Loop-O9500R PTN/SDH/SONET/PDH IMAP

Features

- 6U height, full front access (ETSI) shelf
- SDH/SONET VCn/VTn Cross-Connect Capacity: 14Gbps bidirectional non-blocking
- PTN (CE and MPLS-TP) Switching Capacity: 100Gbps bidirectional non-blocking
- Hot-swappable modular design
  - Cross-connect unit (controller modules, XCU)
    - STM-1/4/16 (OC-3/12/48) aggregate lines
    - Software configurable
  - Tributary Modules
    - High-Speed/High Density (HS) modules (VC/VT XC)
    - Low-Speed (LS) modules (DS0 XC)
  - Power Modules (DC)
    - 48 Vdc, 500W
    - Dual Power (1+1) Protection
- Cross-connect Unit Protection Scheme
  - Dual controller for redundancy
  - MSP (1+1)
  - SNCP/UPSR Ring
- Protection Schemes
  - E1/T1: Card(1:1), Port (1:1), Line (1+1), DS0 SNCP (3E1/T1 card only)
  - E3/T3: Line (1+1)
  - XCU, B155/622: MSP 1+1, SNCP/UPSR
  - B2G5: MSP 1+1
  - Ethernet Card Protection
  - PTN10G Switch Fabric 1:1
  - MPLS tunnel LSP (1+1/1:1), switch time <50ms
  - SNMP Port 1:1 Protection
  - Console 1+1 Protection
- Ethernet Functions
  - Link Aggregation (Inter and Intra board)
  - External/Internal/Line timing source with SSM via SyncE, IEEE 1588, and TDM clocks
  - Ethernet over SDH/SONET supports GFP, LAPS, VCAT, LCAS and non-LCAS
  - Alarm suppression, masking and reports
- Circuit Emulation and Encapsulation for TDM data over Packet Switched Network (SAToP, CESoPSN, CEP)
- Management
  - Console port, VT100 menu-driven
  - SNMP, Telnet and SSH for remote management
  - In-band management channels
    - SDH/SONET DCC (XCU, B16, B2G5)
    - MPLS pseudowire (PTN10G)
    - DS0 timeslots (LS cards)
  - Centralized management with Loop's EMS/NMS
    - Loop-iNET GUI (EMS)
    - Loop-iNMS (NMS) with full FCAPS and end-to-end circuit management and diagnosis
  - Bridge mode or OSPF routing
- RoHS compliant

Description

The Loop-O9500R PTN/SDH/SONET/PDH IMAP (Integrated Multi-Services Access Platform) is an economical, all-in-one solution for integrating various types of signals and transportation over various types of networks within one enclosure. Its universal roles and modular design make it effortless to perform traffic grooming for both peripheral and core networks by providing access interfaces, multiplexing, cross-connection, gateways, and transportation channels.

For **access interfaces**, 10+ low-speed modules are designed to encapsulate industry specific signals into DS0 timeslots. These interfaces include Voice (e.g. FXS, FXO, E&M, and etc.), Digital (e.g. RS232, RS449, X.21, and etc.), Teleprotection (e.g. G.703, C37.94) and so on.

For **multiplexing and cross-connection**, O9500R provides non-blocking cross-connection of up to 672 DS0 timeslots, which equal to 21 E1 channels, to serve as a **MUX/DACS**, and VC-n/VT-n fabric for SDH/SONET non-blocking cross-connection to serve as an **ADM**.

For **transportation**, high-speed modules provide transportation channels such as 10Gb MPLS/Carrier Ethernet/IP switching and routing from PTN10G card, STM-1/4/16(OC-3/12/48) channels from Controller, B155/622, and B2G5 cards, Optical channels from 7-port FOM cards, E1/T1 channels from 63-port E1/T1 cards, and E3/T3 channels from 3-port E3/T3 cards.

For **gateways**, the signals from different interfaces can be freely encapsulated, cross-connected, and transported over a variety of transportation networks. For instance, E1/T1 and E3/T3 channels can be encapsulated into VT/VC paths and transported over SDH/SONET. Modules such as TDMoE and 8GESW make it possible for TDM traffic to be transported over Ethernet (DS0 over Ethernet) and the other way around (Ethernet over SDH/SONET) via circuit emulation and virtual concatenation technologies. Using the PTN10G card, SDH/SONET and DS0 circuits can also be encapsulated for packet network transportation.

Multiple **protection schemes** are designed at different levels, including path-level SNCP/UPSR and section-level MSP (1+1) for SDH/SONET, circuit and line protection for access interfaces, DS0 SNCP/UPSR and ULSR for low-speed modules, MPLS-TP with two LSPs per tunnel, ELPS and ERPS, and 1+1 module redundancy for power, controller, and plug-in cards.

Performance and fault are also monitored to ensure service integrity. Operation, Administration, Maintenance and Provisioning (OAM&P). These functionalities are fully incorporated into the operation system. O9500R is fully compatible with Loop-iNET (EMS) and Loop-iNMS (Integrated NMS) to achieve centralized management for large scale networks.

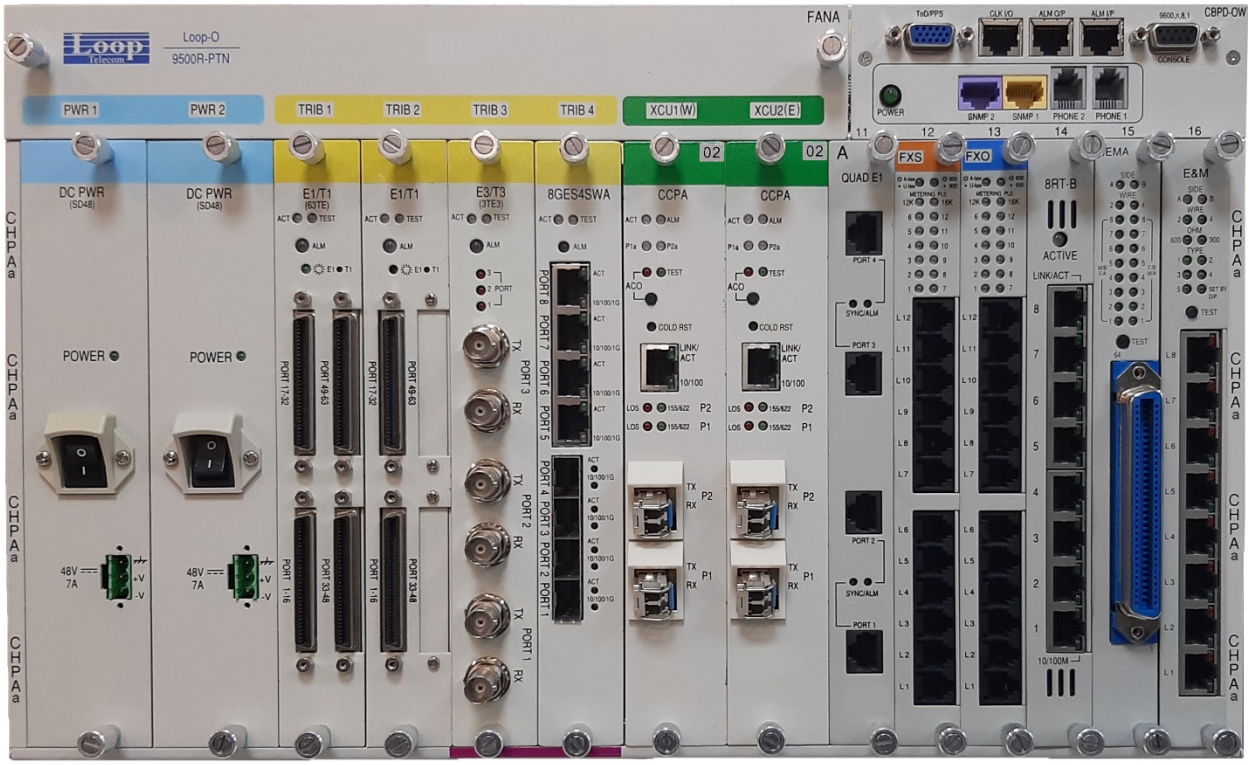
O9500R (CCPA-02) Compatible Tributary Modules

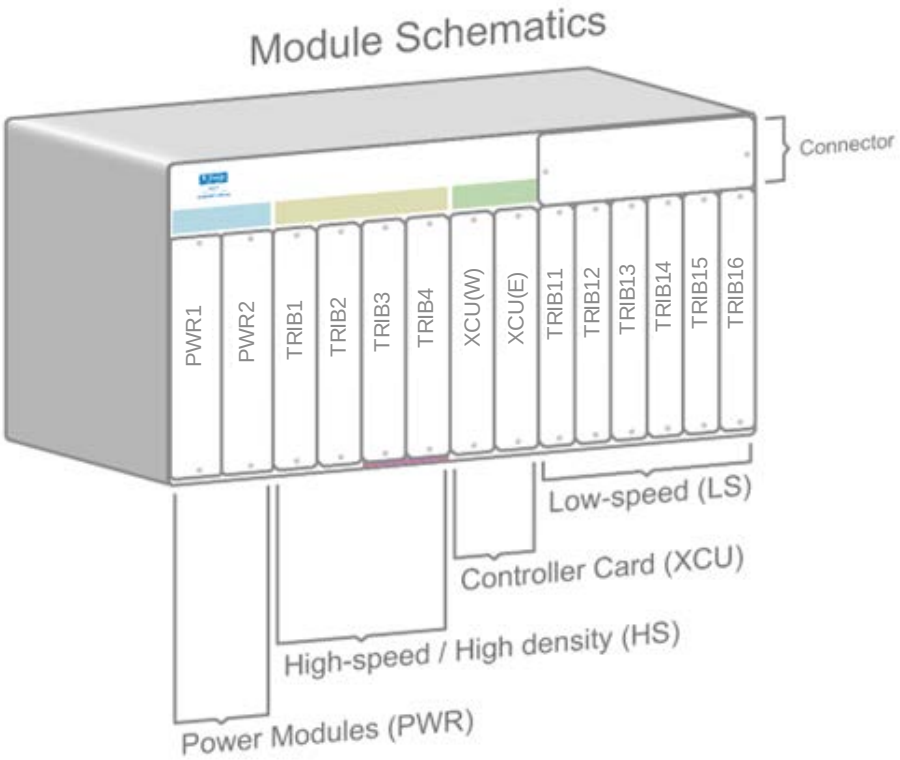
Plug-in cards with yellow background are high-speed cards using 622M backplane, and those with magenta background are high-speed cards using 2.5G backplane. Plug-in cards without background color are low-speed cards.

Type	Module	Description
High-speed/ High Density (HS)	PTN10G	3 x 10GbE + 8 x 1GbE PTN plug-in module
	PTNext	10 x 1GbE PTN plug-in module
	B155/622	2-channel STM-1 (OC-3) tributaries with or without MSP 1+1
		1-channel STM-4 (OC-12) tributaries with or without MSP 1+1
	B2G5	1-channel STM-16 (OC-48) tributaries with or without MSP 1+1
	E1/T1	63 port E1/T1 tributaries
		32 port E1/T1 tributaries
		16 port E1/T1 tributaries
	E1(75 ohm)	63 E1(75 ohm) plug-in card
		32 E1(75 ohm) plug-in card
		16 E1(75 ohm) plug-in card
	E3/T3	3 T3 or 3 E3 software programmable interface with M13/Mx3 function for T3 interface only
	8GESW	8 GbE Ethernet over SDH card with L2 switch (8GES4SWA/8GES16SWA)
Low-speed (LS) Single slot	RTB	8-port Bridge/Router
	4E1/4T1	4-channel E1/T1
	3E1/3T1*	3-channel E1/T1
	2GH	2-channel G.SHDSL (2 pairs) without line power
	4GH	4-channel G.SHDSL (1 pairs) without line power
	6CDA	6-channel G.703 Interface at 64 Kbps data rate
	4C37	4 channel C37.94 (low-speed optical)
	6RS232	6-channel RS232/V.110
	8RS232	8-channel RS232/V.24
	8DCC	8-channel Dry Contact I/O
	8DCB	8-channel Dry Contact I/O type B
	8E&MA	8-channel 2W/4W E&M
	12FXSA	12-channel FXS
	12FXOA	12-channel FXO
	12MAGA	12-channel Magneto
	TDMoEA	4 GbE for TDM signal over Ethernet
	8DBRA	8-channel Data Bridge
	8UDTEA	8-channel DTE
	1FOMB	1 port FOM (1FOMB)
	OCUDPA	8-channel OCU/DP
	6UDTEA	6-channel DTE
Low-speed (LS) Dual slot	TTA	Four ports for DTT input and output.

*Future Option

Front Panel View of O9500R (CHPAa with CCPA-02)





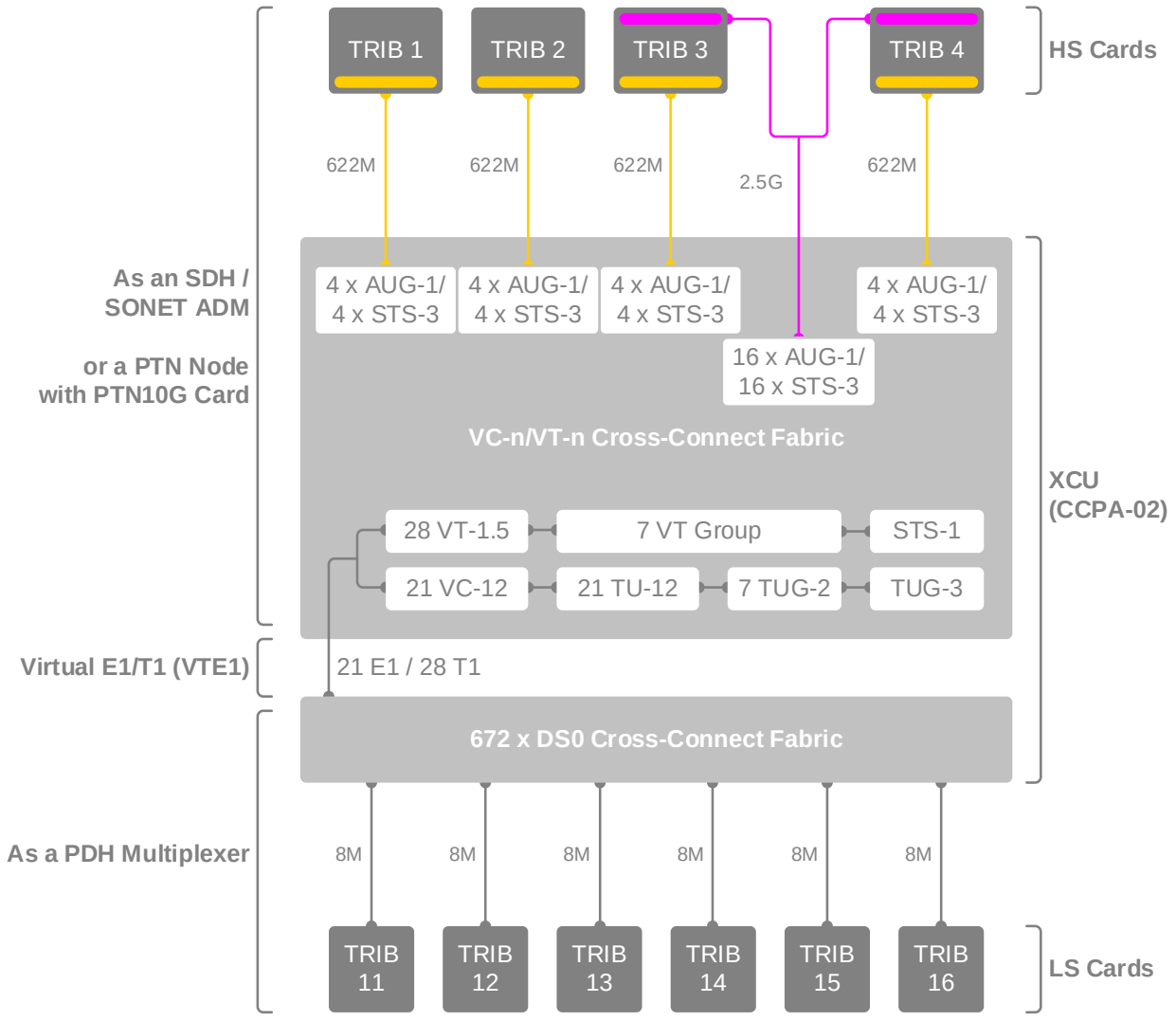
Connectivity

In the tables below, STM-16 is equivalent to OC-48, STM-4 to OC-12, STM-1 to OC-3, E1 to T1, and E3 to T3.

Tributary Module: Backplane Payload

TRIB 1	TRIB 2	TRIB 3	TRIB 4	TRIB 11~16
4 x 155M or 1 x 622M	4 x 155M or 1 x 622M	4 x 155M or 1 x 622M	4 x 155M or 1 x 622M	8M (each)
		1 x 2.5G		

Traffic of each tributary card is connected to the XCU via backplane channels. Each **LS slot (TRIB 11~16)** is provided with **4 E1/T1 (8M)** worth of bandwidth, and each **HS card (TRIB 1~4)** with **4 STM-1/OC-3 (622M)**. Especially, an **additional STM-16/OC-48 (2.5G)** channel is shared by **TRIB 3 and 4** for extra high-speed connection. These 2.5G HS cards are marked with a magenta patch at the bottom of the panel to indicate the existence of the 2.5G channel. Traffic from **HS cards** are directed to the **VC-n/VT-n cross-connect fabric**, while traffic from **LS cards** are directed to the **DS0 cross-connect fabric**. Traffic from LS cards can be merged onto SDH/SONET via the internal **virtual E1/T1 channels**.



Tributary Module: Maximum Capacity without Protection

High-speed Module	Channel	TRIB 1	TRIB 2	TRIB 3	TRIB 4	System Max. Channels
E1/T1	E1/T1	63	63	63	63	252
E3/T3	E3/T3	3	3	3	3	12
8GES4SWA	GbE	8	8	8	8	32
B155/622	STM-1	2	2	2	2	8
	STM-4	1	1	1	1	4
B2G5	STM-16	N/A	N/A	N/A	N/A	1
PTN10G	10GE	N/A	N/A	3	3	6
	1GE	N/A	N/A	8	8	16

Low-speed Module	Channel	Maximum Channels	
		TRIB 11~16 each	System
1FOMB	FOM	1	6
RTB	FE bridge and router	8	48
2/4 channel G.SHDSL	G.SHDSL	2/4	12/24
4E1/T1	E1/T1	4E1/4T1	21E1/28T1
3E1/T1*	E1/T1	3	18
6CDA	G.703	6	36
4C37	C37.94	4	24
8DCC	Dry Contact	8	48
8DCB	Dry Contact	8	48
6RS232	RS232	6	36
8RS232	RS232	8	48
12FXSA	FXS	12	72
12FXOA	FXO	12	72
12MAGA	Magneto	12	72
8E&MA	E&M	8	48
TDMoEA	TDMoE	4	24
8DBRA	RS232	8	48
8UDTEA	RS232/RS422/RS449	8	48
OCUDPA	OCU/DP	8	48
6UDTEA	RS232/X.21/V.35/V.36/EIA530	6	36
TTA	Transfer Trip	4	12

*Future Option

Tributary Module: SDH/SONET Channel and Protection

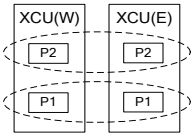
HS Module	Channel	TRIB 1	TRIB 2	TRIB 3	TRIB 4
B155/622	STM-1	2	2	2	2
	STM-1 MSP (1+1)	2		2	
	STM-4	1	1	1	1
	STM-4 MSP (1+1)	1		1	
B2G5	STM-16	N/A	N/A	1	N/A
	STM-16 MSP (1+1)	N/A	N/A	1	N/A
		N/A	N/A	1	

Controller Card: SDH/SONET Channel and Protection

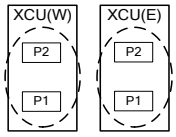
Channel	XCU 1	XCU 2	System
STM-1/4/16	2	2	4
	1 MSP (1+1)	1 MSP (1+1)	2
	2 MSP (1+1)		2

Note 1 STM-16 (OC-48) is not available on O9500-R-CCPA-S4 unless activated by a feature activation license.

Note 2 MSP (1+1) chains on XCU (W) and XCU (E) can be paired as follows:



Card-level protection (horizontal):
XCU(W) port 1 and XCU(E) port 1
XCU(W) port 2 and XCU(E) port 2



Port-level protection (vertical):
XCU(W) port 1 and XCU(W) port 2
XCU(E) port 1 and XCU(E) port 2

Tributary Module: Non-SDH/SONET High-speed Channel and Protection

HS Module	Channel	Protection	Number of channels			
			TRIB 1	TRIB 2	TRIB 3	TRIB 4
16/32/63TE	E1/T1	X	16/32/63	16/32/63	16/32/63	16/32/63
		O	16/32/63	**(B)**	16/32/63	**(B)**
3TE	E3/T3	X	3 E3	3 E3	3 E3	3 E3
		O	3 E3	**(B)**	3 E3	**(B)**
8GES4SWA	Ethernet 10/100/1000BT	X	8 ports	8 ports	8 ports	8 ports
		O	8 ports	**(B)**	8 ports	**(B)**
PTN10G Note 2	10GbE	X	N/A	N/A	3	3 **(B)**
	1GbE	X	N/A	N/A	8	8 **(B)**
PTNext Note 3	1GbE	X	10	10	N/A	N/A
	10GbE	X	1	1	N/A	N/A

(B) signifies backup/protection

Note 1: Protection Group on O9500R shall always be neighboring Tributary cards. Two cards of the identical model shall be mounted on TRIB 1 & 2 or TRIB 3 & 4 to form a protection group. TRIB 1 and TRIB 3 serve as the primary cards while TRIB 2 and TRIB 4 serve for protection.

Note 2: PTN10G card on **TRIB 4** should be registered to protection, even if PTN10G on TRIB 3 is not available for up to 3 x 10G and 8 x 1G. PTN10G card on **TRIB 3** can only be registered without protection for up to 3 x 10G and 8 x 1G. PTN10G card on **TRIB 3 and TRIB 4** can also be registered with protection for up to 6 x 10G and 16 x 1G.

Note 3: The 1GbE ports and the 10GbE port are mutually exclusive. This card **only** works with PTN10G.

Cross-model Comparison for Plug-in Card Compatibility

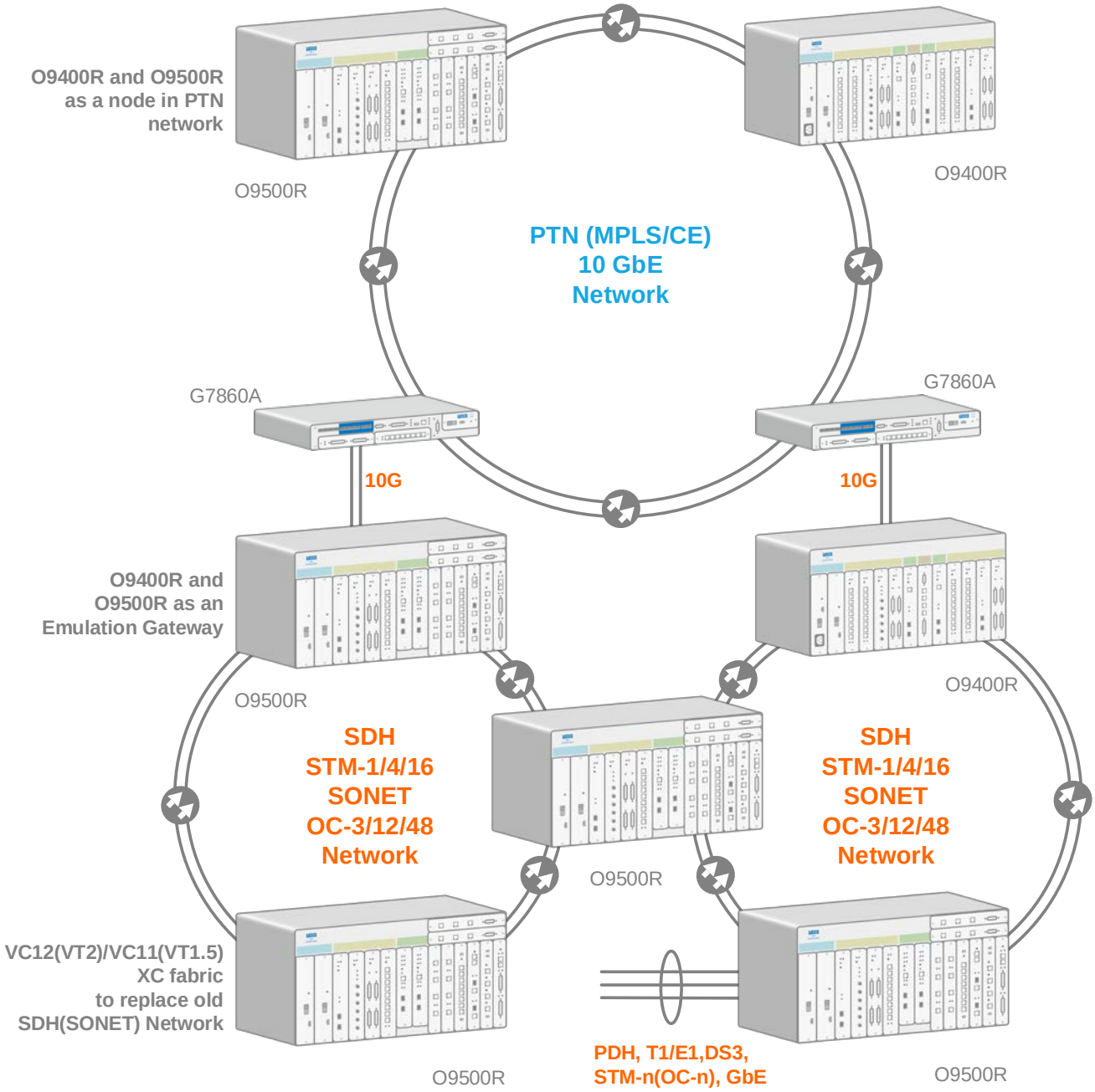
Plug-in Card	O9500R			O9400R			AM3440-A/C
	CC4	CC16	CCPA-02	CC4	CC16	CCPA	
16/32/63TE	v	v	v	v	v	v	x
16/32/63E75	v	v	v	v	v	v	x
3TE3	v	v	v	v	v	v	x
3TE3M13	v	v	v	v	v	v	x
8GES4SWA	v	v	v	v	v	v	x
8GES16SWA	x	*	v	x	*	v	x
B16	v	v	v	v	v	v	x
B2G5	x	v	v	x	v	v	x
PTN10G	x	x	v	x	x	v	x
4E1	v	v	v	x	x	x	v
4T1	v	v	v	x	x	x	v
3E1	v	v	v	x	x	x	v
3T1	v	v	*	x	x	x	v
2GH	v	v	v	x	x	x	v
4GH	v	v	v	x	x	x	v
8DCC	v	v	v	x	x	x	v
8DCB	v	v	v	x	x	x	v
6CDA	v	v	v	x	x	x	v
4C37	v	v	v	x	x	x	v
8RS232	v	v	v	x	x	x	v
6RS232	x	x	v	x	x	x	v
8DBRA	v	v	v	x	x	x	v
RTB	v	v	v	x	x	x	v
TDMoEA	v	v	v	x	x	x	v
6UDTEA	v	v	v	x	x	x	v
8UDTEA	v	v	v	x	x	x	v
8EMA	v	v	v	x	x	x	v
12MAGA	*	*	v	x	x	x	v
12FXSA	v	v	v	x	x	x	v
12FXOA	v	v	v	x	x	x	v
1FOMB	v	v	v	x	x	x	v
OCUDPA	v	v	v	x	x	x	x
TTA	v	v	v	x	x	x	v

* Future Option

Application Illustration

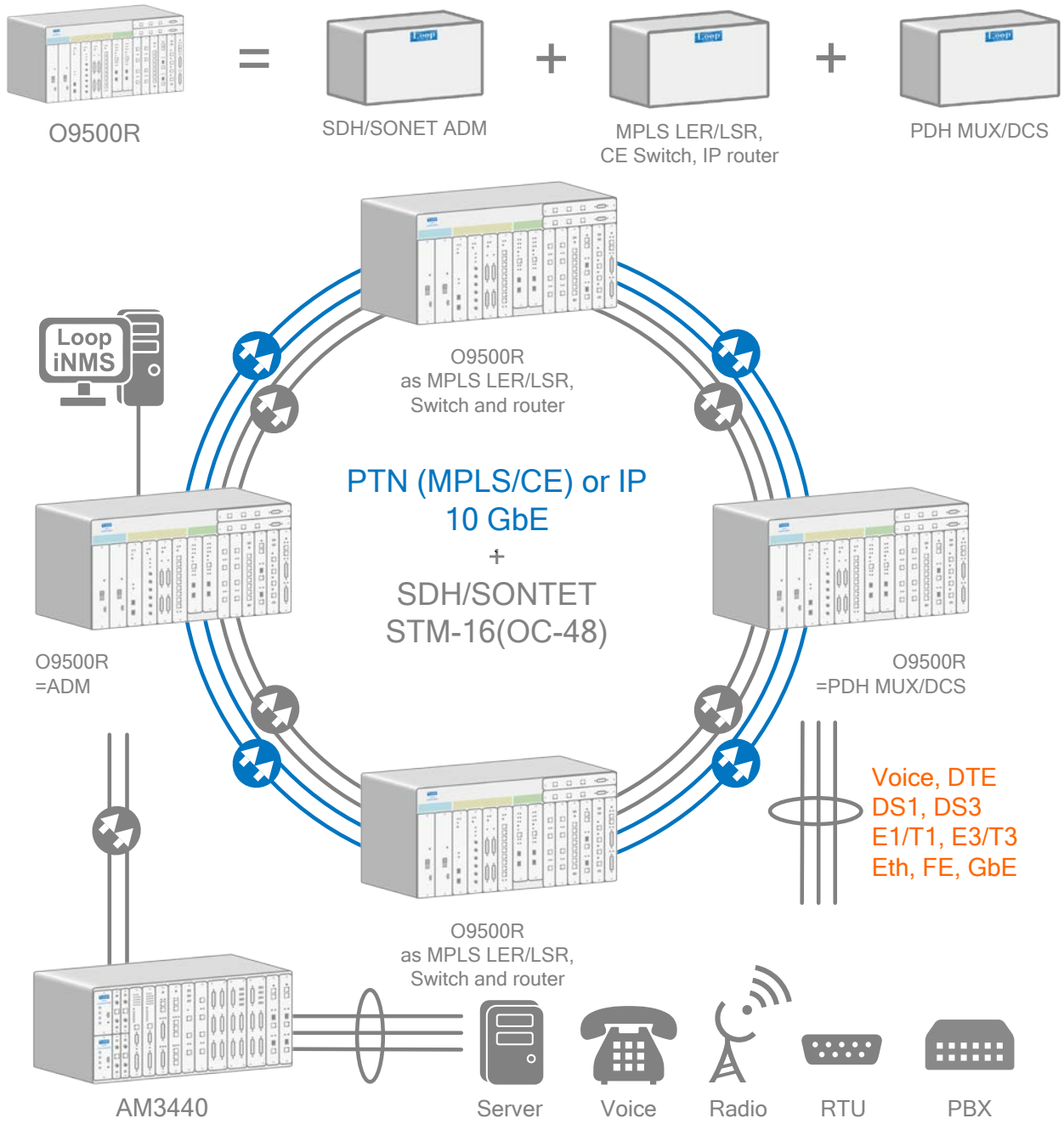
PTN and SDH/SONET Ring Application

O9500R acts as a node in a PTN 10G Network ring or as an Emulation Gateway to merge SDH/SONET traffic onto PTN (MPLS/CE) stream. Distinct from O9400R, O9500R is also capable of cross-connecting PDH and SDH/SONET traffic within the same enclosure, acting as both a Terminal Multiplexer (TM) and a Cross-connect system (DACS).



Dual Ring and Triple Role

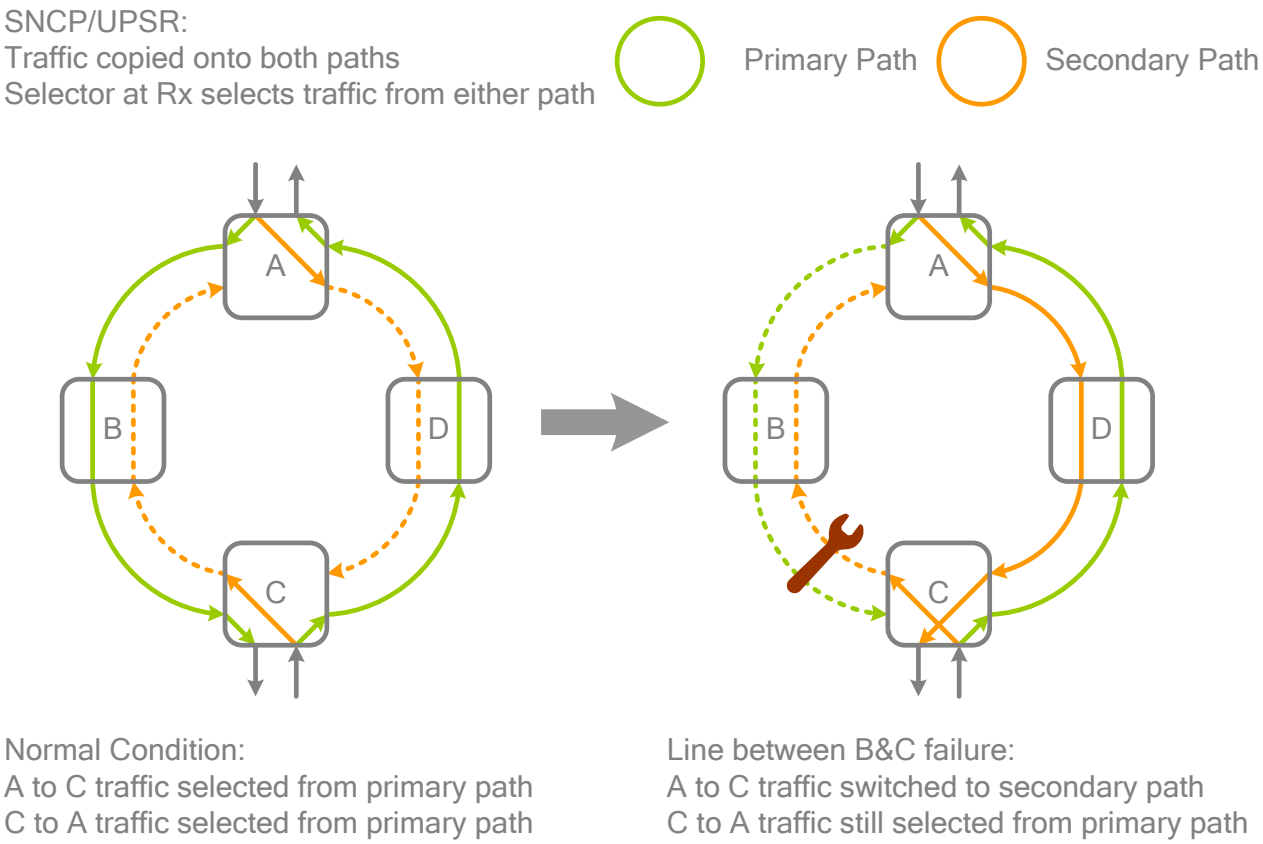
One O9500R can be simultaneously connected to PTN and SDH/SONET backbone rings. PTN10G module and STM-16 (OC-48) interface can be simultaneously mounted in O9500R and form a dual ring (PTN and SDH/SONET rings). The roles of an O9500R can be a deluxe combination of an SDH/SONET ADM, a PTN MPLS Label Edge Router (LER), and a PDH Multiplexer.



SNCP/UPSR Ring Protection for SDH/SONET paths and DS0 (3E1/T1 card only)

SNCP/UPSR is a SDH/SONET path-level protection mechanism by copying traffic onto two paths of any STM-n/OC-n channels. Two types of SNCP/UPSR rings are possible. Traffic is **unidirectional** for both primary and secondary paths. Traffic is counterclockwise on the primary path and clockwise on the secondary path. For each path, A-to-C traffic and C-to-A traffic traverse different intermediate nodes (Node B and D respectively).

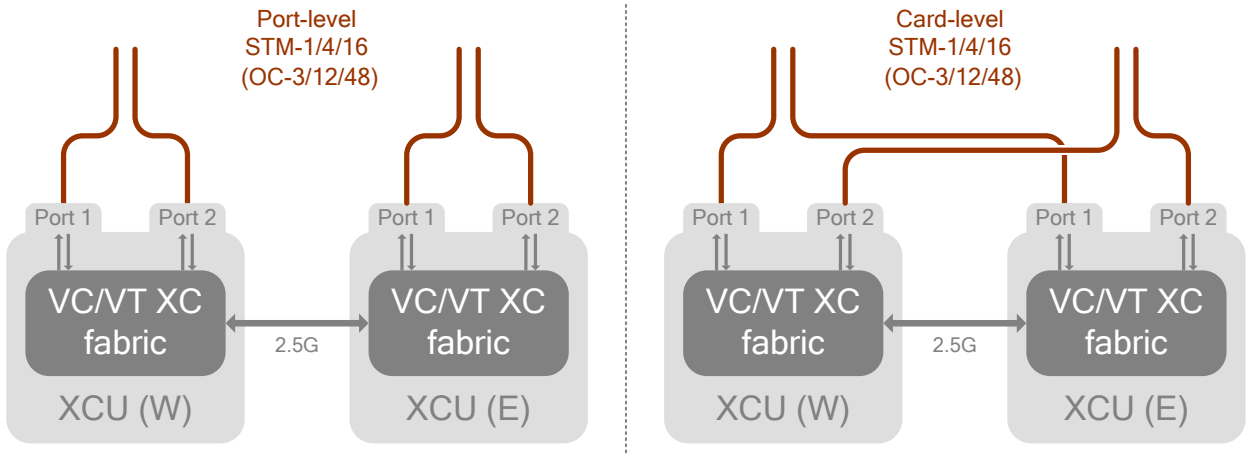
DS0 SNCP/UPSR mechanism is similar to SDH/SONET SNCP/UPSR for path-level protection. Instead of mapping traffic onto two SDH/SONET paths, DS0 traffic is mapped and copied onto two different E1/T1 timeslots for protection. The two timeslots can be of the same line or different lines, entirely dependent on the network topology. DS0 SNCP/UPSR is now only supported by **3E1/T1** card (LS card).



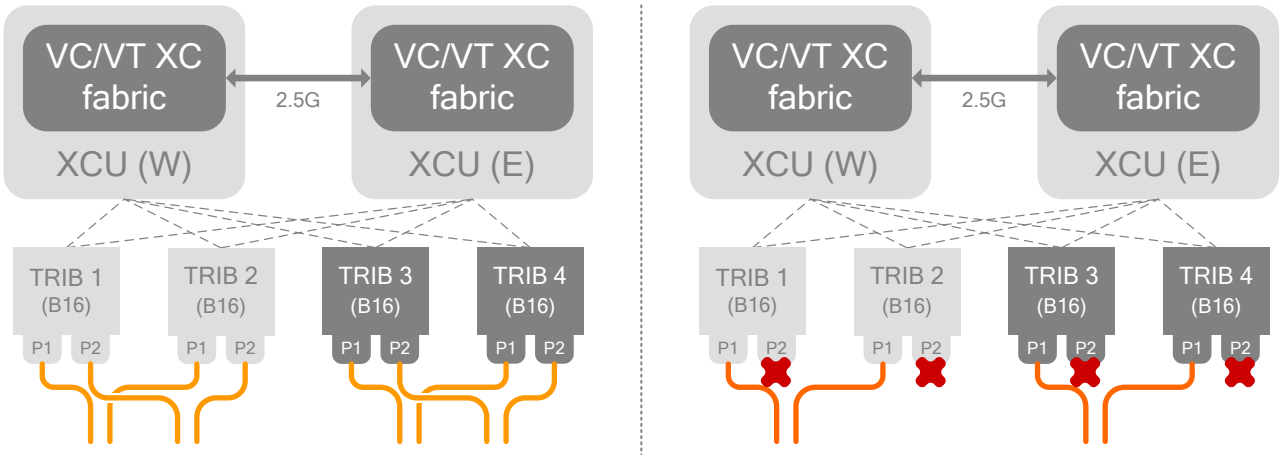
SDH/SONET MSP (1+1) Protection

Multiplex section protection (MSP) is a linear protection scheme by pairing two physical ports together for line protection of a SDH/SONET line section between two nodes. Protection can be configured as port-level or card-level. In port-level protection, two ports on the same card are paired to protection against port failure but not card failure. In card-level protection, two ports on two different cards are paired to protection against port failure and card failure.

MSP (1+1) with XCU

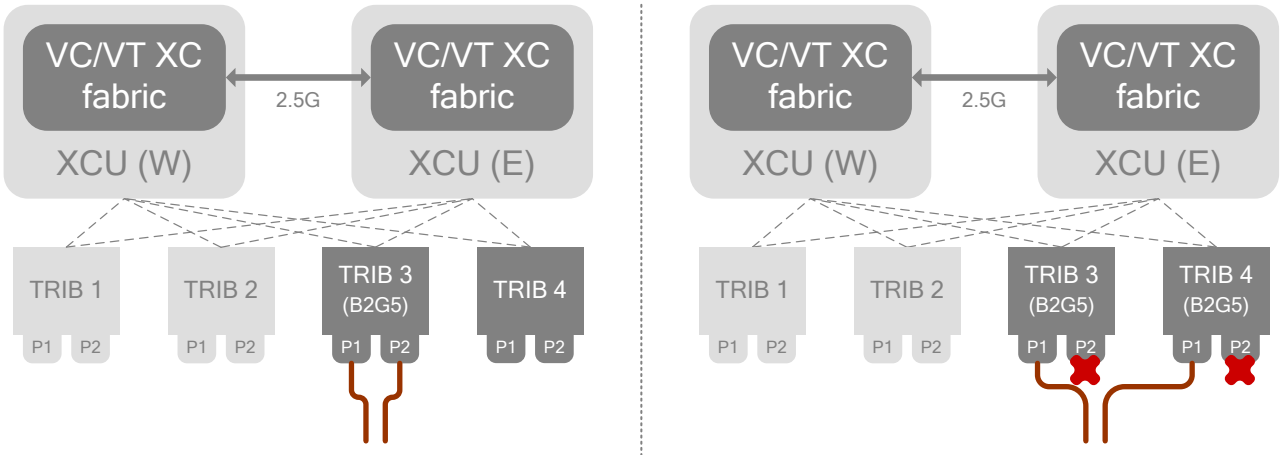


MSP (1+1) with B16 or B2G5 cards



4 x Card-level STM-1 (OC-3) Chains

2 x Card-level STM-4 (OC-12) Chains



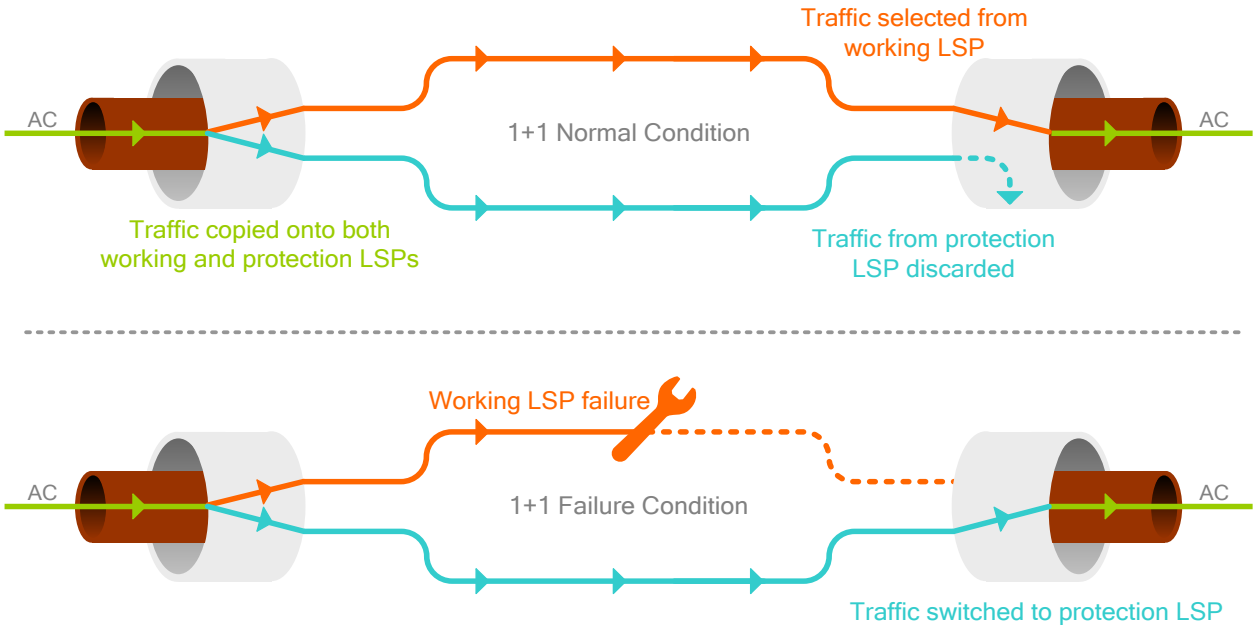
1 x Port-level STM-16 (OC-48) Chain

1 x Card-level STM-16 (OC-48) Chain

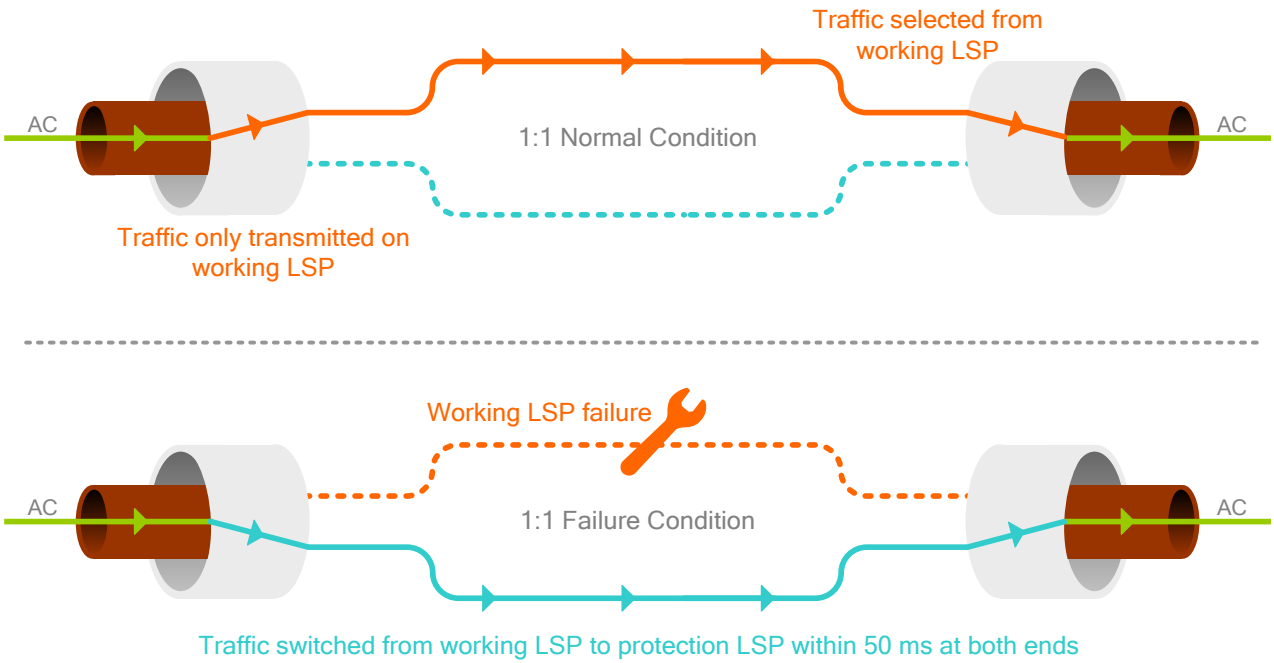
MPLS-TP Protection Schemes

MPLS-TP network is now only supported by PTN10G card. Protection scheme of an MPLS-TP network is standardized as part of the protocol. By deploying static nodes in the network, traffic transported by a tunnel between remote ends is protected by two label switching paths (LSPs) to achieve **1:1** or **1+1** protection.

In 1+1 mode, traffic is copied onto both working and protection LSPs. When receiving traffic, the remote LER only selects traffic from one of the two LSPs to decapsulate.



In 1:1 mode, traffic flows only on the working LSP. When a failure occurs on the working LSP, traffic is then switched to the protection LSP within 50 ms.

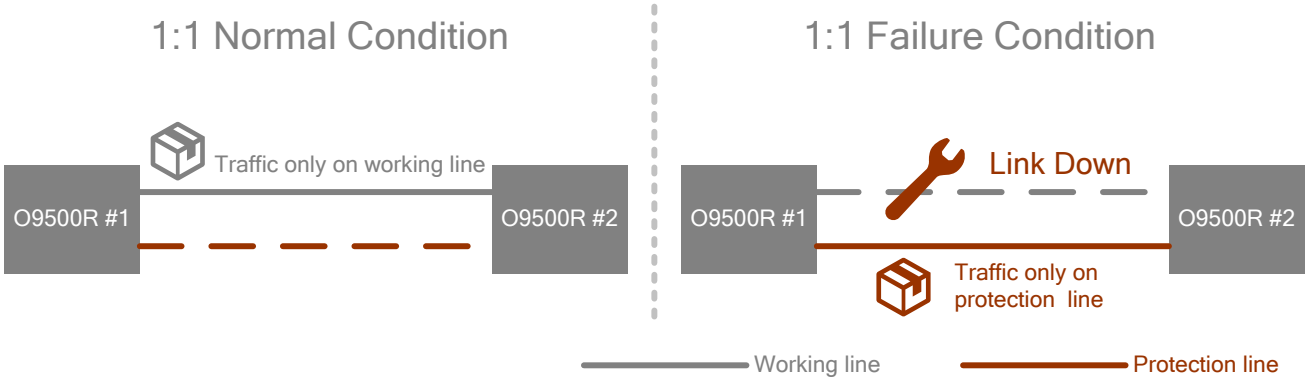


Carrier Ethernet Protection Schemes

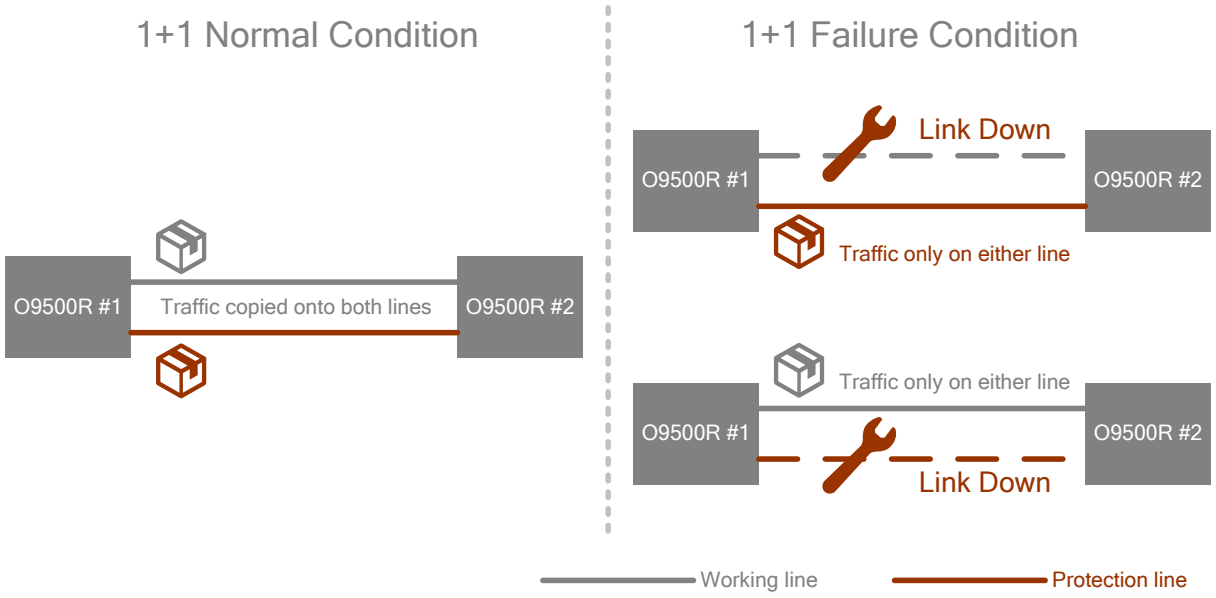
In Carrier Ethernet networks, protection schemes of static route provisioning are usually required for service providers to achieve service reliability and monitoring. **Ethernet linear protection switching (ELPS)** standardized in ITU-T G.8031 and **Ethernet ring protection switching (ERPS)** standardized in ITU-T G.8032 are the two most commonly adopted protection schemes.

ELPS is provisioned between two nodes by constructing point-to-point VLAN or Q-in-Q tagging. A pair of lines (i.e. working line and protection line) achieves either **1+1** or **1:1** protection.

In **1:1 protection** mode, traffic only travels on the working line, and will only switch to the protection line when failure of the working line is detected.

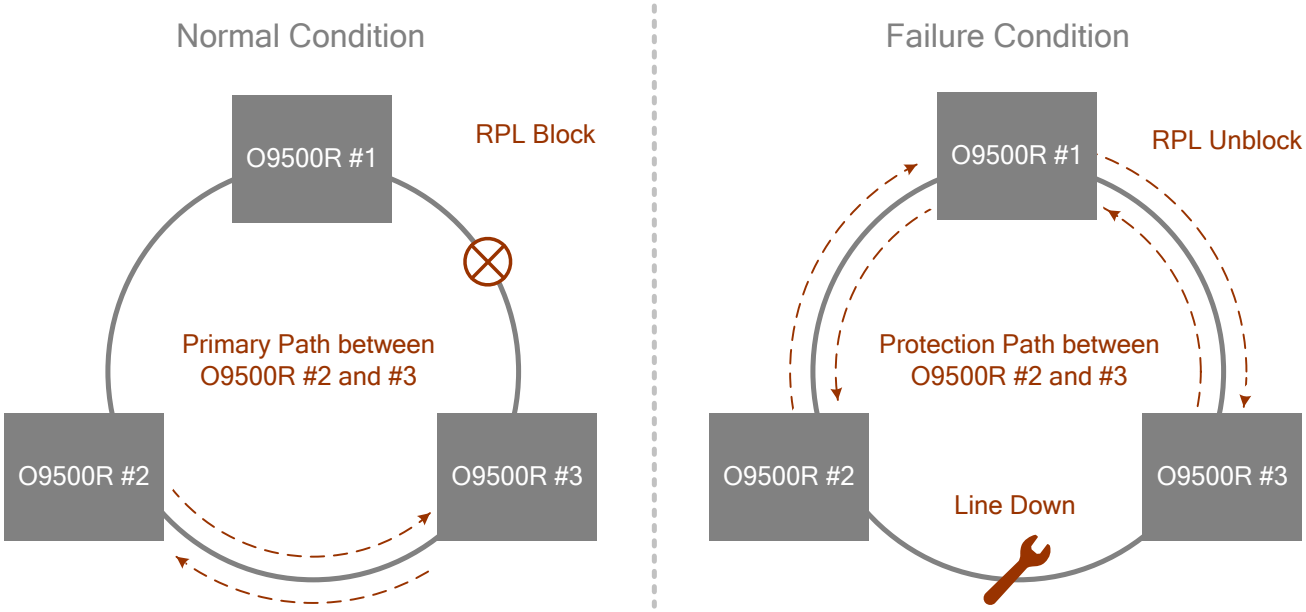


In **1+1 protection** mode, traffic from the head end of a 1+1 link is copied and transmitted on both lines. When line failure occurs in either line, the other line will then become the sole working line.



ERPS is a highly reliable and stable protection mechanism in ring networks with loop prevention. In a ring network, each given node is connected to at least two neighbor nodes via separate links. Multiple nodes interconnected in the topology then form a ring. Any two nodes in the ring can be connected via at least two paths, serving as a protection scheme. The two ports on both ends of a line on neighboring devices are known as ring ports. The minimum amount of nodes in a ring is three. Provisioning is also achieved via VLAN.

To avoid the occurrence of a loop, traffic is allowed to flow on all ring sessions except for the **Ring Protection Link (RPL)**. Under normal conditions, the RPL is blocked from any traffic by the host switches. When a failure in the network is detected, the RPL host unblocks the RPL to allow traffic to pass through. Failure activates protection switching via **Ring Automatic Protection Switching (R-APS)** message relay.



Ordering Information

Note: RoHS compliant units are identified by the letter **G** appearing immediately at the end of the ordering code.

Main Unit (Chassis, CPU, Power, Connector Board, Fan)

Model	Description	Notes
Chassis		
Loop-O9500-R-CHPAa-**G**	6U height Rack chassis for O9500R supporting 2.5G backplane and PTN/SDH/SONET/PDH modules.	Please order CPU, connector board, power, and tributary cards separately.
Controller Modules (CPU)		
Loop-O9500-R-CCPA-02-**mgmt**-**G**	Controller module supporting PTN modules, with cross-connect unit and two STM-1/4/16 (OC-3/12/48) interfaces of SFP housing, SFP (mini-GBIC) optical modules not included	· Order two for redundancy · Please order SFP optical modules separately from SFP optical modules brochure · Compatible with O9500-R-CHPAa-**G**, and O9500-R-PTN10G-**G** Please specify the **mgmt** options listed in the tables below
Loop-O9500-R-CCPA-02-S4-**mgmt**-**G**	Controller module supports up to two STM-1/4 (OC-3/12) on-board channels without SFP (mini-GBIC) optical modules	· Order two for redundancy · Please order SFP modules separately from SFP optical modules brochure · Use with Loop-O9500-R-CHPAa-**G** and O9500-R-PTN10G-**G** · Please specify the desired **mgmt** option listed in the tables below
Power Modules		
Loop-O9500-R-SD48P-**G**	Single power module -48Vdc (-40 to -72 Vdc), 500W	· Order 2 power modules for redundancy protection. · Adaptors and cables are in accessories
Connector Board		
Loop-O9500-R-CBPD-**G**	Connector Board with alarm I/O, two external clock I/O and RS232 console port	· Connector Board is required for each chassis for external clocks. · One 1-meter conversion cable (Loop-ACC-CAB-HDB15M-100-2BNCM-3RJ48M-DB9F-**G**) for PPS, ToD, and Clock I/O should be purchased separately.
Loop-O9500-R-CBPD-OW-**G**	Connector Board with alarm I/O, two external clock I/O, console port, and EoW using VoIP technology (analog phones supported)	
Loop-O9500-R-CBPD-2POEP-**G**	Connector Board with alarm I/O, two external clock I/O, RS232 console port, and PoE+	
Fan Module		
Loop-O9500-R-FANPA-**G**	Fan Tray for chassis cooling	At least one fan module is required for each chassis.
Feature Activation License		
Loop-O9500-R-CCPA-02-LCTLIC	Feature Activation License for LCT Graphical Configuration Software to support O9500-R-CCPA-02-**G** controller card	Loop-LCT Software is purchased separately.
Loop-O9500-R-CCPA-02-S16LIC	Feature Activation License for O9500-R-CCPA-02-S4 controller to support STM-16 (OC-48)	Used with Loop-O9500-R-CCPA-02-S4 controller
Loop-O9500-R-CCPA-02-L3LIC	Feature Activation License for O9500-R-CCPA-02 controller to support L3 routing function of PTN10G card	Used with Loop-O9500-R-CCPA-02-**mgmt**-**G** and Loop-O9500-R-CCPA-02-S4-**mgmt**-**G** controllers
Loop-O9500-R-CCPA-02-IPV6LIC	Feature Activation License for O9500-R-CCPA-02 controller to support IPv6	Use with Loop-O9500-R-CCPA-02-**G** or Loop-O9500-R-CCPA-02-S4-**G**

■ The code **mgmt** must be replaced by the following options. Please replace **mgmt** with your selection.

mgmt=	Description	Notes
LCT	LCT activation license included	Used with Loop-LCT Graphical Configuration Software for management
[blank]	Management via LCT disabled	If LCT is required in the future, it can still be activated via a feature activation license.

High Speed or High Density Tributary Modules

Note: Modules that do not conform to the temperature range from -20 to 65°C (operating) are marked orange.

E1/T1

Loop-O9500-R-16TE-**G**	16 E1 (120 ohm) or 16 T1 software programmable plug-in card	
Loop-O9500-R-32TE-**G**	32 E1 (120 ohm) or 32 T1 software programmable plug-in card	
Loop-O9500-R-63TE-**G**	63 E1 (120 ohm) or 63 T1 software programmable plug-in card	
Loop-O9500-R-16E75-**G**	16 E1(75 ohm) plug-in card	
Loop-O9500-R-32E75-**G**	32 E1(75 ohm) plug-in card	
Loop-O9500-R-63E75-**G**	63 E1(75 ohm) plug-in card	

E3/T3

Loop-O9500-R-3TE3-**G**	3 T3 or 3 E3 software programmable interface plug-in card (operating temperature range from -5 to 65°C)	Order feature activation licenses to activate M13 functions
Loop-O9500-R-3TE3M13-**G**	3 T3 or 3 E3 software programmable interface plug-in modules with M13 /Mx3 function for T3 interface only (operating temperature range from -5 to 65°C)	

EoS

Loop-O9500-R-8GES4SWA-**G**	Eight-channel GbE interface, software configurable plug-in module with L2 switch, using 622Mbps backplane channel on HS slots	Order two for redundancy
Loop-O9500-R-8GES16SWA-**G**	Eight-channel GbE interface, software configurable plug-in module with L2 switch, using 2.5Gbps backplane channel on slot 3 & 4	Only compatible with the following: Chassis: CHAA, CHPAa Controller: CCPA-02

STM-n/OC-n

Loop-O9500-R-B16-**G**	STM-1/4 (OC-3/12) software configurable p lug-in card without SFP (mini-GBIC) optical modules	
Loop-O9500-R-B2G5-**G**	STM-16/OC-48 software configurable interface plug-in module without SFP (mini-GBIC) optical modules	· Compatible only with slot 3 and 4 · SFP optical modules are not included. Please order SFP modules separately. · Order two for redundancy

PTN (MPLS/CE)

Loop-O9500-R-PTN10G-**G**	MPLS-TP plug-in module with 3 x 10G SFP+ ports and 8 x GE SFP ports, without SFP (mini-GBIC) optical modules (operating temperature range from -20 to 65°C)	· Please order SFP optical modules **separately** from SFP optical modules brochure. Compatible SFP modules include GNB1D, GNB2D, TNABD, etc. · 10/100/1000M electrical interface

		should only be used with Loop-branded SFP transceiver model (EMOAR). ・PTN10G is compatible with the following controller modules: ・Loop-O9500-R-CCPA-02-**G** controller module ・Loop-O9500-R-CHPAa-**G** chassis only
Loop-O9500-R-PTNext-**G**	MPLS-TP plug-in module with 1 x 10GbE or 10 x GbE SFP ports, without SFP (mini-GBIC) optical modules	Used only with PTN10G

Low Speed Tributary Modules (Single Slot)

E1/T1

Loop-O9500-R-4E1-**cc**-**G**	4-channel E1 plug-in card.	・For **cc** option, please refer to the table below for detail information. ・Order feature activation licenses to activate ring protection functions
Loop-O9500-R-4T1-**G**	4-channel T1 plug-in card	
Loop- O9500-R-3E1-**cc**-**G**	3-channel E1 plug-in card with DS0 (64K bps) SNCP protection	
Loop-O9500-R-3T1-**G***	3-channel T1 Interface	For software version 3.02.01 or newer versions

G.SHDSL

Loop-O9500-R-2GH-**G**	2-channel G.SHDSL plug-in card (2 pair)	
Loop-O9500-R-4GH-**G**	4-channel G.SHDSL plug-in card (1 pair)	

Dry Contact

Loop-O9500-R-8DCB-**G**	8-channel dry contact type B plug-in card with maximum voltage 220 Vdc or 250 Vac	
Loop-O9500-R-8DCC-**G**	8-channel dry contact type C plug-in card with maximum voltage 100 Vdc or 250 Vac	

G.703

Loop-O9500-R-6CDA-**cdm**-**G**	6-channel G.703 Interface at 64 Kbps data rate. Per port configurable for Co-directional or Contra-directional interfaces.	For **cdm** option, please refer to the table below for detail information.

C37.94

Loop-O9500-R-4C37-**LSFOM**–**G**	4- channel C37.94 plug-in card (Optical Fiber)	For **LSFOM** option, please refer to the table below for detail information
Loop-O9500-R-4C37SFPA–**G**	4- channel C37.94 plug-in card (SFP port)	Please refer to SFP brochure for SFP modules

RS232

Loop-O9500R-6RS232A-RJ-**G**	6-port RS232 card with V.110 encoding, with 6 RJ48 connectors for 6 RS232 Async ports	
Loop-O9500R-6RS232A-DB-**G**	6-port RS232 card with V.110 encoding, with 2 DB44 connectors for Async and Sync ports	Two conversion cables are included, DB44 connector to two DB25 and one DB9 connectors. (Loop-ACC-CAB-DB44M-100-2DB25F-1DB09F-DB)
Loop-O9500-R-8RS232-RJ-**G**	8-port RS232 plug-in card with X.50 subrate multiplexing scheme and X.54 encoding, with 8 RJ48 connectors for 8 RS232 Async ports	
Loop-O9500-R-8RS232-DB-**G**	8-port RS232 plug-in card with X.50 subrate multiplexing scheme and X.54 encoding, with 2RJ48 connectors and 2 DB44 connectors for Async and Sync ports	Two conversion cables are included. (Each cable has one DB44 connector to one DB9 and two DB25 connectors).

Data Bridge

Loop-O9500-R-8DBRA-RJ-**G**	8-channel data bridge plug-in card, with 8 RJ48 connectors for 8 data bridge Async ports	
Loop-O9500-R-8DBRA-DB-**G**	8-channel data bridge plug-in card, with 2 RJ48 connectors and 2DB44 connectors for 8 data bridge Async ports	Two conversion cables are included (DB44 connector to two DB25 and one DB9 connector; (Loop-ACC-CAB-DB44M-100-2DB25F-1DB09F-DB).

Router

Loop-O9500-R-RTB-**G**	8-LAN port/64 WAN ports router/bridge plug-in card	

DTE

Loop-O9500-R-6UDTEA-**G**	6-port universal data interface card that supports three software configurable modes: Port 1 to 4: two DB44 connectors Port 5 to 6: two RJ48 connectors	· No conversion cable is included. Please order conversion cable separately from Accessories. · Three conversion cable types are available: Loop-ACC-CAB-DB44M-100-2DB25F-VB-**G** Loop-ACC-CAB-DB44M-100-2DB15F-VB-**G** Loop-ACC-CAB-DB44M-100-1DB15F-1DB25F-VB-**G**
Loop-O9500-R-8UDTEA-**opm**-**G**	8-port universal data interface card that supports RS232/RS422/RS485 DCE interface which is software configurable Available options: Terminal Server, Omnibus, Clock Pass Through, and full-/half duplex modes	For **opm** option, please refer to the table below for detail information.

E&M

Loop-O9500-R-8EMA-**x**-**pt**-**typ**-**G**	8-channel 2W/4W E&MA plug-in card with 8 RJ45 or 1 Telco64	· For **pt**, **x** and **typ** option, please refer to the table below. · **pt** = power type

FXS

Loop-O9500-R-12FXSA-**sn**-**pt**-**typ**-**G**	12-channel FXS plug-in card with 600/900 Impedance, Battery Reverse, Loop Start and PLAR. Without Ground Start and Metering Pulse. Used with 12 RJ11 or 1 Telco64.	· 12FXSA-GMP includes all FXSA card functions. · For **sn** option, please refer to the table below for detail information. · **pt**= power type. · For **pt** option, please refer to the table below for detail information. · For **typ** option, please refer to the table below for detail information
Loop-O9500-R-12FXSA-P-**sn**-**pt**-**typ**-**G**	12-channel FXS plug-in card with 600/900 Impedance, Battery Reverse, Loop Start, PLAR and [PLAR bit programmable]. Without Ground Start and Metering Pulse. Used with 12 RJ11 or 1 Telco64.	
Loop-O9500-R-12FXSA-M-**sn**-**pt**-**typ**-**G**	12-channel FXS plug-in card with 600/900 Impedance, Battery Reverse, Loop Start, PLAR and [Metering Pulse]. Used with 12 RJ11 or 1 Telco64.	
Loop-O9500-R-12FXSA-MPP-**sn**-**pt**-**typ**-**G**	12-channel FXS plug-in card with 600/900 Impedance, Battery Reverse, Loop Start, PLAR, [PLAR bit programmable] and [Metering Pulse]. Used with 12 RJ11 or 1 Telco64.	
Loop-O9500-R-12FXSA-GS-**sn**-**pt**-**typ**-**G**	12-channel FXS plug-in card with 600/900 Impedance, Battery Reverse, Loop Start, PLAR and [Ground Start]. Used with 12 RJ11 or 1 Telco64.	
Loop-O9500-R-12FXSA-GM-**sn**-**pt**-**typ**-**G**	12-channel FXS plug-in card with 600/900 Impedance, Battery Reverse, Loop Start, PLAR, [Ground Start] and [Metering Pulse]. Used with 12 RJ11 or 1 Telco64.	
Loop-O9500-R-12FXSA-GMP-**sn**-**pt**-**typ**-**G**	12-channel FXS plug-in card with 600/900 Impedance, Battery Reverse, Loop Start, PLAR, [PLAR bit programmable], [Ground Start] and [Metering Pulse]. Used with 12 RJ11 or 1 Telco64.	

FXO

Loop-O9500-R-12FXOA-**typ**-**G**	12-channel FXO plug-in card with 600/ 900 Impedance, Battery Reverse, without Ground Start and Metering Pulse. Used with 12 RJ11 or 1 Telco64.	For **typ** option, please refer to the table below for detail information
Loop-O9500-R-12FXOA-GS-**typ**-**G**	12-channel FXO plug-in card with 600/ 900 Impedance, Battery Reverse, [Ground Start] Used with 12 RJ11 or 1 Telco64.	

FOM

Loop-O9500-R-1FOMB-**opt**-**G**	1FOMB Fiber Optical Interface with 1x9 optical port	· For **opt** option, please refer to the table below for detail information · Order feature activation licenses to activate ring protection functions

12MAGA

Loop-O9500-R-12MAGA-**typ**-**G**	12-channel Magneto plug-in module with ring across L1&GND and L1&L2. Software programmable. Use with 12 RJ11 or 1 Telco64.	· Please use with 100-240Vac or ±48Vdc powered main units. · For **typ** option, please refer to the table below for detail information

OCU-DP

Loop-O9500-R-OCUDPA-**typ**	8-channel OCU-DP plug-in module. Use with 8 RJ45 or 1 Telco64.	· Only **non-RoHS** compliant model available · For **typ** option, please refer to the table below for detail information

TDMoEA

Loop-O9500R-TDMoEA-PPM-**G**	TDMoEA card with 2 GbE combo interfaces and 2 Ethernet interfaces (10/100/1000BaseT) plug-in module Support G.823 Traffic SFP optical module is not included.	

Low Speed Tributary Modules (Dual Slots)

TTA

Loop-O9500-R-TTA-**pwr**-**G**	Dual slot transfer trip plug-in module for O9500R. Four ports for DTT input and output.	For **pwr** option, please refer to the table below for detail information.

Feature Activation License

Loop-O9500-R-3TE3-M13LIC	Feature Activation License for O9500-R-CCPA-02 3TE3 module to support M13/Mx3 function for T3 interface only	Use with 3TE3 HS tributary module
Loop-O9500-R-ERINGLIC	Feature Activation License for O9500-R-CCPA-02 controller module to support framed E1 PDH-Ring function	Use with 4E1 or FOM LS tributary modules
Loop-O9500-R-TRINGLIC	Feature Activation License for O9500-R-CCPA-02 controller module to support framed T1 PDH-Ring function	Use with 4T1 LS tributary modules

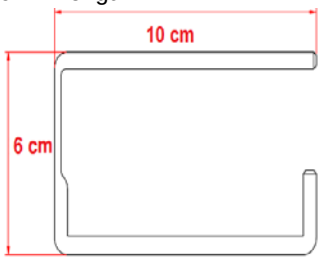
Accessories

SFP Optical Modules		
Please place your order using the 5-digit alphanumeric codes listed in the separate SFP Optical Module Brochure. **Note**: Non-Loop SFP modules are not guaranteed to work with our equipment. It is strongly recommended to buy Loop-logo SFP modules.		
User's Manual		
Loop-O9500-R-UMP	Optional paper copy of User's Manual for Loop-O9500-R-CCPA-02 controller. A CD version of the manual is already included as standard package.	
Power Adaptor (All power adaptors are RoHS compliant)		
Loop-ACC-AC**x**-DC55-500W-**G**	500 Watts, AC (85 ~ 264Vac) to DC (+55 Vdc, 10A) adaptor, temperature range: -30 to 70°C	Where **x** is used for selecting AC power plug type

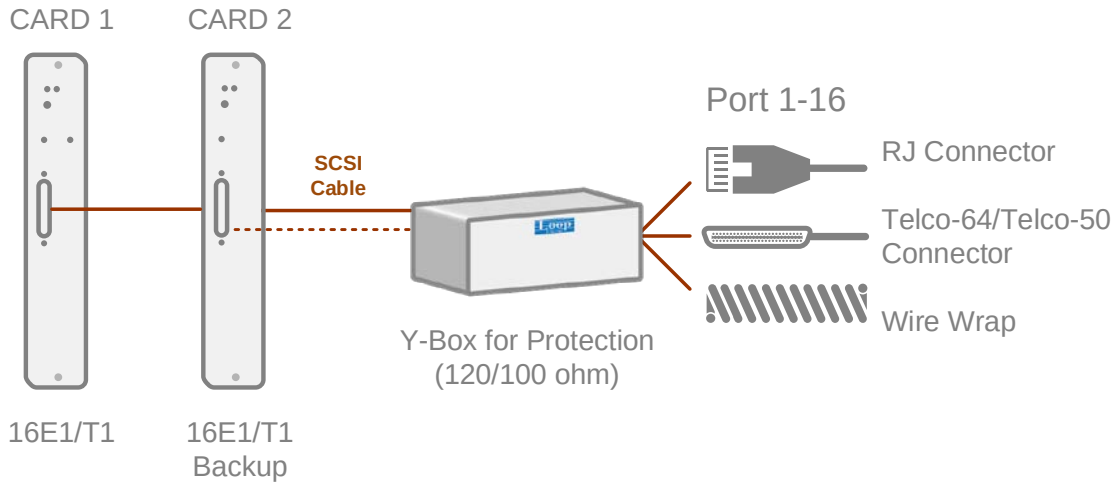
- Where **x** is used for selecting AC power plug type:

x =	Description	Note
A	adaptor power plug type for USA and Taiwan	
E	adaptor power plug type for Europe	
U	adaptor power plug type for UK	

Power Adaptor Tray		
81.TRAY19.0000G	Tray for 500W AC to DC power adaptor	1 tray can hold up to 2 adaptors
FXO BOX		
Loop-ACC-FXOBOX	Support FXO Interface Feed	
Mounting Ear		
19"/23" ear mounts	A pair of 19"/23" ear mounts is supplied as part of standard package. **Note**: For other sizes, please contact your nearest Loop sales representative.	
Conversion Panels		
Loop-ACC-P-1SCSI-16RJ-**G**	1u panel for one SCSI to 16 RJ connectors without cable 432x44x23mm (WxHxD)	· For 16/32/63TE HS tributary module · This panel can also be used in the Loop-O9400R and G7860A
Loop-ACC-P-1SCSI-16WW-**G**	1u panel for one SCSI to 16 Wire Wrap connectors without cable 432x44x40mm (WxHxD)	· For 16/32/63TE or 16/32/63E75 HS tributary module · This panel can also be used in the Loop-O9400R and G7860A

Loop-ACC-P-1SCSI-16BNC-**G**	1.5u panel for one SCSI to 16 BNC connectors without cable 432x66x53mm (WxHxD)	· For 16/32/63E75 HS tributary module · This panel can also be used in the Loop-O9400R
Cable Management with Air Filter		
Loop-ACC-CMFILRa-**G**	2U (88mm) Cable Management and Air Filter Rack, metal air filter included Detachable cable management ring	· Use with Loop-O9400-R-CHA-G, Loop-O9400-R-CHAA-G, Loop-O9400-R-CHPA-G, Loop-O9500-R-CHPA-G, Loop-O9500-R-CHPAa-G and Loop-G7800-CHA-G* · The cable management ring is 10 cm in length. 
Airflow Guide Rack		
Loop-O9500R-AFGR-**G**	Airflow guide rack to guide cold/hot air into or out of the unit and meet the site's heating requirements.	· Also applicable to Loop-V4150 and Loop-O9400R

16-port High-Speed Y-box

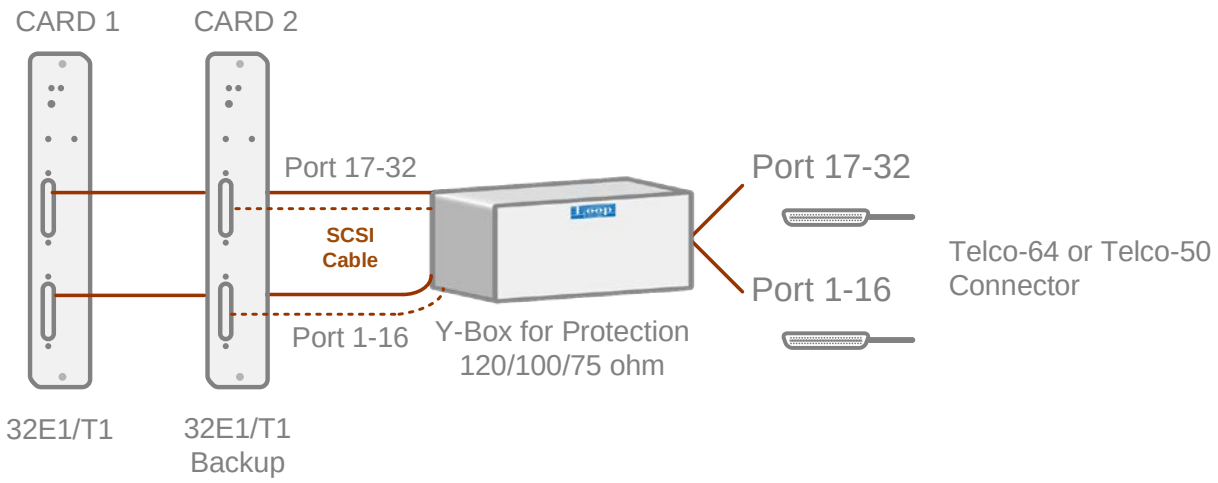


16-port HS Y-Box (120-ohm E1 / 100-ohm T1)

Loop-ACC-Y-2SCSI-16RJ-**G**	1u 16-port Y-box for two SCSI (E1(120 ohm) or T1) to 16 RJ (E1(120 ohm) or T1) connectors without cable	For Loop-O9500-R-16TE-**G** This Y-box can also be used in the Loop-O9400R
Loop-ACC-Y-2SCSI–16WW-**G**	1u 16-port Y-box for two SCSI (E1(120 ohm) or T1) to 16 Wire Wrap (E1(120 ohm) or T1) without cable	
Loop-ACC-Y-2SCSI-2T50P8-16TE-**G**	1u 16-port Y-box in (E1(120 ohm) or T1) for two SCSI two TELCO 50 (E1(120 ohm) or T1) connectors (8 ports per TELCO connector) without cable	
Loop-ACC-Y-2SCSI-1T64P16-16TE-**G**	1u 16-port Y-box in (E1(120 ohm) or T1) for two SCSI to one TELCO 64 (E1(120 ohm) or T1) connectors (16 ports per TELCO connector) without cable	

Loop-ACC-Y-2SCSI-2T50P8-16E75-**G**	1u 16-port Y-box for two SCSI (E1(120 ohm)) to two TELCO 50 (E1(75 ohm)) connectors (8 ports per TELCO connector) without cable	For Loop-O9500-R-16TE-**G** This Y-box can also be used in the Loop-O9400R
Loop-ACC-Y-2SCSI- 1T64P16-16E75-**G**	1u 16-port Y-box for two SCSI (E1(120 ohm)) to one TELCO 64 (E1(75 ohm))connectors (16 ports per TELCO connector) straight without cable	For Loop-O9500-R-16TE-**G** This Y-box can also be used in the Loop-O9400R

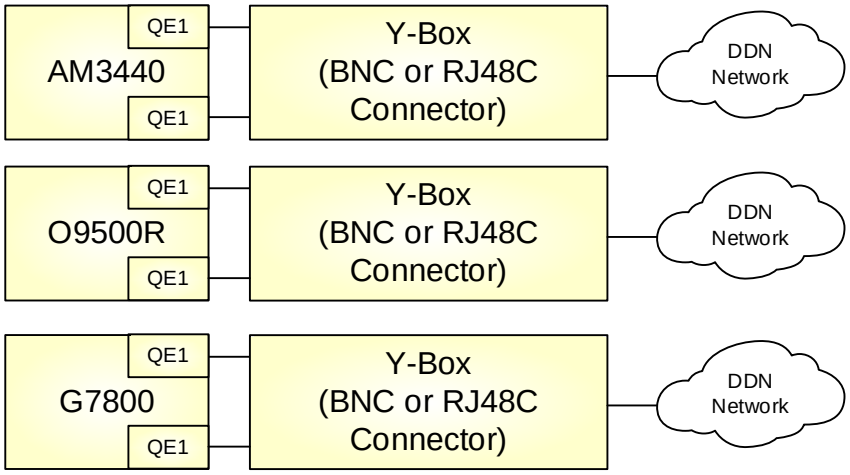
32-port High-Speed Y-box



32-port HD Y-Box (120 ohm E1 / 100 ohm T1 / 75 ohm E1)

Loop-ACC-Y-4SCSI- 4T50P8-32E75-**G**	1u 32-port Y-box for four SCSI (E1(120 ohm)) to four TELCO 50 (E1(75 ohm))connectors (8 ports per TELCO connector) without cable	For Loop-O9500-R-16TE-**G** This Y-box can also be used in the Loop-O9400R and G7860A
Loop-ACC-Y-4SCSI- 3T50P12-32E75-**G**	1u 32-port Y-box for four SCSI (E1(120 ohm)) to three TELCO 50 (E1(75 ohm))connectors (12 ports to the first TELCO connector, 12 ports to the second TELCO connector and 8 ports to the third TELCO connector) without cable	For Loop-O9500-R-32TE-**G** or Loop-O9500-R-63TE-**G** For Loop-O9500-R-16TE-**G** This Y-box can also be used in the Loop-O9400R and G7860A
Loop-ACC-Y-4SCSI- 2T64P16-32E75-**G**	1u 32-port Y-box for four SCSI(E1(120 ohm)) to two TELCO 64 (E1(75 ohm))connectors (16 ports per TELCO connector) without cable	
Loop-ACC-Y-4SCSI-4T50P8-32TE-**G**	1u 32-port Y-box in (E1(120 ohm) or T1) for four SCSI to four TELCO 50 (E1(120 ohm) or T1) connectors (8 ports per TELCO connector) without cable	For Loop-O9500-R-32TE-**G** or Loop-O9500-R-63TE-**G** This Y-box can also be used in the Loop-O9400R and G7860A
Loop-ACC-Y-4SCSI-3T50P12-32TE-**G**	1u 32-port Y-box in (E1(120 ohm) or T1) for four SCSI to three TELCO 50 (E1(120 ohm) or T1) connectors (12 ports to the first TELCO connector, 12 ports to the second TELCO connector and 8 ports to the third TELCO connector) without cable	
Loop-ACC-Y-4SCSI-2T64P16-32TE-**G**	1u 32-port Y-box in E1 120 ohm or T1 for four SCSI to two TELCO 64 (E1(120 ohm) or T1) connectors (16 ports per TELCO connector) without cable	

Low-speed Y-Box (All Y-Box are RoHS compliant)



Loop-VV-B-**G**	1 for 1 protection Y-Box with BNC connectors (4-E1)	For Loop-O9500-R-4E1-**BNC**-**G**
Loop-VV-R-**G**	1 for 1 protection Y-Box with RJ48C connectors (16-E1)	For Loop-O9500-R-4E1-**RJ**-**G**
Loop-VV-T-**G**	1 for 1 protection Y-Box with RJ48C connectors (16-T1)	For Loop-O9500-R-4T1-**G**
Conversion Cables (All conversion cables are RoHS compliant)		
Loop-ACC-CAB-SCSI68M-200-1SCSI68M-**G**	SCSI 68 pin/Male to SCSI 68 pin/Male Extension Cable Length:200cm	For Loop-O9500R Y-boxes and conversion panels
Loop-ACC-CAB-DB44M- 100-2DB25F-1DB09F-DB	DSUB-44 pin/Male to two DSUB-25 pin/Female- one DSBU-9 pin/Female Length 100cm	For Loop-O9500-R-8RS232-DB-**G** and Loop-O9500-R-8DBRA-DB-**G** plug-in card
Loop-ACC-CAB-DB44M-100-2DB25F-VB-**G**	DSUB-44 pin/Male to two DSUB-25 pin/Female for V.35, V.36, RS232, 100cm in length	For 6UDTEA Card port 1 to 4
Loop-ACC-CAB-DB44M-100-2DB15F-VB-**G**	DSUB-44 pin/Male to two DSUB-15 pin/Female for X.21, 100cm in length	
Loop-ACC-CAB-DB44M-100-1DB15F-1DB25F-VB-**G**	DSUB-44 pin/Male to one DSUB-15 pin/Female and DSUB-25 pin/Female for V.35, V.36, RS232, X.21, 100cm in length	
Loop-ACC-CAB-DB44M-100-2M34F-VB-**G**	DSUB-44 pin/Male to two M34 pin/Female for V.35, 100cm in length	
Loop-ACC-CAB-DB44M-100-2DB37F-VB-**G**	DSUB-44 pin/Male to two DSUB-37 pin/Female for RS449 and RS422, 100cm in length	
Loop-ACC-CAB-DB44M-100-1DB37F-1M34F-VB-**G**	DSUB-44 pin/Male to one DSUB-37 pin/Female and one M34 pin/Female for V.35, 100cm in length	
Loop-ACC-CAB-HDB15M-100-2BNCM-3RJ48M-DB9F-**G**	One HD-sub 15 pin/Male connector to two BNC/Male, three RJ45/Male, and one DB9/Female connectors; Length: 100 cm	For Clock interfaces on Connector Board, including external clock, PPS out, and ToD
Loop-ACC-CAB-HDB15M-100-RJ48M-**G**	DB15/Male to RJ48/Male cable; Length: 100 cm	For CCPA-02 controller Clock interface connection, including external clock
Blank Panels		
30.002473.A00LF	Blank panel for XCU slot	
30.001076.A00LF	Blank panel for power supply slots	
30.001077.A00LF	Blank panel for High-speed slots (Slots 1~4)	
30.001027.A00LF	Blank Panel for Low-speed slots (Slots 11~16)	

For 4E1 and 3E1 card:

■ Where **cc** is used to select connector:

cc =	**Description**	**Notes**
RJ	RJ48C connector	
BNC	BNC connector	

For 8UDTEA card:

■ Where **opm** is used to select 8UDTEA functions:

opm =	**Description**
DCE	RS232/RS422/RS485 DCE interface, software configurable
TS	Terminal Server Function and DCE
OMNI	Omnibus Function and DCE
CPT	Clock Pass Through function and DCE
TSOMNI	Terminal Server, Omnibus Function and DCE
HD	RS232/RS422/RS485 DCE interface with Full- and Half-Duplex modes
TSHD	Terminal Server Function and DCE with Full- and Half-Duplex modes
OMNIHD	Omnibus Function and DCE with Full- and Half-Duplex modes
TSOMNIHD	Terminal Server, Omnibus Function and DCE with Full- and Half-Duplex modes
FULL	Terminal Server, Omnibus Function, Clock Pass Through and DCE with Full- and Half-Duplex modes
Feature Activation License	**Description**
Loop-O9500-R-8UDTEA-TSLIC	Terminal Server function
Loop-O9500-R-8UDTEA-OMNILIC	Omnibus function
Loop-O9500-R-8UDTEA-CPTLIC	Clock Pass Through function
Loop-O9500-R-8UDTEA-TSOMNILIC	Terminal Server function and Omnibus function
Loop-O9500-R-8UDTEA-HDLIC	Full- and Half-Duplex modes
Loop-O9500-R-8UDTEA-TSHDLIC	Terminal Server function with Full- and Half-Duplex modes
Loop-O9500-R-8UDTEA-OMNIHDLIC	Omnibus function with Full- and Half-Duplex modes
Loop-O9500-R-8UDTEA-TSOMNIHDLIC	Terminal Server, Omnibus, and Full- and Half-Duplex modes
Loop-O9500-R-8UDTEA-FULLLIC	Terminal Server, Omnibus, Clock Pass Through, and Full- and Half-Duplex modes

For 1FOMB Card:

■ where **opt** is used to select optical module type:

opt =	**Description**	**Notes**
NHB3S (was SAA)	single optical module with dual uni-directional fiber, 1310 nm, SC optical connector, 30 km- ***S1.1 physical layer***	• Use 2 fibers • ITU-T Rec G.957 application code • Use with Single-mode 9/125 μm fiber cables
NHB5S (was SBB)	single optical module with dual uni-directional fiber, 1310 nm, SC optical connector, 50 km - ***L1.1 physical layer***	• Use 2 fibers • ITU-T Rec G.957 application code • Use with Single-mode 9/125 μm fiber cables
NHB3F (was SCC)	single optical module with dual uni-directional fiber, 1310 nm, FC optical connector, 30 km - ***S1.1 physical layer***	• Use 2 fibers • ITU-T Rec G.957 application code • Use with Single-mode 9/125 μm fiber cables
***NHC2S** (was SDD)	single optical module with dual uni-directional fiber, 1550 nm, SC optical connector, 20 km - ***S1.2 physical layer***	• Use 2 fibers • ITU-T Rec G.957 application code • Use with Single-mode 9/125 μm fiber cables *For the orders of the listed optical modules, please contact your Loop sales representative.
NHCUS (was SEE)	single optical module with dual uni-directional fiber, 1550 nm, SC optical connector, 100 km - ***L1.2 physical layer***	• Use 2 fibers • ITU-T Rec G.957 application code

opt =	Description	Notes
		• Use with Single-mode 9/125 μm fiber cables
WHD2S (was SSM)	single optical module with single bi-directional fiber (master), 1310 nm transmit and 1550 receive, SC optical connector, 30 km reach - ***S1.1/ S1.2 physical layer***	• 1310 nm from master to slave • Order **WHD2S** to use with **WHE2S** • Use 1 fiber • ITU-T Rec G.957 application code • Use with Single-mode 9/125 μm fiber cables
WHE2S (was SSS)	single optical module with single bi-directional fiber (slave), 1310 nm receive and 1550 transmit, SC optical connector, 30 km reach - ***S1.1/ S1.2 physical layer***	• 1550 nm from slave to master • Order **WHE2S** to use with **WHD2S** • Use 1 fiber • ITU-T Rec G.957 application code • Use with Single-mode 9/125 μm fiber cables

NOTE: For other special optical modules, please contact your nearest Loop sales representative.

For 8-channel 2W/4W E&M card:

■ Where **pt** is used to select the following functions:

pt=	Description	Note
EMV48	Output +48Vdc	For CHPA chassis only
[blank]	Default output -48Vdc	

■ Where **x** is used to select all of voice card signaling bits. If this option is not required, omit the **x** field in the ordering code.

	x =	Description	Note
8EMA	**E**	Follows ETSI signaling bits	
	A	Follows ANSI signaling bits	Jumper selectable for all channels
	R	Reverse for ON-HOOK and OFF-HOOK signaling bits exchange	
	AR	Follows ANSI signaling bits and reverse bit	
	ER	Follows ETSI signaling bits and reverse bit	
	S	Follows customer's special bit or function assignment	
	S4	Disable the function of the test button	
	S5	Forcing all ports to be OFF-HOOK when an alarm occurs	
	S6	Forcing all ports to be ON-HOOK when an alarm occurs	

Note:

1. For S (customer's special bit), please contact your nearest Loop sales representative.
2. If x is not selected from table above, the default setting for signaling bits is ETSI and for trunk condition is ON-HOOK.

■ Where **typ** is used to select the connector type:

typ=	Description	Note
RJ	8 x RJ45	
TELCO	1 x Telco 64	

For 12-channel FXS card (12FXSA):

■ Where **sn** is used to select special function. If this option is not required, omit the **sn** field in the ordering code.

sn =	Description	Note
[blank]	FXS Loop Feed = -48 Vdc with 25 mA current limit; alarm tone enable; normal ring	
S1	FXS Loop Feed = -48 Vdc with 35 mA current limit	
S4	Remove alarm tone	
S5	Double ring tone transmit	

Note: For sn (special function), please contact your nearest Loop sales representative.

■ Where **pt** is used to select the following functions.

pt=	Description	Note
PWR	with -48Vdc or -125Vdc power modules	
PWR1613	with -48Vdc power modules complied with IEEE 1613 standard	Only for 12FXSA

■ Where **typ** is used to select the connector type:

typ=	Description	Note
RJ	8 x RJ45	
TELCO	1 x Telco 64	

For 12-channel FXO card (12FXOA):

■ Where **typ** is used to select the connector type:

typ=	Description	Note
RJ	8 x RJ45	
TELCO	1 x Telco 64	

For Magneto Card:

■ Where **typ** is used to select the connector type:

typ=	Description	Note
RJ	12 x RJ11	
TELCO	1 x Telco 64	

For 4C37 Card:

■ Where **LSFOM** is to select **LS**-**F**iber **O**ptical **M**odule option, each module has 5 letters.

LSFOM Code	Description										Notes
	Mode		Data Rate		Wavelength		Distance		Connector/ Interface		
	Code	Description	Code	Description	Code	Description	Code	Description	Code	Description	
ZRATT	Z	Multi-mode	R	2 M	A	820nm	T	2km	T	ST/UPC	
QRATT	Q	Multi-mode	R	2 M	A	850nm	T	2km	T	ST/UPC	
NRB2T	N	Single mode	R	2 M	B	1310nm	2	20km	T	ST/UPC	
T	Single mode, 1310nm, Tx_min -13dBm, Rx_max -30dBm, SC type connector. Works with Toshiba teleprotection device in direct mode.										Must use 3 x DS0
S	Single mode,1310nm, Tx_min -14dBm, Rx_max -36dBm, ST type connector Works with SEL teleprotection device in direct mode.										Must use 8 x DS0
GE	Single mode, 1310nm, Tx_min -15dBm, Rx_max -34dBm, ST type connector. Works with GE teleprotection device in direct mode.										Must use 12 x DS0
I	Single mode, 1310nm, Tx_min -5dBm, Rx_max -30dBm, SC type connector. Works with Ingeteam teleprotection device in direct mode.										Must use 3 x DS0

■ SFP module for Loop-O9500-R-4C37SFPA-**G**

Code	Description										Notes
	Mode		Data Rate		Wave Length		Distance		Connector		
	Code	Description	Code	Description	Code	Description	Code	Description	Code	Description	
MRPTD	M	SFP Multi-Mode	R	2 M	P	850nm	T	2km	D	LC connector with DDM	SFP Module
PRB2D	P	SFP Single-Mode	R	2 M	B	1310nm	2	20km	D	LC connector with DDM	SFP Module

For OCUDPA card:

■ Where **typ** is used to select the connector type:

typ=	Description	Note
RJ	8 x RJ45	
TELCO	1 x Telco 64	

For Transfer Trip (TTA) Card:

■ Where **pwr** is used to select the following functions.

pwr=	Description	Note
24	Complied with 24/48V voltage	*Future option
48	Complied with 48/125V voltage	
125	Complied with 125/250V voltage	*Future option

For 6CDA Card:

■ Where **cdm** is used for co-directional/contra-directional mode selection. Must select one from table below.

cdm=	Description	Note
cc	Supports G.703 Contra-directional controlling (DCE) and Co-directional interface configuration	
mixed	Supports G.703 Contra-directional controlling (DCE) and Co-directional interface configuration	6CDA card does not support Contra-directional subordinate (DTE) mode when used with O9500R-CCPA-02 controller, but may support it on other Loop devices such as Loop-AM3440 series.

Example:

Loop-O9500-R-CHPAa-G, Loop-O9500-R-CCPA-02-G, Loop-O9500-R-CBPD-G, Loop-O9500-R-FANPA-G, Loop-O9500-R-63TE-G, Loop-O9500-4E1-RJ, Loop-O9500-R-4GH, Loop-O9500-R-SD48P:

For model O9500R CHPAa 6U height Rack chassis with one CPU card, one connector board, and one Fan board, one 63E1 software programmable interface plug-in card, one 4-channel E1 interface with RJ48C connectors, one 4-channel G.SHDSL plug-in card (1-pair), and a single –48 Vdc power module.

Product Specifications

High Speed or High Density Tributary Modules

T1 Interface

Line Rate	1.544 Mbps ± 32 ppm	Jitter	ITU G.824
Line Code	AMI/B8ZS	Framing	Unframed with a framing monitor on receiving side
Input Signal	ITU G.703 DSX-1 0dB to –6dB	Impedance	100 ohm twisted pair
Output Signal	ITU G.703 DSX-1 w/short (0-110, 110-220, 220-330, 330-440, 440-550, 550~660 (feet)	Connector	SCSI-II 68-pin One connector for 16 ports Two connectors for 32 ports Four connectors for 63 ports
Output Mask	Bellcore GR-499-core		

E1 Interface

Line Rate	2.048 Mbps ± 50 ppm	Jitter	ITU G.823
Line Code	AMI/HDB3	Framing	Unframed with a framing monitor on receiving side
Input Signal	ITU G.703	Impedance	75 ohm coax/120Ω twisted pair
Output Signal	ITU G.703	Connector	SCSI-II 68-pin One connector for 16 ports Two connectors for 32 ports Four connectors for 63 ports
Output Mask	ETS 300 689 Sec.4.2.1.2 ITU G.703		

E3 Interface

Line Rate	34.368 Mbps ± 20ppm	Jitter	ITU G.823
Line Code	HDB3	Framing	Unframed, G.751
Input Signal	ITU G.703	Impedance	75 ohm coax
Output Signal	ITU G.703	Connector	BNC connector
Output Mask	ETS 300 689 Sec.4.2.1.2 ITU G.703	Temperature	-5 to 65°C

T3 interface

Line Rate	44.736 Mbps ± 20ppm	Jitter	ITU G.824
Line Code	B3ZS	Framing	Unframed, M13/Mx3 (unframed E1/T1), G.747
Input Signal	ITU G.703	Impedance	75Ω coax
Output Signal	ITU G.703	Connector	BNC connector
Output Mask	Bellcore GR-499-core	Temperature	-5 to 65°C

8-port Gigabit Ethernet Interface (8GES4SWA/8GES16SWA)

LAN Gigabit Ethernet (GbE) Interface

Electrical Ports	4 RJ45 ports (Port 5 to 8) BaseT 10/100/1000 Mbps per port Auto MDI/MDIX
Optical Ports	4 ports of SFP housing (Port 1 to 4) 10/100/1000 Mbps per port auto laser shutdown (ALS)
Speed	10/100/1000 Mbps, auto-negotiation
Direction	duplex(half/full), auto-negotiation

WAN Transmission

Max. Throughput	8GES4SWA: up to 4 x STM-4/OC-12 (4 cards without card-level protection) 8GES16SWA: up to 1 x STM-16/OC-48
Per-card throughput	8GES4SWA: 1 x STM-4/OC-12 8GES16SWA: up to 1 x STM-16/OC-48
EVC services	E-line mode: Port-based E-line (Ethernet Private Line, EPL) Virtual E-line mode: VLAN-based E-line (Ethernet Virtual Private Line, EVPL) E-LAN mode: Port-based E-LAN (Ethernet Private LAN, EPLAN)
Protection	External switch connected to two 8GE cards at the same time for card-level 1+1 protection*

*Future Option

Ethernet over SDH/SONET

Line Rate	10/100/1000 Mbps

SDH/SONET Mapping	n x AU4/AU3/TU3/TU11/TU12 (STS3C/STS1/VT1.5/VT2)
Multiplexing	G.707
Layer 2 Protocols	RSTP (802.1W), VLAN (802.1Q, 802.1P) Flow Control (802.3X) MSTP (802.1S) IGMP Snooping QoS
EoS Protocols	Virtual Concatenation (VCAT) Encapsulation: GFP(G.7041), LAPS LCAS (G.7042) and non-LCAS
Bridge	802.1d MAC learning (maximum MAC table 16K entry)
VLAN	IEEE 802.1q bridging VLAN packet transparent
QoS	Eight priority queues per LAN/WAN port Packet classification based on 802.1p user priority (CoS) or DSCP Traffic Engineering supports TRTC and SRTC meter rules, and packet color remark Queue scheduling algorithm either Strictly Priority or Weighted Round-Robin (WRR)

Standards Compliance

IEEE	802.1q, 802.1p, 802.3, 802.3u, 802.3ab, 802.3z, 802.1s, 802.1w, 802.1x G.7041, G.7042

PTN10G/PTNext

Interface

1 GbE		**10 GbE**	
Number of Ports	8 PTNext (Operable with PTN10G only): 10	Number of Ports	3 PTNext (Operable with PTN10G only): 1
Connector	SFP	Connector	SFP+

SDH/SONET	
Number of Ports	1 STM-16/OC-48
Connector	Backplane to XCU

Circuit Emulation

SAToP	Unframed E1/T1 packets
CESoPSN	Fractional E1/T1 (N x DS0) packets
CEP	SDH/SONET path packets

Encapsulation

TDM	over MPLS, over Carrier Ethernet, over IP (using pseudowire)
IP	over MPLS (using pseudowire)
Ethernet	VPWS, VPLS (using pseudowire)

QoS

Eight priority queues per port
Scheduling – Strict Priority, Weighted Round Robin with hierarchy
Ingress policing per service
Egress shaping per service
CIR / PIR (EIR) Two-rate, three-color. (Committed Information Rate, Peak or Expected Information Rate)
E-LSP: EXP-Inferred PSC (Per Hop Behavior Scheduling Class) LSP. (Label Switching Path)
WRED for congestion management. (Weighted Random Early Detection)

Standard Compliance

IEEE		RFC (IETF)	
802.1d	STP	2131 & 2132	DHCP
802.1w	RSTP	6378	MPLS-TP Linear Protection
802.1s	MSTP	1058	RIPv1
802.1q	VLAN	1389	RIPv2
802.1ad	VLAN Tag Stacking (Q-in-Q)	2328	OSPFv2
802.1ag	Ethernet OAM (CFM)	5340	OSPFv3
802.3ah	Ethernet in the First Mile (EFM)	4842	Circuit Emulation over Packet (CEP)
1588 v2	Precision Time Protocol (PTP)	3985	Pseudowire End-to-end Emulation (PWE3)
ITU-T			
G.8031	ELPS		
G.8032	ERPS		
G.8113.2	MPLS-TP OAM		
Y.1731	Ethernet OAM		

EMC/EMI	Safety
FCC15 Class A	EN60950-1
EN55022 Class A	
EN55035	

B155/622 STM-1/4 (OC-3/12) Interface Card

Total Ports		2
Total channel per card		2 STM-1/OC-3 1 STM-4/OC-12
Protection		SNCP/UPSR via mapping 2 STM-1/OC-3 MSP (1+1) pairs with 2 cards 1 STM-4/OC-12 MSP (1+1) pair with 2 cards
Data Rate		155/622 Mbps
Line Code	LC connector	NRZ
	BNC Connector	CMI
Output Mask	BNC Connector	ITU.G703
Connector		LC, BNC
Jitter		ITU G.703
Impedance	BNC Connector	75ohm coax
Loopback	Local loopback, payload loopback, line loopback:	
BERT		

Note: For SFP modules, please refer to SFP brochure.

B2G5 STM-16/OC-48 Interface Card

Total Ports	2
Total channel per chassis	1 STM-16/OC-48 1 MSP (1+1) STM-16/OC-48
Protection	SNCP/UPSR via mapping Port-level MSP (1+1) with one card Card-level MSP (1+1) with two cards
Data Rate	2.5Gbps
Line Code	NRZ CMI
Output Mask	ITU.G703
Jitter	ITU G.703

Note: For SFP modules, please refer to SFP brochure.

Low Speed Tributary Modules

Network Line Interface – 4E1

Line Rate	2.048 Mbps ± 50 ppm	Framing	ITU G.704
Line Code	AMI or HDB3	Connector	BNC/RJ48C
Input Signal	ITU G.703	Electrical	75 ohm Coax/120 ohm twisted pair
Output Signal	ITU G.703	Jitter	ITU G.823

Network Line Interface - 4T1

Line Rate	1.544 Mbps ± 32 ppm	Output Signal	DSX1w/0, -7.5, -15 dB LBO
Line Code	AMI or B8ZS	Framing	D4/ESF (selectable)
Input Signal	DSX-1 0 dB to -30 dB w/ALBO	Connector	RJ48C

Network Line Interface - 3E1

Line Rate	2.048 Mbps ± 50 ppm	Framing	ITU G.704
Line Code	AMI or HDB3	Connector	BNC/RJ48C
Input Signal	ITU G.703	Electrical	75 ohm Coax/120 ohm twisted pair
Output Signal	ITU G.703	Jitter	ITU G.823
Function	Support DS0-SNCP		

Network Line Interface – 3T1*

Line Rate	1.544 Mbps ± 32 ppm	Framing	D4/ESF
Line Code	AMI/B8ZS	Output Signal	DSX-1 w/0, -7.5, -15 dB LBO
Input Signal	DSX-1 0dB to -30dB w/ALBO	Connector	RJ48C
Jitter	AT&T TR 62411	Pulse Template	AT&T TR 62411
Data Rate	n * (64) Kbps (n = 1 to 24)	Surge Protection	FCC Part 68 Sub Part D

G.shdsl Line Interface (2GH/4GH)

Number of ports	2 or 4
Line Rate for 4-channel G.shdsl	n x 64Kbps (n= 3 to 31)
Line Rate for 2-channel G.shdsl	n x 64Kbps (n= 3 to 15)
Line Code	16-TCPAM, full duplex with adaptive echo cancellation
Connector	RJ45
Electrical	Unconditioned 19-26 AWG twisted pair
Sealing current	Max. 20 MA source current
Clock Source	From System, Line
Diagnostic Test	G.SHDSL Loopback: To-LINE, To-bus BERT: QRSS

C37.94 Interface (4C37 / 4C37SFPA)

For SFP module for **Loop-O9500-R-4C37-LSFOM-G:**

ZRATT

Multi-Mode, 2Mbps, 820nm, 2KM, ST/UPC connector

Tx						Rx						Note
Power (dBm)			Wavelength (nm)			Power (dBm)			Wavelength (nm)			
Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
-19.8	--	-12.8	792	820	865	-25.4	--	-9.2	792	820	865	50/125µm Fiber Cable
-16	--	-9				-25.4	--	-9.2				62.5/125µm Fiber Cable

QRATT

Multi-Mode, 2Mbps, 850nm, 2KM, ST/UPC connector

Tx						Rx						Note
Power (dBm)			Wavelength (nm)			Power (dBm)			Wavelength (nm)			
Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
-23	--	-11	790	--	870	-32	--	-11	790	--	870	50/125µm Fiber Cable
-19	--	-11				-32	--	-11				62.5/125µm Fiber Cable

NRB2T

Single-Mode, 2Mbps, 1310nm, 20KM, ST/UPC connector

Tx						Rx						Note
Power (dBm)			Wavelength (nm)			Power (dBm)			Wavelength (nm)			
Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
-20	--	0	1261	1310	1360	-32	--	0	1260	--	1610	

For SFP module for **Loop-O9500-R-4C37SFPA-G:**

MRPTD

Multi-Mode, 2Mbps, 850nm, 2KM, LC connector with DDM

Tx						Rx						Note
Power (dBm)			Wavelength (nm)			Power (dBm)			Wavelength (nm)			
Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
-23	--	-11	830	850	860	-32	--	-8	790	--	870	50/125μm Fiber Cable
-19	--	-11										62.5/125μm Fiber Cable

PRB2D

Single-Mode, 2Mbps, 1310nm, 20KM, LC connector with DDM

Tx						Rx						Note
Power (dBm)			Wavelength (nm)			Power (dBm)			Wavelength (nm)			
Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
-19	--	-11	1290	1310	1350	-32	--	-8	1260	--	1360	

Dry Contact I/O card (8DCC)

Inputs -		**Outputs -**	
8-channel	2-port per card, 4-pair per port	8-channel	8-pair per card
Connector	RJ45	Connector	Screw type
Internal Resistance	1 K	Initial Insulation Resistance	Min. 100M ohm (at 500 Vdc)
Activation Current	3 ma	Max. Current	5A
Deactivation Current	1.5 ma	Max. Voltage	100 Vdc, 250 Vac
Allowable Current	4 ma		

Dry Contact Type B Interface

Inputs -		**Outputs -**	
8-channel	2-port per card, 4-pair per port	8-channel	8-pair per card
Connector	RJ45	Connector	Screw type
Internal Resistance	100 K	Initial Insulation Resistance	Min. 1000M ohm (at 500 Vdc)
Activation Current	3 ma	Max. Current	2A
Deactivation Current	1.5 ma	Max. Voltage	220 Vdc, 250 Vac
Allowable Current	4 ma		

Router-B Interface (RTB)

Number of ports	8 LAN ports, Max. 64 WAN ports. Each WAN port has data rate n x 64K bps, 1≤ n ≤32 (≤ 8Mbps for total of all 64 WAN ports
Physical Interface	10/100 BaseT x 8
Connector	RJ45
Routing protocol	RIP-I, RIP-II, OSPF, Static
Supporting Protocols	PPP (IPCP/BCP), MLPPP, HDLC, Frame Relay, and Cisco compatible HDLC, NAT/NAPT, DHCP
Diagnostic	Ping, Trace route
QoS	Rate limit

Data Bridge Card (DBRA)

Data Port	Up to twelve 8-port data bridge card (each card supports up to 120 DS0 for data bridge)	
Feature	20 end points per multi-drop circuit to into a logical ended 56K or 64K channel Per port supports bridge function to N remote Trib. Site (N=1~20)	
Data Rate	Asynchronous	Support to receive 1200 to 19200 bps asynchronous data via oversampling channel
Bridge function	One port with one DS-0 to many (Maximum is 20 for remote Tributary data box)	

20 drops for each DS0 to remote Tributary data box and 8 ports RS232 shared the 128 channels.

DTE (RS232 with V.110 encoding, 6-port) Interface (6RS232)

Data Port	Up to 6 ports		
MUX	Maximum 6 subrate port / 64Kbps		
Data Rate	Asynchronous	Mux mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K
		Independent mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K
	Synchronous	Mux mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K,
		Independent mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 48K, 64K

Card Type	Port Number 1	2	3	4	5	6
RJ48	Async	Async	Async	Async	Async	Async
DB44	Sync/Async	Sync/Async	Async	Sync/Async	Sync/Async	Async

Connector	DB44 (port1,port2,port3) DB44 (port4,port5,port6) or RJ48 (port 1 to Port 6 are 6RJ48)
Alarm	Remote Alarm RTS Loss
Loopback	To-DTE To-DS1 (To Line)
Electrical	RS232 Interface, DCE

DTE (RS232-X.50 mux. 8-port) Interface (8RS232)

Data Port	Up to twelve 8-port RS232 cards		
MUX	Maximum 5 subrate port per 64K bps		
Data Rate	Asynchronous	Mux mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K
		Independent mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K
	Synchronous	Mux mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K
		Independent mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 48K, 64K

Card Type	Port Number 1	2	3	4	5	6	7	8
Eight RJ48	Async	Async	Async	Async	Async	Async	Async	Async
Two DB44 + Two RJ48	Async/Sync	Async/Sync	Async	Async/Sync	Async/Sync	Async	Async	Async

Connector	Eight RJ48 (port 1 to port 8) DB44 (port1,port2,port3), DB44 (port4,port5,port6), RJ48 (port7) and RJ48(port8)
Conversion Cable	A three-into-one conversion cable adapts the DB44 connector to 3 connecters (one DB9S and two DB25S)
Electrical	RS232 Interface, DCE

6CDA G.703 co-directional and Contra-directional Interface Card

Data Port	6-port
Interface	cc mode : ITU G.703 64 Kbps co-directional and Contra-directional controlling (DCE) interface mixed mode : ITU G.703 64 Kbps co-directional, Contra-directional controlling (DCE) and Contra-directional subordinate (DTE) interface
Connector	120ohm, RJ48
Line Distance	Up to 500 meters
Alarm	Co-directional : LOS and insert AIS(All 1) Contra-directional : LOO (Loss Of Octet)
Loopack	DTE Payload Loopback, Local Loopback

6UDTEA Universal Data Interface Card

Mode 1: V.110

Multiplexing

One MUX group per card
MUX group bandwidth up to 64Kbps
Maximum 6 port-based sub-rates

DTE Interface (X.21/RS422/RS232)

Data Port	**Up to 4 (Port 1 to Port 4)**		
MUX	Maximum 4 subrate port / 64Kbps		
Data Rate	Asynchronous	Mux mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K
		Independent mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K
	Synchronous	Mux mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K,
		Independent mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 48K, 64K
Connector	DB44 (Port 1 and Port 2), DB44 (Port 3 and Port 4)		
Alarm	Remote Alarm RTS Loss		
Loopback	To-DTE, To-DS1 (To Line)		
Electrical	DCE		
Protocol	V.110		

DTE Interface (RS232)

Data Port	**Up to 2 (Port 5 and Port 6)**		
MUX	Maximum 6 subrate port / 64Kbps		
Data Rate	Asynchronous	Mux mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K
		Independent mode	0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K
Connector	RJ48 (port5, port6)		
Alarm	Remote Alarm RTS Loss		
Loopback	To-DTE, To-DS1 (To Line)		
Electrical	DCE		
Protocol	V.110		

Mode 2: N x 64K

DTE Interface (X.21/RS449/RS422/RS232/V.35/V.36/EIA530)

Data Port	**Up to 4 (Port 1 to 4)**
Data Rate	Synchronous N*64kbps, N = 1~32
Connector	DB44
Alarm	RTS Loss
Loopback	To-DTE, To-DS1 (To Line)
Electrical	DCE

Note: Port 5~6 are disabled in Mode 2.

Mode 3: N x 64K + Oversampling

DTE Interface (X.21/RS449/RS422/RS232/V.35/V.36/EIA530)

Data Port	**Up to 4 (Port 1 to 4)**
Data Rate	Synchronous N * 64 Kbps, N = 1 to 32 for Port 1~3 Synchronous N * 64 Kbps, N = 1 to 20 for Port 4
Connector	DB44
Alarm	RTS Loss
Loopback	To-DTE, To-DS1 (To Line)

DTE Interface (RS232)

Data Port	**Up to 2 (Port 5 to 6)**
MUX	Max 2 oversampling port / 64kbps
Data Rate	Asynchronous 0.2K, 0.3K, 0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K
Connector	RJ48 (Port 5 & 6)
Alarm	Remote Alarm RTS Loss
Loopback	To-DTE, To-DS1 (To Line)
Electrical	DCE

Mode 4: Clock Pass Through

DTE Interface (X.21/RS449/RS422/RS232/V.35/V.36/EIA530)

Data Port	**Up to 4 (Port 1 to 4)**
Data Rate	Synchronous 0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K Tx and Rx byte count
Connector	DB44
Alarm	LOLC, LOCH, CRE
Loopback	To-DTE, To-DS1 (To Line)
Electrical	DCE

Note: Port 5~6 are disabled in Mode 4.

Mode 5: N x 64K with Local and Remote Loopback

DTE Interface (X.21/RS449/RS422/RS232/V.35/V.36/EIA530)

Data Port	**Up to 4 (Port 1 to 4)**
Data Rate	Synchronous N*64kbps, N = 1~32
Connector	DB44
Alarm	RTS Loss
Diagnostics	DTE Loopback: To-DTE, To-DS1 (To Line) Local and Remote Loopback V.54 standard BERT
Electrical	DCE

Note: Port 5~6 are disabled in Mode 5.

8UDTEA (RS232/RS422/RS485) Universal Data Interface Card

Data Port	8 port UDTE card
ASYNC Data Rate	200,300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K, 128K bps by oversampling
Connector	RJ48C
Interface	DCE only
Flow Control (RS232 only)	Hardware (RTS and DTR), none
Loopback function	DTE to DTE loopback; DTE to Line loopback

1FOMB

Source	MLM Laser	Line Code	Scrambled NRZ
Wavelength	1310 ± 50 nm, 1550 ± 40 nm 50 Km reach	Detector Type	PIN-FET

NOTE: Longer or shorter, 15 to 120Km, on special order.

Voice Card Magneto (12MAGA)

Connector	Twelve RJ11
Alarm Conditioning	CGA busy after 2.5 seconds of LOS, LOF
Encoding	A-law or μ-law, user selectable together for all
Impedance	Balanced 600 or magneto telephone impedance match
Longitudinal Conversion Loss	> 46dB
Gain Adjustment	-21 to +10 dB / 0.1dB step transmit & receive
Signal/ Distortion	> 25dB with 1004 Hz, 0dBm input
Frequency Response	± 0.5 dB from 300 to 3400 Hz, coincide with ITU-T G.712
Idle Channel Noise	Max. –65 dBm0p
Min Detectable Ringing Voltage	16 Vrms
Ringing Detectable Across	L1 and L2 (Tip and Ring), L1 and GND (Tip and GND)
Ringing Generation	Voltage: 76 Vrms (sine wave) Frequency: 20Hz (with optional choices of 16, 25, 50 Hz) Cadence: 1. Normal: Ring after crank 2. PLAR ON: -Single Ring Type: ring for 2 sec. and stop, or ring for 4 sec. and stop -Continuous Ring Type: 1 sec on 2 sec off, or 2 sec on 4 sec off
Ringing Send Across	L1 and L2 (Tip and Ring), L1 and GND (Tip and GND)
Signaling	Magneto MRD(Ringing across Tip and Ring or Tip and Ground)
Signaling Bit A,B,C,D	Programable

Signaling is carried transparently by the digitizing process.
Use Magneto card default setting for communications between magneto telephones
Use Magneto card PLAR mode setting for communications between a magneto telephone and a regular telephone

Voice Card E&MA (8EMA)

Connector	Eight RJ45
Alarm Conditioning	CGA busy after 2.5 seconds of LOS, LOF
Encoding	A-law or μ-law, user selectable together for all
Impedance	Balanced 600 or 900 ohms
Gain Adjustment (Per-port setting)	-16 to +7 dB / 0.1dB step for transmit (D/A) gain -16 to +14 dB / 0.1dB step for receive (A/D) gain
I/O Power Range	A/D Analog input level: -66 dBm (0.00039 Vrms) ~ + 3 dBm (1.09 Vrms) D/A Analog output level: -66 dBm (0.00039 Vrms) ~ + 4 dBm (1.22 Vrms)
Gain Variation	± 0.5 dB from 300 to 3400 Hz, coincide with ITU-T G.712
Frequency Response	± 0.5 dB from 300 to 3400 Hz, coincide with ITU-T G.712
Longitudinal Conversion Loss	＞ 46dB
Total Distortion	＞ 35 dB at 0 dBm0 input
Idle Channel Noise	Max. –65 dBm0p
Carrier Connection	Side A (exchange side) and Side B (carrier side) setup by side switch
Wire Mode	2 wire and 4 wire (programmable)
Signaling	Type 1, Type 2, Type 3, Type 4, and Type 5, Transmit only (programmable)
Modems	Full compatibility with V.90 modems
Output Power on E/M leads	-48Vdc

All in-band signaling tones are carried transparently by the digitizing process.
Customer is responsible for in-band signaling compatibility between a telephone and a switch, or between a PBX and a switch.

Voice Card (12FXOA, 12FXSA)

12 FXS/FXO Connector	Twelve RJ11 or One Telco64	
Alarm Conditioning	CGA busy after 2.5 seconds of LOS, LOF	
Encoding	A-law or μ-law, user selectable together for all	
AC Impedance	Balanced 600 or 900 ohms (selectable together for all)	
Longitudinal Conversion Loss	> 46dB	
Cross talk measure	Max -70dBm0	
Gain Adjustment	FXS: -21 to +3 dB / 0.1dB step transmit & receive FXO: -21 to +10 dB / 0.1dB step transmit & receive	
Signal/ Distortion	> 25dB with 1004 Hz, 0dBm input	
Frequency Response	± 0.5 dB from 300 to 3400 Hz, coincide with ITU-T G.712	
Idle Channel Noise	Max. –65 dBm0p	
Variation of Gain	±0.5dB	
FXO	Ringing REN	0.5B (AC)
	Detectable Ringing	25 Vrms
	Loop Resistance	≤ 1800 Ω
	DC Impedance (ON-HOOK)	> 1M Ω
	DC Impedance (OFF-HOOK)	235 Ω @ 25mA feed 90 Ω @ 100mA feed
FXS Loop Feed	-48Vdc with 25mA current limit per port Jumper Selectable: 25mA(default=25mA), 30mA, or 35mA(sn=S1)	
FXS Signalling	Normal / PLAR: Private Line Auto Ring down	
FXS Ringing	1 REN at 5K meters per port 16.7Hz, 20Hz, 25Hz, 50Hz, user selectable for all ports Jumper selectable: 64, 76, and 85 Vrms (triangle wave), (default= 76 Vrms for Ring Voltage) 2 sec on 4 sec off, or 1 sec on 2 sec off optional for PLAR ON	
FXS Tone	Alarm Tone: 480Hz/620Hz/-24dBm Ring Back Tone: 440Hz/480Hz/-19dBm	
FXS functions	Basic functions: Bettary Reverse, Loop Star, PLAR Optional functions: PLAR ON/PLAR bit programmable, Ground Start, and/or Meter Pulse.	
Signaling Bit A,B,C,D	Programable bit	

- All in-band signaling tones are carried transparently by the digitizing process.
- Customer is responsible for in-band signaling compatibility between a telephone and a switch, or between a PBX and a switch.

TDMoEA

Combo Gigabit Ethernet(GbE) Interface

Number of Ports	2
Speed	10/100/1000M bps
Connector	RJ45 for twisted pair GbE, LC for optical GbE, auto detection

Gigabit Ethernet(GbE) Interface

Number of Port	2
Speed	10/100/1000 BaseT
Connector	RJ45

Ethernet Function

Basic Features	MDI/MDIX for 10/100/1000M BaseT auto-sensing Ping function contained ARP Per port, programmable MAC hardware address learn limiting (max. MAC table 8192 (8k) en Packet Delay Variation: - Unframed T1: Up to 340 ms - Framed T1: Up to 256 ms - E1:up to 256 ms - Framed T1 with CAS: Up to 192 ms
Packet Transparency	Packet transparency support for all types of packet types including IEEE 802.1q VLAN and 802.1ad (Q-in-Q)
QoS	User configurable 802.1p CoS, ToS in out going IP frame
Traffic Control	Ingress packet Rate limiting buckets per port for ethernet port Supporting Rate-based and Priority-based rate limiting for LAN port Granularity: a. From 64 Kbps to 1 Mbps in increments of 64 Kbps b. From 1 Mbps to 100 Mbps in increments of 1 Mbps c. From 100 Mbps to 1000 Mbps in increments of 10Mbps Pause frame issued when the traffic exceeding the limited rate before packet dropped follow IEEE802.3X
Link Aggregation	WAN support link aggregation

Jitter & Wander

PPM: per G.823 Traffic

Standard Compliance

IETF	TDMoIP (RFC5087), SAToP (RFC4553), CESoPSN (RFC5086)
IEEE	802.1q, 802.1p, 802.1d, 802.3, 802.3u, 802.3x, 802.3z, 802.1s, 802.1w, 802.1AX

OCU-DP Interface

Ports	8 Ports for each card
Line Status Indicator	Per Port 1 dual color LED; Red for LOS, Green for SYNC
Network Connector	RJ48S
Electrical network connection	Tip/Ring and Tip1/Ring1
Transmit Source Impedance	135 Ohms +/- 20%
Receive Input Impedance	135 Ohms +/- 20%
Receiver Sensitivity/ Dynamic Range	0 to 43 dB loop loss at 72K & 56K 0 to 34 all other rates Automatic line equalization
Pulse Amplitude	+/- 1.5 V (+/- 10%) peak, all rates except 9.6k +/- 0.75 V (+/- 10%) peak at 9.6k Bipolar Return to zero, 50% duty cycle
Sealing Current	Typically 16 mA DC
Operating Modes	4-wire DDS Switched 56 support is optional.
Circuit Rates	SYNC: 2.4, 4.8, 9.6, 19.2, 56, 72kbps (64k) clear channel Conforms with AT&T Pub 41458
Encoding and decoding rules	Use bipolar violation to indicate control information: Idle, out of service, Zero substitution using unframed loops
Maintenance control	DSU Non-latching loop-back code (for 2.4, 4.8, 9.6, 19.2, 56k circuit rate) DSU Latching loop-back (TIP, LSC, LBE, FEV) code (for 72k circuit rate) Machine maintenance OCU/DP card* operation: Payload loopback OCU loopback Local loopback Bi-directional loopback V.54 remote loopback code
Fault and Performance	Custom defined remote loopback code BERT test support all ones, all zeros, 2047, 511, 63 pattern. LOS, OOS, ES, SES and UAS alarm. Current, last 96 registry and 7 days performance storage.
Environment	Humidity: Up to 90% RH non-condensing
Specification Standard	ANSI T1.410; AT&T Pub 62319, AT&T Pub 62310, ITU-T V.54

EoW with VoIP Technology (CBPD-OW)

Data Networking

Router or Bridge Mode of Operation

Voice Gateway

SIPv2	Session Initiation Protocol Version 2 (RFC3261, 3262, 3263, 3264)
Voice Algorithms	G.711 (A-law and mu-law)
Attenuation	Gain Adjustments

Physical Interfaces

Two RJ-45 Port	Ethernet 100BaseT Interface (IEEE 802.3)
Two RJ-11 FXS Port	For Analog Circuit Telephone Device (Tip/Ring)

Subscriber Line Interface Circuit(SLIC)

Ring Voltage	40 – 55 V_{RMS} Configurable
Ring Frequency	10Hz – 40Hz
Ring Waveform	Trapezoidal and Sinusoidal
Max. Ringer Load	3 REN
On-hook/off-hook	Characteristics
	On-hook voltage (tip/ring) : -50 V $_{NOMINAL}$
	Off-hook current : 20 mA min
	Terminating Impedance : 600 ohms

Regulatory Compliance

FCC Part	15 Class B
CE	Mark
ICES-003	
ESD level	Class B
	Air: ± 8Kv
	Contact: ± 4Kv

Power Supply

DC	Input Voltage: +5 VDC at 2.0 A Max.
Power Consumption	5 Watts

Indicator Lights

Indicator Lights/LED	Power

Storage Temperature

Storage	Temperature -13°F to 185°F (-25°C to 85°C)

Unit Dimensions

W x H x D	122.5mm x 43.7mm x 92.8mm

System Operation and management

System Clock

Clock Source	Internal clock Aggregate lines clocks from STM-1/4/16 (OC-3/12/48) XCU channels Tributary clocks from B16/B2G5 channels 1 external input clocks (ITU-T G.703 - 2.048 MHz or E1 or T1) SyncE (over Ethernet interface on PTN10G)
Clock Output	1 external output (E1 or T1) 1 ToD/PPS

Management Interface

LED	Multi colors
Local Console	Electrical: RS232 Connector: DB9S (DCE) on Connector card Ternimal: Menu driven VT-100
Remote Console	Electrical: 10/100BaseT FE (IEEE 802.3u) Connector: RJ45 port on XCU card Support SNMPv1, v3 (RFC1213, RFC2863, RFC1493)
In-band interface	DCC/HDLC/Ethernet type II/Pseudowire

Alarm Input/Output

Inputs		**Outputs**	
Channel	4	Channel	4
Connector	RJ45	Connector	RJ45
Internal Resistance	1K	Initial Insulation Resistance	Min. 100M ohm (at 500Vdc)
Activation Current	3 mA	Maximum switching voltage	110 V DC, 125 V AC
Deactivation Current	1.5 mA		
Allowable Current	4 mA		

Diagnostics

XCU card

Loopback Test	Local loopback, payload loopback, line loopback	
BERT Test	Optical interface	Direction: to optical lines

B155/622 card

Loopback Test	Local loopback, payload loopback, line loopback:	
BERT Test	Optical interface	Direction: to optical lines

E1/T1 card

Loopback Test	Local loopback, line loopback:	
BERT Test	E1/T1 interface	Direction: to optical lines, to tributary lines

Performance Monitor

Performance Reports	Performance Parameters: Error Block (EB), Background Block Error (BBE), Error Second(ES), Burst Error Second (BES), Severe Error Second (SES), Unavailable Second(UAS)			
Alarm History	System Alarm	Alarm Cut Off, Power Loss/Uneqp, Fan Fail, Fan Module Uneqp, Overheat, TS Sync Loss, Logon and Logout, Optical Port Uneqp, Card In, Card Out, Card Type Mismatch, Card Port Number Mismatch, Card Fail, Card Registration, SNCP Switch, MSP Switch, Trib Protection Sync, Standby XCU Takeover, Standby Trib Takeover, XCU Sync, SFP Tx Fail, SFP Rx Fail, SFP Temperature, LS Protection, LS ID Mismatch		
	SDH/SONET Line Alarm	SDH	Line	PI-LOS RS-LOF RS-TIM MS-SD MS-SF MS-AIS MS-RDI MS-REI B1-BIP B2-BIP
			Ho-Path	AU-LOP AU-AIS HP-SD HP-SF HP-UNEQ HP-PLM HP-TIM HP-RED-P HP-RDI-S HP-RDI-C HP-LOM HP-REI

Alarm History		Lo-Path	TU-LOP TU-AIS LP-SD LP-SF LP-UNEQ LP-PLM LP-TIM LP-RDI-P LP-RDI-S LP-RDI-C LP-REI LP-BIP
	SONET	Line	LOS-PI, LOF-S, TIM-S, SD-L , SF-L , AIS-L , RDI-L , REI-L UAS, B1-BIP, B2-BIP
		STS-Path	LOP-P, AIS-P, SD-P, SF-P, UNEQ-P, PLM-P, TIM-P, RDI-P-P, RDI-S-P, RDI-C-P, RDI-P-P, LOM-P, REI-P, B3-BIP-P
		VT-Path	LOP-V, AIS-V, SD-V, SF-V, UNEQ-V, PLM-V, TIM-V, RDI-P-V, RDI-S-V, RDI-C-V, REI-V, BIP-V
Alarm Queue	Contains up to 300 alarm records of latest alarm types, alarm severity, date, and time.		

Electrical

DC Power: Single/ Dual 48 Vdc power module (SD48P): -40 to -72 Vdc, 500W

Power Consumption: 337 Watts (may vary according to the number of equipped modules)

Module Type	Module	Power Consumption (Watt)
Controller (XCU)	CCPA-02	28W
Connecter Board	Connecter Board	3W
High-Speed (HS) Card	STM-4 (OC-12)/ STM-1 (OC-3) tributaries (B155/622)	14W
	16/32/63 TE and 16/32/63 E75 port E1/T1 tributaries (E1/T1)	14W
	3-port E3/T3 tributaries (E3/T3)	7W
	B2G5	19W
	8GES4SWA	30W
	PTN10G	41W
Low-Speed (LS) Card	Quad E1/T1 (4-channel E1/T1)	4W
	2-channel G.SHDSL (2 pairs) w/o line power (2GH)	6W
	4-channel G.SHDSL (2 pairs) w/o line power (4GH)	6W
	6-channel G.703 card at 64 Kbps data rate (6CDA)	3W
	8-channel 2W/4W E&M (8EMA)	8W
	12-channel FXS (12FXSA)	27W
	12-channel FXO (12FXOA)	5W
	4 channel C37.94 (low speed optical) (4C37)	3W
	8-channel RS232/V.24 (8RS232)	3W
	8-port Bridge/Router (Router B)	7W
	TDMoEA	6W
	8-channel Dry Contact I/O (8DCC)	4W
	8-channel Dry Contact I/O type B (8DCB)	4W
	12-channel Magneto	8W
	8-channel Data Bridge	2W
	3-channel E1	3W
	8UDTEA	4W
	1FOM	3W
	8OCUDP	11W
	3T1*	4W
	FAN module	2W
FAN	FAN 4 working	13W
	FAN 8 working	26W

* Future option

Physical and Environmental

Dimensions for 6U	433mm x264mm x 223.5mm (W/H/D)
Net Weight	8 kg (17.64 lbs)
Max. Weight	18 kg (39.68 lbs)
Temperature	-20 to 65°C (operating) -30 to 70°C (storage)

Note: Some of the plug-in cards do not support full operating temperature range. Please refer to specifications of individual cards.

Humidity	0-95%RH (non-condensing)
Mounting	Desk-top stackable, 19/23 inch rack mountable
MTBF	748 years

Standards Compliance

ITU-T	G.707, G.7041, G.7042, G.775, G.783, G.806, G.8121.2, G.8132, G.8131, G.823, G.747, X.86, G.664, Q552, Q553
ANSI	T1.105, T1.107
IEEE	802.1q (VLAN), 802.1w (RSTP), 802.1s (MSTP), 802.1ad (stack VLAN), 802.3x (flow control), 802.1p (QoS), 802.1AX
UL94 Flame Class	UL94V-0
Environmental	ETSI EN300 019-1-1, 1-2, 1-3, 2-1, 2-2, 2-3 IEC 60068-2-1, IEC 60068-2-3, IEC 60068-2-52, IEC 60068-2-64, IEC 61850-3
Telcordia	GR-253

Certifications

EMI/EMC	EN55032 Class A, EN55035, EN50121-4: 2016+A1: 2019 FCC Part 15 Class A IEC 61850-3, IEEE 1613-2003 ANSI C63.4a-2017 ETSI EN 300386, ETSI ES 201468 IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-6
Safety	EN-62368-1

Note for IEC 61850-3 and IEEE1613:

(1) These certifications only appliy to O9500-R with 48Vdc/150W power module
(2) The magento card does not support IEC 61850-3 and IEEE 1613
(3) Use shielding cable with the following modules:

- RS232-X.50 module
- Input Port of Dry Contact B module
- Input Port of Dry Contact module
- RS232 X.50-8 module
- SNMP of XCU
- Console port of XCU

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