		13 dB
Path penalty		1 dB
Amplified and unamplified link		
Maximum residual chromatic dispersion		400 ps/nm
Minimum residual chromatic dispersion		-300 ps/nm
Maximum differential group delay		10 ps
Minimum optical return loss		24 dB
Maximum discrete reflectance		-27 dB

Table 22-64 Line-side parameters for tunable 4x28G CFP (C113G4T) interfaces in 112SDX11 (continued)

Parameter	Specification	
Receiver characteristics at R Unamplified link		
Overload @1E-12	1	0
Sensitivity @ BER=2E-3[1]	-16 dBm	-15 dBm
Sensitivity @ BER=1E-4[1]	-15 dBm	-14 dBm
Sensitivity @ BER=1E-12[2]	-12 dBm	-11 dBm
Amplified link		
Mean input power: maximum		0 dBm
Mean input power: minimum		-10 dBm
OSNR Tolerance with 0 ps/nm		
@ BER=2E-3[1]	17 dB	18 dB
@ BER=1E-4[1]	19.5 dB	20.5 dB
@ BER=1E-12[2]	29 dB	30 dB
OSNR Tolerance with ±400 ps/nm		
@ BER=2E-3[1]	18 dB	19 dB
@ BER=1E-4[1]	20.5 dB	21.5 dB
@ BER=1E-12[2]	31 dB	32 dB
Unamplified and Amplified link		
RX_LOS assert level8	from -17 dBm to -23 dBm / BER>2E-3	
Hysteresis for RX_LOS, assert-deassert		0.5 dB to 3 dB
Maximum reflectance of receiver		-26 dB

Notes:

1. Specified parameter limits assume amplitude and phase decision thresholds set to optimum values
2. Specified parameter limits assume amplitude threshold set to 50% and phase to 0.5 UI.

Optical client WDM OT interfaces

The following table shows the fixed client-side parameters for the 43SCA1, 43STA1P, and 43STA1PB OTs.

Table 22-65 STM256/OC768 VSR2000-3R2-3R3-3R5 Client-side Optical Parameters. (43SCA1, 43STA1P, and 43STA1PB)

Parameter	Values	
	BOL	EOL
Target distance	2 km	
Operating wavelength range		1530-1565 nm
Transmitter at reference Point S		
Source type		SLM[1]
Spectral characteristics: – maximum –20 dB width – maximum side mode supression ratio – maximum spectral power density		1 nm 30 dB 0.1 mW/MHz
Mean launched power: – maximum – minimum	+2.5 dBm +1 dBm	+3 dBm 0 dBm
Maximum mean launched in case Tx_Dis and/or P_Down are high		-30 dBm
Minimum extinction ratio	9.2 dB	8.2 dB
Optical path between Point S and Point R		
Attenuation range		0-4 dB
Maximum dispersion	-10 ps/nm	40 ps/nm
Maximum DGD		7.5 ps
Minimum optical return loss of cable plant at Point S, including any connectors		24 dB
Maximum discrete reflectance between Point S and Point R		-27 dB
Receiver at reference Point R [2]		
Minimum receiver sensitivity	-8 dBm	-6 dBm
Minimum overload	+4 dBm	+3 dBm
RX-LOS assert level		See footnote[3]
Hysteresis for RX-LOS, assert-deassert		0.5 — 2.0 dB
Maximum optical path penalty on SSMF	1.8 dB	2 dB
Maximum reflectance of receiver, measured at Point R		-27 dB

Notes:

1. SLM = single-longitudinal mode laser.
2. The receiver is specified for the 1550nm window; in the 1310nm window, the receiver shall have comparable performance.
3. RX_LOS. This alarm shall be based upon total optical power received at the photodiode. The assert level shall occur at the optical input power that corresponds to an equivalent BER of $1x10^{-2}$ to 1×10^{-4}. LOS shall not be asserted at power levels where there is error-free transmission.

CFP parameters

The following table lists the optical modules providing CFP optical interfaces and the cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-66 Optical CFP modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
C04L2W28G10C	1AB402160001	C113G4Cd	CFP 100GBASE LR4 (4x25G) Dual Rate 100GE/OTU4 w/HeatSink (-5/+70)	130SCA1
C10L3W11G10C	1AB402160010	C113G10C	CFP 100GBASE LR10 (10x10G) Dual Rate 100GE/OTU4 w/HeatSink	112SCA1, 112SNA1
C04L2W26G10C	1AB402160012	C113G4C	CFP 100GBASE LR4 (4x25G) Dual Rate 100GE/OTU4 w/HeatSink (-5/+70)	130SCA1
C10L1W10G01C	1AB402160017	C113S10	CFP 100GBASE-SR10 (10x10G) Single Rate 100GE (with faceplate adapter)	112SCA1, 112SNA1, 130SCA1
C04L2W26G10C	1AB402160018	C113G4C	CFP 100GBASE LR4 (4x25G) Single Rate 100GE (GEN2 with faceplate adapter)	112SCA1, 112SNA1, 130SCA1
C04L2W28G10C	1AB402160022	C113G4Cd	CFP 100G BASE LR4 (4x25G) Dual Rate 100GE/OTU4(GEN2 with flat top)	112SDX11
C44L2W28G10C	3AL82023AA	C4CLR4d	CFP4 100GBASE-LR4/ OTU4 (4x25G) Dual Rate 100GE/OTU4 (-5/+75)	D5X500
C44L2W26G10C	3AL82020AA	C4CLR4e	CFP4 100GBASE-LR4 (4x25G) Single Rate 100GE (-5/+75)	D5X500

The following tables describe the optical specifications/parameters for CFP.

Table 22-67 10x10 CFP Pluggable module (10km - C113G10C)

Specification	Unit	Values
Application code		
Operating distance	km	0 to 10
Fiber Type		G.652
Data rate per channel	Gb/s	10.30125 ± 100 ppm 11.1809 ± 20 ppm

Table 22-67 10x10 CFP Pluggable module (10km - C113G10C) (continued)

Specification	Unit	Values	
		BOL	EOL
Transmitter characteristics @ reference TP2			
Center Wavelength	nm	See, Table 22-69, "10x10G Center wavelengths" (p. 22-87)	
Maximum center wavelength deviation	nm	±1.5	±2
Spectral characteristics:			
- maximum -20 dB width	nm		0.4
- minimum side mode suppression ratio	dB		30
Total maximum mean launched power	dBm	12.5	13
Mean Launched power per channel			
- maximum	dBm	2.5	3
- minimum	dBm	0.9	-0.1
Optical Modulation Amplitude (OMA) per channel			
- maximum	dBm	1.9	2.9
- minimum	dBm	-0.9	-1.9
Maximum mean launched power per channel when Tx_Dis is asserted	dBm		-30
Minimum extinction ratio	dB	3	2.5
Eye mask definition {X1, X2, X3, Y1, Y2, Y3}		0.25, 0.4, 0.45, 0.25, 0.28, 0.4	
Eye mask margin	%	10	
Optical Path between TP2 and TP3			
Maximum chromatic dispersion range			
- at upper wavelength limit	ps/nm		206
- at lower wavelength limit	ps/nm		163
Attenuation			
- minimum	dB		0
- maximum	dB		4.4
Path Penalty	dB		2.5
Maximum optical return loss @ TP2	dB		20

Table 22-67 10x10 CFP Pluggable module (10km - C113G10C) (continued)

Specification	Unit	Values	
Maximum discrete reflectance between TP2 and TP3	dB		-26
Maximum differential group delay	ps		30
Receiver characteristics @ TP3			
Maximum mean input power per channel	dBm	3.5	3
Receiver Sensitivity per channel	dBm	-6.3	-5.3
OMA receiver sensitivity per channel	dBm	-8.3	-7.3
OMA receiver sensitivity after optical path per channel	dBm	-7.3	-6.3
Maximum receiver reflectance	dB		-26
RX LOS assert level (For RX mean input power ≤30 dBm LOS must be active)	dBm	The assert level shall occur for the RX input power to a channel corresponding to an equivalent BER of 1E-2 to 1E-4.	
Hysteresis for RX-LOS, assert-deassert (LOS shall not be still asserted at power levels where there is error-free transmission and for a RX OMA ≥-11.5 dBm)	dB		0.5 to 3

Table 22-68 10x10 CFP Pluggable module (10x10G MMF, SR10 - C113S10)

Specification	Unit	Values	
IEEE Application code		100GBASE-SR10	
Operating distance	m	100	
Fiber Type		50/125 µm multimode OM3 or OM4	
Data rate per channel	Gb/s	10.3125 ± 100 ppm 11.1809 ± 20 ppm	
		BOL	EOL
Transmitter characteristics @ reference TP2			
Center Wavelength	nm	840-860	
Spectral characteristics:			
RMS spectral width	nm		0.65

Table 22-68 10x10 CFP Pluggable module (10x10G MMF, SR10 - C113S10) (continued)

Specification	Unit	Values	
Total maximum mean launched power	dBm	11.9	12.4
Mean Launched power per channel			
- maximum	dBm	1.9	2.4
- minimum	dBm	-6.6	-7.6
Optical Modulation Amplitude (OMA) per channel			
- maximum	dBm	2	3
- minimum	dBm	-4.6	-5.6
Transmitter and dispersion penalty (TDP) per channel	dB		3.5
Maximum mean launched power per channel when Tx_Dis is asserted	dBm		-30
Minimum extinction ratio	dB	4	3
Eye mask definition {X1, X2, X3, Y1, Y2, Y3}		0.25, 0.34, 0.43, 0.27, 0.35, 0.4	
Eye mask margin	%	10	
Optical Path between TP2 and TP3			
Effective modal bandwidth at 850 nm			
OM3	Mhz*km		2000
OM4	Mhz*km		4700
Attenuation			
- minimum	dB		0
- maximum for OM3	dB		1.9
- maximum for OM4	dB		1.5
Path Penalty	dB		1
Maximum optical return loss @ TP2	dB		12
Maximum discrete reflectance between TP2 and TP3	dB		-20
Receiver characteristics @ TP3			
Maximum mean input power per channel	dBm	2.9	2.4
OMA receiver sensitivity per channel	dBm	-7.4	-6.4

Table 22-68 10x10 CFP Pluggable module (10x10G MMF, SR10 - C113S10) (continued)

Specification	Unit	Values	
OMA stressed receiver sensitivity per channel	dBm	-6.4	-5.4
Maximum receiver reflectance	dB		-12
RX LOS assert level (For RX mean input power ≤30 dBm LOS must be active)	dBm	The assert level shall occur for the RX input power to a channel corresponding to an equivalent BER of 1E-2 to 1E-4.	
Hysteresis for RX-LOS, assert-deassert (LOS shall not be still asserted at power levels where there is error-free transmission and for a RX OMA ≥-8.5 dBm)	dB		0.5 to 3

Table 22-69 10x10G Center wavelengths

Channel Number	Wavelength (nm)
1	1523
2	1531
3	1539
4	1547
5	1555
6	1563
7	1571
8	1579
9	1587
10	1595

Table 22-70 4x25 CFP Pluggable single rate module (LR4 - C113G4C)

Specification	Unit	Values
IEEE application code		100GBASE-LR4
Operating distance	km	0 to 10
Fiber Type		G.652
Test Pattern		PRBS31

Table 22-70 4x25 CFP Pluggable single rate module (LR4 - C113G4C) (continued)

Specification	Unit	Values	
Data rate per channel	Gb/s	25.753123 ± 100ppm	
		BOL	EOL
Transmitter characteristics @ reference TP2			
Center Wavelength	nm	1295.56 1300.05 1304.58 1309.14	
Maximum center wavelength deviation	nm	±0.5	±1
Spectral characteristics per channel:			
- maximum -20 dB width	nm		0.15
- minimum side mode suppression ratio	dB		30
Total maximum mean launched power	dBm		10.5
Mean Launched power per channel			
- maximum	dBm	4	4.5
- minimum	dBm	-3.3	-4.3
Optical Modulation Amplitude (OMA) per channel			
- maximum	dBm	3.5	4.5
- minimum	dBm	-0.3	-1.3
Maximum mean launched power per channel when Tx_Dis is asserted	dBm		-30
Minimum extinction ratio	dB	5	4
Eye mask definition {X1, X2, X3, Y1, Y2, Y3}		0.25, 0.4, 0.45, 0.25, 0.28, 0.4	
Eye mask margin	%	10	
Optical Path between TP2 and TP3			
Maximum chromatic dispersion range			
- at upper wavelength limit	ps/nm		-13 to 9.5
- at lower wavelength limit	ps/nm		-28 to -5
Attenuation			

Table 22-70 4x25 CFP Pluggable single rate module (LR4 - C113G4C) (continued)

Specification	Unit	Values	
- minimum	dB		0
- maximum	dB		6.3
Maximum Path Penalty	dB		1.5
Maximum optical return loss @ TP2	dB		20
Maximum discrete reflectance between TP2 and TP3	dB		-26
Maximum differential group delay	ps		8
Receiver characteristics @ TP3			
Maximum mean input power per channel	dBm	5.5	4.5
OMA receiver sensitivity per channel	dBm	-9	-8
OMA receiver sensitivity after optical path per channel	dBm	-7.8	-6.8
Stressed Receiver Sensitivity	dBm	-7.8	-6.8
Maximum receiver reflectance	dB		-26
RX LOS assert level (For RX mean input power ≤30 dBm LOS must be active)	dBm	The assert level shall occur for the RX input power to a channel corresponding to an equivalent BER of 1E-2 to 1E-4.	
Hysteresis for RX-LOS, assert-deassert (LOS shall not be still asserted at power levels where there is error-free transmission and for a RX OMA ≥-8.5 dBm)	dB		0.5 to 3

Table 22-71 4x25 CFP Pluggable dual rate module (LR4 - C113G4CD)

Specification	Unit	Values
ITU-T application code		4I1-9D1F
IEEE application code		100GBASE-LR4
Operating distance	km	0 to 10
Fiber Type		G.652
Test Pattern		PRBS31

Table 22-71 4x25 CFP Pluggable dual rate module (LR4 - C113G4CD) (continued)

Specification	Unit	Values	
Data rate per channel	Gb/s	25.753123 ± 100ppm 27.95225 ± 20ppm	
		BOL	EOL
Transmitter characteristics @ reference TP2			
Center Wavelength	nm	1295.56 1300.05 1304.58 1309.14	
Maximum center wavelength deviation	nm	±0.5	±1
Spectral characteristics:			
- maximum -20 dB width	nm		0.15
- minimum side mode suppression ratio	dB		30
Total maximum mean launched power	dBm	8.4	8.9
Mean Launched power per channel			
- maximum	dBm	2.4	2.9
- minimum	dBm	-1.5	-2.5
Optical Modulation Amplitude (OMA) per channel			
- maximum	dBm	3.5	4.5
- minimum	dBm	-0.2	-1.2
Maximum mean launched power per channel when Tx_Dis is asserted	dBm		-30
Minimum extinction ratio	dB	8	7
Eye mask definition {X1, X2, X3, Y1, Y2, Y3}		0.25, 0.4, 0.45, 0.25, 0.28, 0.4	
Eye mask margin	%	10	
Optical Path between TP2 and TP3			
Maximum chromatic dispersion range			
- at upper wavelength limit	ps/nm		-13 to 9.5
- at lower wavelength limit	ps/nm		-28.5 to -5
Attenuation			

Table 22-71 4x25 CFP Pluggable dual rate module (LR4 - C113G4CD) (continued)

Specification	Unit	Values	
- minimum	dB		0
- maximum	dB		6.3
Path Penalty	dB		1.5
Maximum optical return loss @ TP2	dB		20
Maximum discrete reflectance between TP2 and TP3	dB		-26
Maximum differential group delay	ps		8
Receiver characteristics @ TP3			
Maximum mean input power per channel	dBm	3.9	2.9
Receiver Sensitivity per channel	dBm	-11.3	-10.3
OMA receiver sensitivity per channel at BER+1E-12: 100GbE	dBm	-9	-8
OMA receiver sensitivity per channel at BER+1E-12: OTU4	dBm	-8	-7
OMA receiver sensitivity after optical path per channel at BER+1E-12 at OTU4	dBm	-7	-6
OMA Stressed Receiver Sensitivity at 100GbE	dBm	-7.8	-6.8
Maximum receiver reflectance	dB		-26
RX LOS assert level (For RX mean input power ≤ -30 dBm LOS must be active)	dBm	The assert level shall occur for the RX input power to a channel corresponding to an equivalent BER of 1E-2 to 1E-4.	
Hysteresis for RX-LOS, assert-deassert (LOS shall not be still asserted at power levels where there is error-free transmission and for a RX OMA ≥ -8.5 dBm)	dB		0.5 to 3

Table 22-72 4x10 CFP Pluggable module (LR4 - C43G4C)

Specification	Unit	Values
ITU-T application code		C4S1-2D1

Table 22-72 4x10 CFP Pluggable module (LR4 - C43G4C) (continued)

Specification	Unit	Values	
IEEE application code		40GBASE-LR4	
Operating distance	km	0 to 10	
Fiber Type		G.652	
Test Pattern		PRBS31	
Data rate per channel	Gb/s	9.95328 ± 20ppm, 10.3125 ±100ppm 10.7456 ± 20ppm, 11.14274 ± 20ppm, and 11.14584 ±20ppm	
		BOL	EOL
Transmitter characteristics @ reference TP2			
Center Wavelength	nm	1271 1291 1311 1331	
Maximum center wavelength deviation	nm	±2	±6.5
Spectral characteristics:			
- maximum -20 dB width	nm		1
- minimum side mode suppression ratio	dB		30
Total maximum mean launched power	dBm	7.8	8.3
Mean Launched power per channel			
- maximum	dBm	1.8	2.3
- minimum	dBm	-1.3	-2.3
Optical modulation Amplitude (OMA) per channel			
- maximum	dBm	-2.5	3.5
- minimum	dBm	-1.5	-2.5
Maximum mean launched power per channel when Tx_Dis is asserted	dBm		-30
Minimum extinction ratio	dB	5.5	4.5
Eye mask definition {X1, X2, X3, Y1, Y2, Y3}		0.25, 0.4, 0.45, 0.25, 0.28, 0.4	
Eye mask margin	%	10	
Optical Path between TP2 and TP3			

Table 22-72 4x10 CFP Pluggable module (LR4 - C43G4C) (continued)

Specification	Unit	Values	
Maximum chromatic dispersion			
- at upper wavelength limit	ps/nm		12.5 to 33.5
- at lower wavelength limit	ps/nm		-59.5 to -34.5
Attenuation			
- minimum	dB		0
- maximum	dB		7.1
Maximum Path Penalty	dB		1.5
Maximum optical return loss @ TP2	dB		20
Maximum discrete reflectance between TP2 and TP3	dB		-26
Maximum differential group delay	ps		10
Receiver characteristics @ TP3			
Maximum mean input power per channel	dBm	3.3	2.3
Receiver Sensitivity per channel	dBm	-11.5	-10.5
OMA receiver sensitivity per channel	dBm	-11.6	-10.6
OMA receiver sensitivity after optical path per channel	dBm	-10.6	-9.6
OMA Stressed Receiver Sensitivity	dBm	-10.6	-9.6
Maximum receiver reflectance	dB		-26
RX LOS assert level (For RX mean input power ≤30 dBm LOS must be active)	dBm	The assert level shall occur for the RX input power to a channel corresponding to an equivalent BER of 1E-2 to 1E-4.	
Hysteresis for RX-LOS, assert-deassert (LOS shall not be still asserted at power levels where there is error-free transmission and for a RX OMA ≥-11.5 dBm)	dB		0.5 to 3

Optical parameters - CFP2

The following table describes the optical specifications/parameters for CFP2.

The following table lists the optical modules providing CFP2 optical interfaces and the cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-73 Optical CFP2 modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
C24L2W26G10C	1AB426470001	C2CLR4e	CFP2 100GBASE-LR4	260SCX2
C2XL1W10G01C	1AB426470002	C2CSR10e	CFP2 100GBASE-SR10 (10x10G) Single Rate 100GE (with flat top)	260SCX2
C2XL1W11G01C	3AL82021AA	C2CLR4d	CFP2 100GBASE-SR10 (10x10G) Dual Rate 100GE/OTU4	260SCX2
C24L2W26G40C	3AL82022AA	C2CER4E	CFP2 100G BASE-ER4 (4X25G) Single Rate 100GE	260SCX2
C24L2W28G10C	3AL81820AA	C2CLR4d	CFP2 100GBASE-LR4 (4x25G), Dual Rate 100GE/OTU4 (flat top)	260SCX2

Table 22-74 4x25G 10 km single rate CFP2 Pluggable module

Specification	Unit	Values	
Application code		100GBASE-LR4	
Operating distance	km	0 to 10	
Fiber Type		G.652	
Data rate per channel	Gb/s	25.78125 ± 100 ppm	
		BOL	**EOL**
Transmitter characteristics @ reference TP2			
Center Wavelength	nm	1295.56 1300.05 1304.58 1309.14	
Spectral characteristics:			
RMS spectral width	nm		0.65
Total maximum mean launched power	dBm	-	10.5
Mean Launched power per channel			
- maximum	dBm	4	4.5
- minimum	dBm	-3.3	-4.3

Table 22-74 4x25G 10 km single rate CFP2 Pluggable module (continued)

Specification	Unit	Values	
Optical Modulation Amplitude (OMA) per channel			
- maximum	dBm	3.5	4.5
- minimum	dBm	-0.3	-1.3
Maximum Transmitter and dispersion penalty (TDP) per channel	dB		2.2
Maximum mean launched power per channel when Tx_Dis is asserted	dBm		-30
Minimum extinction ratio	dB	5	4
Eye mask definition {X1, X2, X3, Y1, Y2, Y3}		0.25, 0.4, 0.45, 0.25, 0.28, 0.4	
Eye mask margin	%	10	
Optical Path between TP2 and TP3			
Effective modal bandwidth at 850 nm			
Maximum chromatic dispersion range - at upper wavelength limit	ps/nm		-13 to 9.5
- at lower wavelength limit	ps/nm		-28.5 to -5
Attenuation			
- minimum	dB		0
- maximum	dB		6.3
Maximum optical return loss @ TP2	dB		20
Maximum discrete reflectance between TP2 and TP3	dB		-26
Maximum differential group delay	ps		8
Receiver characteristics @ TP3			
Maximum mean input power per channel	dBm	5.5	4.5
Maximum input OMA per lane	dBm	5.5	4.5
OMA receiver sensitivity per channel	dBm	-9	-8
OMA stressed receiver sensitivity per channel	dBm	-7.8	-6.8
Maximum receiver reflectance	dB		-26

Table 22-74 4x25G 10 km single rate CFP2 Pluggable module (continued)

Specification	Unit	Values	
RX LOS assert level (For RX mean input power ≤30 dBm LOS must be active)	dBm	The assert level shall occur for the RX input power to a channel corresponding to an equivalent BER of 1E-2 to 1E-4.	
Hysteresis for RX-LOS, assert-deassert (LOS shall not be still asserted at power levels where there is error-free transmission and for a RX OMA ≥-8.5 dBm)	dB		0.5 to 3

Table 22-75 4x25G 10 km dual rate EML

Specification	Unit	Values	
Application code		100GBASE-LR4	
ITU-T application code		4I1-9D1F	
Operating distance	km	0 to 10	
Fiber Type		G.652	
Data rate per channel 100 GbE OTU4	Gb/s	25.78125 ± 100 ppm 27.9525 ± 20 ppm	
		BOL	**EOL**
Transmitter characteristics @ reference TP2			
Center Wavelength	nm	1295.56 1300.05 1304.58 1309.14	
Spectral characteristics:			
Maximum spectral excursion	GHz	±134	±184
Minimum side mode suppression ratio	dB		30
Total maximum mean launched power	dBm	8.4	8.9
Mean Launched power per channel			
- maximum	dBm	2.4	2.9
- minimum	dBm	-1.5	-2.5
Optical Modulation Amplitude (OMA) per channel			

Table 22-75 4x25G 10 km dual rate EML (continued)

Specification	Unit	Values	
- maximum	dBm	3.5	4.5
- minimum	dBm	-0.3	-1.3
Transmission and dispersion penalty (TDP) at 100 GbE	dB		2.2
Maximum mean launched power per channel when Tx_Dis is asserted	dBm		-30
Minimum OMA - TDP at 100 GbE	dBm	-1.3	-2.3
Minimum extinction ratio	dB	8	7
Eye mask definition {X1, X2, X3, Y1, Y2, Y3}		0.25, 0.4, 0.45, 0.25, 0.28, 0.4	
Eye mask margin	%	10	
Optical Path between TP2 and TP3			
Maximum chromatic dispersion range			
- at upper wavelength limit	ps/nm		-13 to 9.5
- at lower wavelength limit	ps/nm		-28.5 to -5
Attenuation			
- minimum	dB		0
- maximum	dB		6.3
- maximum at OTU4 without RX-FEC	dB		4.7
Path penalty	dB		1.5
Maximum optical return loss @ TP2	dB		20
Maximum discrete reflectance between TP2 and TP3	dB		-26
Maximum differential group delay	ps		8
Receiver characteristics @ TP3			
Maximum mean input power per channel	dBm	3.9	2.9
Receiver Sensitivity per lane at BER=1E^{-6} OTU4	dBm	-11.3	-10.3

Table 22-75 4x25G 10 km dual rate EML (continued)

Specification	Unit	Values	
OMA receiver sensitivity per channel at BER=$1E^{-12}$ 100GbE OTU4	dBm	-9 -8	-8 -7
OMA receiver Sensitivity per lane after optical path at BER=1E-12 OTU4	dBm	-7	-6
OMA stressed receiver sensitivity per channel 100 GbE	dBm	-7.8	-6.8
Maximum receiver reflectance	dB		-26
RX LOS assert level (For RX mean input power ≤30 dBm LOS must be active)	dBm	The assert level shall occur for the RX input power to a channel corresponding to an equivalent BER of $1E^{-2}$ to $1E^{-4}$.	
Hysteresis for RX-LOS, assert-deassert (LOS shall not be still asserted at power levels where there is error-free transmission and for a RX OMA ≥-8.5 dBm)	dB		0.5 to 3

Table 22-76 10x10G MMG

Specification	Unit	Values	
Application code		100GBASE-SR-10	
Operating distance for OM3 for OM4	km	0 to 100 0 to 150	
Fiber Type		50/125 µm multimode OM3 or OM4	
Data rate per channel	Gb/s	10.3125 ± 100 ppm 11.1809 ± 20 ppm	
		BOL	**EOL**
Transmitter characteristics @ reference TP2			
Center Wavelength	nm	840 - 860	
Spectral characteristics:			

Table 22-76 10x10G MMG (continued)

Specification	Unit	Values	
RMS spectral width	nm		0.65
Total maximum mean launched power	dBm	11.9	12.4
Mean Launched power per channel			
- maximum	dBm	1.9	2.4
- minimum	dBm	-6.6	-7.6
Optical Modulation Amplitude (OMA) per channel			
- maximum	dBm	2	3
- minimum	dBm	-4.6	-5.6
Transmitter and dispersion penalty (TDP) per channel	dB		3.5
Maximum mean launched power per channel when Tx_Dis is asserted	dBm		-30
Minimum extinction ratio	dB	4	3
Eye mask definition {X1, X2, X3, Y1, Y2, Y3}		0.25, 0.34, 0.43, 0.27, 0.35, 0.4	
Eye mask margin	%	10	
Optical Path between TP2 and TP3			
Effective modal bandwidth at 850 nm for OM3 for OM4	MHz*km		2000 4700
Attenuation			
- minimum	dB		0
- maximum for OM3 for OM4	dB		1.9 1.5
Path penalty	dB		1
Maximum optical return loss @ TP2	dB		12
Maximum discrete reflectance between TP2 and TP3	dB		-20
Receiver characteristics @ TP3			
Maximum mean input power per channel	dBm	2.9	2.4

Table 22-76 10x10G MMG (continued)

Specification	Unit	Values	
OMA receiver sensitivity per channel	dBm	-7.4	-6.4
OMA stressed receiver sensitivity per channel	dBm	-6.4	-5.4
Maximum receiver reflectance	dB		-12
RX LOS assert level (For RX mean input power ≤30 dBm LOS must be active)	dBm	The assert level shall occur for the RX input power to a channel corresponding to an equivalent BER of 1E-2 to 1E-4.	
Hysteresis for RX-LOS, assert-deassert (LOS shall not be still asserted at power levels where there is error-free transmission and for a RX OMA ≥-8.5 dBm)	dB		0.5 to 3

Optical parameters - CFP4

The following table lists the optical modules providing CFP4 optical interfaces and the cards that support these optical modules in Alcatel-Lucent 1830 PSS.

Table 22-77 Optical CFP4 modules

Optical module			Optical interface	Card name
Item (mnemonic)	APN	S/W mnemonic		
C44L2W26G10C	3AL82020AA	C4CLR4e	CFP4 100GBASE-LR4 (4x25G) Single Rate 100GE	D5X500
C44L2W28G10C	3AL82023AA	C4CLR4d	CFP4 100GBASE-LR4/ OTU4 (4x25G) Dual Rate 100GE/OTU4	D5X500

SVAC/MVAC alien wavelength client

The following table describes the specifications for the SVAC and MVAC Variable Attenuator Cards.

Table 22-78 Specifications for SVAC and MVAC

Acronym	Add direction						Drop Direction
	LOS threshold		Min. Input Power (dBm)		Max. Input	VOA Max. Atten. (dB)	Loss (dB)
	Value (dBm)	Port	Connected to alien wave-length	Con-nected to OPSA			
SVAC	-21 ± 3	C1	-1	-6.95	5	25	1
MVAC	-21 ± 3	G{1-8}	-1	-6.95	5	25	NA
MVAC8B	-21 ± 3	C{1-8}	-1	-6.95	5	25	1

Performance

Performance independence

As long as the system is not in recovery state, the transmission and protection performance of the Alcatel-Lucent 1830 PSS is independent of the operation load and the other way round. That means, for example, that in case of a software download or/and configuration database download the protection performance still meets the requirements.

FEC support

Performance independence

Depending on the card and operating software release, Alcatel-Lucent 1830 PSS optical transponders may provide support for the following types of FEC.

- AFEC: Alcatel-Lucent proprietary FEC encoding. This terminology is used for signals that are 40G and higher (OTU3 and OTU4). AFEC is designed as a BCH (1020, 988) code, and is compliant with Appendix I.9 of ITU-T G.975.1.
- EFEC: AMCC proprietary FEC. EFEC is compliant with Appendix I.4 of ITU-T G.975.1.
- EFEC2: Alcatel-Lucent proprietary FEC encoding. This terminology is used for signals that are 10G (OTU2). EFEC2 is a BCH (1020, 988) code, which is compliant with Appendix I.9 of ITU-T G.975.1. In reality, AFEC is equivalent to EFEC2. EFEC2 is better than EFEC.
- NOFEC: no FEC running
- RSFEC: standard Reed-Solomon G.709
- SDFEC: Alcatel-Lucent Soft Decision FEC is a proprietary 23% overhead FEC providing higher error correction performance than hard-decision FEC's.
- UFEC: An older proprietary Lucent code. UFEC is an example of a low-density parity check (LDPC) code, and is described in Appendix I.6 of ITU-T G.975.1. 16

The following tables identify the FEC types supported in Alcatel-Lucent 1830 PSS Release 8.2 for specific optical transponders.

Table 22-79 FEC types for optical transponders

Card type	OTN line	OTN client
112SDX11	RSFEC	No OTN client support
112SCA1 112SNA1	AFEC	RSFEC NOFEC
112SCX10 112SNX10	AFEC	EFEC EFEC2 RSFEC NOFEC
130SCX10 130SNX10	AFEC SDFEC	EFEC EFEC2 RSFEC NOFEC

Table 22-79 FEC types for optical transponders (continued)

Card type	OTN line	OTN client
130SNQ10	AFEC SDFEC	EFEC EFEC2 RSFEC NOFEC
130SCA1	AFEC SDFEC	RSFEC NOFEC
260SCX2	OTU4 (130G mode): AFEC, SDFEC OTU4x2 (260G mode): SDFEC	No OTN client support
11DPE12	EFEC2 RSFEC	No OTN client support
11DPE12A	EFEC RSFEC	No OTN client support
11DPE12E 11QPE24	EFEC EFEC2 RSFEC	No OTN client support
11OPE8	EFEC EFEC2 RSFEC	
11DPM12	EFEC EFEC2 RSFEC NOFEC	RSFEC NOFEC
11QPA4	EFEC RSFEC	RSFEC NOFEC
11QPEN4	EFEC EFEC2 RSFEC NOFEC	RSFEC NOFEC
11STAR1	EFEC RSFEC	RSFEC NOFEC

Table 22-79 FEC types for optical transponders (continued)

Card type	OTN line	OTN client
11STGE12	EFEC2 RSFEC	No OTN client support
11STMM10	EFEC2 RSFEC	RSFEC NOFEC
12P120	EFEC EFEC2 RSFEC No FEC	EFEC EFEC2 RSFEC No FEC
43SCA1	AFEC	RSFEC NOFEC
43SCX4 43SCX4E	AFEC	EFEC EFEC2 RSFEC NOFEC
43CGE1	AFEC	No OTN client support
43STA1P	UFEC	Not supported on OTN client
43STX4 43STX4P	AFEC	RSFEC NOFEC
4DPA2	No OTN signal support	No OTN client support
4DPA4	RSFEC NOFEC	No OTN client support
1UD200 (100G mode)	AFEC SDFEC	NA
1UD200 (200G mode)	SDFEC	NA
20P200	EFEC EFEC2 RSFEC No FEC	NA

Weight and power consumption

Weight and power consumption specifications

The following specifications apply to Alcatel-Lucent 1830 PSS with regard to weight and typical power consumption of the individual parts/circuit packs. The values for the worst case power consumption are roughly 20 % higher.

Table 22-80 Weight and power consumption for Alcatel-Lucent 1830 PSS

Pack	Description	Weight (kg)	Power Consumption (Watts)			
			Percent Utilization			Max
			0%	50%	100%[1]	
Common						
EC	Equipment Controller	0.7	28	28	28	43
32EC2	PSS-32 Equipment controller	0.7	36	36	36	50
8EC2	PSS-8 Equipment controller	0.43	28	28	28	35
USRPNL	User Panel (PSS-32)	0.3	6	6	6	6
	User Panel (PSS-16)	0.77	6	6	6	6
16UP2	User Panel (PSS-16II)	0.95	4.5	4.5	4.5	6
8UP	User Panel (PSS-8)	0.30	1.2	1.2	1.2	1.5
PFDC20	DC Power Filter (20A - PSS-32)	0.75	10	10	10	10
PFDC30	DC Power Filter (30A)	0.75	10	10	10	10
PFDC50	DC Power Filter (50A)	0.75	10	10	10	10
PFDC60	DC Power Filter (60A)	0.75	10	10	10	10
PFDC70	DC Power Filter (70A)	0.75	10	10	10	10
PFDCA	DC Power Filter (no circuit breaker and WT support)	0.69	10	10	10	10
PFDC20K	PSS-16 DC power Filter Managed (20A)	0.8	8	8	8	8
PFDC35K	PSS-16 DC power Filter Managed (35A)	0.8	8	8	8	8
FAN[2]	Fan Unit (PSS-32)	2.5	37	37	37	185
FAN32H	High Output Fan Unit (PSS-32)	3.0	78	78	78	255
FAN16	Fan Unit (PSS-16)	1.52	41	41	41	110
16FAN2	Fan Unit (PSS-16II)	0.6	120	120	120	460
8FAN	Fan Unit (PSS-8)	1.30	25	25	25	105

Table 22-80 Weight and power consumption for Alcatel-Lucent 1830 PSS (continued)

Pack	Description	Weight (kg)	Power Consumption (Watts)			
			Percent Utilization			Max
			0%	50%	100%[1]	
8DC30	PSS-8 power filter card - DC	0.60	12	12	12	18
8AC7	PSS-8 power filter card - AC (110 V range)	1.45	120	120	120	134
	PSS-8 power filter card - AC (220 V range)	1.45	80	80	80	93
16DC65	PSS-16II power filter card Note: The maximum current rating of the PSS-16II DC power filter (16DC65) is 63A.	0.7	10	10	10	15
Universal						
CWR8[3]	Colorless Wave Router - 44ch	2.9	23	23	23	45
CWR8[3] Optimum	Colorless Wave Router - 44ch	2.9	23	23	23	35
CWR8B[3]	Colorless Wave Router - 44ch	2.7	23	23	23	35
CWR8-88[3]	Colorless Wave Router - 44ch@50Ghz boundaries (frequencies for 88 channel operation w/CWR8)	3.01	21	21	21	40
WR2-88	2-channel wavelength router - optimized ROADM - 50GHz	1.64	16	18	18	37
WR8-88A[3]	8-channel wavelength router - add side WSS	3.01	23	28	28	30
WR8-88AF[3]	8-channel wavelength router - add side WSS Flex Grid	3.01	23	28	28	30
WR20-TF	WR20-TF - 1x20 Twin Flex WSS	4.01	40	40	40	57
WR20-TFM	WR20-TFM Twin 1x20 w/ MPO Connectors	4.01	40	40	40	57
PTPCTL	Precision Time Protocol Control card	0.62	24	24	24	33
PTPIO	Precision Time Protocol I/O card	22	4.5	4.5	4.5	7
AHPHG[4]	Adj High Power High Gain Optical Amp with mid-stage access (13 - 33 dB gain)	1.6	27	27	27	31

Table 22-80 Weight and power consumption for Alcatel-Lucent 1830 PSS (continued)

Pack	Description	Weight (kg)	Power Consumption (Watts)			
			Percent Utilization			Max
			0%	50%	100%[1]	
ALPHG[4]	Adj Low Power High Gain Optical Amp with mid-stage access (10 - 30 dB gain)	1.6	27	27	27	31
AHPLG[4]	Adj High Power Low Gain Optical Amp with mid-stage access (6 - 24 dB gain)	1.33	27	27	27	31
A2325A[4]	23dB Variable Gain Amplifier with mid-stage access	1.6	32	32	32	37
AM2125A	Medium Variable Gain Amplifier with mid-stage access	2.5	32	32	32	37
AM2125B	Medium Variable Gain Amplifier with no mid-stage access	1.4	32	32	32	37
AM2318A	Variable low gain amplifier with no mid-stage access	1.37	32	32	32	37
RA2P	Long Haul - 2 pump Raman, no mid-stage access	1.4	37	37	37	49
A2P2125	Hybrid RAMAN+EDFA amplifier See [6].	2.5	58	58	58	93
AM2625A	Variable High gain amplifier with no mid-stage access See [6].	1.5	58	74	90	100
AM2032A	Variable gain amplifier with no mid-stage access	1.5	58	63	65	75
AAR-8A	AAR-8A Amp Array 8-amps	1.5	30	30	30	44
ASWG	ASWG Amplifier, Switched Gain EDFA	1.6	45	45	45	70
A4PSWG	A4PSWG Hybrid Amp 4 RP + SG EDFA	3.2	75	75	75	126
D5X500	500G Muxponder/Uplink DP-8QAM	3.6	-	-	370	400
OSCT	Optical Supervisory Card Total Power	0.65	22	22	22	31
OTDR	OTDR for fiber characterization	1.34	5	5	5	29
OPSA	Optical Protection Switch	0.74	9	9	9	10

Table 22-80 Weight and power consumption for Alcatel-Lucent 1830 PSS (continued)

Pack	Description	Weight (kg)	Power Consumption (Watts)			
			Percent Utilization			Max
			0%	50%	100%[1]	
OPSB	Optical Protection Switch - enhanced, non-latching	0.74	10	10	10	13
4DPA4	MSC - 4G Dual Port Pluggable AnyRate (4 client)	0.68	17	21	21	23
4DPA2	MSC - 4G Dual Port Pluggable AnyRate (2 client)	0.55	20	20	20	21
11STAR1	10G Transponder	0.9	40	40	40	47
11STAR1A	10G Transponder, enhanced	0.9	29	29	29	48
11STMM10	10 x Any Transponder	1.5	100	105	109	127
11STGE12	12 x GbE, Tunable	1.9	49	60	60	66
11DPE12	11G Dual Port Pluggable GbE Mux (12 client) - similar to PSS-1 GBE		61	78	78	84
11DPE12E	11G Dual Port Pluggable GbE Mux (12 client) - enhanced	1.4	56	60	64	70
11DPE12A	11G Dual Port Pluggable GbE Mux (12 client) - enhanced, 2nd generation	1.24	56	58	61	75
11DPM12	11G Dual Port Pluggable 12-anyrate Mux OT	1.5	85	85	85	93
11QPA4	11G Quad Port Pluggable Anyrate (4 client)	1.24	71	75	75	81
11QPA4A	11G Quad Port Pluggable Anyrate (4 client)	1.25	71	75	75	85
11QPEN4	11G Quad Port Pluggable SAN Encryption	1.7	92	100	109	120
11QPE24	11G/10GE Quad Port 24 GE/FE Client Interface Card See [6].	2.06	67	87	107	116
11QCE12X	Carrier Ethernet MuxOT, 4x10GbE/OTU2e Lines, 12x1GbE Clients	1.85	67.6	86.5	102.2	115.9
11OPE8	Carrier Ethernet MuxOT, 8x10GbE/OTU2e Line & Clients	2.02	91	102	112	160

Table 22-80 Weight and power consumption for Alcatel-Lucent 1830 PSS (continued)

Pack	Description	Weight (kg)	Power Consumption (Watts)			
			Percent Utilization			Max
			0%	50%	100%[1]	
12P120	6x11G AnyRate Pluggable Transponder	-	40	70	105	140
43STX4	40G Single Port Tunable Mux - 44 channels (4 client) See [7]	3.0	122	129	136	153
43SCX4	40G Single Port Tunable Mux Coherent (4 clients) See [7]	3.4	146	160	174	240
43SCX4E	40G Single Port Tunable Mux Coherent (4 client), 2 slot See [6]	3.0	150	171	182	220
43STX4P	40G Single Port Tunable Mux - optimized for 88 channels, PDPSK (4 client) See [7]	3.0	160	160	160	160
43STA1P	40G single Port Tunable AnyRate (1 client) - optimized for 44 channels, PDPSK See [7]	3.4	100	100	100	100
43STA1PB	40G single Port Tunable AnyRate (1 client) - optimized for 44 channels, PDPSK See [7]	3.4	83	83	83	165
43SCA1	40G single Port Tunable AnyRate Coherent (1 client) - Add/Drop See [7]	3.3	150	150	150	221
11DPM8	11G 8xAny Add-Drop Optical Transponder	1.21	36.3	48.5	54.4	60.2
112SCA1	100G anyrate A/D, coherent See [7]	3.9	235	250	250	290

Table 22-80 Weight and power consumption for Alcatel-Lucent 1830 PSS (continued)

Pack	Description	Weight (kg)	Power Consumption (Watts)			
			Percent Utilization			Max
			0%	50%	100%[1]	
112SCX10	100G Single port tunable mux (10 universal clients), coherent See [7]	4.3	199	252	304	316
112SNX10	100G Single port tunable mux (10 universal clients), coherent, w/Enhanced OSNR for extended reach See [7]	4.3	199	252	304	316
112SNA1	112G Single Port Tunable Coherent AnyRate Transponder w/enhanced OSNR (1 client) for extended reach See [7]	3.75	235	250	250	290
112SDX11	112G Data Center Interconnect Ethernet Muxponder - 11 clients	3.5	50	86	110	130
130SCX10	130G Single Port Tunable Coherent Mux Transponder with SDFEC (10 clients) See [6]	3.28	247	263	273	300
130SNX10	100G Mux 10CL, Flex Coherent See [6]	3.28	247	263	273	310
130SNQ10	100G Mux 10CL, Flex Coherent See [6]	3.12	252	257	263	290
130SCA1	130G Single Port Tunable Coherent AnyRate Transponder (1 client) See [6]	3.5	235	250	250	290
260SCX2	2x100G Transponder/Muxponder card See [6]	3.3	181	223	241	286
1UD200	100/200G Uplink Dist OTN Switch	2.6	83	165	208	231
20P200	20x10G Multirate I/O Module	1.6	87	104	131	170
SVAC	Single Port Variable Attenuator	0.6	22	22	22	28
MVAC	Multiple Variable Attenuator Card Keyed	0.64	21	23	25	28

Table 22-80 Weight and power consumption for Alcatel-Lucent 1830 PSS (continued)

Pack	Description	Weight (kg)	Power Consumption (Watts)			
			Percent Utilization			Max
			0%	50%	100%[1]	
MVAC8B	8-Port Bidirectional Variable Attenuator Card	1.2	27	29	30	32
SFC2x	Static Filter CWDM 2 Channel (A-D Variants)	0.15	0.2	0.2	0.2	0.2
SFC4x	Static Filter CWDM 4 Channel (A&B Variants)	0.63	0.2	0.2	0.2	0.2
SFC8	Static Filter CWDM 8 Channel	1.1	0.2	0.2	0.2	0.2
SFD5x	Static Filter DWDM 4 Channel (A-H Variants)	0.67	0.2	0.2	0.2	0.2
SFD8x	Static Filter DWDM 8 Channel (A-D Variants)	1.2	0.2	0.2	0.2	0.2
ITLB	88 Channel Interleaver	0.79	0	0	0	0
ITLU	88 Channel Interleaver (unidirectional)	0.79	0	0	0	0
MESH4	1x4 Splitter card with optical amplifier	1.37	35	35	35	50
MSH8-FSM	MSH8-FSM Mesh 8-deg Fiber Shuffle	3.39	0	0	0	0
MCS8-16	MCS8-16 MultiCastSwitch 8-deg 16-ports	1.95	30	30	30	30
WTOCM	Wavelength Tracker optical channel monitor	0.78	23	23	23	28
WTOCMA	Wavelength Tracker optical channel monitor supporting OSNR measurement	0.78	21	21	21	28
WTOCM-F	WTOCM-F - WTOCM w/ Flex Capability	0.73	15	15	15	18
MON-OCM	Optical channel monitor	0.61	1	1	1	1
IROADMF	Integrated ROADM card - Fixed	1.90	24	66	71	72
IROADMV	Integrated ROADM card - Variable	1.90	24	46	71	72
Rack Mount						
DMSMF010	DCM010 - 10km DCM	1.25	0.2	0.2	0.2	0.2
DMSMF020	DCM020 - 20km DCM	1.35	0.2	0.2	0.2	0.2
DMSMF030	DCM030 - 30km DCM	1.45	0.2	0.2	0.2	0.2

Table 22-80 Weight and power consumption for Alcatel-Lucent 1830 PSS (continued)

Pack	Description	Weight (kg)	Power Consumption (Watts)			
			Percent Utilization			Max
			0%	50%	100%[1]	
DMSMF040	DCM040 - 40km DCM	1.54	0.2	0.2	0.2	0.2
DMSMF050	DCM050 - 50km DCM	195	0.2	0.2	0.2	0.2
DMSMF060	DCM060 - 60km DCM	2.06	0.2	0.2	0.2	0.2
DMSMF070	DCM070 - 70km DCM	2.16	0.2	0.2	0.2	0.2
DMSMF080	DCM080 - 80km DCM	2.25	0.2	0.2	0.2	0.2
DMSMF090	DCM090 - 90km DCM	2.5	0.2	0.2	0.2	0.2
DMSMF100	DCM100 - 100km DCM	3.0	0.2	0.2	0.2	0.2
DMSMF110	DCM110 - 110km DCM	3.1	0.2	0.2	0.2	0.2
DMSMF120	DCM120 - 120km DCM	3.2	0.2	0.2	0.2	0.2
DMSMF130	DCM130 - 130km DCM	3.3	0.2	0.2	0.2	0.2
DMSMF140	DCM140 - 140km DCM	3.4	0.2	0.2	0.2	0.2
DMTWR020	DCM - TWRS 20 km	1.3	0.2	0.2	0.2	0.2
DMTWR040	DCM - TWRS 40 km	1.3	0.2	0.2	0.2	0.2
DMTWR060	DCM - TWRS 60 km	1.4	0.2	0.2	0.2	0.2
DMTWR080	DCM - TWRS 80 km	1.4	0.2	0.2	0.2	0.2
DMTWR100	DCM - TWRS 100 km	1.4	0.2	0.2	0.2	0.2
DMTWR120	DCM - TWRS 120 km	1.4	0.2	0.2	0.2	0.2
DMLEF020	DCM - ELEAF 20 km	1.7	0.2	0.2	0.2	0.2
DMLEF040	DCM - ELEAF 40 km	1.7	0.2	0.2	0.2	0.2
DMLEF060	DCM - ELEAF 60 km	1.8	0.2	0.2	0.2	0.2
DMLEF080	DCM - ELEAF 80 km	2.0	0.2	0.2	0.2	0.2
DMLEF100	DCM - ELEAF 100 km	2.0	0.2	0.2	0.2	0.2
DMLEF120	DCM - ELEAF 120 km	2.0	0.2	0.2	0.2	0.2
DMBSM010 - DMBSM120	DCM - Fiber Bragg SMF 10 km - 120km (increments of 10km)	1.2	0.2	0.2	0.2	0.2
DMBSM140 - DMBSM240	DCM - Fiber Bragg SMF 140 km - 240km (increments of 20km)	2.3	0.2	0.2	0.2	0.2
DMBLE040 - DMBLE240	DCM - Fiber Bragg ELEAF 40 km - 240 km (increments of 20km)	1.2	0.2	0.2	0.2	0.2

Table 22-80 Weight and power consumption for Alcatel-Lucent 1830 PSS (continued)

Pack	Description	Weight (kg)	Power Consumption (Watts)			
			Percent Utilization			Max
			0%	50%	100%[1]	
RA3P	External Raman Amplifier[5]	5.7	55	55	55	55
PB1	External Power Booster Amplifier[5]	5.7	55	55	55	55
SFD44	Static filter - 44 channel	2.14	0.2	0.2	0.2	0.2
SFD44B	Static filter - 44 channel @ 50 GHz offset	2.4	0.2	0.2	0.2	0.2
SFD40	Static filter - 40 channel Mux/Demux	3.5	23	23	23	23
SFD40B	Static filter - 40 channel Mux/Demux @ 50 GHz offset	3.5	23	23	23	23
PTMs						
SFP		0.2	0.9	0.9	0.9	1.1
XFP-MM		0.2	1.0	1.0	1.0	2.5
XFP-SR1		0.2	1.9	1.9	1.9	2.5
XFP-IR2		0.2	3.1	3.1	3.1	3.5
XFP-LR2		0.2	3.2	3.2	3.2	3.5
XFP-CWDM SH		0.2	2.5	2.5	2.5	3.5
XFP-CWDM LH		0.2	2.8	2.8	2.8	3.5
XFP-DWDM		0.2	3.5	3.5	3.5	3.5
XFP-Tunable		0.2	3.0	3.0	3.0	3.5
VOAs						
fVOA		0.2	0.8	0.8	0.8	0.8
sVOA		0.2	0.8	0.8	0.8	0.8

Notes:

1. Represents “typical” power consumption @ 25° Centigrade.
2. Fan power starts to increase when the ambient temperature rises past 30°C and reaches its MAX at approximately 44°C. During system startup or when an EC has been replaced, the Fan will operate at MAX power until the EC has completed its startup procedures.
3. The MAX power will decrease by 5 W after an initial 3-minute startup period.
4. MAX value decreases by 10 W after initial 3-minute startup period.
5. See the Alcatel-Lucent 1830 Photonic Service Switch (PSS) Raman Amplifier and Erbium Doped Fiber Amplifier (EDFA) User Guide for details.

6. This is a two-slot wide card.
7. This is a three-slot wide card.

For the fields marked with “n.a.”, data was not available on the issue date.

Power planning

The following section provides power consumption values for Alcatel-Lucent 1830 PSS-32 shelf under various configurations.

Table 22-81 Power consumption values for PSS-32 under different configurations

System configuration	Power consumption		Total	W/Gb/s
	Common parts	I/O Cards		
PSS32 shelf w/16 11DPM12	119	1344	1463	
PSS32 shelf w/16 11QPA4	119	1200	1319	1.86
PSS32 shelf w/8 130SCX10	119	2400	2519	2.85
PSS32 shelf w/8 43SCX4E	119	1456	1575	4.45
PSS32 with 4 WR8-88 and 8 AM2125A	119	368	487	0.04

WDM channel plan

DWDM channels

The following table describes the standard channels of the ITU DWDM C-Band spaced at 100 GHz intervals.

Table 22-82 DWDM wavelengths (100 GHz spacing)

DWDM (C-Band)			
ITU Channel	**PSS-1830 channel**	**Frequency (GHz)**	**Wavelength (nm)**
17	9170	191700	1563.86
18	9180	191800	1563.05
19	9190	191900	1562.23
20	9200	192000	1561.42
21	9210	192100	1560.61
22	9220	192200	1559.79
23	9230	192300	1558.98
24	9240	192400	1558.17
25	9250	192500	1557.36
26	9260	192600	1556.56
27	9270	192700	1555.75
28	9280	192800	1554.94
29	9290	192900	1554.13
30	9300	193000	1553.33
31	9310	193100	1552.52
32	9320	193200	1551.72
33	9330	193300	1550.92
34	9340	193400	1550.12
35	9350	193500	1549.32
36	9360	193600	1548.52
37	9370	193700	1547.72
38	9380	193800	1546.92
39	9390	193900	1546.12
40	9400	194000	1545.32
41	9410	194100	1544.53

Table 22-82 DWDM wavelengths (100 GHz spacing) (continued)

DWDM (C-Band)			
ITU Channel	**PSS-1830 channel**	**Frequency (GHz)**	**Wavelength (nm)**
42	9420	194200	1543.73
43	9430	194300	1542.94
44	9440	194400	1542.14
45	9450	194500	1541.35
46	9460	194600	1540.56
47	9470	194700	1539.77
48	9480	194800	1538.98
49	9490	194900	1538.19
50	9500	195000	1537.4
51	9510	195100	1536.61
52	9520	195200	1535.82
53	9530	195300	1535.04
54	9540	195400	1534.25
55	9550	195500	1533.47
56	9560	195600	1532.68
57	9570	195700	1531.9
58	9580	195800	1531.12
59	9590	195900	1530.33
60	9600	196000	1529.55

The following table describes the standard channels of the ITU DWDM C-Band spaced at 50 GHz (0.05 THz) intervals.

Table 22-83 DWDM wavelengths (50 GHz spacing)

Chan. #	Freq. (THz)	λ (nm)	Chan. #[1]	Freq. (THz)[2]	λ (nm)	Chan. #	Freq. (THz)	λ (nm)	Chan. #[1]	Freq. (THz)[2]	λ (nm)
9170	191.7	1563.863	**9175**	191.75	1563.455	**9180**	191.8	1563.047	**9185**	191.85	1562.64
9190	191.9	1562.233	**9195**	191.95	1561.826	**9200**	192.0	1561.419	**9205**	192.05	1561.013
9210	192.1	1560.606	**9215**	192.15	1560.200	**9220**	192.2	1559.794	**9225**	192.25	1559.389
9230	192.3	1558.983	**9235**	192.35	1558.578	**9240**	192.4	1558.173	**9245**	192.45	1557.768
9250	192.5	1557.363	**9255**	192.55	1556.959	**9260**	192.6	1556.555	**9265**	192.65	1556.151
9270	192.7	1555.747	**9275**	192.75	1555.343	**9280**	192.8	1554.94	**9285**	192.85	1554.537
9290	192.9	1554.134	**9295**	192.95	1553.731	**9300**	193.0	1553.329	**9305**	193.05	1552.926
9310	193.1	1552.524	**9315**	193.15	1552.122	**9320**	193.2	1551.721	**9325**	193.25	1551.319
9330	193.3	1550.918	**9335**	193.35	1550.517	**9340**	193.4	1550.116	**9345**	193.45	1549.715
9350	193.5	1549.315	**9355**	193.55	1548.915	**9360**	193.6	1548.515	**9365**	193.65[2]	1548.115
9370	193.7	1547.715	**9375**	193.75	1547.316	**9380**	193.8	1546.917	**9385**	193.85	1546.518
9390	193.9	1546.119	**9395**	193.95	1545.72	**9400**	194.0	1545.322	**9405**	194.05	1544.924
9410	194.1	1554.526	**9415**	194.15	1544.128	**9420**	194.2	1543.73	**9425**	194.25	1543.333
9430	194.3	1542.936	**9435**	194.35	1542.539	**9440**	194.4	1542.142	**9445**	194.45	1541.746
9450	194.5	1541.349	**9455**	194.55	1540.953	**9460**	194.6	1540.557	**9465**	194.65	1540.162
9470	194.7	1539.766	**9475**	194.75	1539.371	**9480**	194.8	1538.976	**9485**	194.85	1538.581
9490	194.9	1538.186	**9495**	194.95	1537.792	**9500**	195.0	1537.397	**9505**	195.05	1537.003
9510	195.1	1536.609	**9515**	195.15	1536.216	**9520**	195.2	1535.822	**9525**	195.25	1535.429
9530	195.3	1535.036	**9535**	195.35	1534.643	**9540**	195.4	1534.25	**9545**	195.45	1533.858
9550	195.5	1533.465	**9555**	195.55	1533.073	**9560**	195.6	1532.681	**9565**	195.65	1532.29
9570	195.7	1531.898	**9575**	195.75	1531.507	**9580**	195.8	1531.116	**9585**	195.85	1530.725
9590	195.9	1530.334	**9595**	195.95	1529.944	**9600**	196.0	1529.553	**9605**	196.05	1529.163

Notes:

1. 50 GHz “offset” frequency for the odd channels: Support for this frequency requires SFD44B and ITLB to interlace with the frequencies from SFD44.
2. The odd channels offset 50 GHz from standard 100 GHz-spaced ITU channels cannot be added unless the signal has passed through an ITLB or a 50 GHz WSS. Adjacent 40G signals cannot be added directly to the WSS colorless ports. See the *Alcatel-Lucent 1830 Photonic Service Switch (PSS) Release 8.2 User Provisioning Guide* for full configuration and implementation details.

CWDM channels

Table 22-84 CWDM wavelengths

CWDM		
ITU Channel	**Frequency (GHz)**	**Wavelength (nm)**
1471	204100	1470
1491	201300	1490
1511	198700	1510
1531	195300	1530
1551	195500	1550
1571	191100	1570
1591	188700	1590
1611	188300	1610

Amplifier (LD) specifications

WDM amplifiers

The following table contains basic specifications for Alcatel-Lucent 1830 PSS WDM amplifiers. The other tables in this section provide detailed specifications for RA2P, A2P2125A, AM2125A, and AM2318A.

Table 22-85 WDM amplifier specifications

APN	Acronym	Type	Gain (dB)	Min Input Power (dBm)	Max Input Power (dBm)	Max Output Power (dBm)	EDFA Max Flat Gain (dB)
8DG60567AA	RA2P	RAMAN	Refer to Table 22-86, "RA2P RAMAN amplifier detailed specifications" (p. 22-122) for detailed specifications.				
			10 SSMF[1] 12 ELEAF[1] 14 TWRS[1]	−32	0	0 + Fiber Gain	NA
8DG60566AA	AM2125A	EDFA	Refer to Table 22-87, "AM2125A EDFA amplifier detailed specifications" (p. 22-124) for detailed specifications.				
			15–31	−35	+6	+21.5	25
8DG60912AA	AM2125B	EDFA	15–31	−35	+6	+21.5	25
8DG60565AA	AM2318A	EDFA	Refer to Table 22-88, "AM2318A EDFA amplifier detailed specifications" (p. 22-126) for detailed specifications.				
			7–24	−28	+15.5	+22.5	18
8DG59244AA	ALPHG	EDFA	10–30	−30	+7	+17	23

Table 22-85 WDM amplifier specifications (continued)

APN	Acronym	Type	Gain (dB)	Min Input Power (dBm)	Max Input Power (dBm)	Max Output Power (dBm)	EDFA Max Flat Gain (dB)
8DG59245AA 8DG59245AB See [2]	AHPHG	EDFA	13–33	−30	+7	For planning purposes, the maximum operating signal power is 20.0 dBm and the maximum power emitted from the interface is limited to 20.5 dBm.	26
8DG59945AA 8DG59945AB See [2]	AHPLG	EDFA	6–24	−24	+7	For planning purposes, the maximum operating signal power is 20.0 dBm and the maximum power emitted from the interface is limited to 20.5 dBm.	17
8DG60242AA 8DG60242ABSee [2]	A2325A	EDFA	16–32	−33	+7	+23	25

Table 22-85 WDM amplifier specifications (continued)

APN	Acronym	Type	Gain (dB)	Min Input Power (dBm)	Max Input Power (dBm)	Max Output Power (dBm)	EDFA Max Flat Gain (dB)
8DG61230AA	A2P2125	Hybrid Amp					
		RAMAN	Refer to Table 22-86, "RA2P RAMAN amplifier detailed specifications" (p. 22-122) for detailed specifications.				
			10 SSMF[1] 14 ELEAF[1] 16 TWRS[1]	−32	0	0 + Fiber Gain	
		EDFA	Refer to Table 22-87, "AM2125A EDFA amplifier detailed specifications" (p. 22-124) for detailed specifications.				
			15–31	−35	+6	+21.5	25
3KC13447AA	AM2625A	EDFA	16–30	−30	+10	26	25
3KC13202AA	AM2032A	EDFA	26–40	−37	−6	20	32
8DG60568AA	MESH4	EDFA	7– 24	−27	+17	+17	18

Notes:

1. Average
2. Bidirectional Amplifiers Variants with OSC SFPs extruded on the faceplate

RA2P amplifier

The RA2P amplifier uses LC connectors.

The following table applies to the RA2P RAMAN amplifier and the RAMAN part of the A2P2125 hybrid amplifier.

Table 22-86 RA2P RAMAN amplifier detailed specifications

Parameter	Conditions	Min	Max
Signal wavelength range	1529.2 nm and 1565.1 nm are the 1st and 91st channels with 100 GHz guard band on either side.	1528.4 nm	1565.9 nm
Supervisory wavelength range		1500 nm	1520 nm
Optical damage threshold	At all optical ports	30 dBm	

Table 22-86 RA2P RAMAN amplifier detailed specifications (continued)

Parameter	Conditions	Min	Max
RAMAN pump center wavelengths	Pump 1	1423 nm	1429 nm
	Pump 2	1452 nm	1458 nm
Maximum available pump power per wavelength at port 1 (Pmax)	Measured using a wide area detector at Port 1. Applies to both pumps. Must be SBS-free within full operating power range in all fiber types.		
	bol	340 mW	
	eol	320 mW	
Minimum stable pump power per wavelength at port 1	Pump power levels will stay at the minimum pump power even if a target gain/tilt requires lower power. In this case, one of the pumps will stay at the stable power level while the second pump adjusts to maintain target tilt. Hence, target gain will not be achieved.		65 mW
Input signal power range (Pumps off)[1]	Applies to all fiber types.	−32 dBm	0 dBm
Signal gain (Gmax), in MP mode, 0 dB target tilt[2]	SSMF	10 dB	
	eLEAF	12 dB	
	TWRS	14 dB	
Gain accuracy (between set, measured and reported)	The following assumes the RAMAN pumps are turned on in the presence of incoming C-band signal, a connector mating loss of <0.5 dB and some nominal deviation in the Raman gain coefficient of the transmission fiber from that used during factory calibration. When there is sufficient pump power to achieve the set gain. Gain accuracy between set gain, actual gain and reported gain at ambient temperature and bol.	−0.5 dB	0.5 dB
Gain tilt range	Software programmable. Total gain will be modified if one or both pumps are at their maximum or minimum power so that gain tilt is maintained.	−3 dB	3 dB
Gain tilt accuracy	The gain tilt is defined as the peak-to-peak gain variation of a least-square-fitted line of the output channel power levels over the full signal band.	−0.5 dB	0.5 dB

Table 22-86 RA2P RAMAN amplifier detailed specifications (continued)

Parameter	Conditions	Min	Max
Gain variation at 0 dB tilt setting	Defined as the peak-to-peak difference from a least-square-fitted line of the gain spectrum. Applies to MP mode input power of -3 dBm before Raman gain.		
	SSMF		1 dB
	eLEAF		0.8 dB
	TWRS		1 dB
Gain variation at ±3 dB tilt setting	Defined as the peak-to-peak difference from a least-square-fitted line of the gain spectrum. Applies to MP mode and input power of −3 dBm before Raman gain.		
	SSMF		2 dB
	eLEAF		1.8 dB
	TWRS		2 dB
Noise figure at 0 dB tilt setting[2]			−1 dB

Notes:

1. Input powers are given for pumps turned off and output powers are given for pumps turned on.
2. These values are averages and show what gain might be obtained under favorable fiber span conditions. The actual gain can be set over a range, both to lower and higher values than what is shown in the table. However, the actual ranges depend on the quality of the fiber span.

AM2125A amplifier

The AM2125A amplifier uses LC connectors.

The following table applies to the AM2125A EDFA amplifier and the EDFA part of the A2P2125 hybrid amplifier.

Table 22-87 AM2125A EDFA amplifier detailed specifications

Parameter	Conditions	Min	Max
Signal wavelength range	1529.2 nm and 1565.1 nm are the 1st and 91st channels with 100 GHz guard band on either side.	1528.4 nm	1565.9 nm
Supervisory wavelength range		1500 nm	1520 nm

Table 22-87 AM2125A EDFA amplifier detailed specifications (continued)

Parameter	Conditions	Min	Max
Optical damage threshold	At all optical ports	26 dBm	
Total input signal power range minimum (Input LOS threshold settable range)		−35 dBm	6 dBm
Signal gain	Under Software Control in 0.1 dB steps	15 dB	31 dB
Gain accuracy	Defined as deviation of total output signal gain from nominal set gain.	−0.5 dB	0.5 dB
Gain tilt set range		−4 dB	4 dB
Gain tilt accuracy	Gain tilt is defined as the gain variation of a least-square-fitted line of the output channel power levels over the full signal band.	−0.4 dB	0.4 dB
Gain variation at nominal gain tilt (within 15–25 dB gain range)	Defined as the peak-to-peak gain difference. At the nominal gain tilt of −1.0 dB, the gain variation is at its smallest.		0.8 dB
Gain variation at ±4 dB Tilt (within 15–25 dB gain range)			1.8 dB
Gain variation at extended gain range (within 25–31 dB)			1.8 dB
Gain tilt at extended gain range	28 dB	−3.2 dB	
	31 dB	−5.3 dB	
Noise figure at 24-25 dB gain			5.3 dB
Noise figure at 22 dB gain			5.4 dB
Noise figure at 20 dB gain			5.7 dB
Noise figure at 18 dB gain			6.2 dB
Noise figure at 16 dB gain			6.9 dB

Table 22-87 AM2125A EDFA amplifier detailed specifications (continued)

Parameter	Conditions	Min	Max
Noise figure at 14 dB gain			8.1 dB
Noise figure at 28 dB gain			5.2 dB
Noise figure at 31 dB Gain			5.2 dB
Output VOA loss range		18 dB	

AM2318A amplifier

The AM2318A amplifier uses LC connectors.

The following table applies to the AM2318A EDFA amplifier.

Table 22-88 AM2318A EDFA amplifier detailed specifications

Parameter	Conditions	Min	Max
Signal wavelength range	1529.2 nm and 1565.1 nm are the 1st and 91st channels with 100 GHz guard band on either side.	1528.4 nm	1565.9 nm
Supervisory wavelength range		1500 nm	1520 nm
Optical damage threshold	At all optical ports	26 dBm	
Total input signal power range minimum (Input LOS threshold settable range)		−28 dBm	15.5dBm
Signal gain	Under Software Control in 0.1 dB steps	7 dB	24 dB
Gain accuracy	Defined as deviation of total output signal gain from nominal set gain.	−0.5	0.5 dB
Gain tilt set range		−4 dB	4 dB
Gain tilt accuracy	Gain tilt is defined as the gain variation of a least-square-fitted line of the output channel power levels over the full signal band.	−0.4 dB	0.4 dB

Table 22-88 AM2318A EDFA amplifier detailed specifications (continued)

Parameter	Conditions	Min	Max
Gain variation at nominal gain tilt (within 7–18 dB gain range)	Defined as the peak-to-peak gain difference. At the nominal gain tilt of −0.5 dB, the gain variation is at its smallest.		0.6 dB
Gain variation at ±4 dB Tilt (within 7–18 dB gain range)			1.5 dB
Gain variation at extended gain range (within 18–24 dB)			1.5 dB
Gain tilt at extended gain range	21 dB	−3.2 dB	
	24 dB	−5.3 dB	
Noise figure at 18 dB gain			6 dB
Noise figure at 16 dB gain			6.5 dB
Noise figure at 14 dB gain			7.5 dB
Noise figure at 12 dB gain			8.9 dB
Noise figure at 10 dB gain			10.8 dB
Noise figure at 8 dB gain			13.1 dB
Noise figure at 7 dB gain			14.5 dB
Noise figure at 21 dB Gain			5.7 dB
Noise figure at 24 dB Gain			5.5 dB
Output VOA loss range		18 dB	

Supported LD combinations for OADM and ILA configurations

Valid LD combinations

The following tables summarize the LD combinations supported on an optical line for each node type. Note that each LD pair need not be in the same shelf. Also note the following:

- An egress unidirectional LD is required when an ingress unidirectional LD is used (except for ILAs).
- Cascaded LDs are not supported.
- Mixing unidirectional and bidirectional LDs on the same optical line is not supported. However they may be on different optical lines on the same node.
- High power amps (A2325A, A2P2125, AM2125A, AM2125B, AM2318A) cannot be used in the ingress position on a FOADM
- RA2Ps and LDs on the same optical line are not required to be on the same shelf. Although this is the most common configuration
- "WTOCM support" includes both WTOCM and WTOCMA cards.

For 1830 PSS-32 TOADM the following combinations support use of the WTOCM and support both Auto and Manual power management.

Table 22-89 1830 PSS-32 TOADM valid LD combinations

Raman Amp/EDFA Booster	Ingress LD	Egress LD	CWR
None	A2325A	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8/CWR8-88
None	AHPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8/CWR8-88
None	AHPLG	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8/CWR8-88
None	ALPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8
None	AM2125A	AM2125A, AM2318A	CWR8/CWR8-88
None	AM2125B	AM2125B, AM2318A	CWR8/CWR8-88

Table 22-89 1830 PSS-32 TOADM valid LD combinations (continued)

Raman Amp/EDFA Booster	Ingress LD	Egress LD	CWR
None	AM2318A	A2325A, AM2125B, AM2318A	CWR8/CWR8-88
RA3P	A2325A	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8/CWR8-88
RA3P	AHPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8/CWR8-88
RA3P	AHPLG	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8/CWR8-88
RA3P	ALPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8
RA3P+PB1	A2325A	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8/CWR8-88
RA3P+PB1	AHPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8/CWR8-88
RA3P+PB1	AHPLG	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8/CWR8-88
RA3P+PB1	ALPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	CWR8
RA2P	A2325A	A2325A, AHPHG, AHPLG, or None	CWR8/CWR8-88
RA2P	AHPHG	A2325A, AHPHG, AHPLG, or None	CWR8/CWR8-88
RA2P	AHPLG	A2325A, AHPHG, AHPLG, or None	CWR8/CWR8-88
RA2P	AM2125A	AM2125A, AM2318A	CWR8/CWR8-88
RA2P	AM2125B	AM2125B, AM2318A	CWR8/CWR8-88

Table 22-89 1830 PSS-32 TOADM valid LD combinations (continued)

Raman Amp/EDFA Booster	Ingress LD	Egress LD	CWR
RA2P	AM2318A	AM2125A, AM2125B AM2318A	CWR8/CWR8-88
RA2P+PB1	A2325A	A2325A, AHPHG, AHPLG	CWR8/CWR8-88
RA2P+PB1	AHPHG	A2325A, AHPHG, AHPLG	CWR8/CWR8-88
RA2P+PB1	AHPLG	A2325A, AHPHG, AHPLG	CWR8/CWR8-88
RA2P+PB1	AM2125A	AM2125A, AM2318A	CWR8/CWR8-88
RA2P+PB1	AM2125B	AM2125B, AM2318A	CWR8/CWR8-88
RA2P+PB1	AM2318A	A2325A, AM2125B, AM2318A	CWR8/CWR8-88

For 1830 PSS-32 and 1830 PSS-16 ROADM all of the following combinations can use WR2-88 or WR8-88A(F), and support use of the WTOCM and both Auto and Manual power management.

Table 22-90 1830 PSS-32 and 1830 PSS-16 ROADM valid LD combinations

Raman Amp/EDFA Booster	Ingress LD	Egress LD
None	A2325A	A2325A, AHPHG, AHPLG, ALPHG, or None
None	A2P2125	AM2125A, AM2125B, AM2318A
None	AHPHG	A2325A, AHPHG, AHPLG, ALPHG, or None
None	AHPLG	A2325A, AHPHG, AHPLG, ALPHG, or None
None	AM2032A	AM2625A
None	AM2125A	AM2125A, AM2318A
None	AM2125B	AM2125B, AM2318A

Table 22-90 1830 PSS-32 and 1830 PSS-16 ROADM valid LD combinations (continued)

Raman Amp/EDFA Booster	Ingress LD	Egress LD
None	AM2318A	AM2125A, AM2125B, AM2318A
RA3P	A2325A	A2325A, AHPHG, AHPLG, ALPHG, or None
RA3P	AHPHG	A2325A, AHPHG, AHPLG, ALPHG, or None
RA3P	AHPLG	A2325A, AHPHG, AHPLG, ALPHG, or None
RA3P+PB1	A2325A	A2325A, AHPHG, AHPLG
RA3P+PB1	AHPHG	A2325A, AHPHG, AHPLG
RA3P+PB1	AHPLG	A2325A, AHPHG, AHPLG
RA2P	A2325A	A2325A, AHPHG, AHPLG, or None
RA2P	AHPHG	A2325A, AHPHG, AHPLG, or None
RA2P	AHPLG	A2325A, AHPHG, AHPLG, or None
RA2P	AM2032A	AM2625A
RA2P	AM2125A	AM2125A, AM2318A
RA2P	AM2125B	AM2125B, AM2318A
RA2P	AM2318A	AM2125A, AM2125B AM2318A
RA2P+PB1	A2325A	A2325A, AHPHG, AHPLG
RA2P+PB1	AHPHG	A2325A, AHPHG, AHPLG
RA2P+PB1	AHPLG	A2325A, AHPHG, AHPLG
RA2P+PB1	AM2125A	AM2125A, AM2318A
RA2P+PB1	AM2125B	AM2125B, AM2318A
RA2P+PB1	AM2318A	AM2125A, AM2125B AM2318A

Table 22-91 1830 PSS-32 and 1830 PSS-16 DFOADM valid LD combinations

Raman Amp/EDFA Booster	Ingress LD	Egress LD	Power Management Support	WTOCM Support
None	None	None	Manual	N
None	AHPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	D1: Auto & Manual D2+: Manual	Y
None	AHPLG	A2325A, AHPHG, AHPLG, ALPHG, or None	D1: Auto & Manual D2+: Manual	Y
None	ALPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	D1: Auto & Manual D2+: Manual	Y
None	OSCT	None	Manual	N
None	AM2032A	AM2625A	D1: Auto & Manual D2+: Manual	Y
RA3P	AHPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	D1: Auto & Manual D2+: Manual	Y
RA3P	AHPLG	A2325A, AHPHG, AHPLG, ALPHG, or None	D1: Auto & Manual D2+: Manual	Y
RA3P	ALPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	D1: Auto & Manual D2+: Manual	Y

Table 22-91 1830 PSS-32 and 1830 PSS-16 DFOADM valid LD combinations (continued)

Raman Amp/EDFA Booster	Ingress LD	Egress LD	Power Management Support	WTOCM Support
RA3P+PB1	AHPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	D1: Auto & Manual D2+: Manual	Y
RA3P+PB1	AHPLG	A2325A, AHPHG, AHPLG, ALPHG, or None	D1: Auto & Manual D2+: Manual	Y
RA3P+PB1	ALPHG	A2325A, AHPHG, AHPLG, ALPHG, or None	D1: Auto & Manual D2+: Manual	Y
RA2P	AHPHG	A2325A, AHPHG, AHPLG, or None	D1: Auto & Manual D2+: Manual	Y
RA2P	AHPLG	A2325A, AHPHG, AHPLG, or None	D1: Auto & Manual D2+: Manual	Y
RA2P	AM2032A	AM2625A	D1: Auto & Manual D2+: Manual	Y
RA2P+PB1	AHPHG	A2325A, AHPHG, AHPLG	D1: Auto & Manual D2+: Manual	Y
RA2P+PB1	AHPLG	A2325A, AHPHG, AHPLG	D1: Auto & Manual D2+: Manual	Y

Table 22-92 1830 PSS-32 and 1830 PSS-16 ILA valid LD combinations

Raman Amp/EDFA Booster	Ingress LD	Egress LD
None	A2325A	None
None	A2P2125	None
None	AHPHG	None
None	AHPLG	None
None	AM2032A	None
None	AM2125A	None
None	AM2125B	None
None	AM2318A	None
None	AM2625A	None
RA3P	A2325A	None
RA3P	AHPHG	None
RA3P	AHPLG	None
RA3P+PB1	A2325A	None
RA3P+PB1	AHPHG	None
RA3P+PB1	AHPLG	None
RA2P	A2325A	None
RA2P	AHPHG	None
RA2P	AHPLG	None
RA2P	AM2032A	None
RA2P	AM2125A	None
RA2P	AM2125B	None
RA2P	AM2318A	None
RA2P	AM2625A	None
RA2P+PB1	A2325A	None
RA2P+PB1	AHPHG	None
RA2P+PB1	AHPLG	None

Table 22-92 1830 PSS-32 and 1830 PSS-16 ILA valid LD combinations (continued)

Raman Amp/EDFA Booster	Ingress LD	Egress LD
RA2P+PB1	AM2032A	None
RA2P+PB1	AM2125A	None
RA2P+PB1	AM2125B	None
RA2P+PB1	AM2318A	None
RA2P+PB1	AM2625A	None

Note: All the above 1830 PSS-32 and PSS-16 ILA combinations support use of the WTOCM, and support both Auto and Manual power management.

Interleaver specifications

ITLU

The 50GHz-100GHz channel spacing optical single interleaver module (ITLU) is a three-port device. Its function is to separate 88 channels with 50 GHz spacing from the common port into two groups of 44 interleaved channels with 100 GHz spacing at the output Even and Odd ports; or combine two groups of 44 interleaved channels with 100 GHz spacing at Even and Odd port into 88 channels with 50 GHz spacing at Common port.

Optical specifications

Table 22-93 ITLU optical specifications

Parameter	Conditions	Specification
Wavelength range		1529.163 nm to 1563.863 nm
Center wavelength	See Definitions. Measure in vacuum.	Table 22-94, “Wavelength allocations and fiber designations” (p. 22-137)
Insertion loss (IL)	Measure between Common port – Even port, Common port – Odd port, (include LC connectors)	1.0 dB IL 2.3 dB
Insertion loss uniformity	Measure at the clear channel bandwidth over all 44 channels.	< 0.6 dB
Ripple	Measure at the clear channel bandwidth.	< 0.5 dB
0.5 dB bandwidth	Net filter bandwidth around the ITU	> 30 GHz
3.0 dB bandwidth		> 40 GHz
Total adjacent crosstalk	At 20 GHz from center of ITU wavelength.	6 dB
	At 15 GHz from center of ITU wavelength.	15 dB
	At 10 GHz from center of ITU wavelength.	17 dB
Operating local temperature		−5°C to 70°C
Fiber and connectors		SM and LC connectors
Power tolerance		22 dBm
Clear channel Bandwidth		20 GHz centered at ITU

Wavelengths

Table 22-94 Wavelength allocations and fiber designations

50 GHz Spacing Label			Common	
100 GHz Spacing Label			Even	Odd
Channel	Frequency (THz)	Wavelength (nm)		
1	196.050	1529.163		X
2	196.000	1529.553	X	
3	195.950	1529.944		X
4	195.900	1530.334	X	
5	195.850	1530.725		X
6	195.800	1531.116	X	
7	195.750	1531.507		X
8	195.700	1531.898	X	
9	195.650	1532.290		X
10	195.600	1532.681	X	
11	195.550	1533.073		X
12	195.500	1533.465	X	
13	195.450	1533.858		X
14	195.400	1534.250	X	
15	195.350	1534.643		X
16	195.300	1535.036	X	
17	195.250	1535.429		X
18	195.200	1535.822	X	
19	195.150	1536.216		X
20	195.100	1536.609	X	
21	195.050	1537.003		X
22	195.000	1537.397	X	
23	194.950	1537.792		X
24	194.900	1538.186	X	
25	194.850	1538.581		X
26	194.800	1538.976	X	
27	194.750	1539.371		X

Table 22-94 Wavelength allocations and fiber designations (continued)

50 GHz Spacing Label			Common	
100 GHz Spacing Label			Even	Odd
Channel	Frequency (THz)	Wavelength (nm)		
28	194.700	1539.766	X	
29	194.650	1540.162		X
30	194.600	1540.557	X	
31	194.550	1540.953		X
32	194.500	1541.349	X	
33	194.450	1541.746		X
34	194.400	1542.142	X	
35	194.350	1542.539		X
36	194.300	1542.936	X	
37	194.250	1543.333		X
38	194.200	1543.730	X	
39	194.150	1544.128		X
40	194.100	1544.526	X	
41	194.050	1544.924		X
42	194.000	1545.322	X	
43	193.950	1545.720		X
44	193.900	1546.119	X	
45	193.850	1546.518		X
46	193.800	1546.917	X	
47	193.750	1547.316		X
48	193.700	1547.715	X	
49	193.650	1548.115		X
50	193.600	1548.515	X	
51	193.550	1548.915		X
52	193.500	1549.315	X	
53	193.450	1549.715		X
54	193.400	1550.116	X	
55	193.350	1550.517		X
56	193.300	1550.918	X	

Table 22-94 Wavelength allocations and fiber designations (continued)

50 GHz Spacing Label			Common	
100 GHz Spacing Label			Even	Odd
Channel	Frequency (THz)	Wavelength (nm)		
57	193.250	1551.319		X
58	193.200	1551.721	X	
59	193.150	1552.122		X
60	193.100	1552.524	X	
61	193.050	1552.926		X
62	193.000	1553.329	X	
63	192.950	1553.731		X
64	192.900	1554.134	X	
65	192.850	1554.537		X
66	192.800	1554.940	X	
67	192.750	1555.343		X
68	192.700	1555.747	X	
69	192.650	1556.151		X
70	192.600	1556.555	X	
71	192.550	1556.959		X
72	192.500	1557.363	X	
73	192.450	1557.768		X
74	192.400	1558.173	X	
75	192.350	1558.578		X
76	192.300	1558.983	X	
77	192.250	1559.389		X
78	192.200	1559.794	X	
79	192.150	1560.200		X
80	192.100	1560.606	X	
81	192.050	1561.013		X
82	192.000	1561.419	X	
83	191.950	1561.826		X
84	191.900	1562.233	X	
85	191.850	1562.640		X

Table 22-94 Wavelength allocations and fiber designations (continued)

50 GHz Spacing Label			Common	
100 GHz Spacing Label			Even	Odd
Channel	Frequency (THz)	Wavelength (nm)		
86	191.800	1563.047	X	
87	191.750	1563.455		X
88	191.700	1563.863	X	

External filter shelf specifications

SFD44/SFD44B

The 44-Channel, 100GHz Channel Spacing Optical Multiplexer/Demultiplexer (SFD44/SFD44B) is used to multiplex 44 optical channels with 100 GHz channel spacing and to demultiplex 44 optical channels with 100 GHz channel spacing in the C-Band. For SFD44, channels nominally centered at frequencies from 196.000 THz to 191.700 THz and for SFD44B channels nominally centered at frequencies from 196.050 THz to 191.750 THz.

Optical specifications

Table 22-95 SFD44/SFD44B optical specifications

Parameters	Condition	Min	Max
Optical insertion loss at ITU grid (WXYZ In to OMD OUT)	Defined as the minimum transmission at ITU wavelength for all channels. Includes LC connector loss. For each channel, at all temperatures and polarizations.	3 dB	5.7 dB
Optical insertion loss at ITU grid (OMD IN to WXYZ out)	Defined as the minimum transmission at ITU wavelength for all channels. Includes LC connector loss. For each channel, at all temperatures and polarizations.	3 dB	6 dB
1 dB clear channel bandwidth	Clear channel bandwidth defined by passband shape, for each channel.	18 GHz	
3 dB clear channel bandwidth	Clear channel bandwidth defined by passband shape, for each channel.	25 GHz	50 GHz
Center wavelength offset from ITU grid	Defined as the maximum absolute value of the difference between the measured center wavelength and the corresponding ITU wavelength, for each channel.	−7 GHz	7 GHz
Insertion loss variation	The difference between the maximum and minimum insertion loss across all channels		2 dB
Insertion loss ripple	The difference between any maxima and any minima of optical loss across Ã¯Â±25GHz around ITU frequency, excluding boundary points, for each channel at each port.		0.5 dB
Maximum input optical power		25 dBm	

Wavelength router specifications

Wavelength routers

The Alcatel-Lucent 1830 Photonic Service Switch (PSS) Reconfigurable Optical Add/Drop Multiplexer (ROADM) and ROADM with Any-Direction Add/Drop configurations are based on the 88-channel wavelength routers (WR2-88, WR8-88A, WR8-88AF) and Flex-Grid router (WR20-TF). This section details the WR8-88AF and WR20-TF cards. The WR8-88AF is based on a 1x9 Wavelength Selective Switch (WSS) with flexible bandwidth, and the WR20-TF is based on a twin 1x20 WSS with flexible bandwidth. Both versions support Flexible Grid, with channels centering grid in C-band.

Both the WR8-88AF and the WR20-TF can be provisioned to support standard fixed ITU 50 GHz grid, or set to spectrally filter off-grid following ITU recommendation G.694.1 Each sub-band frequency can be tuned by 12.5 GHz increments.

The minimum number of sub-bands for WR8-88AF is 2, for minimize channel width of 25 GHz; the maximum number of sub-bands is 20, for maximum channel size of 250 GHz.

The minimum number of sub-bands for WR20-TF is 2, and the maximum number of sub-bands is 33 (for maximum channel size of 412.5 GHz).

Environmental conditions

Table 22-96 Wavelength routers environmental specifications

Parameter	Min	Max
Operating case temperature	−5°C	70 °C
Operating ambient humidity, non condensing	5% RH	85% RH
Total optical input power (P_{max})[1]		25 dBm
Per channel optical power (P_{ch_max})[1]		7 dBm
Electrical power consumption[2]		24W–30W

Notes:

1. Damage threshold of the device.
2. Under normal operation; warm up may incur additional power.

Optical specifications

Table 22-97 Wavelength routers optical specifications

Parameter	Min	Max
Signal spectral range (SR)	191.3 THz	196.05 THz
Insertion loss for active channel (I_m)	2.5 dB	6.5 dB (WR8-88AF)
		8 dB (WR20-TF)
Stop band range 1 (SB1)	196.09 THz	196.55 THz
Stop band range 2 (SB2)	191.200 THz	191.66 THz
	190.800 THz	191.26 THz
Out-of_band Insertion Loss Over SB1 or SB2 (I_{sb})	20 dB	
Return Loss, including connectors (RL)	30 dB	
Operational attenuation range (T)	0 dB	15 dB
Attenuation step size (T)	0.1 dB	
Attenuation step accuracy (A_{acc})	±0.5 dB or ±10% of attenuation setting, whichever is greater (so ±0.5 dB up to 5 dB of VOA)	
Port to port isolation 1x9 WSS port isolation is better than the 1x20. The typical port isolation of the 1x20 is 22dB		22 dB
Power-off transient	None	
Power-off port	Dark	

System frequencies and wavelength

The sub-band indexes ($S\text{-}_{Bind}$) and corresponding high-end frequencies (low-end wavelength, vacuum) are listed in Table 22-98, “Sub-bands indexes and corresponding high end frequencies (low end wavelength)” (p. 22-143). Central ITU frequencies for 96 channels on fixed 50GHz ITU grid are in **bold**.

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength)

$S\text{-}_{Bind}$	Frequency	Wavelength
1	196.075	1528.968
2	196.0625	1529.066

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
3	**196.05**	**1529.163**
4	196.0375	1529.261
5	196.025	1529.358
6	196.0125	1529.456
7	**196**	**1529.553**
8	195.9875	1529.651
9	195.975	1529.748
10	195.9625	1529.846
11	**195.95**	**1529.944**
12	195.9375	1530.041
13	195.925	1530.139
14	195.9125	1530.236
15	**195.9**	**1530.334**
16	195.8875	1530.432
17	195.875	1530.529
18	195.8625	1530.627
19	**195.85**	**1530.725**
20	195.8375	1530.823
21	195.825	1530.92
22	195.8125	1531.018
23	**195.8**	**1531.116**
24	195.7875	1531.213
25	195.775	1531.311
26	195.7625	1531.409
27	**195.75**	**1531.507**
28	195.7375	1531.605
29	195.725	1531.702
30	195.7125	1531.8
31	**195.7**	**1531.898**
32	195.6875	1531.996

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
33	195.675	1532.094
34	195.6625	1532.192
35	**195.65**	**1532.29**
36	195.6375	1532.387
37	195.625	1532.485
38	195.6125	1532.583
39	**195.6**	**1532.681**
40	195.5875	1532.779
41	195.575	1532.877
42	195.5625	1532.975
43	**195.55**	**1533.073**
44	195.5375	1533.171
45	195.525	1533.269
46	195.5125	1533.367
47	**195.5**	**1533.465**
48	195.4875	1533.563
49	195.475	1533.661
50	195.4625	1533.759
51	**195.45**	**1533.858**
52	195.4375	1533.956
53	195.425	1534.054
54	195.4125	1534.152
55	**195.4**	**1534.25**
56	195.3875	1534.348
57	195.375	1534.446
58	195.3625	1534.545
59	**195.35**	**1534.643**
60	195.3375	1534.741
61	195.325	1534.839
62	195.3125	1534.937

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
63	**195.3**	**1535.036**
64	195.2875	1535.134
65	195.275	1535.232
66	195.2625	1535.33
67	**195.25**	**1535.429**
68	195.2375	1535.527
69	195.225	1535.625
70	195.2125	1535.724
71	**195.2**	**1535.822**
72	195.1875	1535.92
73	195.175	1536.019
74	195.1625	1536.117
75	**195.15**	**1536.216**
76	195.1375	1536.314
77	195.125	1536.412
78	195.1125	1536.511
79	**195.1**	**1536.609**
80	195.0875	1536.708
81	195.075	1536.806
82	195.0625	1536.905
83	**195.05**	**1537.003**
84	195.0375	1537.102
85	195.025	1537.2
86	195.0125	1537.299
87	**195**	**1537.397**
88	194.9875	1537.496
89	194.975	1537.594
90	194.9625	1537.693
91	**194.95**	**1537.792**
92	194.9375	1537.89

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
93	194.925	1537.989
94	194.9125	1538.087
95	**194.9**	**1538.186**
96	194.8875	1538.285
97	194.875	1538.383
98	194.8625	1538.482
99	**194.85**	**1538.581**
100	194.8375	1538.679
101	194.825	1538.778
102	194.8125	1538.877
103	**194.8**	**1538.976**
104	194.7875	1539.074
105	194.775	1539.173
106	194.7625	1539.272
107	**194.75**	**1539.371**
108	194.7375	1539.47
109	194.725	1539.568
110	194.7125	1539.667
111	**194.7**	**1539.766**
112	194.6875	1539.865
113	194.675	1539.964
114	194.6625	1540.063
115	**194.65**	**1540.162**
116	194.6375	1540.261
117	194.625	1540.359
118	194.6125	1540.458
119	**194.6**	**1540.557**
120	194.5875	1540.656
121	194.575	1540.755
122	194.5625	1540.854

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
123	**194.55**	**1540.953**
124	194.5375	1541.052
125	194.525	1541.151
126	194.5125	1541.25
127	**194.5**	**1541.349**
128	194.4875	1541.448
129	194.475	1541.548
130	194.4625	1541.647
131	**194.45**	**1541.746**
132	194.4375	1541.845
133	194.425	1541.944
134	194.4125	1542.043
135	**194.4**	**1542.142**
136	194.3875	1542.241
137	194.375	1542.341
138	194.3625	1542.44
139	**194.35**	**1542.539**
140	194.3375	1542.638
141	194.325	1542.737
142	194.3125	1542.837
143	**194.3**	**1542.936**
144	194.2875	1543.035
145	194.275	1543.135
146	194.2625	1543.234
147	**194.25**	**1543.333**
148	194.2375	1543.432
149	194.225	1543.532
150	194.2125	1543.631
151	**194.2**	**1543.73**
152	194.1875	1543.83

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
153	194.175	1543.929
154	194.1625	1544.029
155	**194.15**	**1544.128**
156	194.1375	1544.227
157	194.125	1544.327
158	194.1125	1544.426
159	**194.1**	**1544.526**
160	194.0875	1544.625
161	194.075	1544.725
162	194.0625	1544.824
163	**194.05**	**1544.924**
164	194.0375	1545.023
165	194.025	1545.123
166	194.0125	1545.222
167	**194**	**1545.322**
168	193.9875	1545.422
169	193.975	1545.521
170	193.9625	1545.621
171	**193.95**	**1545.72**
172	193.9375	1545.82
173	193.925	1545.92
174	193.9125	1546.019
175	**193.9**	**1546.119**
176	193.8875	1546.219
177	193.875	1546.318
178	193.8625	1546.418
179	**193.85**	**1546.518**
180	193.8375	1546.617
181	193.825	1546.717
182	193.8125	1546.817

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
183	**193.8**	**1546.917**
184	193.7875	1547.016
185	193.775	1547.116
186	193.7625	1547.216
187	**193.75**	**1547.316**
188	193.7375	1547.416
189	193.725	1547.516
190	193.7125	1547.615
191	**193.7**	**1547.715**
192	193.6875	1547.815
193	193.675	1547.915
194	193.6625	1548.015
195	**193.65**	**1548.115**
196	193.6375	1548.215
197	193.625	1548.315
198	193.6125	1548.415
199	**193.6**	**1548.515**
200	193.5875	1548.615
201	193.575	1548.715
202	193.5625	1548.815
203	**193.55**	**1548.915**
204	193.5375	1549.015
205	193.525	1549.115
206	193.5125	1549.215
207	**193.5**	**1549.315**
208	193.4875	1549.415
209	193.475	1549.515
210	193.4625	1549.615
211	**193.45**	**1549.715**
212	193.4375	1549.816

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
213	193.425	1549.916
214	193.4125	1550.016
215	**193.4**	**1550.116**
216	193.3875	1550.216
217	193.375	1550.317
218	193.3625	1550.417
219	**193.35**	**1550.517**
220	193.3375	1550.617
221	193.325	1550.717
222	193.3125	1550.818
223	**193.3**	**1550.918**
224	193.2875	1551.018
225	193.275	1551.119
226	193.2625	1551.219
227	**193.25**	**1551.319**
228	193.2375	1551.42
229	193.225	1551.52
230	193.2125	1551.62
231	**193.2**	**1551.721**
232	193.1875	1551.821
233	193.175	1551.922
234	193.1625	1552.022
235	**193.15**	**1552.122**
236	193.1375	1552.223
237	193.125	1552.323
238	193.1125	1552.424
239	**193.1**	**1552.524**
240	193.0875	1552.625
241	193.075	1552.725
242	193.0625	1552.826

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
243	**193.05**	**1552.926**
244	193.0375	1553.027
245	193.025	1553.128
246	193.0125	1553.228
247	**193**	**1553.329**
248	192.9875	1553.429
249	192.975	1553.53
250	192.9625	1553.631
251	**192.95**	**1553.731**
252	192.9375	1553.832
253	192.925	1553.933
254	192.9125	1554.033
255	**192.9**	**1554.134**
256	192.8875	1554.235
257	192.875	1554.335
258	192.8625	1554.436
259	**192.85**	**1554.537**
260	192.8375	1554.638
261	192.825	1554.739
262	192.8125	1554.839
263	**192.8**	**1554.94**
264	192.7875	1555.041
265	192.775	1555.142
266	192.7625	1555.243
267	**192.75**	**1555.343**
268	192.7375	1555.444
269	192.725	1555.545
270	192.7125	1555.646
271	**192.7**	**1555.747**
272	192.6875	1555.848

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
273	192.675	1555.949
274	192.6625	1556.05
275	**192.65**	**1556.151**
276	192.6375	1556.252
277	192.625	1556.353
278	192.6125	1556.454
279	**192.6**	**1556.555**
280	192.5875	1556.656
281	192.575	1556.757
282	192.5625	1556.858
283	**192.55**	**1556.959**
284	192.5375	1557.06
285	192.525	1557.161
286	192.5125	1557.262
287	**192.5**	**1557.363**
288	192.4875	1557.465
289	192.475	1557.566
290	192.4625	1557.667
291	**192.45**	**1557.768**
292	192.4375	1557.869
293	192.425	1557.97
294	192.4125	1558.072
295	**192.4**	**1558.173**
296	192.3875	1558.274
297	192.375	1558.375
298	192.3625	1558.477
299	**192.35**	**1558.578**
300	192.3375	1558.679
301	192.325	1558.78
302	192.3125	1558.882

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
303	**192.3**	**1558.983**
304	192.2875	1559.084
305	192.275	1559.186
306	192.2625	1559.287
307	**192.25**	**1559.389**
308	192.2375	1559.49
309	192.225	1559.591
310	192.2125	1559.693
311	**192.2**	**1559.794**
312	192.1875	1559.896
313	192.175	1559.997
314	192.1625	1560.099
315	**192.15**	**1560.2**
316	192.1375	1560.302
317	192.125	1560.403
318	192.1125	1560.505
319	**192.1**	**1560.606**
320	192.0875	1560.708
321	192.075	1560.809
322	192.0625	1560.911
323	**192.05**	**1561.013**
324	192.0375	1561.114
325	192.025	1561.216
326	192.0125	1561.317
327	**192**	**1561.419**
328	191.9875	1561.521
329	191.975	1561.622
330	191.9625	1561.724
331	**191.95**	**1561.826**
332	191.9375	1561.927

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
333	191.925	1562.029
334	191.9125	1562.131
335	**191.9**	**1562.233**
336	191.8875	1562.334
337	191.875	1562.436
338	191.8625	1562.538
339	**191.85**	**1562.64**
340	191.8375	1562.742
341	191.825	1562.844
342	191.8125	1562.945
343	**191.8**	**1563.047**
344	191.7875	1563.149
345	191.775	1563.251
346	191.7625	1563.353
347	**191.75**	**1563.455**
348	191.7375	1563.557
349	191.725	1563.659
350	191.7125	1563.761
351	**191.7**	**1563.863**
352	191.6875	1563.965
353	191.675	1564.067
354	191.6625	1564.169
355	**191.65**	**1564.271**
356	191.6375	1564.373
357	191.625	1564.475
358	191.6125	1564.577
359	**191.6**	**1564.679**
360	191.5875	1564.781
361	191.575	1564.883
362	191.5625	1564.985

Table 22-98 Sub-bands indexes and corresponding high end frequencies (low end wavelength) (continued)

$S\text{-}_{Bind}$	Frequency	Wavelength
363	**191.55**	**1565.087**
364	191.5375	1565.189
365	191.525	1565.292
366	191.5125	1565.394
367	**191.5**	**1565.496**
368	191.4875	1565.598
369	191.475	1565.7
370	191.4625	1565.802
371	**191.45**	**1565.905**
372	191.4375	1566.007
373	191.425	1566.109
374	191.4125	1566.211
375	**191.4**	**1566.314**
376	191.3875	1566.416
377	191.375	1566.518
378	191.3625	1566.621
379	**191.35**	**1566.723**
380	191.3375	1566.825
381	191.325	1566.928
382	191.3125	1567.03
383	**191.3**	**1567.133**
384	191.2875	1567.235

Part IV: Interworking information

Overview

Purpose

This part provides information on the interworking and the interoperability of the photonic compound and the OTN switching compound of the Alcatel-Lucent 1830 Photonic Service Switch (PSS).

Contents

Chapter 23, Interworking and interoperability	23-1

23 Interworking and interoperability

Overview

Introduction

Alcatel-Lucent 1830 PSS has been specifically developed and tested to interwork with the following network elements:

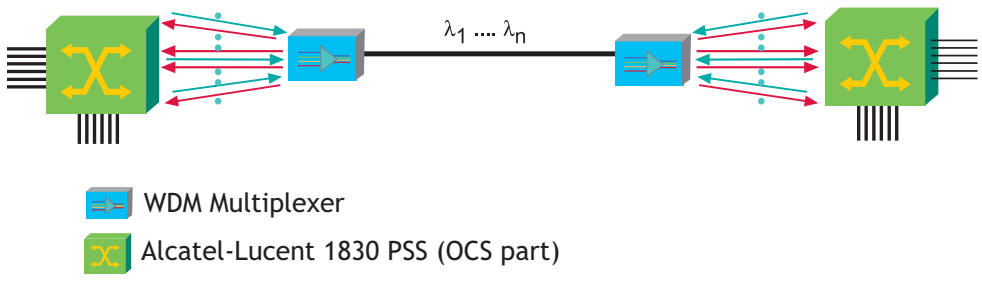
- Alcatel-Lucent 1625 LambdaXtreme Transport (LX)
- Alcatel-Lucent 1626 Light Manager (LM)
- Alcatel-Lucent 1665 DMX Multiplexer
- Alcatel-Lucent 1675 LambdaUnite MultiService Switch (MSS)
- Alcatel-Lucent 1678 Metro Core Connect (MCC)

In this section, the scope of interworking and the applicable restrictions are listed.

Interworking between the OCS application and WDM

Dense Wavelength Division Multiplexing (DWDM) systems can be used with the OCS part of Alcatel-Lucent 1830 PSS for cost-efficient data transport over long and intermediate distances. For this purpose, a tunable DWDM XFP (X11MDTNC or X11MDTSZC) can be used.

Figure 23-1 DWDM topology example



STM-64 transport

Alcatel-Lucent allows the “black and white” transmission of STM-64 signals from and to WDM equipment. The WDM equipment serves as clear channel for the overhead, that means, MSOH and RSOH remain unchanged by the WDM equipment.

OC-192 transport

Alcatel-Lucent allows the “black and white” transmission of OC-192 signals from and to WDM equipment. The WDM equipment serves as clear channel for the overhead, that means, line OH and section OH remain unchanged by the WDM equipment.

OTM-n.2 transport

Alcatel-Lucent allows the “black and white” and “colored” transmission of OTM-0.2 signals from and to WDM equipment with or without FEC.

OTU2 overhead is terminated. The trail trace signals SAPI, DAPI, and the 32 operator specific bytes interwork. Same applies to the section monitoring bytes (for BIP-8, BEI/BIAE, BDI and IAE) and the OTUn-AIS signal.

ODUk- and OPUk-OH, $k \leq 2$, are transported unchanged by the WDM equipment.

OTM-0.3 transport

Alcatel-Lucent allows the “black and white” transmission of OTM-0.3 signals from and to WDM equipment with or without FEC.

OTU3 overhead is terminated. The trail trace signals SAPI, DAPI, and the 32 operator specific bytes interwork. Same applies to the section monitoring bytes (for BIP-8, BEI/BIAE, BDI and IAE) and the OTUn-AIS signal.

ODUk- and OPUk-OH, $k \leq 3$, are transported unchanged by the WDM equipment.

OTM-0.4 transport

Alcatel-Lucent allows the “black and white” transmission of OTM-0.4 signals from and to WDM equipment with or without FEC.

OTU4 overhead is terminated. The trail trace signals SAPI, DAPI, and the 32 operator specific bytes interwork. Same applies to the section monitoring bytes (for BIP-8, BEI/BIAE, BDI and IAE) and the OTUn-AIS signal.

ODUk- and OPUk-OH, $k \leq 4$, are transported unchanged by the WDM equipment.

GCC

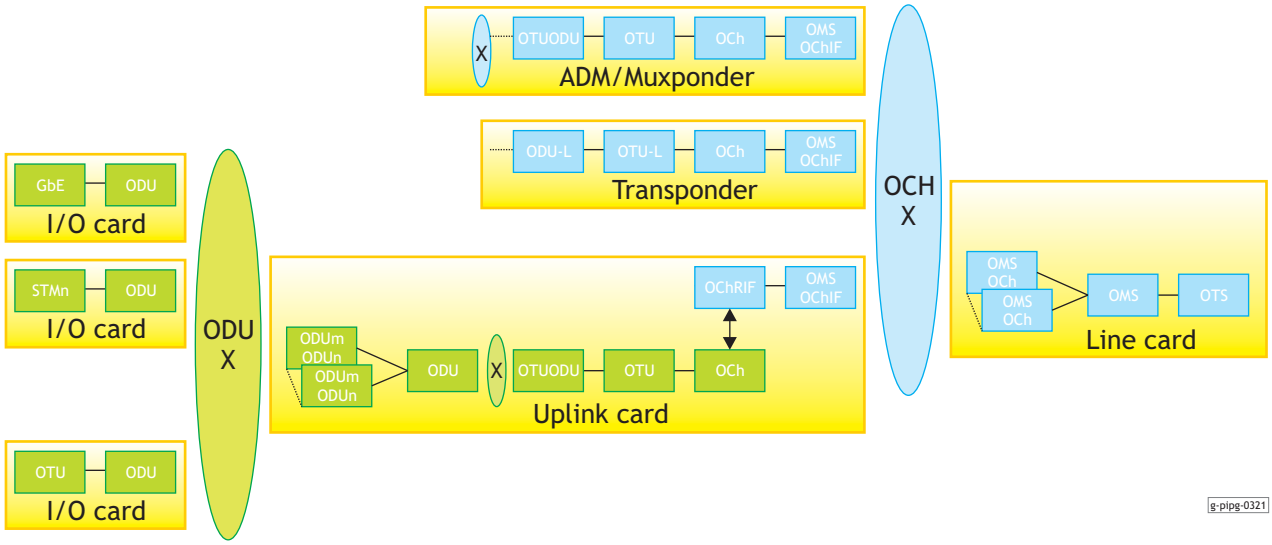
The WDM equipment transports the GCC1 as a clear channel.

Interworking via uplink cards

The interworking between WDM domain and switching domain can also be established via uplink cards supporting 10G (OTM-N.2[e]), 40G (OTM-N.3e2), and 100G (OTM-N.4) bitrates. The WDM (optical) domain can provide management of optical

properties using Wavelength Tracker. The following figure shows the transmission facilities within the Alcatel-Lucent 1830 PSS system. Entities belonging to the switching domain are shown in green color and those belonging to the photonic domain in blue color. The entities, which logically reside on an uplink card are partially represented by the switching domain and partially by the photonic domain. For more detailed information on the implementation in the network element, refer to Chapter 8, “OCS product description”.

Figure 23-2 Transmission facilities of the TDM and WDM domain



1830 WDM and OCS optical card interoperability

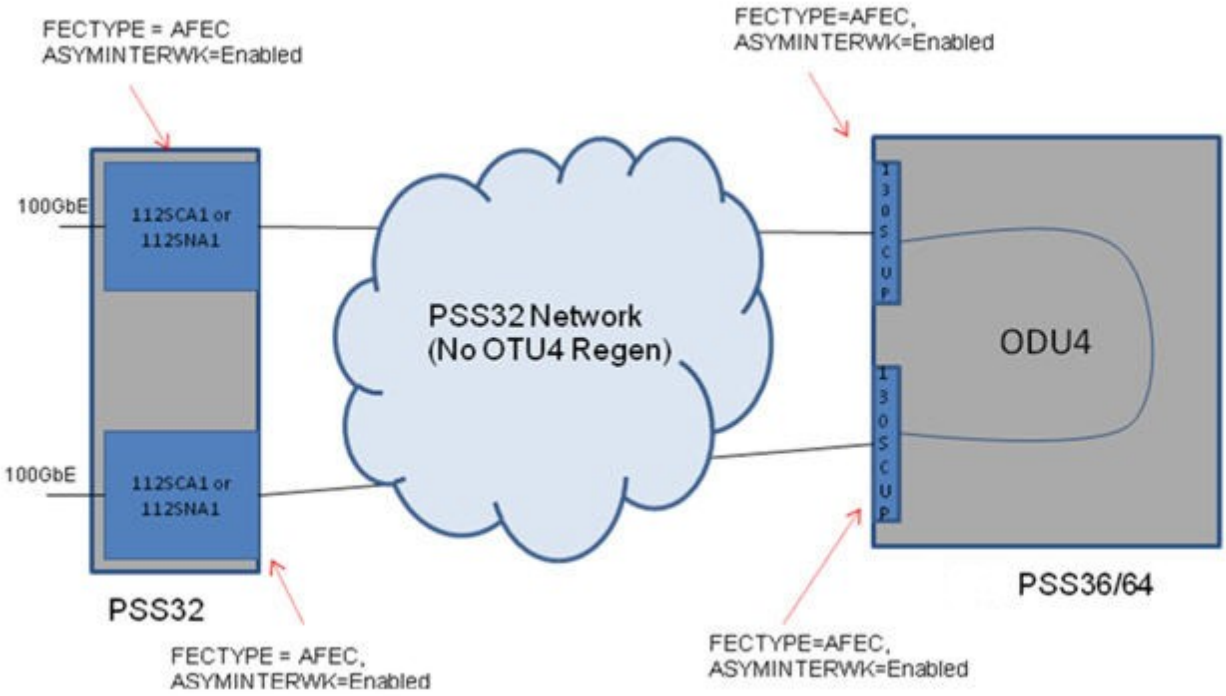
Introduction

Alcatel-Lucent 1830 PSS OCS and WDM optical cards share uniform behavior for transmission and fault and performance monitoring. The client services described here can be transported by WDM Optical cards and can be directly de-mapped by OCS service/uplink cards.

100G services

For 100 GbE services, interoperability between the 130G uplink cards 130SCUP/130SCUPB/130SCUPC and legacy 112SCA1/112SNA1 cards is supported. See the following figure.

Figure 23-3 100 GbE services interoperability between the 130G uplink cards and legacy 112SCA1/112SNA1



To support interworking between second generation 130G uplink cards 130SCUP/130SCUPB/130SCUPC and legacy 100G coherent cards (112SCA1 or 112SNA1), a new user provisioning parameter is added:

ASYMINTERWK - Asymmetric Interworking Mode. This parameter allows the user to enable interworking between the uplink card and legacy 100G Add/Drop cards (112SCA1 or 112SNA1)

Allowed values for ASYMINTERWK: {ENABLED, DISABLED}.

Default: <previously existing value, with DISABLED being the factory default>

ASYMINTERWK= ENABLED is used to allow interworking between legacy (112SCA1 or 112SNA1) and second generation uplink line ports. The value ASYMINTERWK=ENABLED needs to be provisioned if on one side of the OTU trail a legacy coherent OTU4 port is located, while on the other side a second generation uplink card is present.

ASYMINTERWK=DISABLED is used when no interworking is needed (for example, an OTU4 trail with legacy cards on either side, or an OTU4 trail with second generation uplink cards on either side).

Note: Regeneration is not supported for interworking configurations in Release 6.0.

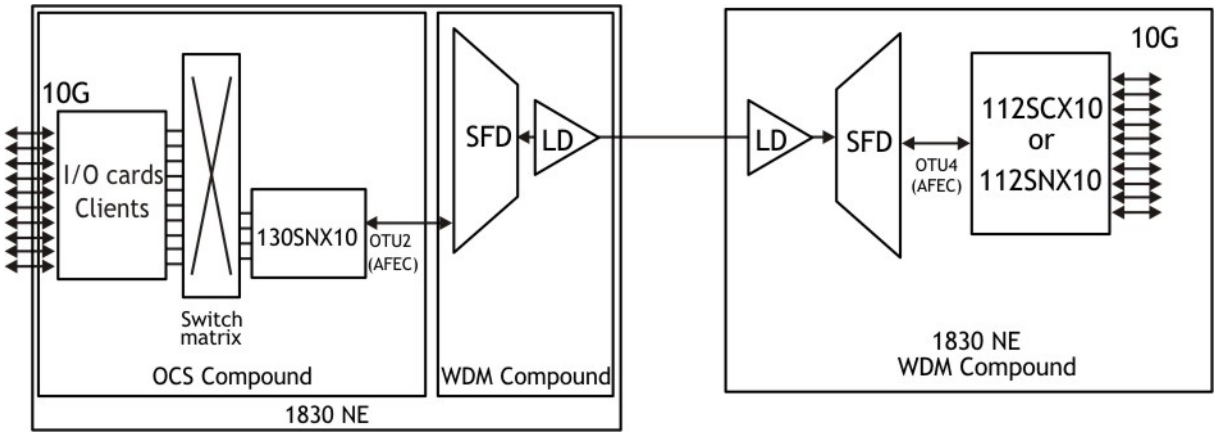
Note: When the uplink card or 112SCA1 or 112SNA1 is provisioned with ASYMINTERWK=ENABLED, an external optical loopback on its L1 line interface (for testing purposes) is not supported. To test the card using an external optical loopback jumper cable on its line interface, set ASYMINTERWK=DISABLED.

10G Services

Interoperability is supported for the following end-to-end 10G services:

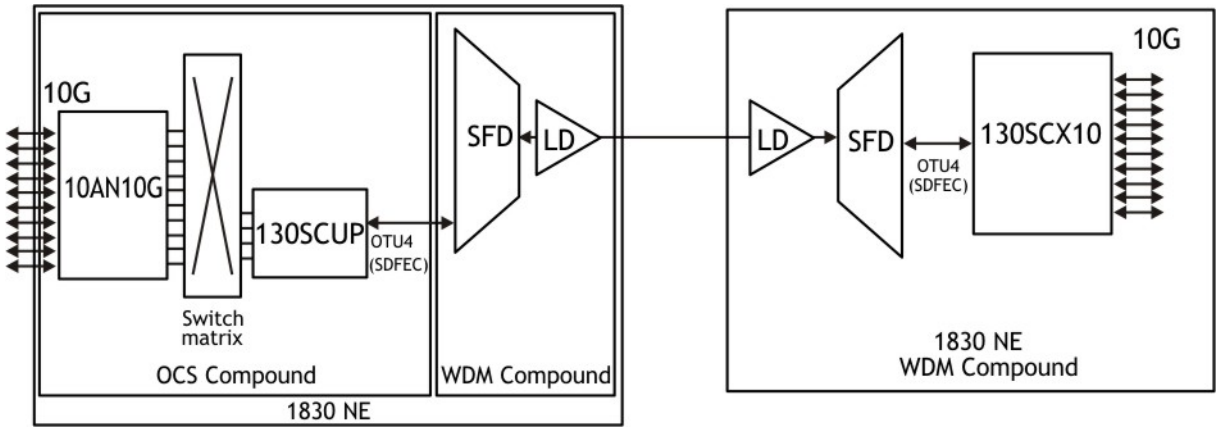
- OC-192/STM-64 with Bit-Sync/Async mapping method
- 10 GbE with 11.096G CBR mapping method (ODU2e)
- OTU2 (10.709G)
- OTU2e (11.096G)

Figure 23-4 10G service interoperability over 100G OTU2 link (AFEC)



The 130SNX10 cards support interworking with legacy 100G cards (112SCX10/112SNX10). However, 130SNX10 must be provisioned with ASYMINTERWK=ENABLED and FECTYPE=AFEC.

Figure 23-5 10G service interoperability over 100G OTU4 link (SDFEC)



For 10G service interworking over an OTU4 link, the following OT cards can be used.

- OCS NE:

  10AN10G as the client service card

  130SCUP as the uplink card

  130SCUPB as the uplink card

  130SCUPC as the uplink card

- WDM NE:

  For interworking between 130G uplink cards 130SCUP/130SCUPB/130SCUPC and 130SCX10/130SNX10 (Mux of ODU2/ODU2e into ODU4), the uplink cards must be provisioned with the following time slot structure:

- Tributary Port 1: (1, 11, 21, 31, 41, 51, 61, 71)
- Tributary Port 2: (2, 12, 22, 32, 42, 52, 62, 72)
- Tributary Port 3: (3, 13, 23, 33, 43, 53, 63, 73)
- Tributary Port 4: (4, 14, 24, 34, 44, 54, 64, 74)
- Tributary Port 5: (5, 15, 25, 35, 45, 55, 65, 75)
- Tributary Port 6: (6, 16, 26, 36, 46, 56, 66, 76)
- Tributary Port 7: (7, 17, 27, 37, 47, 57, 67, 77)
- Tributary Port 8: (8, 18, 28, 38, 48, 58, 68, 78)
- Tributary Port 9: (9, 19, 29, 39, 49, 59, 69, 79)
- Tributary Port 10: (10, 20, 30, 40, 50, 60, 70, 80)

For specific configuration details, see the Alcatel-Lucent 1830 Photonic Service Switch (PSS) Release 8.2 User Provisioning Guide.

Figure 23-6 10G service interoperability over 40G OTU3e link

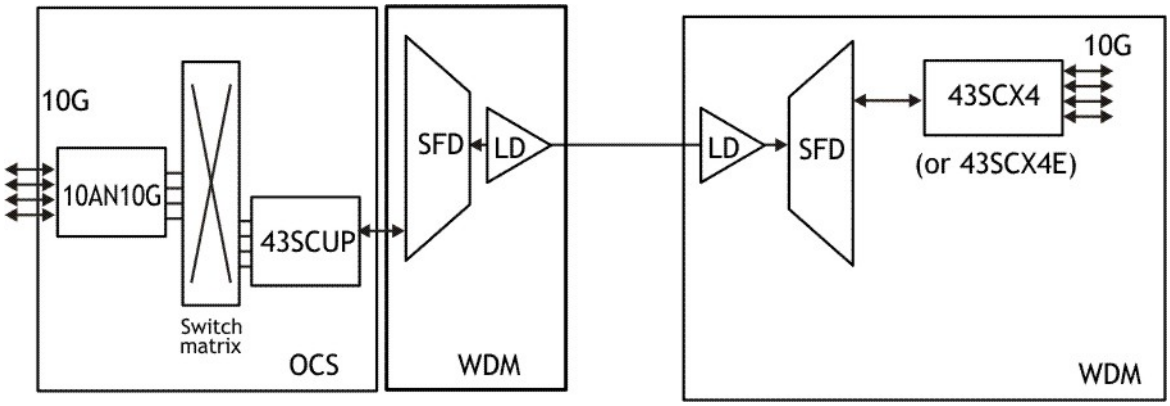
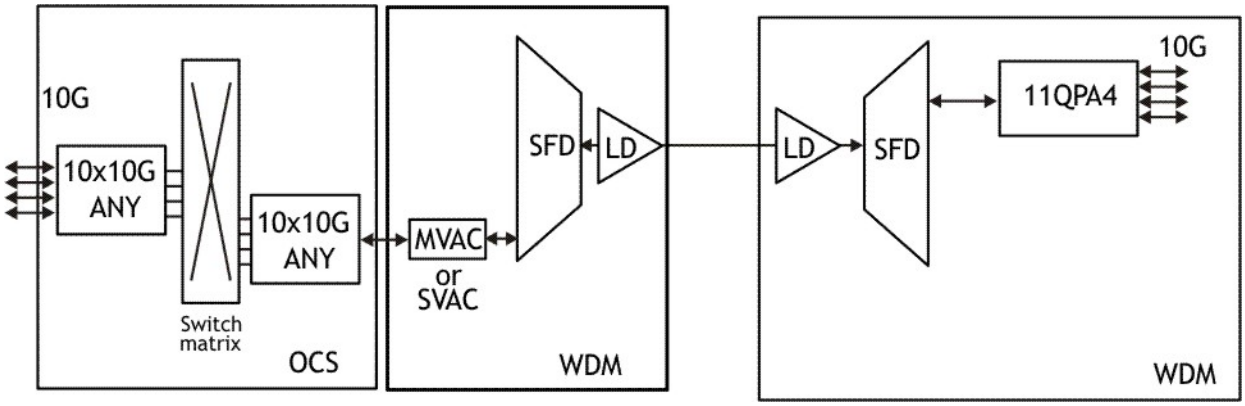


Figure 23-7 10G service interoperability over 10G OTU2/OTU2e link



For 10G service interworking over an OTU3 link, the following OT cards can be used.

- OCS NE:

  10AN10G as the client service card

  43SCUP as the uplink card

- WDM NE:

  43SCX4/43SCX4E cards to map/demap the 10G services

To support transmission interoperability, the 43SCX4/43SCX4E Line port must be set to the proper interworking mode (ODU3 interworking mode = Enabled), and the ODU3 structure of the 43SCUP card must be provisioned with the following time slot structure:

- Tributary Port 1: (1,5,9,13,17,21,25,29)
- Tributary Port 2: (2,6,10,14,18,22,26,30)

- Tributary Port 3: (3,7,11,15,19,23,27,31)
- Tributary Port 4: (4,8,12,16,20,24,28,32)

For 10G service interworking over an OTU2/OTU2e link, the following OT cards can be used.

- OCS NE:

  10AN10G used as both the client service card and the uplink card

- WDM NE:

  11QPA4 used to map/demap the 10G service

10G service protection interoperability

E-SNCP interoperability is implemented for the following end-end 10G services:

- OC-192/STM-64 with Bit-Sync/Async mapping method
- 10 GbE with 11.096G CBR mapping method (ODU2e)
- OTU2 (10.709G)
- OTU2e (11.096G)

E-SNCP interworking over OTU2/OTU2e links is supported by the following cards:

- OCS NE:

  10AN10G as both the client service card and the uplink card

- WDM NE:

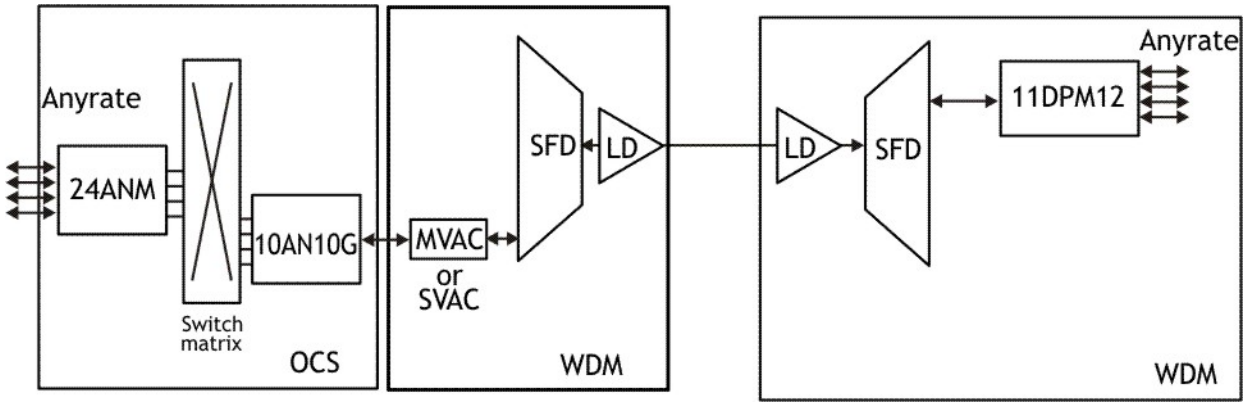
  11QPA4 for E-SNCP services

Sub-10G service interoperability

Interoperability is supported for the following end-end sub-10G services:

- STM-16 (Bit-Sync mapping and Async-mapping over ODU1)
- GbE (ODU0 mapping)
- STM-1 (ODU0 mapping)
- STM-4 (ODU0 mapping)

Figure 23-8 Sub-10G service interoperability over 10G OTU2/OTU2e link



Sub-10G service interworking over a OTU2/OTU2e link is supported by the following cards.

- OCS:

  24ANM as the client service card

  10AN10G as the uplink card

- WDM:

  11DPM12 to map/demap sub-10G services

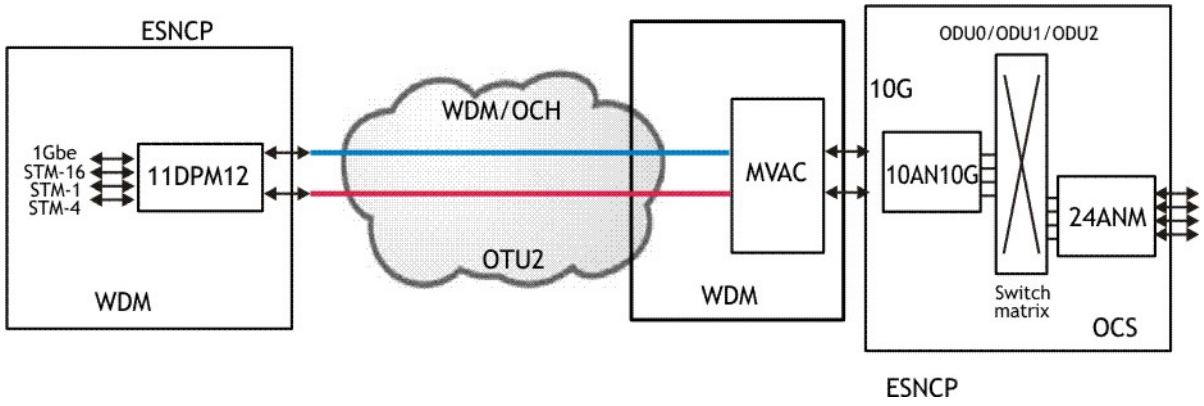
  Note: To support transmission and alarm interoperability, the proprietary ODU2 APS signaling of the 11DPM12 must be disabled.

Sub-10G service protection interoperability

The service protection interoperability is implemented for the following end-end sub-10G services:

- STM-16 (Bit-Sync mapping and Async-mapping over ODU1)
- GbE (ODU0 mapping)
- STM-1 (ODU0 mapping)
- STM-4 (ODU0 mapping)

Figure 23-9 Sub-10G service protection interoperability over 10G OTU2/OTU2e link



The following cards can be used for sub-10G service interworking over the OTU2/OTU2e link. OCS NE uses 24ANM as the client service card and 10AN10G as the uplink card, and WDM NE uses 11DPM12 for E-SNCP functions.

- OCS

  24ANM as the client service card

  10AN10G as the uplink card

- WDM

  11DPM12 for E-SNCP

Protection Transparency

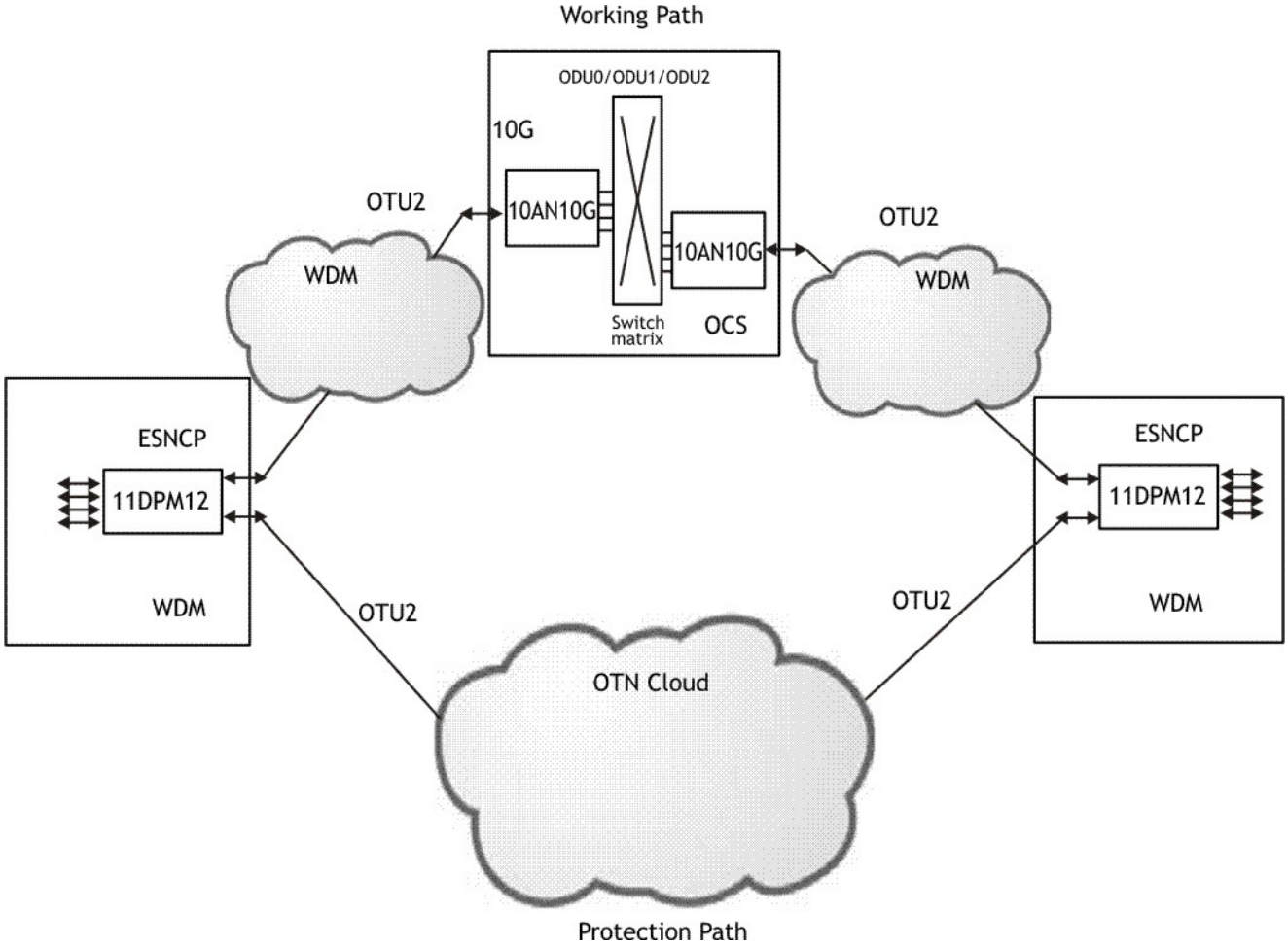
To provide protection transparency, the WDM/OCS system must be transparent to any end-to-end protection signaling, for example, an APS channel in the APS/PCC bytes, and any ODU layer defects (ODU-AIS, ODU-OCI).

An 11DPM12 E-SNCP link can be transparently transported over an OCS system with the following ODU switching granularity:

- ODU2 for all client services
- ODU1 for STM-16, OTU1 service
- ODU0 for GbE, STM-1/STM-4 service

  Note: For ODU1/ODU0 E-SNCP transparency, the proprietary ODU2 APS signaling of 11DPM12 must be disabled.

Figure 23-10 11DPM12 ESNCP link over an OCS system



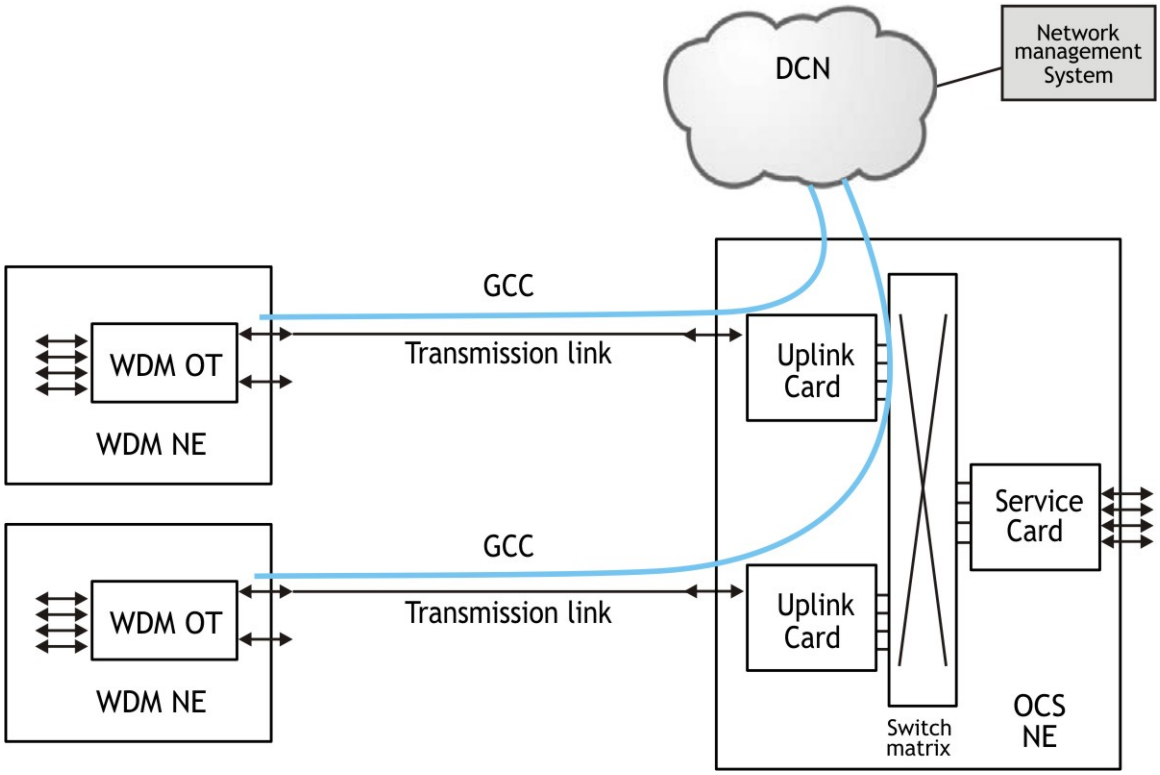
When 10AN10G is used as the OCS uplink cards, the following VAC cards can be used in WDM system to support transmission with wavelength tracker encoding.

- SVAC
- MVAC
- MVAC8B

SVAC or MVAC cards are not required in the WDM NE for unkeyed optical transmission.

DCN interoperability

Figure 23-11 DCN with WDM and OCS NEs



IP and OSPF routing interoperability over the GCC channel is implemented between WDM and OCS NEs. GCC0 and GCC1 interoperability is supported by the following OT cards:

- OCS uplink card:
  - 11QCUPC OTU2/OTU2e Interface
  - 43SCUP OTU3e2 Interface
  - 130SCUP OTU4 Interface
  - 130SCUPB OTU4 Interface
  - 130SCUPC OTU4 Interface
- WDM OT:
  - 11QPA4 OTU2/OTU2e Line Port
  - 11DPE12E OTU2e Line Port
  - 11DPM12 OTU2 Line Port

OSPF with MD5 authentication is supported in the DCN.

Glossary

Numerics

16FS

16 columns with Fixed Stuff

3R

Reamplification, Reshaping and Retiming

A

ABN

Abnormal (condition)

ABS (Absent)

Used to indicate that a given circuit pack is not installed.

Accepted trace identifier

A received trace identifier is considered “accepted” if the same trace identifier value has been received at least three times in sequence.

ACO (Alarm Cut-Off)

A button on the user panel used to clear the network element alarm indicators (LEDs on the active FLC, rack top lamp interface, the remote alarms interface).

ACT (Active)

Used to indicate that a circuit pack or module is in-service and currently providing service functions.

ACT

Activation (in the TCM ACT byte)

Adaptive-rate tributary operation of a port (Pipe mode)

Mode of operation of a port in which tributaries are *not* explicitly provisioned for the expected signal rates. The signal rates are automatically identified.

AEL

Accessible Emission Limits

Agent

Performs operations on managed objects and issues events on behalf of these managed objects. All SDH managed objects will support at least an agent. Control of distant agents is possible via

local “Managers”.

AGNE

Alarm Gateway Network Element

AI

Adapted Information

AID (Access Identifier)

A technical specification for explicitly naming entities (both physical and logical) of an NE using a grammar comprised of ASCII text, keywords, and grammar rules.

AINS (Automatic In-Service)

One possible state of a port or slot. When a port is in the AINS state and a good signal is detected, the port automatically enters the IS (in-service) state. When a port or slot is in the AINS state and a circuit pack is detected, the slot/port automatically enters the IS state. The important things about AINS state is that alarms are suppressed. Absence of the circuit pack is not alarmed. Absence of a signal is not alarmed on the port.

AIS (Alarm Indication Signal)

A code transmitted downstream in a digital network that indicates that an upstream failure has been detected and alarmed if the upstream alarm has not been suppressed.

Alarm

An alarm is a human observable alerting indication, for example visually, to a condition that may have immediate or potential negative impact on the state of the monitoring network element.

Alarm Correlation

The search for a directly-reported alarm that can account for a given symptomatic condition.

Alarm Severity

An attribute defining the priority of the alarm message. The way alarms are processed depends on the severity.

Alarm Suppression

Selective removal of alarm messages from being forwarded to the GUI or to network management layer OSs.

AMCC

Applied Micro Circuits Corporation

AMI (Alternate Mark Inversion)

A line code that employs a ternary signal to convert binary digits, in which successive binary ones are represented by signal elements that are normally of alternative positive and negative polarity but equal in amplitude and in which binary zeros are represented by signal elements that have zero amplitude.

AMP

Asynchronous Mapping Procedure

Anomaly

A difference between the actual and desired operation of a function.

ANSI

American National Standards Institute

APD

Avalanche Photo Diode

API

Access point identifier

APIPA

Automatic Private IP Addressing

APS (Automatic Protection Switch)

A protection switch that occurs automatically in response to an automatically detected fault condition.

ASN.1

Abstract Syntax Notation 1

ASON

Automatically switched optical network

Assembly

Gathering together of payload data with overhead and pointer information (an indication of the direction of the signal).

Association

A logical connection between manager and agent through which management information can be exchanged.

ASTN

Automatic Switched-Transport Network

Attribute

Alarm indication level: critical, major, minor, or no alarm.

AU

Administrative Unit

Autolock

Action taken by the system in the event of circuit pack failure/trouble. System switches to protection and prevents a return to the working circuit pack even if the trouble clears. Multiple protection switches on a circuit pack during a short period of time cause the system to autolock

the pack.

Autonomous Message

A message transmitted from the controlled Network Element to a management system which was not a response to a management system originated command.

AVAIL

Available

B

Bandwidth

The difference in Hz between the highest and lowest frequencies in a transmission channel. The data rate that can be carried by a given communications circuit.

Baud Rate

Transmission rate of data (bits per second) on a network link.

BDI

Backward Defect Indication

BDI-O

Backward Defect Indication Overhead

BDI-P

Backward Defect Indication Payload

BEI

Backward Error Indication

BER (Bit Error Rate)

The ratio of error bits received to the total number of bits transmitted.

BI

Backward Indication

BIAE

Backward Incoming Alignment Error

Bidirectional Line

A transmission path consisting of two fibers that handle traffic in both the transmit and receive directions.

Bidirectional Switch

Protection switching performed in both the transmit and receive directions.

BIP-N (Bit Interleaved Parity-N)

A method of error monitoring over a specified number of bits (BIP-3 or BIP-8).

Bit Error Rate Threshold

The point at which an alarm is issued for bit errors.

BITS

Building Integrated Timing Supply

BMP

Bit-synchronous Mapping Procedure

Bridge a cross-connection

The setting up of a cross-connection leg with the same input tributary as that of an existing cross-connection leg. Thus, forming a 1:2 bridge from an input tributary to two output tributaries.

Broadband Communications

Voice, data, and/or video communications at greater than 2 Mbit/s rates.

Broadband Service Transport

STM-1 concatenation transport over the 1675 LambdaUnite MSS for ATM applications.

C

C

Container

CAUI

Chip to 100Gb/s Attachment Unit Interface

CB

Control Block

CBR

Constant Bit Rate

CC (Clear Channel)

A digital circuit where no framing or control bits are required, thus making the full bandwidth available for communications.

CC (Cross-connection)

Path-level connections between input and output tributaries or specific ports within a single NE. Cross-connections are made in a consistent way even though there are various types of ports and various types of port protection. Cross-connections are re-configurable interconnections between tributaries of transmission interfaces.

CFP (C form-factor pluggable)

A CFP is a pluggable optical module with either 40 or 100 Gb/s transmission rate. The CFP layout has been standardized by a consortium of leading suppliers of telecommunications equipment.

Channel

A sub-unit of transmission capacity within a defined higher level of transmission capacity.

CI

Characteristic Information

Circuit

A set of transmission channels through one or more network elements that provides transmission of signals between two points, to support a single communications path.

CISPR

Comité International Spécial des Perturbations Radioélectriques

CL

Clear

***CLEI*™ code**

COMMON LANGUAGE® equipment code

Client

Computer in a computer network that generally offers a user interface to a server.

CLLI

Common Language Location Identifier

Closed Ring Network

A network formed of a ring-shaped configuration of network elements. Each network element connects to two others, one on each side.

CM (Configuration Management)

Subsystem that configures the network and processes messages from the network.

C_m

number of m-bit client data entities

CM

Connection Monitoring

CMEP

Connection Monitoring End Point

CMI

Coded Mark Inversion

CMISSSER

Serialized CMISS information

CMOH

Connection Monitoring Overhead

C_n

number of n-bit client data entities

C_{nD}

difference between Cn and (m/n x Cm)

CO (Central Office)

A building where common carriers terminate customer circuits.

Co-Resident

A hardware configuration where two applications can be active at the same time independently on the same hardware and software platform without interfering with each others functioning.

Collocated

System elements that are located in the same location.

Command Group

An administrator-defined group that defines commands to which a user has access.

Concatenation

A procedure whereby multiple virtual containers are associated one with each other resulting in a combined capacity that can be used as a single container across which bit sequence integrity is maintained.

Correlation

A process where related hard failure alarms are identified.

CoS (Class of Service)

Class of service is a parameter used in data and voice protocols to differentiate the types of payloads contained in the packet being transmitted. The objective of such differentiation is generally associated with assigning priorities to the data payload or access levels to the telephone call.

CP

This abbreviation has the following possible expansions:

1. Circuit Pack
2. Control Plane.

CPE

Customer Premises Equipment

CPR (Control Plane Routing)

IP routing performed by an NE for RSVP notify messages, and for management traffic. OSPF is used as routing protocol. A CPR domain contains NEs and Network Operation Centers (NOCs). CPR domains can be de-coupled from IP routing in the operator's DCN, by setting up IP-in-IP tunnels between NEs attached to the Out-of-band DCN, and NOCs.

CPRI

Common Public Radio Interface

CR (Critical (alarm))

Alarm that indicates a severe, service-affecting condition.

CRC

Cyclic Redundancy Check

Crosstalk

An unwanted signal introduced into one transmission line from another.

CRU

Clock Recovery Unit

CS

Client Specific

CSF

Client Signal Fail

CSMA/CD

Carrier Sense Multiple Access with Collision Detection

CTRL

Control word sent from source to sink

Current Value

The value currently assigned to a provisionable parameter.

Cyclic Redundancy Check (CRC)

Cyclic redundancy checking is a widespread error detection method based on parity bit calculations.

D

DAPI

Destination access point identifier

Data

A collection of system parameters and their associated values.

Database Administrator

A user who administers the database of the application.

Databearer

A databearer represents a physical link connection between two nodes in the transport plane.

DCE (Data Communications Equipment)

The equipment that provides signal conversion and coding between the data terminating equipment (DTE) and the line. The DCE may be separate equipment or an integral part of the DTE or of intermediate equipment. A DCE may perform other functions usually performed at the network end of the line.

DCF

Data Communications Function; Dispersion Compensation Fiber

DCM (Dispersion Compensation Module)

A device used to compensate the dispersion, the pulse spreading properties of an optical fiber. DCMs are necessary for very-long-haul applications and high bit rates.

DCN

Data Communications Network

Default

An operation or value that the system or application assumes, unless a user makes an explicit choice.

Default Provisioning

The parameter values that are pre-programmed as shipped from the factory.

Defect

A limited interruption of the ability of an item to perform a required function. It may or may not lead to maintenance action depending on the results of additional analysis.

Demultiplexing

A process applied to a multiplexed signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

DEMUX (Demultiplexer)

A device that splits a combined signal into individual signals at the receiver end of transmission.

Deprovisioning

The inverse order of provisioning. To manually remove/delete a parameter that has (or parameters that have) previously been provisioned.

DGE

Dynamic gain equalizer

Digital Multiplexer

Equipment that combines by time-division multiplexing several digital signals into a single composite digital signal.

Digital Section

A transmission span such as an STM-*N* signal. A digital section may contain multiple digital channels.

Disassembly

Splitting up a signal into its constituents as payload data and overhead (an indication of the direction of a signal).

Dispersion

Time-broadening of a transmitted light pulse.

Dispersion Shifted Optical Fiber

1330/1550 nm minimum dispersion wavelength.

Divergence

When there is unequal amplification of incoming wavelengths, the result is a power divergence between wavelengths.

DM

Delay Measurement

DMp

Delay Measurement of ODU*k* path

DMt*i*

Delay Measurement of TCM*i*

DNI (Dual Node Ring Interworking)

A topology in which two rings are interconnected at two nodes on each ring and operate so that inter-ring traffic is not lost in the event of a node or link failure at an interconnecting point.

DNU

Do Not Use

Doping

The addition of impurities to a substance in order to attain desired properties.

Downstream

At or towards the destination of the considered transmission stream, for example, looking in the same direction of transmission.

DPR

Data Plane Routing

DRAM

Dynamic Random Access Memory

Drop and Continue

A circuit configuration that provides redundant signal appearances at the outputs of two network elements in a ring. Can be used for Dual Node Ring Interworking (DNI) and for video distribution applications.

DS1

Digital Signal - Level 1 (1.544 Mbit/s)

DS3

Digital Signal - Level 3 (44.736 Mbit/s)

DSCP (Differentiated services code point)

DTE (Data Terminating Equipment)

The equipment that originates data for transmission and accepts transmitted data.

DWDM (Dense Wavelength Division Multiplexing)

Transmitting two or more signals of different wavelengths simultaneously over a single fiber.

E

EBCN

Ethernet-based communication network

EBER (Excessive Bit Error Rate)

The calculated average bit error rate over a data stream.

EC

Equipment Controller

ECC

Embedded Communication Channel

EDC

Error Detection Code

EEPROM

Electrically Erasable and Programmable Read-Only Memory

EIA (Electronic Industries Association)

A trade association of the electronic industry that establishes electrical and functional standards.

EMC (Electromagnetic Compatibility)

A measure of equipment tolerance to external electromagnetic fields.

EMI (Electromagnetic Interference)

High-energy, electrically induced magnetic fields that cause data corruption in cables passing through the fields.

EMS

Element Management System

Entity

A specific piece of hardware (usually a circuit pack, slot, or module) that has been assigned a name recognized by the system.

Entity Identifier

The name used by the system to refer to a circuit pack, memory device, or communications link.

EOS

End of Sequence

EPS

Equipment Protection Switching

EQPS

Equipment Protection Switching

ES (Errored Seconds)

A performance monitoring parameter. ES “type A” is a second with exactly one error; ES “type B” is a second with more than one and less than the number of errors in a severely errored second for the given signal. ES by itself means the sum of the type A and type B ESs.

ESD

Electrostatic Discharge

ESNCP

Electrical sub-block network connection protection

ESP

Electrostatic Protection

Establish

A user-initiated command, at the Alcatel-Lucent 1830 PSS ZIC, to create an entity and its associated attributes in the absence of certain hardware.

ETH-DM

Ethernet Frame Delay Measurement

ETH-LM

Ethernet Frame Loss of Measurement

ETH-SLM

Ethernet Frame Loss of Measurement

ETR

Extended temperature range

ETSI

European Telecommunications Standards Institute

Event

A significant change. Events in controlled Network Elements include signal failures, equipment failures, signals exceeding thresholds, and protection switch activity. When an event occurs in a controlled Network Element, the controlled Network Element will generate an alarm or status message and send it to the management system.

Event Driven

A required characteristic of network element software system: NEs are reactive systems, primarily viewed as systems that wait for and then handle events. Events are provided by the external interface packages, the hardware resource packages, and also by the software itself.

EXP

Experimental

Externally Timed

An operating condition of a clock in which it is locked to an external reference and is using time constants that are altered to quickly bring the local oscillator's frequency into approximate agreement with the synchronization reference frequency.

ExTI

Expected Trace Identifier

Extra traffic

Unprotected traffic that is carried over protection channels when their capacity is not used for the protection of working traffic.

F

FAS

Frame alignment signal

FAS

Frame Alignment Signal

Fault

Term used when a circuit pack or signal has a hard (not temporary) fault and cannot perform its normal function. For signals the fault may be temporary.

Fault Management

Collecting, processing, and forwarding of autonomous messages from network elements.

FC

Flag Continuation

FCC

Federal Communications Commission

FDA/CDRH

The Food and Drug Administration's Center for Devices and Radiological Health.

FDDI (Fiber Distributed Data Interface)

Fiber interface that connects computers and distributes data among them.

FDI

Forward Defect Indication

FDI-O

Forward Defect Indication Overhead

FDI-P

Forward Defect Indication Payload

FE (Far End)

Any other network element in a maintenance subnetwork other than the one the user is at or working on. Also called remote.

FEBE (Far-End Block Error)

An indication returned to the transmitting node that an errored block has been detected at the receiving node. A block is a specified grouping of bits.

FEC (Forward Error Correction)

An error correction technique in which redundant bits are added to the payload signal enabling the receiving station to detect and correct bit errors that unavoidably occur when an optical line signal is transmitted over longer distances over an optical fiber. FEC is used to increase the transmission span length.

FEPROM (Flash EPROM)

A technology that combines the non-volatility of EPROM with the in-circuit re-programmability of EEPROM.

FERF (Far-End Receive Failure)

An indication returned to a transmitting Network Element that the receiving Network Element has detected an incoming section failure. Also known as RDI.

FIB (Forwarding Information Base)

A FIB, also known as a forwarding table, is most commonly used in network bridging, routing, and similar functions to find the proper interface to which the input interface should forward a packet.

FIT (Failures in Time)

Circuit pack failure rates per 10^9 hours as calculated using the method described in Reliability Prediction Procedure for Electronic Equipment, BellCore Method I, Issue 6, December 1997.

Fixed-rate tributary operation of a port

Mode of operation of a port in which tributaries are provisioned for the expected signal rates. This provisioning information is used for cross-connection rate validation and for alarm handling (for example “Loss of Pointer”).

FLC

First-Level Controller

Folded Rings

Folded (collapsed) rings are rings without fiber diversity. The terminology derives from the image of folding a ring into a linear segment.

Forced

Term used when a circuit pack (either working or protection) has been locked into a service-providing state by user command.

FPS

Facility Protection Switching

FR (Frame Relay)

A form of packet switching that relies on high-quality phone lines to minimize errors. It is very good at handling high-speed, bursty data over wide area networks. The frames are variable lengths and error checking is done at the end points.

Frame

The smallest block of digital data being transmitted.

Framework

An assembly of equipment units capable of housing shelves, such as a bay framework.

Free Running

An operating condition of a clock in which its local oscillator is not locked to an internal synchronization reference and is using no storage techniques to sustain its accuracy.

G

GCC

General Communications Channel

GID

Group Identification

Global Wait to Restore Time

Corresponds to the time to wait before switching back to the timing reference. It occurs after a timing link failure has cleared. This time applies for all timing sources in a system hence the name global. This can be between 0 and 60 minutes, in increments of one minute.

GMP

Generic Mapping Procedure

GMPLS (generalized multi-protocol label switching)

A protocol suite (defined by IETF) that extends the label switching paradigm introduced in MPLS to include both packet-switched and circuit-switched networks and that provides the distributed intelligence required to build efficient and resilient multi-layer networks.

GMRE

GMPLS Routing Engine

GNE (Gateway Network Element)

A network element that passes information between other network elements and management systems through a data communication network.

GPON

Gigabit-capable passive optical networks

Grooming

In telecommunications, the process of separating and segregating channels, as by combing, such that the broadest channel possible can be assembled and sent across the longest practical link. The aim is to minimize de-multiplexing traffic and reshuffling it electrically.

H

Hard Failure

An unrecoverable non-symptomatic (primary) failure that causes signal impairment or interferes with critical network functions.

HDB3 (High Density Bipolar 3 Code)

Line code for 2 Mbit/s transmission systems.

HDLC (High Level Data Link Control)

OSI reference model data link layer protocol.

HO

Higher Order

Holdover

An operating condition of a clock in which its local oscillator is not locked to an external reference but is using storage techniques to maintain its accuracy with respect to the last known frequency comparison with a synchronization reference.

Hot Standby

A circuit pack ready for fast, automatic placement into operation to replace an active circuit pack. It has the same signal as the service going through it, so that choice is all that is required.

HPCFAP

High Power Connection Fuse and Alarm Panel

I

I/O

Input/Output

IaDI

Intra-Domain Interface

IAE

Incoming Alignment Error

ICMP (Internet Control Message Protocol)

The ICMP is one of the main protocols of the Internet Protocol Suite. It is used by network devices, like routers, to send error messages indicating, for example, that a requested service is

not available or that a host or router could not be reached.

ID

Identifier

IEC

International Electro-Technical Commission

IEEE

Institute of Electrical and Electronics Engineers

IETF

Internet Engineering Task Force

IGMP (Internet Group Management Protocol)

The IGMP is a communications protocol used by hosts and adjacent routers on IP networks to establish multicast group memberships. IGMP is an integral part of IP multicast.

ILA

In-line amplifier

IMF

Infant Mortality Factor

Insert

To physically insert a circuit pack into a slot, thus causing a system initiated restore of an entity into service and/or creation of an entity and associated attributes.

Interface Capacity

The total number of STM-1 equivalents (bidirectional) tributaries in all transmission interfaces with which a given transmission interface subrack can be equipped at one time. The interface capacity varies with equipage.

Intermediate System (IS)

A system which routes/relays management information. An SDH Network Element may be a combined intermediate and end system.

IP

Internet Protocol

IPCP (IP Control Protocol)

IPCP is the Network Control Protocol for IPv4.

IPL

Inter-processor link

IrDI

Inter-Domain Interface

IS (In-Service)

A memory administrative state for ports. IS refers to a port that is fully monitored and alarmed.

ISDN

Integrated Services Digital Network

ITU-T

International Telecommunications Union — Telecommunication standardization sector. Formerly known as CCITT: Comité Consultatif International Télégraphique & Téléphonique; International Telegraph and Telephone Consultative Committee.

J

JC

Justification Control

Jitter

Short term variations of amplitude and frequency components of a digital signal from their ideal position in time.

JOH

Justification Overhead

L

LAN (Local Area Network)

A communications network that covers a limited geographic area, is privately owned and user administered, is mostly used for internal transfer of information within a business, is normally contained within a single building or adjacent group of buildings, and transmits data at a very rapid speed.

LBC

Laser Bias Current

LBFC

Laser Backface Currents

LBO (Lightguide Build-Out)

An attenuating (signal-reducing) element used to keep an optical output signal strength within desired limits.

LC

Lucent Connector (also called “Little Connector” or “Local Connector” – an optical fiber connector type according to *IEC 61754-20* using a ferrule diameter of 1.25 mm.

LCAS

Link Capacity Adjustment Scheme

LCN

Local Communications Network

LCP

Link Control Protocol

LCS

Local Customer Support

LD

Line driver

LDC

Local Data Controller

LED

Light-Emitting Diode

LF

Local Fault

LH

Long Haul

Line

A transmission medium, together with the associated equipment, required to provide the means of transporting information between two consecutive network elements. One network element originates the line signal; the other terminates it.

Line Protection

The optical interfaces can be protected by line protection. Line protection switching protects against failures of line facilities, including the interfaces at both ends of a line, the optical fibers, and any equipment between the two ends. Line protection includes protection of equipment failures.

Line Timing

Refers to a network element that derives its timing from an incoming STM-*N* signal.

Link

The mapping between in-ports and out-ports. It specifies how components are connected to one another.

LLM

Logical Lane Marker

LMP

Link Management Protocol

LO

Lower Order

Location

An identifier for a specific circuit pack, interface module, interface port, or communications link.

Lockout of Protection

The Alcatel-Lucent 1830 PSS ZIC command that prevents the system from switching traffic to the protection line from a working line. If the protection line is active when a "Lockout of Protection" is entered – this command causes the working line to be selected. The protection line is then locked from any Automatic, Manual, or Forced protection switches.

Lockout State

The Lockout State is defined for each working or protection circuit pack. The two permitted states are: None – meaning no lockout is set for the circuit pack, set meaning the circuit pack has been locked out. The values (None & Set) are taken independently for each working or protection circuit pack.

LOF (Loss of Frame)

A failure to synchronize an incoming signal.

LOM

Loss of Multiframe

Loop Timing

A special case of line timing. It applies to network elements that have only one STM-*N*/OC-*N* interface. For example, terminating nodes in a linear network are loop timed.

Loopback

Type of diagnostic test used to compare an original transmitted signal with the resulting received signal. A loopback is established when the received optical or electrical external transmission signal is sent from a port or tributary input directly back toward the output.

LOP (Loss of Pointer)

A failure to detect the signal structure in an incoming signal.

LOS (Loss of Signal)

The complete absence of an incoming signal.

Loss Budget

Loss (in dB) of optical power due to the span transmission medium (includes fiber loss and splice losses).

LSB

Least Significant Bit

LTE

Line Terminating Equipment

M

MAF

Management Application Function

Manager

Capable of issuing network management operations and receiving events. The manager communicates with the agent in the controlled network element.

Manual Switch State

A protection group enters the Manual Switch State upon the initiation and successful completion of the Manual Switch command. The protection group leaves the Manual Switch state by means of the Clear or Forced Switch commands. While in the Manual Switch state the system may switch the active unit automatically if required for protection switching.

MCF (Message Communications Function)

Function that provides facilities for the transport and routing of Telecommunications Management Network messages to and from the Network Manager.

MD (Mediation Device)

Allows for exchange of management information between Operations System and Network Elements.

MEC (Manufacturer Executable Code)

Network Element system software in binary format that after being downloaded to one of the stores can be executed by the system controller of the network element.

MEM

Memory

MFAS

MultiFrame Alignment Signal

MFI

Multiframe Indicator

MJ (Major (alarm))

Indicates a service-affecting failure, main or unit controller failure, or power supply failure.

MMF

Multi-Mode Fiber

MN (Minor (alarm))

Indicates a non-service-affecting failure of equipment or facility.

MO
Managed Object

MPLS
Multi Protocol Label Switching

MS
Maintenance Signal

MSB
Most Significant Bit

MSI
Multiplex Structure Identifier

MST
Member Status

MTBF
Mean Time Between Failures

MTBMA
Mean Time Between Maintenance Activities

MTIE
Maximum Time Interval Error

MTTR
Mean Time To Repair

Multiplexer
A device (circuit pack) that combines two or more transmission signals into a combined signal on a shared medium.

Multiplexing
A procedure by which multiple lower order path layer signals are adapted into a higher order path, or the multiple higher order path layer signals are adapted into a multiplex section.

N

NA
Not Applicable

naOH
non associated overhead

NE (Network Element)
A node in a telecommunication network that supports network transport services and is directly manageable by a management system.

NEBS

Network Equipment-Building System

NMI

Network Management Interface

NMON (Not Monitored)

A provisioning state for equipment that is not monitored or alarmed.

NNI

Network-Network Interface

NNI

Network Node Interface

No Request State

This is the routine-operation quiet state in which no external command activities are occurring.

NOC

Network Operation Center

Node

A network element in a ring or, more generally, in any type of network. In a network element supporting interfaces to more than one ring, node refers to an interface that is in a particular ring. Node is also defined as all equipment that is controlled by one system controller. A node is not always directly manageable by a management system.

Non-Revertive Switching

In non-revertive switching, an active and standby line exist on the network. When a protection switch occurs, the standby line is selected to support traffic, thereby becoming the active line. The original active line then becomes the standby line. This status remains in effect even when the fault clears. That is, there is no automatic switch back to the original status.

Non-Synchronous

The essential characteristic of time-scales or signals such that their corresponding significant instants do not necessarily occur at the same average rate.

NORM

Normal Operating Mode

NORM

Normal Operating Mode

NOS

Not Operational primitive Sequence

NPI

Null Pointer Indication

NRZ

Non-Return to Zero

NSA

Non-Service Affecting

NTP (Network Time Protocol)

NTP is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks.

O

OA

Optical Amplifier

OAM&P

Operations, Administration, Maintenance, and Provisioning

OC-192

Optical Carrier, Level 192 (9953.28 Mbit/s) (10 Gbit/s)

OC-48

Optical Carrier, Level 48 (2488.32 Mbit/s) (2.5 Gbit/s)

OC, OC-n

Optical Carrier

OCC

Optical Channel Carrier

OCCo

Optical Channel Carrier – overhead

OCCp

Optical Channel Carrier – payload

OCCr

Optical Channel Carrier with reduced functionality

OCG

Optical Carrier Group

OCGr

Optical Carrier Group with reduced functionality

OCh

Optical channel with full functionality

OChr

Optical channel with reduced functionality

OCI

Open Connection Indication

OCS

Optical Core Switch

ODTUG

Optical channel Data Tributary Unit Group

ODTU*jk*

Optical channel Data Tributary Unit *j* into *k*

ODTU*k.ts*

Optical channel Data Tributary Unit *k* with *ts* tributary slots

ODU

Optical Channel Data Unit

ODUk (Optical Channel Data Unit - k)

According to the *ITU-T Recommendation G.709*, the ODU*k* is an information structure consisting of the information payload (OPU*k*, Optical Channel Payload Unit) and ODU*k* related overhead. ODU*k* capacities are defined for *k* = 0, 1, 2, 2e, 3, 3e2, and 4 where *k* indicates the bit rate of the client signa (1.2 Gbit/s, 2.5 Gbit/s, 10.0 Gbit/s, 10.4 Gbit/s, 40.4 Gbit/s, 41.8 Gbit/s, 104.8 Gbit/s).

ODU*k***-***X***v**

X virtually concatenated ODU*k*s

ODU*k***P**

Optical Channel Data Unit-k Path Monitoring level

ODU*k***T**

Optical Channel Data Unit-*k* Tandem Connection Monitoring level

OFCS

Optical fiber communications

OH

Overhead

OI (Operations Interworking)

The capability to access, operate, provision, and administer remote systems through craft interface access from any site in an SDH network or from a centralized operations system.

OMD

Optical Multiplex/Demultiplex

OMFI

OPU Multi-Frame Identifier

OMS

Optical Multiplex Section. A section of a DWDM system that incorporates an optical Add/Drop Multiplexer.

OMS-OH

Optical Multiplex Section Overhead

OMSP

Optical Multiplex Section Level Protection.

OMU

Optical Multiplex Unit

ONNI

Optical Network Node Interface

OOB

Out of band

OOBDCN

Out-of-band DCN

OOF

Out-of-Frame

OOS (Out-of-Service)

An equipment entity is not providing its normal service function (removed from either the working or protection state) either because of a system problem or because the pack has been removed from service.

OOS

OTM Overhead Signal

OOS-AU (Out-of-Service - Autonomous)

An equipment entity is in an out-of-service state caused solely by an autonomous event.

OOS-AUMA (Out-of-Service - Autonomous and Management)

An equipment entity is in an out-of-service state caused by both an autonomous event and a management event.

OOS-MA (Out-of-Service - Management)

An equipment entity is in an out-of-service state caused solely by a management event.

Open shortest path first (OSPF)

A hierarchical link-state protocol for network routing, developed by the Internet Engineering Task Force (IETF).

Operations Interface

Any interface providing you with information on the system behavior or control. These include the equipment LEDs, user panel, Alcatel-Lucent 1830 PSS ZIC, office alarms, and all telemetry interfaces.

Operator

A user of the system with operator-level user privileges.

OPS

Optical Physical Section

OPSM

Optical Physical Section Multilane

Optical Channel

A STM-*n* wavelength within an optical line signal. Multiple channels, differing by 1.5 µm in wavelength, are multiplexed into one signal.

Optical Line Signal

A multiplexed optical signal containing multiple wavelengths or channels.

OPU

Optical Channel Payload Unit

OPUk (Optical Channel Payload Unit - k)

According to the *ITU-T Recommendation G.709*, the OPU*k* is the information structure used to adapt client information for the transport over an optical channel. It comprises client information together with any overhead needed to perform rate adaptation between the client signal rate and the OPU*k* payload rate and other OPU*k* overhead supporting the client signal transport. This overhead is adaptation specific.

OPU*k* capacities are defined for *k* = 0, 1, 2, 2e, 3, 3e2, and 4 where *k* indicates the bit rate of the client signa (1.2 Gbit/s, 2.5 Gbit/s, 10.0 Gbit/s, 10.4 Gbit/s, 40.4 Gbit/s, 41.8 Gbit/s, 104.8 Gbit/s).

OPUk-*X*v

X virtually concatenated OPU*k*s

OS (Operations System)

A central computer-based system used to provide operations, administration, and maintenance functions.

OSC

Optical Supervisory Channel

OSNCP

Optical sub-block network connection protection

OSP

Outside plant

OSPF

Open shortest path first

OTH

Optical Transport Hierarchy

OTL

Optical channel Transport Lane

OTLC

Optical Transport Lane Carrier

OTLCG

Optical Transport Lane Carrier Group

OTM

Optical Transport Module

OTN

Optical Transport Network

OTS (Optical Transport Segment)

The physical link between equipment at two different NEs; may be referred to the as OTS transmit line, or OTS receive line, or the OTS link.

OTS

Optical Transmission Section

OTS-OH

Optical Transmission Section Overhead

OTU

Optical Channel Transport Unit

OTUk (Optical Channel Transport Unit - k)

According to the *ITU-T Recommendation G.709*, the OTUk is the information structure used for the transport of an ODUk over one or more optical channel connections. It consists of the optical channel data unit and OTUk related overhead (FEC and overhead for management of an optical channel connection). It is characterized by its frame structure, bit rate, and bandwidth.
OTUk capacities are defined for k = 0, 1, 2, 2e, 3, 3e2, and 4 where k indicates the bit rate of the client signa (1.2 Gbit/s, 2.5 Gbit/s, 10.0 Gbit/s, 10.4 Gbit/s, 40.4 Gbit/s, 41.8 Gbit/s, 104.8 Gbit/s).

OTUk-v

Optical Channel Transport Unit-k with vendor specific OTU FEC

OTUkV

Functionally standardized Optical Channel Transport Unit – k (acc. to *ITU-T Recommendation G.709*)

OTUkV

functionally standardized Optical Channel Transport Unit-k

Outage

A disruption of service that lasts for more than 1 second.

P

P-CMEP

Path-Connection Monitoring End Point

Parameter

A variable that is given a value for a specified application. A constant, variable, or expression that is used to pass values between components.

Parity Check

Tests whether the number of ones (or zeros) in an array of binary bits is odd or even; used to determine that the received signal is the same as the transmitted signal.

Pass-Through

Paths that are cross-connected directly across an intermediate node in a network.

Path

A logical connection between the point at which a standard frame format for the signal at the given rate is assembled, and the point at which the standard frame format for the signal is disassembled.

Path Terminating Equipment

Network elements in which the path overhead is terminated.

PCB

Printed Circuit Board

PCC

Protection Communication Channel

PCM

Pulse Code Modulation

PCS

Physical Coding Sublayer

PDU1C, PDU2C

The Power Distribution Unit is used to provide the Alcatel-Lucent 1830 PSS-36 subrack with power. PDU1C is the ETSI market version, PDU2C is used for the ANSI market.

PFC

PSS-36 Power filter card

PI

Physical Interface

Platform

A family of equipment and software configurations designed to support a particular application.

PLD

Payload

Plesiochronous Network

A network that contains multiple subnetworks, each internally synchronous and all operating at the same nominal frequency, but whose timing may be slightly different at any particular instant.

PM (Performance Monitoring)

Measures the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated).

PM

Path Monitoring

PMA

Physical Medium Attachment sublayer

PMD (Polarization Mode Dispersion)

Output pulse broadening due to random coupling of the two polarization modes in an optical fiber.

PMI

Payload Missing Indication

PMOH

Path Monitoring OverHead

PMP

Performance monitoring process

PN

Pseudo-random Number

POP

Point of Presence

Port State Provisioning

A feature that allows a user to suppress alarm reporting and performance monitoring during provisioning by supporting multiple states (automatic, in-service, and not monitored) for low-speed ports.

POS

Position field

POTS

Plain Old Telephone Service

PPP

Point to point protocol

PRBS

See “pseudo-random binary sequence ” (p. GL-32).

Pre-provisioning

The process by which the user specifies parameter values for an entity in advance of some of the equipment being present. These parameters are maintained only in NVM. These modifications are initiated locally or remotely by a management system (such as Alcatel-Lucent 1830 PSS ZIC for example). Pre-provisioning provides for the de-coupling of manual intervention tasks (for example, install circuit packs) from those tasks associated with configuring the node to provide services (for example, specifying the entities to be cross-connected).

PRI

Primary

Proactive Maintenance

Refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming, but indicative of an impending signal fail or signal degrade defect.

Protection Access

To provision traffic to be carried by protection tributaries when the port tributaries are not being used to carry the protected working traffic.

Protection Group Configuration

The members of a group and their roles, for example, working protection, line number, etc.

Protection Path

One of two signals entering a path selector used for path protection switching or dual ring interworking. The other is the working path. The designations working and protection are provisioned by the user, whereas the terms active path and standby path indicate the current protection state.

Protection State

When the working unit is currently considered active by the system and that it is carrying traffic. The “active unit state” specifically refers to the receive direction of operation — since protection switching is unidirectional.

PROTN (Protection)

Extra capacity (channels, circuit packs) in transmission equipment that is not intended to be used for service, but rather to serve as backup against equipment failures.

PROV (Provisioned)

Indicating that a circuit pack is ready to perform its intended function. A provisioned circuit pack

can be active (ACT), in-service (IS), standby (STBY), provisioned out-of-service (POS), or out-of-service (OOS).

PSDN
Public Switched Data Network

pseudo-random binary sequence (PRBS)
A sequence of bits commonly used for testing.

PSF3T8
PSS-64 Power Supply, Filter, and Clock Interface Card

PSI
Payload Structure Identifier

PT
Payload Type

PTF
Path termination function

PTM
Pluggable transmission module (commonly, SFP, XFP, or CFP)

PTP (Precision Time Protocol)
The PTP is a protocol used to synchronize clocks throughout a computer network. On a local area network, it achieves clock accuracy in the sub-microsecond range, making it suitable for measurement and control systems.

PWR
Power

PWR ON
Power On

Q

QOS
Quality of Service

R

RADIUS
Remote Authentication Dial In User Service

RAM
Random Access Memory

RDI (Remote Defect Indication)
An indication returned to a transmitting terminal that the receiving terminal has detected an

incoming section failure. [Previously called far-end-receive failure (FERF).]

Reactive Maintenance

Refers to detecting defects/failures and clearing them.

Receive-Direction

The direction towards the Network Element.

Regeneration

The process of reconstructing a digital signal to eliminate the effects of noise and distortion.

Regenerator Section Termination (RST)

Function that generates the Regenerator Section Overhead (RSOH) in the transmit direction and terminates the RSOH in the receive direction.

Reliability

The ability of a software system performing its required functions under stated conditions for a stated period of time. The probability for an equipment to fulfill its function. Some of the ways in which reliability is measured are: MTBF (Mean Time Between Failures) expressed in hours; Availability = (MTBF)/(MTBF+MTTR)(%) [where MTTR = mean time to restore]; outage in minutes per year; failures per hour; percentage of failures per 1,000 hours.

Remote Network Element

Any Network Element that is connected to the referenced Network Element through either an electrical or optical link. It may be the adjacent node on a ring, or N nodes away from the reference. It also may be at the same physical location but is usually at another (remote) site.

Restore Timer

Counts down the time (in minutes) during which the switch waits to let the worker line recover before switching back to it. This option can be set to prevent the protection switch continually switching if a line has a continual transient fault.

Revertive

A protection switching mode in which, after a protection switch occurs, the equipment returns to the nominal configuration (that is, the working equipment is active, and the protection equipment is standby) after any failure conditions that caused a protection switch to occur, clear, or after any external switch commands are reset. (See “Non-Revertive”.)

Revertive Switching

In revertive switching, there is a working and protection high-speed line, circuit pack, etc. When a protection switch occurs, the protection line, circuit pack, etc. is selected. When the fault clears, service “reverts” to the working line.

RF

Remote Fault

RJ45

Registered jack, standardized according to *IEC60603-7*.

Route

A series of contiguous digital sections.

Router

An interface between two networks. While routers are like bridges, they work differently. Routers provide more functionality than bridges. For example, they can find the best route between any two networks, even if there are several different networks in between. Routers also provide network management capabilities such as load balancing, partitioning of the network, and trouble-shooting.

RS

Regenerator Section

RS

Reed-Solomon

RS-Ack

Re-sequence acknowledge

RSOH

Regenerator Section OverHead; part of SOH

RST

Regenerator Section Termination

RSVP

Reservation Protocol

RZ (Return to Zero)

A code form having two information states (termed zero and one) and having a third state or an at-rest condition to which the signal returns during each period.

S

SA

Service Affecting

SAPI

Source access point identifier

SD

Signal Degrade

SDH (Synchronous Digital Hierarchy)

A hierarchical set of digital transport structures, standardized for the transport of suitable adapted payloads over transmission networks.

SDS

Standard Directory Service based on ANSI recommendation T1.245

Section

The portion of a transmission facility, including terminating points, between a terminal network element and a line-terminating network element, or two line-terminating network elements.

Self-Healing

A network's ability to automatically recover from the failure of one or more of its components.

Server

Computer in a computer network that performs dedicated main tasks which generally require sufficient performance.

Service

The operational mode of a physical entity that indicates that the entity is providing service. This designation will change with each switch action.

SES (Severely Errored Seconds)

This performance monitoring parameter is a second in which a signal failure occurs, or more than a preset amount of coding violations (dependent on the type of signal) occurs.

SFP (small form-factor pluggable)

An SFP is a hot-pluggable compact transceiver used for data communications and telecommunications. It interfaces a so-called "parent board" to a fiber optic. The SFP layout has been standardized by a consortium of leading suppliers of telecommunications equipment.

SH

Short Haul

Single-Ended Operations

Provides operations support from a single location to remote Network Elements in the same SDH subnetwork. With this capability you can perform operations, administration, maintenance, and provisioning on a centralized basis. The remote Network Elements can be those that are specified for the current release.

Site Address

The unique address for a Network Element.

Sk

Sink

SLC

Second-level controller

Slot

A physical position in a subrack designed for holding a circuit pack and connecting it to the backplane. This term is also used loosely to refer to the collection of ports or tributaries connected to a physical circuit pack placed in a slot.

SM

Section Monitoring

SM or SMF (Single-Mode Fiber)

A low-loss, long-span optical fiber typically operating at either 1310 nm, 1550 nm, or both.

SMOH

Section Monitoring OverHead

SNBF

Single Network Bay Frame, rack type used in ANSI equipment.

SNC

Subnetwork Connection

SNC/I

Subnetwork Connection (protection) / Inherent monitoring

SNC/N

Subnetwork Connection (protection) / Non-intrusive monitoring

SNC/S

Subnetwork connection protection with sublayer monitoring

SNR (Signal-to-Noise Ratio)

The relative strength of signal compared to noise.

So

Source

Software Backup

The process of saving an image of the current network element's databases, which are contained in its NVM, to a remote location.

Software Download

The process of transferring a software release generic from a remote file server to the network element's memory.

Software ID

Number that provides the software version information for the system.

SONET (Synchronous Optical Network)

The North American standard for the rates and formats that defines optical signals and their constituents.

Span

An uninterrupted bidirectional fiber section between two network elements.

Span Growth

A type of growth in which one wavelength is added to all lines before the next wavelength is added.

SPE

Synchronous Payload Envelope

SPF (Single point of failure)

A single failure in the network that causes isolation of more than one nodek. The use of IS-IS areas, without obeying all rules and guidelines, increases the risk of a single point of failure in the network.

SPI

Serial Peripheral Inventory

SQ

Sequence Indicator

Standby Path

One of two signals entering a constituent path selector, the standby path is the path not currently being selected.

State

The state of a circuit pack indicates whether it is defective or normal (ready for normal use). Operational state indicates dynamic system view: defective or normal. Administrate state indicates provisioned user view: in-service, out-of-service, maintenance. Alarms are generated only when administrative state is in-service.

Status

The indication of a short-term change in the system.

STBY (Standby)

The circuit pack is in service but is not providing service functions. It is ready to be used to replace a similar circuit pack either by protection or by duplex switching.

STM-N (Synchronous Transport Module, Level N)

A building block information structure that supports SDH section layer connections, where N represents a multiple of 155.52 Mbit/s. Normally N = 1, 4, 16, 64 or 256.

Supervisor

A user of the application with supervisor user privileges.

Suppression

A process where service-affecting alarms that have been identified as an “effect” are not displayed to a user.

SYNC

Synchronizer

Synchronization Messaging

Synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork.

Synchronous

The essential characteristic of time scales or signals such that their corresponding significant instances occur at precisely the same average rate, generally traceable to a single Stratum 1 source.

System Administrator

A user of the computer system on which the system's OS software application can be installed.

T

TC

Tandem Connection

TC-CMEP

Tandem Connection-Connection Monitoring End Point

TCA (Threshold-Crossing Alert)

A message type sent from a Network Element that indicates that a certain performance monitoring parameter has exceeded a specified threshold.

TCM

Tandem Connection Monitoring

TCMOH

Tandem Connection Monitoring OverHead

TCP/IP

Transmission Control Protocol / Internet Protocol

TDM (Time Division Multiplexing)

A technique for transmitting a number of separate data, voice, and/or video signals simultaneously over one communications medium by interleaving a portion of each signal one after another.

Through (or continue) cross-connection

A cross-connection within a ring, where the input and output tributaries have the same tributary number but are in lines opposite each other.

TID (Target Identifier)

A provisionable parameter that is used to identify a particular Network Element within a network. It is a character string of up 20 characters where the characters are letters, digits, or hyphens (-).

TIM

Trace identifier mismatch

TL1 (Transaction Language One)

A management protocol developed by Bellcore in 1984 for man-machine and machine-machine communications. TL1 is defined in Telcordia® *Requirement GR-831-CORE*.

TM (Terminal multiplexer)

An Add/drop multiplexer with only one stream interface.

TMN

Telecommunications Management Network

TPID (Tag protocol identifier, Ethertype)

Indicates the presence of a VLAN tag in a MAC frame. Furthermore, it indicates that the length/type field can be found at a different position in the frame (moved by 4 bytes).

Transmit Direction

The direction outwards from the Network Element.

Tributary

This term may refer to the following definitions:

1. A signal of a specific rate (2 Mbit/s, 34 Mbit/s, 140 Mbit/s, VC-12, VC-3, VC-4, STM-1 or STM-4) that may be added to or dropped from a line signal.
2. A path-level unit of bandwidth within a port, or the constituent signal(s) being carried in this unit of bandwidth, for example, an STM-1 tributary within an STM-*N* port.

TRU

Top Rack Unit

TS

Tributary Slot

TSOH

Tributary Slot Overhead

TTI

Trail trace identifier

TTP

Trail Termination Point

TTT

Timing Transparent Transcoding

TU (Tributary Unit)

An information structure which provides adaptation between the lower order path layer and the higher path layer. Consists of a VC-*n* plus a tributary unit pointer (TU PTR).

Two-Way Point-to-Point Cross-Connection

A two-legged interconnection, that supports two-way transmission, between two and only two tributaries.

TxTI

Transmitted Trace Identifier

U

UAS (Unavailable Seconds)

In performance monitoring, the count of seconds in which a signal is declared failed or in which 10 consecutively severely errored seconds (SES) occurred, until the time when 10 consecutive non-SES occur.

UITS (Unacknowledged Information Transfer Service)

Unconfirmed mode of LAPD operation.

UNI

User-to-Network Interface

Upstream

At or towards the source of the considered transmission stream, for example, looking in the opposite direction of transmission.

USB

Universal Serial Bus

User Privilege

Permissions a user must perform on the computer system on which the system software runs.

UTC (Universal Time Coordinated)

A time-zone independent indication of an event. The local time can be calculated from the Universal Coordinated Time.

V

Value

A number, text string, or other menu selection associated with a parameter.

Variable

An item of data named by an identifier. Each variable has a type, such as int or Object, and a scope.

VCG

Virtual Concatenation Group

VCOH

Virtual Concatenation Overhead

vcPT

virtual concatenated Payload Type

VF

Voice frequency

Virtual Circuit

A logical connection through a data communication (for example, X.25) network.

Voice Frequency (VF) Circuit

A 64 kilobit per second digitized signal.

Volatile Memory

Type of memory that is lost if electrical power is interrupted.

VPLS (Virtual Private LAN Service)

VPLS is a way to provide Ethernet-based multipoint to multipoint communication over IP or MPLS networks.

VSR

Very short reach

W

WAN (Wide Area Network)

A communication network that uses common-carrier provided lines and covers an extended geographical area.

Wavelength Interchange

The ability to change the wavelength associated with an STM-*N* signal into another wavelength.

WDM (Wavelength Division Multiplexing)

A means of increasing the information-carrying capacity of an optical fiber by simultaneously transmitting signals at different wavelengths.

Wideband Communications

Voice, data, and/or video communication at digital rates from 64 kbit/s to 2 Mbit/s.

Working

Label attached to a physical entity. In case of revertive switching the working line or unit is the entity that is carrying service under normal operation. In case of non-revertive switching the label has no particular meaning. Working/Protection assignments are provisioned and do not change dynamically. Active/Standby status changes dynamically. When the "working" entity is failed, the protection entity is active and the working entity is standby. Otherwise the working entity is active and the protection entity is standby. "Protection" is the label attached to the *other* entity, not one that is active when the "Working" entity is failed.

WRED

weighted random early detection

WRK (Working)

Secondary state of system components. In case of revertive switching the working line or unit is the entity that is carrying service under normal operation. In case of non-revertive switching the label has no particular meaning. Working/Protection assignments are provisioned and do not change dynamically. Active/Standby status changes dynamically. When the "working" entity is

failed, the protection entity is active and the working entity is standby. Otherwise the working entity is active and the protection entity is standby. "Protection" is the label attached to the *other* entity, not one that is active when the "Working" entity is failed.

WRT (Wait to Restore Time)

Corresponds to the time to wait before switching back after a failure has cleared, in a revertive protection scheme. This can be between 0 and 15 minutes, in increments of one minute.

WS

Work Station

WTR (Wait to Restore)

Applies to revertive switching operation. The protection group enters the WTR state when all Equipment Fail (EF) conditions are cleared, but the system has not yet reverted back to its working line. The protection group remains in the WTR state until the Wait-to-Restore timer completes the WTR time interval.

X

XC

Cross-connect

XFP (extended form-factor pluggable)

An XFP is a hot-pluggable compact transceiver used for data communications and telecommunications. It interfaces a so-called “parent board” to a fiber optic. The XFP layout has been standardized by a consortium of leading suppliers of telecommunications equipment.

Z

Zero Code Suppression

A technique used to reduce the number of consecutive zeros in a line-coded signal (B3ZS, B8ZS).

Index

Numerics

1 × 100G ANY Port Unit (1XANY100G), 8-5, 8-10, 8-179

front view, 8-183

LEDs, 9-17

1 × 43G Switchponder (43SCUP)
See: 43G Single Port Tunable Coherent Uplink (43SCUP)

10 × 10 GbE / XFP Port Unit (10XETH10G), 8-5, 8-9, 8-101

front view, 8-105

LEDs, 9-17

10 × 10 GbE / XFP Port Unit (10XETH10GC), 8-5, 8-9, 8-107

front view, 8-109

LEDs, 9-17

10 × 10G ANY Port Unit (10XANY10G), 8-5, 8-9, 8-78

front view, 8-84

LEDs, 9-17

10 × 10G ANY Port Unit (10XANY10GC), 8-5, 8-9, 8-86

front view, 8-88

LEDs, 9-17

10 × OTU2 / XFP Port Unit (10XOTH10G), 8-5, 8-9, 8-95

front view, 8-99

LEDs, 9-17

10 × STM-64/OC-192 / XFP Port Unit (10XSTH10G), 8-5, 8-9, 8-90

front view, 8-93

LEDs, 9-17

1000BLXU, 8-13

1000BSXU, 8-13

1000BZXU, 8-13

10AN10G
See: 10 × 10G ANY Port Unit (10XANY10G)

10AN10GC
See: 10 × 10G ANY Port Unit (10XANY10GC)

10XANY10G
See: 10 × 10G ANY Port Unit (10XANY10G)

10XANY10GC
See: 10 × 10G ANY Port Unit (10XANY10GC)

10XETH10G
See: 10 × 10 GbE / XFP Port Unit (10XETH10G)

10XETH10GC
See: 10 × 10 GbE / XFP Port Unit (10XETH10GC)

10XOTH10G
See: 10 × OTU2 / XFP Port Unit (10XOTH10G)

10XSTH10G
See: 10 × STM-64/OC-192 / XFP Port Unit (10XSTH10G)

1+1 MSP, 9-98

1+1 ODUk SNC/I protection, 9-84

1+1 ODUk SNC/N protection, 9-85

11G 4 Port Tunable Uplink (11QCUPC), 8-5, 8-10, 8-145

front view, 8-149

LEDs, 9-17

11QCUPC
See: 11G 4 Port Tunable Uplink (11QCUPC)

130G Single Port Tunable Coherent Uplink (130SCUP), 8-5, 8-10, 8-158

front view, 8-163

LEDs, 9-17

130G Single Port Tunable Coherent Uplink (130SCUPB), 8-5, 8-10, 8-165

front view, 8-170

LEDs, 9-17

130G Single Port Tunable Coherent Uplink (130SCUPC), 8-5, 8-10, 8-172

front view, 8-177

LEDs, 9-17

130SCUP
See: 130G Single Port Tunable Coherent Uplink (130SCUP)

130SCUPB
See: 130G Single Port Tunable Coherent Uplink (130SCUPB)

130SCUPC
See: 130G Single Port Tunable Coherent Uplink (130SCUPC)

1830 PSS-1
mixed network (w/PSS-32), 17-227

1830 PSS-1 GBE/GBEH
linear network, 17-225
ring network, 17-226

1830 PSS-64 integrated bay
See: 7-feet Seismic Network Bay Frame rack (SNBF)

1 × 100G Switchponder (130SCUP)
See: 130G Single Port Tunable Coherent Uplink (130SCUP)

1 × 100G Switchponder (130SCUPB)
See: 130G Single Port Tunable Coherent Uplink (130SCUPB)

1 × 100G Switchponder (130SCUPC)
See: 130G Single Port Tunable Coherent Uplink (130SCUPC)

1AN100G
See: 1 × 100G ANY Port Unit (1XANY100G)

1:N ODUk SNC/S protection, 9-90

1T9 Agnostic Matrix (MT1T9), 8-4, 8-59, 9-72
equipment protection, 6-30, 8-61, 8-64, 9-75
LEDs, 9-15

1T9 Agnostic Matrix (MT1T9C), 8-9, 9-72
equipment protection, 8-63

1T9 Agnostic Matrix (MT1T9CN), 8-9

1XANY100G
See: 1 × 100G ANY Port Unit (1XANY100G)

2 × 40G ANY Port Unit (2XANY40G), 8-5, 8-9, 8-111
front view, 8-115
LEDs, 9-17

2 × 40G ANY Port Unit (2XANYQ40G) with QSFP+ modules, 8-10

2 × 40G ANY Port Unit with QSFP+ modules (2XANYQ40G), 8-5, 8-117
front view, 8-121
LEDs, 9-17

200G ADM
Client/Line configuration with ODU2/2e switching, 17-113

24 × 1 GbE / SFP Port Unit (24XETH1G), 8-5, 8-10, 8-140
front view, 8-142
LEDs, 9-17

24 × 1 GbE / SFP Port Unit (24XETH1GB), 8-5, 8-10, 8-144
LEDs, 9-17

24 × Multirate ANY Port Unit (24XANYMR), 8-5, 8-10, 8-123
front view, 8-127
LEDs, 9-17

24 × Multirate ANY Port Unit (24XANYMRB), 8-5, 8-10, 8-129
LEDs, 9-17

24 × SDH/SONET / SFP Port Unit (24XSTHMR), 8-5, 8-10, 8-130
front view, 8-133
LEDs, 9-17

24ANM
See: 24 × Multirate ANY Port Unit (24XANYMR)

24XANYMR
See: 24 × Multirate ANY Port Unit (24XANYMR)

24XANYMRB
See: 24 × Multirate ANY Port Unit (24XANYMRB)

24XETH1G
See: 24 × 1 GbE / SFP Port Unit (24XETH1G)

24XETH1GB
See: 24 × 1 GbE / SFP Port Unit (24XETH1GB)

24XSTHMR
See: 24 × SDH/SONET / SFP Port Unit (24XSTHMR)

2-Degree FOADM, 17-39

2-Degree TOADM, 17-24

2XANY40G
See: 2 × 40G ANY Port Unit (2XANY40G)

2XANYQ40G
See: 2 × 40G ANY Port Unit (2XANYQ40G) with QSFP+ modules
See: 2 × 40G ANY Port Unit with QSFP+ modules (2XANYQ40G)
See: 2 × 40G ANY Port Unit with QSFP+ modules (2XANYQ40G)

300-mm ETSI One Rack, 8-4, 8-8, 8-29, 8-32, 18-5, 18-142, 18-144, 18-147

floorplan guidelines, 10-25

3-Degree FOADM, 17-46

3-Degree TOADM mesh, 17-26

3T8 Agnostic Matrix (MT3T8), 8-5, 8-59, 9-72

equipment protection, 6-30, 8-61, 9-75

front view, 8-65

LEDs, 9-15

4 × 10G ANY Port Unit (4XANY10G), 8-5, 8-9, 8-70

front view, 8-76

LEDs, 9-17

43G Single Port Tunable Coherent Uplink (43SCUP), 8-5, 8-10, 8-151

front view, 8-156

LEDs, 9-17

43SCGE1 module, 18-462

43SCUP
See: 43G Single Port Tunable Coherent Uplink (43SCUP)

4 × 11G Switchponder (11QCUPC)
See: 11G 4 Port Tunable Uplink (11QCUPC)

4XANY10G
See: 4 × 10G ANY Port Unit (4XANY10G)

7-feet Seismic Network Bay Frame rack (SNBF), 8-4, 8-8, 8-29, 8-32, 18-5, 18-142, 18-147

floorplan guidelines, 10-25

8 × 1 GbE / SFP Port Unit (8XETH1G), 8-5, 8-10, 8-135

front view, 8-137

LEDs, 9-17

8 × 1 GbE / SFP Port Unit (8XETH1GB), 8-5, 8-10, 8-139

LEDs, 9-17

8XETH1G
See: 8 × 1 GbE / SFP Port Unit (8XETH1G)

8XETH1GB
See: 8 × 1 GbE / SFP Port Unit (8XETH1GB)

960G Agnostic Matrix (MT960C), 8-59, 9-72

equipment protection, 6-30, 8-61, 9-75

front view, 8-62

LEDs, 9-15

PSS-36, 8-9

A

A4PSWG, 18-327

AAR-8A, 18-330

Access Control Lists (ACL), 9-25

ACL
See: Access Control Lists (ACL)

ACO button, 9-36

acoustic noise damper, 8-6, 8-10, 8-10

add adjustment, 19-27

addresses

MAC, 8-219

agnostic matrix cards, 8-59

equipment protection, 6-30, 8-61

front view, 8-62, 8-63, 8-64, 8-65

LEDs, 9-15

air filter, 4-19

air filter PSS-36, 8-11

air filter PSS-64, 8-6

airflow, 20-20

alarm, 9-32, 9-35

management, 9-31

notification, 9-32

reporting, 19-32

alarm severity assignment profiles (ASAP), 9-35

Alcatel-Lucent 1830 PSS

applications, 1-18

configurations, 1-16

key innovations OCS, 1-22

key innovations WDM and switched DWDM, 1-19

OCS application, 1-18

profile, 1-14

WDM application, 1-18

Alcatel-Lucent 1830 PSS Zero Installation Craft Terminal (ZIC), 9-5

domains, 9-5

interfaces, 8-217, 18-558

LAN interface, 8-56

user interface, 9-5

Alcatel-Lucent 1830 PSS-16

installation kit (ANSI), 18-9

installation kit (ETSI), 18-9

main shelf kit, 18-6

orderable items, 18-5

subrack, 18-142

Alcatel-Lucent 1830 PSS-16II

subrack, 18-144

Alcatel-Lucent 1830 PSS-32

extension shelf kit, 18-6

extension shelf kit, high capacity, 18-6

installation kit (ANSI), 18-7

installation kit (ETSI), 18-7

main shelf kit, high capacity, 18-6

orderable items, 18-5

subrack, 18-147

Alcatel-Lucent 1830 PSS-36

baffle metal flap repair kit, 8-11

baffle rubber flap repair kit, 8-11

installation kit (ANSI), 8-11

installation kit (ETSI), 8-11

orderable items, 8-8

shelf, 8-9

shelf cover, 8-9

shelf kit, 8-8

subrack (CMSHF), 8-32

Alcatel-Lucent 1830 PSS-36 shelf
See: Alcatel-Lucent 1830 PSS-36 subrack

Alcatel-Lucent 1830 PSS-64

cable kit (ETSI and ANSI), 8-6

installation kit (ANSI), 8-6

installation kit (ETSI), 8-6

installation kit for vertical fiber management rack extension, 8-6

orderable items, 8-4

shelf (S3T8), 8-4, 8-29

subrack (S3T8), 8-4, 8-29

vertical fiber management rack extension, 8-6

Alcatel-Lucent 1830 PSS ZIC
See: Alcatel-Lucent 1830 PSS Zero Installation Craft Terminal (ZIC)

alien wavelength

protection, 19-125

amplifier nodes, 14-30

anomaly, 9-32

ASAP
See: alarm severity assignment profiles (ASAP)

authentication, 19-16

autodiscovery, 6-35

automated optical power management system, 19-21

automatic switched optical network (ASON), 1-30

autoprovisioning, 9-73, 19-107

B

backup database

primary, 9-67, 19-73

secondary, 9-67, 19-73

Basic Ethernet services and features, 15-7

EPL and EVPL services, 15-7

BFP
See: full slot blank front plate

BHFP
See: half slot blank front plate

blank front plate, 8-6, 8-6, 8-10, 8-10, 8-10, 8-29, 8-32

types, 10-6, 10-22, 10-24

blocking, 9-32

bonding points

ESD, 6-11

BT36
See: Bus Termination (BT36)

BT3T8
See: Bus Termination (BT3T8)

BTC3T8
See: Bus Termination CMISS (BTC3T8)

Bus Termination (BT36), 8-42

front view, 8-44

PSS-36, 8-9

removing tool, 8-11

Bus Termination (BT3T8), 9-72

front view, 8-41

PSS-64, 8-4, 8-39

Bus Termination CMISS (BTC3T8), 9-72

front view, 8-41

PSS-64 CMISS, 8-4, 8-39

buttons

ACO, 9-36

C

CCAL
See: Command Community Authorization Levels (CCAL)

central office shelf (COSHF), 1-29, 18-10, 20-2

chromatic dispersion compensation, 14-31

circuit breaker, 8-11

Class 1 laser statements

Canada, 4-4

China, 4-5

European Union, 4-8

United States, 4-14

clear validation time, 9-32

CLEI™ codes, 9-69, 19-75

climatic conditions

stationery operation, 10-11

CMSHF
See: Alcatel-Lucent 1830 PSS-36 subrack (CMSHF)

Coax Timing Adapter 1.0/2.3, 12-2, 22-6

Command Community Authorization Levels (CCAL), 9-23

command line interface (CLI), 14-61

compatibility
electromagnetic, 4-7, 10-16

compound
photonic, 1-14
switching, 1-14

conditions, 9-34

conditions severities, 9-34

configuration
management, 9-67, 19-73

conformance statements
Canada, 4-3
China, 4-5
eco-environmental, Canada, 4-4
eco-environmental, China, 4-6
eco-environmental, European Union, 4-9
eco-environmental, United States, 4-14
European Union, 4-7
Federal Communications Commission, United States, 4-13
indoor applications, Canada, 4-3
indoor applications, China, 4-5
indoor applications, European Union, 4-8
indoor applications, United States, 4-13
industry Canada, 4-3
industry Japan, 4-12
Japan, 4-12
laser warning, Canada, 4-4
laser warning, China, 4-6
laser warning, European Union, 4-9
laser warning, United States, 4-14
material content compliance, China, 4-6
material content compliance, European Union, 4-10
optical transmitter, Canada, 4-3
optical transmitter, China, 4-5
optical transmitter, European Union, 4-8
optical transmitter, United States, 4-13
packaging collection and recovery, Canda, 4-4
packaging collection and recovery, China, 4-6
packaging collection and recovery, European Union, 4-9
packaging collection and recovery, United States, 4-14
product safety, Canada, 4-3
product safety, China, 4-5
product safety, European Union, 4-8
product safety, United States, 4-13
recycling / take-back / disposal of products and batteries, European Union, 4-9
United States, 4-13

connectors
electrical, 10-30, 10-31
optical, 10-30

consequent actions, 9-32

converged backbone transformation, 1-26

cooling
shelf, 20-20

correlated fault cause, 9-32

correlation, 9-32

COSHF
See: central office shelf (COSHF)

CSF
Client Signal Fail indication, 6-20

CWDM
filters, 14-19
networks, 14-19
optical interface, 14-20

CWDM/DWDM FOADM, 17-47

CWR8, 18-227
colorless wavelength router, 18-227

CWR8-88, 18-227
colorless wavelength router, 18-231

D

data communications network (DCN), 6-41
interfaces, 8-217, 18-558
protection, 6-41, 8-216

database
download performance, 9-69, 19-75
upload performance, 9-69, 19-75
volatile, 9-67, 19-73
DCM
modules, 18-33, 18-149
shelf, 1-29, 14-5, 18-149
shelf, 19-inch EIA, 18-7
shelf, ETSI/ANSI, 18-7
default users, 9-22
defect, 9-32
domains
Alcatel-Lucent 1830 PSS Zero Installation Craft Terminal (ZIC), 9-5
download
software, 9-62
drop adjustment, 19-28
dust filter, 8-6
DWDM
external filters, 18-214
filter modules, 18-208
uplink performance monitoring parameters, 9-53
wavelength channels, 14-9

E
EC
See: Equipment Controller (EC)
EC_HC
See: First-Level Controller (FLC)
EC_HC PSS-64 First-Level Controller (FLC), 8-4
eco-environmental statements
Canada, 4-4
China, 4-6
European Union, 4-9
United States, 4-14
EFEC
See: enhanced forward error correction (EFEC)
egress adjustment, 19-27
electrical connectors, 10-30, 10-31
electromagnetic compatibility, 4-7, 10-16
embedded communication channel (ECC)
protection, 8-216
termination, 8-215, 18-554
embedded control channel (ECC)
protection, 6-41
end office shelf (EOSHF), 1-29, 18-7, 20-2, 20-3, 20-3
Engineering and Planning Tool
(EPT), 20-12
engineering services; installation
services, 10-2
enhanced forward error correction (EFEC), 6-23
environmental conditions
storage, 10-7
transportation, 10-9
EOSHF
See: end office shelf (EOSHF)
equipment, 6-32
Equipment Controller (EC), 18-179, 18-182, 18-186
active main, 18-179, 18-183, 18-187
LEDs, 19-8
sub-tending, 18-180, 18-183, 18-187
equipment entities
mandatory, 9-72, 19-106
non-mandatory, 9-72, 19-106
equipment protection
1T9 Agnostic Matrix, 6-30, 8-61, 8-63, 8-64, 9-75
3T8 Agnostic Matrix, 6-30, 8-61, 9-75
960G Agnostic Matrix, 6-30, 8-61, 9-75
agnostic matrix cards, 6-30, 8-61
First-Level Controller, 6-30, 8-55, 9-75
ESD
See: electrostatic discharge (ESD)
bonding points, 6-11
E-SNCP, 19-125
Ethernet
OAM terminologies, 15-2
Ethernet features
11QPE24 feature enhancements, 15-6
E-LAN, 15-6
ERP hold-off timer, 15-25
EVPL, 15-6
L2 Smart SFP & Smart cEDD remote management, 15-6
L2CP processing compliant to MEF 6.1.1 EPL option 2, 15-8
MAC move, 15-50
MAC swapping, 15-50
TPoP/CSoP Smart SFPs, 15-68

TSoP Smart SFPs, 15-66

Ethernet OAM

Ethernet OAM enhancements, 15-84

Maintenance parameters
See: Maintenance Domain (MD), Maintenance association (MA), Maintenance point (MP)

Ethernet performance monitoring parameters, 9-53

events, 9-35

extended form-factor pluggables (XFP), 6-31

IR211G1AU, 8-13

LR211G1AU, 8-13

LRT11G1TU, 8-13

LRxxW11G1TUC, 8-13

LRxxW11G1TUI, 8-13

SR111G1AU, 8-13, 9-72

SRxxW11G1TUC, 8-13

SRxxW11G1TUI, 8-13

external timing

input, 8-187

references, 8-188

extraction

clamp for LC and XFP, 8-11

extracting clamp for LC and XFP, 8-7

F

facility

loopbacks, 9-40, 19-35

protection, 9-78

protection switching, 9-78

facility loopbacks, 6-39

failure, 9-32

Tandem connection monitoring (TCM), 6-38

failure-in-time rates, 4-23

FAN (PSS-16), 18-163

FAN (PSS-16II), 18-166

FAN (PSS-32)

FAN, standard, 18-168

FAN32H, high capacity, 18-168

FAN (PSS-8), 18-159

Fan Unit (FAN32H), 19-106

Fan Unit (FAN3T8), 8-4, 8-9, 8-35, 9-72, 10-5

front view, 8-37

LEDs, 9-6, 19-4

service life, 4-19

FAN3T8
See: Fan Unit (FAN3T8)

fault, 9-32

detection, 9-31

management, 9-31, 14-65, 19-31

management process, 9-32

reporting, 9-31

FCC
See: Federal Communications Commission (FCC)

Federal Communications Commission (FCC)

conformance statements, United States, 4-13

field-replaceable units

(FRUs), 4-35

firewall traversal, 9-25

First-Level Controller (FLC), 8-4, 8-4, 8-9, 8-9, 8-9, 8-54, 9-61, 9-72

blank front plate, 8-11

equipment protection, 6-30, 8-55, 9-75

front view, 8-57

LEDs, 9-12

solid-state disk, 4-19, 9-62, 9-67, 19-73

FLC
See: EC_HC PSS-64 First-Level Controller (FLC)
See: First-Level Controller (FLC)
See: FLC64 PSS-64 First-Level Controller (FLC)

FLC slots, 8-29, 8-32

FLC36
See: First-Level Controller (FLC)

FLC36 PSS-36 First-Level Controller (FLC), 8-9, 8-9

FLC36EA PSS-36 First-Level Controller (FLC), 8-9

FLC64
See: First-Level Controller (FLC)

FLC64 PSS-64 First-Level Controller (FLC), 8-4

flex shelf

19-inch EIA, 18-7

23-inch ANSI, 18-7

ETSI, 18-7

floorplan guidelines, 10-25

FOADM

architecture, 14-9

hub, 17-39

line terminal, 17-31

free-running mode, 8-193, 12-44

front plates

blank, 8-6, 8-6, 8-10, 8-10, 8-10, 8-29, 8-32, 10-6, 10-22

full-size, 10-6, 10-22

GC slot, 10-6, 10-22

front views

1 × 100G ANY Port Unit (1XANY100G), 8-183

10 × 10 GbE / XFP Port Unit (10XETH10G), 8-105

10 × 10 GbE / XFP Port Unit (10XETH10GC), 8-109

10 × 10G ANY Port Unit (10XANY10G), 8-84

10 × 10G ANY Port Unit (10XANY10GC), 8-88

10 × OTU2 / XFP Port Unit (10XOTH10G), 8-99

10 × STM-64/OC-192 / XFP Port Unit (10XSTH10G), 8-93

11G 4 Port Tunable Uplink (11QCUPC), 8-149

130G Single Port Tunable Coherent Uplink (130SCUP), 8-163

130G Single Port Tunable Coherent Uplink (130SCUPB), 8-170

130G Single Port Tunable Coherent Uplink (130SCUPC), 8-177

2 × 40G ANY Port Unit (2XANY40G), 8-115

2 × 40G ANY Port Unit with QSFP+ modules (2XANYQ40G), 8-121

24 × 1 GbE / SFP Port Unit (24XETH1G), 8-142

24 × Multirate ANY Port Unit (24XANYMR), 8-127

24 × SDH/SONET / SFP Port Unit (24XSTHMR), 8-133

3T8 Agnostic Matrix, 8-65

4 × 10G ANY Port Unit (4XANY10G), 8-76

43G Single Port Tunable Coherent Uplink (43SCUP), 8-156

8 × 1 GbE / SFP Port Unit (8XETH1G), 8-137

960G Agnostic Matrix, 8-62

agnostic matrix cards, 8-62, 8-63, 8-64, 8-65

Bus Termination (BT36), 8-44

Bus Termination (BT3T8), 8-41

Bus Termination CMISS (BTC3T8), 8-41

Fan Unit (FAN3T8), 8-37

First-Level Controller (FLC), 8-57

High Power Connection, Fuse and Alarm Panel (HPCFAP), 8-52

Power Distribution Unit (PDU1C), 8-53

Power Distribution Unit (PDU2C), 8-53

Power Filter Card AC (PFD), 18-173

Power Filter Card DC (PFD), 18-176, 18-178

Power Filter Card (PFC), 8-50

Power Supply, Filter, and Clock Interface Card (PSF3T8), 8-47

Precision Time Protocol Control (PTPCTL), 18-297

Precision Time Protocol I/O (PTPIO), 18-288

static filter CWDM 2 channel (SFC2), 18-222

static filter CWDM 4 channel (SFC4), 18-223

static filter CWDM 8 channel (SFC8), 8-68, 18-224

static filter DWDM 40 channel (SFD40), 18-216

static filter DWDM 40 channel (SFD40B), 18-216

static filter DWDM 44 channel (SFD44), 18-219

static filter DWDM 44 channel (SFD44B), 18-219

static filter DWDM 5 channel (SFD5), 18-209

static filter DWDM 8 channel (SFD8), 18-211

User Panel (PSS-16), 18-200

User Panel (PSS-32), 18-200

full slot blank front plate, 8-6, 8-10

G

gateway network element (GNE), 14-61

GC slots, 8-29, 8-32

unused, 10-6, 10-22, 10-24

general communication channel (GCC)

protection, 6-41, 8-216

termination, 8-215, 18-554

general planning information, 10-2

generalized multi-protocol label switching (GMPLS), 1-30, 6-1, 14-1

GMPLS
See: generalized multi-protocol label switching (GMPLS)

grounding

shelf, 20-13

growth controller slot blank front plate, 8-6

H half slot, 8-6

half slot adapter - PSS-36, PSS-64, 8-6, 8-11

half slot blank front plate, 8-10

half slot mechanical adapter tool, 8-6, 8-11

heat dissipation, 10-5, 10-5

High Power Connection, Fuse and Alarm Panel (HPCFAP), 8-4, 8-51, 9-72

front view, 8-52

LEDs, 9-7

High Power Connection, Fuse and Alarm Panel (HPCFAP-R), 8-4

hold-off timer, 9-80

holdover mode, 8-188, 8-193, 8-198, 8-198, 12-44

HPCFAP
See: High Power Connection, Fuse and Alarm Panel (HPCFAP)

HPCFAP-R
See: High Power Connection, Fuse and Alarm Panel (HPCFAP-R)

HSA3664
See: half slot adapter - PSS-36, PSS-64

HSLADTL
See: half slot mechanical adapter tool

I IEEE

1588v2, 14-86

IEEEv2 1588 PTP, 14-81

IETF
See: Internet Engineering Task Force (IETF)

ILA node, 17-186

indications

visual, 9-6, 9-7, 9-8, 9-10, 9-12, 9-38, 19-4, 19-5, 19-8, 19-9, 19-11

indoor applications statements

conformance statements, Canada, 4-3

conformance statements, China, 4-5

conformance statements, European Union, 4-8

conformance statements, United States, 4-13

industry Canada

conformance statements, 4-3

industry Japan

conformance statements, 4-12

ingress adjustment, 19-26

initial software installation, 9-61

in-line amplifier

ILA, 14-31

Insertion Loss, 22-7

in-service upgrade, 9-63, 19-72

installation

software, 9-61

interconnected rings, 17-4

interfaces

Alcatel-Lucent 1830 PSS ZIC, 8-217, 18-558

data communications network (DCN), 8-217, 18-558

management communication network (MCN), 8-217, 18-558

signaling communication network (SCN), 8-217, 18-558

synchronization, 12-2, 22-6

timing, 6-7, 12-2, 22-6

Internet Engineering Task Force (IETF), 6-1, 14-1

inventory, 6-32

I/O card slots, 8-29, 8-32, 18-142, 18-144, 18-147

unused, 10-6, 10-22, 10-24

I/O cards, 8-5, 8-9, 9-72, 18-22, 19-106

IP addresses, 8-219

IR12G7AU, 8-13

IR12G7TU, 8-13

IR211G1AU, 8-13

ITLB, 18-203

shelf, 14-5

static filter CWDM, 18-203

ITLU, 18-203

shelf, 14-5

L LAN interface

Alcatel-Lucent 1830 PSS Zero Installation Craft Terminal (ZIC), 8-56

User Panel (USRPNL), 18-202

laser statements

Canada, 4-4

China, 4-5

European Union, 4-8

United States, 4-14

laser warning statements

Canada, 4-4

China, 4-6

European Union, 4-9

United States, 4-14

LEDs

1 × 100G ANY Port Unit (1XANY100G), 9-17

10 × 10 GbE / XFP Port Unit (10XETH10G), 9-17

10 × 10 GbE / XFP Port Unit (10XETH10GC), 9-17

10 × 10G ANY Port Unit (10XANY10G), 9-17

10 × 10G ANY Port Unit (10XANY10GC), 9-17

10 × OTU2 / XFP Port Unit (10XOTH10G), 9-17

10 × STM-64/OC-192 / XFP Port Unit (10XSTH10G), 9-17

11G 4 Port Tunable Uplink (11QCUPC), 9-17

130G Single Port Tunable Coherent Uplink (130SCUP), 9-17

130G Single Port Tunable Coherent Uplink (130SCUPB), 9-17

130G Single Port Tunable Coherent Uplink (130SCUPC), 9-17

1T9 Agnostic Matrix (MT1T9), 9-15

2 × 40G ANY Port Unit (2XANY40G), 9-17

2 × 40G ANY Port Unit with QSFP+ modules (2XANYQ40G), 9-17

24 × 1 GbE / SFP Port Unit (24XETH1G), 9-17

24 × 1 GbE / SFP Port Unit (24XETH1GB), 9-17

24 × Multirate ANY Port Unit (24XANYMR), 9-17

24 × Multirate ANY Port Unit (24XANYMRB), 9-17

24 × SDH/SONET / SFP Port Unit (24XSTHMR), 9-17

3T8 Agnostic Matrix, 9-15

4 × 10G ANY Port Unit (4XANY10G), 9-17

43G Single Port Tunable Coherent Uplink (43SCUP), 9-17

8 × 1 GbE / SFP Port Unit (8XETH1G), 9-17

8 × 1 GbE / SFP Port Unit (8XETH1GB), 9-17

960G Agnostic Matrix (MT960C), 9-15

agnostic matrix cards, 9-15

color hierarchy, 9-38

Equipment Controller, 19-8

Fan Unit, 9-6, 19-4

First-Level Controller, 9-12

High Power Connection, Fuse and Alarm Panel (HPCFAP), 9-7

Power Filter Card (PFC), 9-10, 19-5

Power Supply, Filter, and Clock Interface Card, 9-8

Precision Time Protocol Control (PTPCTL), 19-7

static filter CWDM 8 channel (SFC8), 9-17

static filter DWDM 40 channel (SFD40), 19-11

static filter DWDM 40 channel (SFD40B), 19-11

User Panel, 19-9

WDM amplifiers, 19-12

WDM optical transponders, 19-12

line drivers

optical amplifiers, 18-300

line timing references, 8-188

linear configuration, 17-3

link pass through (LPT), 6-20

locked mode, 8-192, 12-44

loopbacks

controlling, 9-40, 19-35

facility, 6-39, 9-40, 19-35

terminal, 6-39, 9-40, 19-35

LPT

See: link pass through (LPT)

LR12G7TU, 8-13

LR211G1AU, 8-13

LR22G7TU, 8-13

LRT11G1TU, 8-13

LRxxW11G1TUC, 8-13

LRxxW11G1TUI, 8-13

M

MAC addresses, 8-219

management

alarm, 9-31

configuration, 9-67, 19-73

fault, 9-31

interfaces, 14-60

software, 9-61, 19-72

management communication network (MCN)

interfaces, 8-217, 18-558

management communications network (MCN), 6-41

mandatory equipment entities, 9-72, 19-106

manual provisioning, 9-73, 19-107

masking, 9-32

material content compliance statements

China, 4-6

European Union, 4-10

matrix slots, 8-29, 8-32

MCS8-16 (Multicast Switch 8-degrees with 16 add/drop), 18-336

mean time between failures (MTBF), 4-20

Mesh 8-degree Fiber Shuffle Module (MSH8-FSM), 18-343

mesh configuration, 17-5

MESH4 card, 18-324

modules

optical, 8-13, 9-72, 19-106

MON-OCM (Wavelength tracker optical channel monitor flex), 18-268

MON-OTDR

Filter card, 18-282

MPLS

MPLS-TP, 15-70

MPLS-TP

Maintenance Identifiers, 15-73

OAM, 15-74

Overview, 15-70

Protection, 15-78

MSH8-FSM (Mesh 8-degree Fiber Shuffle Module), 18-343

MT1T9
See: 1T9 Agnostic Matrix (MT1T9)

MT1T9C
See: 1T9 Agnostic Matrix (MT1T9C)

MT1T9CN
See: 1T9 Agnostic Matrix (MT1T9CN)

MT3T8
See: 3T8 Agnostic Matrix (MT3T8)

MT960C
See: 960G Agnostic Matrix (MT960C)

MTBF
See: mean time between failures (MTBF)

Multicast Switch 8-degrees with 16 add/drop (MCS8-16), 18-336

multi-shelf configuration, 8-207

MVAC module, 18-251

MVAC8B module, 18-253

N

network configurations

DWDM topologies, 14-21

Ethernet, 15-6

network element alarm indicators, 9-36

network element expansion, 1-15

network element transmission, 17-7

node expansion, 1-15

non-mandatory equipment entities, 9-72, 19-106

notification codes, 9-34

NTP server, 19-16

O

OAM

demarcation, 15-92

remote OAM, 15-92

ODUk non-intrusive client protection, 9-88

ODUk SNCP, 9-78

1+1 architecture, 9-78

1:N architecture, 9-78

OEO conversion, 14-79

OMD

installation kit, 18-9

OMD shelf, 1-29

OMSP

protection, 19-125

operating environment, 20-17, 20-17

operations interfaces, 9-4

OPS, 19-122

OPS module, 18-548

optical 1+1 protection, 19-121

optical amplifiers, 18-19

A2325A, 18-300

A2P2125, 18-300

AHPHG, 18-300

AHPLG, 18-300

ALPHG, 18-300

AM2032A, 18-300

AM2125A, 18-300

AM2318A, 18-300

AM2625A, 18-300

line drivers, 14-26

MESH4, 18-300

RA2P, 18-300

optical connectors, 10-30

optical line

protection, 19-126

optical modules, 8-13, 9-72, 19-106

1000BLXU, 8-13

1000BSXU, 8-13

1000BZXU, 8-13

IR12G7AU, 8-13

IR12G7TU, 8-13

IR211G1AU, 8-13

LR12G7TU, 8-13

LR211G1AU, 8-13

LR22G7TU, 8-13

LRT11G1TU, 8-13

LRxxW11G1TUC, 8-13

LRxxW11G1TUI, 8-13

Q11M10C, 8-13

SL10G155TU, 8-13

SL10G622TU, 8-13

SL20G155TU, 8-13

SL20G622TU, 8-13

SR10G155TU, 8-13

SR10G622TU, 8-13

SR111G1AU, 8-13

SR12G7TU, 8-13

SRxxW11G1TUC, 8-13

SRxxW11G1TUI, 8-13

Optical parameters

CFP4, 22-100

optical supervisory card, 18-246

Optical time domain reflectometer (OTDR), 18-277

optical transmitter statements

conformance statements, Canada, 4-3

conformance statements, China, 4-5

conformance statements, European Union, 4-8

conformance statements, United States, 4-13

optical transponder, 18-29

112SCA1, 18-518

112SCX10, 18-492

112SDX11 OT, 18-531

112SNA1, 18-518

112SNX10, 18-492

11DPE12A, 18-377

11DPE12(E), 18-377

11DPM12, 18-391

11dpm8, 18-405

11OPE8, 18-430

11QCE12X, 18-425

11QPA4(A) OT, 18-364

11QPE24, 18-410

11QPEN4, 18-442

11STAR1 OT, 18-436

11STGE12 OT, 18-371

11STMM10 OT, 18-357

12P120, 18-449

130SCA1, 18-509

130SCX10, 18-498

130SNQ10, 18-514

130SNX10, 18-504

1UD200, 18-539

20P200, 18-455

260SCX2, 18-523

43SCA1 OT, 18-486

43SCX4(E) OT, 18-469

43STA1P OT, 18-481

43STX4(P) OT, 18-476

4DPA4 OT, 18-346, 18-350

iROADMF; iROADMV, 18-272

OT compatibility, 18-125

Optical Transport Network (OTN)

overhead, 6-25

Optional rack door kit, 8-6, 8-10

orderable items

Alcatel-Lucent 1830 PSS-16, 18-5

Alcatel-Lucent 1830 PSS-32, 18-5

Alcatel-Lucent 1830 PSS-36, 8-8

Alcatel-Lucent 1830 PSS-64, 8-4

OSC, 14-29, 14-61

OSCT, 18-246

O-SNCP, 19-122

OT compatibility, 18-125

OTDR (Optical time domain reflectometer), 18-277

OTN performance monitoring parameters, 9-47

overhead

Optical Transport Network (OTN), 6-25

Synchronous Digital Hierarchy (SDH), 6-26

Synchronous Optical Network (SONET), 6-26

P

packaging collection and recovery statements
Canada, 4-4
China, 4-6
European Union, 4-9
United States, 4-14
passwords, 9-24
PDU1C
See: Power Distribution Unit (PDU1C)
PDU2C
See: Power Distribution Unit (PDU2C)
performance
database download, 9-69, 19-75
database upload, 9-69, 19-75
software download, 9-63
performance monitoring parameters
DWDM uplink, 9-53
Ethernet, 9-53
OTN, 9-47
SDH, 9-51
SONET, 9-52
performance monitoring (PM), 9-46
data storage, 9-55
data transfer, 9-56
process, 9-46
persistency check, 9-32
PFC
See: Power Filter Card (PFC)
PFD
See: Power Filter Card DC (PFD)
photonic compound, 1-14
photonic service assurance, 1-26
planning
considerations, 10-2
power
monitoring, 20-16
shelf, 20-13
sources, 20-15
Power Distribution Unit (PDU1C), 8-53
ETSI, 8-8
front view, 8-53
Power Distribution Unit (PDU2C), 8-53
ANSI, 8-8
front view, 8-53
Power Filter Card DC (PFD), 18-172, 18-175, 18-177
front view, 18-173, 18-176, 18-178
Power Filter Card (PFC), 8-9, 8-48
external interfaces, 8-49
front view, 8-50
LEDs, 9-10, 19-5
Power Filter Card (PFD), 19-106
Power Supply, Filter, and Clock Interface Card (PSF3T8), 8-4, 8-45, 9-72
external interfaces, 8-46
front view, 8-47
LEDs, 9-8
PRBS
See: pseudo-random binary sequence
Precision Time Protocol Control (PTPCTL), 18-292
front view, 18-297
LEDs, 19-7
Precision Time Protocol I/O (PTPIO), 18-287
front view, 18-288
Precision Time Protocol (PTP), 14-81
preprovisioning, 9-73, 19-107
pressure sensor kit, 8-6
primary backup database, 9-67, 19-73
product reliability, 4-16
product safety statements
conformance statements, Canada, 4-3
conformance statements, China, 4-5
conformance statements, European Union, 4-8
conformance statements, United States, 4-13
protection
data communications network (DCN), 6-41, 8-216
embedded communication channel (ECC), 8-216
embedded control channel (ECC), 6-41
general communication channel (GCC), 6-41, 8-216
optical layer, 19-128, 19-128
WDM, 14-58
protection groups
embedded communication channel (ECC), 8-216

provisioning
equipment, 9-72, 19-106
modes, 9-73, 19-107
timing, 8-195
pseudo-random binary sequence, GL-32
PSF3T8
See: Power Supply, Filter, and Clock Interface Card (PSF3T8)
PSS-16 shelf, 1-29, 13-3
PSS-16II shelf, 13-4
PSS-32 shelf, 1-29, 13-5
PSS-36 shelf, 1-29
PSS-64 shelf, 1-29
PSS-8 shelf, 13-2
PTP
See: Precision Time Protocol (PTP)
PTPCTL
See: Precision Time Protocol Control (PTPCTL)
PTPIO
See: Precision Time Protocol I/O (PTPIO)

Q Q11M10C, 8-13
quad small form-factor pluggables (QSFP+)
Q11M10C, 8-13
quality policy, 4-16

R Rack Alarm Unit (RAU), 8-6, 8-51
rack top lamps, 9-7, 9-36
rack types
ANSI, 8-4, 8-8, 8-29, 8-32, 18-5, 18-142, 18-144, 18-147
ETSI, 8-4, 8-8, 8-29, 8-32, 18-5, 18-142, 18-144, 18-147
RADIUS
Access-Accept message, 9-21
Access-Request message, 9-21
Vendor-Specific-Attribute, 9-22
RADIUS server, 9-21
raise validation time, 9-32
RAU
See: Rack Alarm Unit (RAU)
records
circuit provisioning, 6-38
recycling / take-back / disposal of products and batteries statements
European Union, 4-9
reliability, 4-16
remote alarm interface, 9-36
remote file system, 9-67, 19-73
ring configuration, 17-3
ROADM, 14-14

S S1 byte, 8-196
S3T8
See: Alcatel-Lucent 1830 PSS-64 shelf (S3T8)
Sa bits, 8-196
safety statements
laser warning, Canada, 4-4
laser warning, China, 4-6
laser warning, European Union, 4-9
laser warning, United States, 4-14
SDH performance monitoring parameters, 9-51
SDH/SONET, 14-66
secondary backup database, 9-67, 19-73
security, 9-21
security log, 9-25
SFC2
See: static filter CWDM 2 channel (SFC2)
SFC4
See: static filter CWDM 4 channel (SFC4)
SFC8
See: static filter CWDM 8 channel (SFC8)
SFD2
See: static filter DWDM 2 channel (SFD2)
SFD4
See: Static filter DWDM 4 channel (SFD4)
SFD40
See: static filter DWDM 40 channel (SFD40)
SFD40B
See: static filter DWDM 40 channel (SFD40B)
SFD44
See: static filter DWDM 44 channel (SFD44)
SFD44B
See: static filter DWDM 44 channel (SFD44B)
SFD5
See: static filter DWDM 5 channel (SFD5)
SFD8
See: static filter DWDM 8 channel (SFD8)
SFP
dummy plug kit, 8-6, 8-11
module removal tool, 8-7, 8-11

shelf
central office, 1-29
cooling, 20-20
DCM, 1-29, 14-5
end office, 1-29
interconnection, 8-207
ITLB, 14-5
ITLU, 14-5
non-COS/EOS, 14-4
OCS application, 1-29
OMD, 1-29
power and grounding, 20-13
PSS-16, 1-29, 13-3
PSS-16II, 13-4
PSS-32, 1-29, 13-5
PSS-36, 1-29
PSS-64, 1-29, 8-29
PSS-8, 13-2
universal, 1-29
WDM application, 1-29
Shelf ID, 8-39, 8-42
signal fail (SF) condition, 9-32
signaling communication network (SCN), 6-41
interfaces, 8-217, 18-558
SL10G155TU, 8-13
SL10G622TU, 8-13
SL20G155TU, 8-13
SL20G622TU, 8-13
slot
numbering, 10-22
numbering scheme, 8-30, 8-33
usage, 10-22
slot types
EC, 18-142, 18-144, 18-147
FLC, 8-29, 8-32
GC, 8-29, 8-32
matrix, 8-29, 8-32
slots
GC, 8-29, 8-32
I/O cards, 8-29, 8-32, 18-142, 18-144, 18-147
LC, 8-29, 8-32
matrix, 8-29, 8-32
small form-factor pluggables (SFP), 6-31, 9-72, 19-106
1000BLXU, 8-13
1000BSXU, 8-13
1000BZXU, 8-13
IR12G7AU, 8-13
IR12G7TU, 8-13
LR12G7TU, 8-13
LR22G7TU, 8-13
SR12G7TU, 8-13
smart devices, 15-92
SNBF rack
See: 7-feet Seismic Network Bay Frame rack (SNBF)
SNC/I protection, 9-78
SNC/N protection, 9-78
SNCP hold-off timer, 9-80
SNCP wait-to-restore (WTR) timer, 9-78, 9-80
SNC/S protection, 9-78
SNMP, 14-60
software
download, 9-62
download performance, 9-63
initial installation, 9-61
in-service upgrade, 9-63, 19-72
management, 9-61, 19-72
SONET performance monitoring parameters, 9-52
SR10G155TU, 8-13
SR10G622TU, 8-13
SR111G1AU, 8-13
SR12G7TU, 8-13
SRxxW11G1TUC, 8-13
SRxxW11G1TUI, 8-13
SSM
See: Synchronization Status Message (SSM)
static filter CWDM 2 channel (SFC2), 18-26, 18-220
front view, 18-222
static filter CWDM 4 channel (SFC4), 18-26, 18-26, 18-220
front view, 18-223
static filter CWDM 8 channel (SFC8), 8-5, 8-10, 8-67, 18-26, 18-27, 18-220
front view, 8-68, 18-224
LEDs, 9-17
static filter DWDM 2 channel (SFD2), 18-23
static filter DWDM 4 channel (SFD4), 18-23, 18-27
static filter DWDM 40 channel (SFD40), 14-4, 14-13, 18-25, 18-215
front view, 18-216
LEDs, 19-11
static filter DWDM 40 channel (SFD40B), 14-4, 14-13, 18-25, 18-215
front view, 18-216

LEDs, 19-11

static filter DWDM 44 channel (SFD44), 14-4, 14-13, 18-25, 18-217

front view, 18-219

static filter DWDM 44 channel (SFD44B), 14-5, 14-13, 18-26, 18-218

front view, 18-219

static filter DWDM 5 channel (SFD5), 14-10, 18-24, 18-208

front view, 18-209

static filter DWDM 8 channel (SFD8), 14-11, 18-25, 18-27, 18-211

front view, 18-211

station clock

input, 8-187

subnetwork connection protection (SNCP), 9-78

subrack

Alcatel-Lucent 1830 PSS-16, 18-142

Alcatel-Lucent 1830 PSS-16II, 18-144

Alcatel-Lucent 1830 PSS-32 subrack, 18-147

Alcatel-Lucent 1830 PSS-36 subrack (CMSHF), 8-32

Alcatel-Lucent 1830 PSS-64 subrack (S3T8), 8-29

subrack (S3T8)
See: Alcatel-Lucent 1830 PSS-64 shelf (S3T8)

super users, 9-23

SVAC module, 18-250, 18-439

switching compound, 1-14

synchronization, 8-185, 12-44

input, 12-2, 22-6

interfaces, 12-2, 22-6

Synchronization Status Message (SSM), 8-187, 8-195

Synchronous Digital Hierarchy (SDH)

overhead, 6-26

Synchronous Optical Network (SONET)

overhead, 6-26

system timing operational modes, 8-192

T

Tandem connection monitoring (TCM)

failure, 6-38

TCA
See: threshold crossing alert (TCA)

TCA modes, 9-58, 19-69

standing condition method, 9-59, 19-70

transient condition method, 9-58, 19-69

TCA profiles, 9-57, 19-68

terminal loopbacks, 6-39, 9-40, 19-35

termination card

blank front plate, 8-10

threshold crossing alert (TCA), 19-46

TCA mode, 9-58, 19-69

TCA profile, 9-57, 19-68

thresholding, 9-58, 19-69

standing condition method, 9-59, 19-70

transient condition method, 9-58, 19-69

tilt adjustment, 19-28

timing, 12-44

adapters, 12-2, 22-6

generator, 8-188, 8-198

input, 12-2, 22-6

interfaces, 6-7, 12-2, 22-6

operational modes, 8-192

provisioning, 8-195

timing interface blank front plate, 8-10

timing operational modes, 12-44

TL1, 14-60

features, 6-35

interface, 6-35

TOADM, 14-16

TOADM networks

linear, 17-14

split, 17-15

TOADM rings, 17-11

interconnected, 17-13

TOADM terminal node, 17-22

U

UCAL
See: User Community Authorization Levels (UCAL)

unidirectional path-switched ring (UPSR), 9-95

universal shelf, 1-29

USB

connector, 9-61

flash drive, 9-61

user authentication, 9-21

User Community Authorization Levels (UCAL), 9-23

user IDs, 9-22

user interface

Alcatel-Lucent 1830 PSS Zero Installation Craft Terminal (ZIC), 9-5

User Panel (USRPNL), 18-193, 18-196, 18-200

User panel (USRPNL), 19-106

User Panel (USRPNL)

front panel interfaces, 18-202

front view (PSS-16), 18-200

front view (PSS-16II), 18-197

front view (PSS-32), 18-200

front view (PSS-8), 18-193

LAN interface, 18-202

LEDs, 19-9

user privilege categories, 9-23

V validation, 9-32

visual indications, 9-6, 9-7, 9-8, 9-10, 9-12, 9-38, 19-4, 19-5, 19-8, 19-9, 19-11

W wait-to-restore (WTR) timer, 9-80

wavelength routers

CWR8, 18-227

CWR8-88, 18-227

WR2-88, 18-227

WR8-88A, 18-227

WR8-88AF, 18-227

wavelength tracker, 14-68

performance, 1-26

Wavelength tracker optical channel monitor flex(MON-OCM), 18-268

Wavelength tracker optical channel monitor flex(WTOCM-F), 18-266

wavelength tracker optical channel monitor (WTOCM, WTOCMA), 18-257

WDM amplifier

LEDs, 19-12

WDM optical transponder

LEDs, 19-12

Web GUI, 14-60

WR20-TF, 18-227

WR20-TFM, 18-227

wavelength router, 18-240

WR2-88, 18-227

wavelength router, 18-238

WR8-88A, 18-227

WR8-88AF, 18-227

WR8-88A(F)

wavelength router, 18-235

Wrap Timing Adapter, 12-2, 22-6

WTOCM

See: wavelength tracker optical channel monitor (WTOCM, WTOCMA)

WTOCMA

See: wavelength tracker optical channel monitor (WTOCM, WTOCMA)

WTOCM-F (Wavelength tracker optical channel monitor flex), 18-266

X XFP

dummy plug kit, 8-6, 8-11

extracting clamp, 8-7, 8-11

Z ZIC

See: Alcatel-Lucent 1830 PSS Zero Installation Craft Terminal (ZIC)