5

Plug-in Modules

High-speed (HS) Cards

Low-speed (LS) Cards

Transportation

Serial and Digital Access

Plug-in Modules

High-speed (HS) Cards

Compatibility Table
High-speed cards for O9500R, O9400R, and V4150
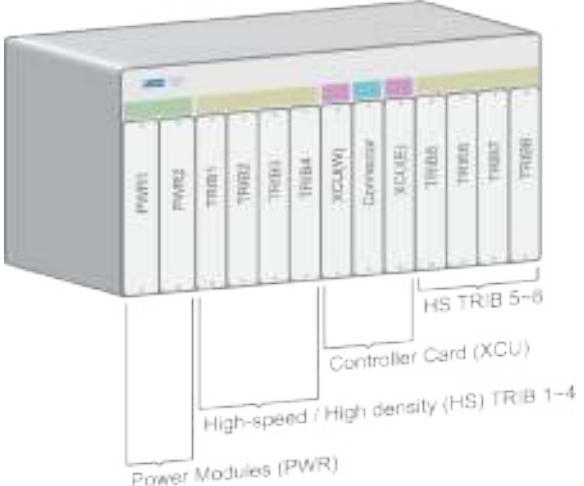
Module Schematics	Module Schematics					Module Schematics				
Model	O9500R					O9400R				
CONTROLLER	CC4		CC16		CCPA	CC4		CC16		CCPA
CHASSIS	CHA	CHAA	CHA	CHAA	CHPA	CHA	CHAA	CHA	CHAA	CHPA
7 FOM	√		√		√	√		√		√
B155/622	√		√		√	√		√		√
16/32/63 E1/T1	√		√		√	√		√		√
E3/T3	√		√		√	√		√		√
TDMoG	X		X		X	X		√		√
8GES4SWA	√		√		√	√		√		√
8GES16SWA*	X		X	*	*	X		X	*	*
4 GEoSDH	X		X	√	√	X		X	√	√
B2G5	X		X	√	√	X		X	√	√
PTN10G	X		X		√	X		X		√
PTNext	X		X		*	X		X		√

Note 1: √ = Supported × = Not Supported * = Future Option
Note 2: HS cards with magenta background require 2.5G backplane, and are for TRIB 3 & 4 only.

Model	V4150	Module Schematics
B155	√	
16/32/63 E1/T1	√	
3-channel T3/M13 (3T3MX3)	√	

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(B16) B155/622 STM-1/4 (OC-3/12)
For O9400R and O9500R HS Slot

Features

- Dual ports STM-1/4 (OC-3/12) plug-in card
- Software configurable STM-1/4 and OC-3/12 interface card
- With or without MSP (1+1) card-level protection
- Hot-swappable
- RoHS compliant

Description

The B155/622 plug-in card is also known as an STM-1/4 and OC-3/12 interface card. It is software configurable. The card is hot-swappable and can be installed on O9500R and O9400R chassis for SDH/SONET path cross-connection and transportation with or without MSP 1+1 software-configured.

Note: The number of supported channels differs from chassis to chassis. Please refer to O9500R and O9400R sections.

Application Illustrations

MSP (1+1) chains with B16 on O9500R (CHAA & CHPA)
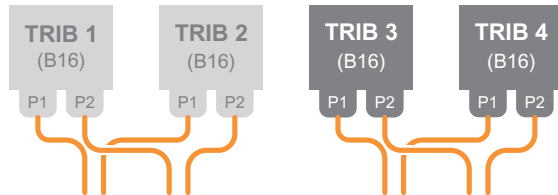
4 x Card-level STM-1 (OC-3) Chains
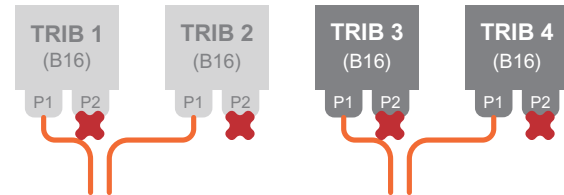
2 x Card-level STM-4 (OC-12) Chains
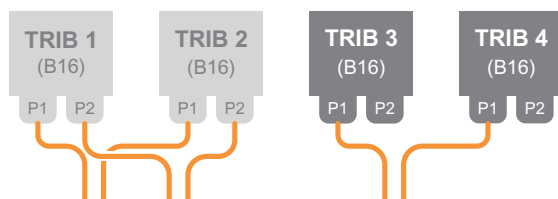
MSP (1+1) chains with B16 on O9500R (CHA)

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

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

Plug-in Modules

High-speed (HS) Cards
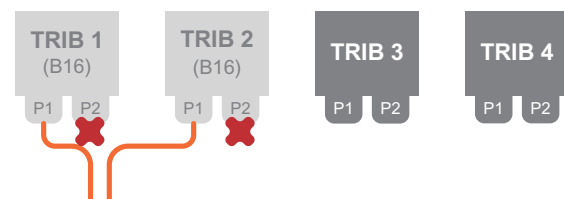
MSP (1+1) chains with B16 on O9400R (CHAA & CHPA)
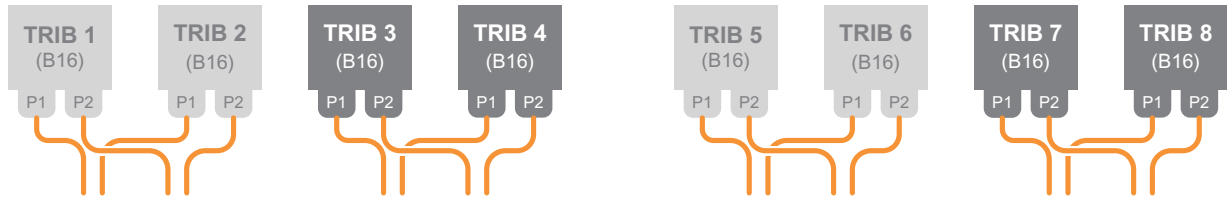
8 x Card-level STM-1 (OC-3 Chains
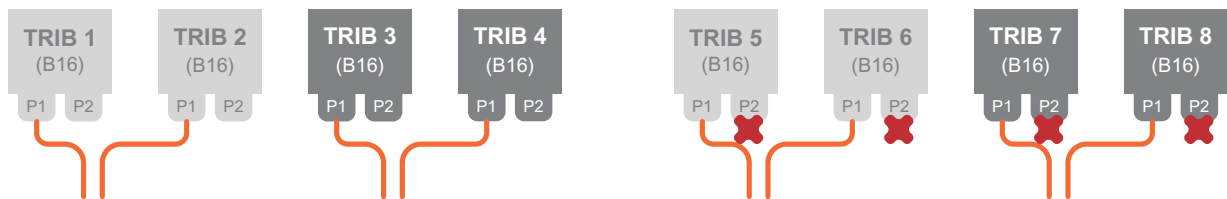
4 x Card-level STM-4 (OC-12) Chains

MSP (1+1) chains with B16 on O9400R (CHA)

6 x Card-level STM-1 (OC-3 Chains
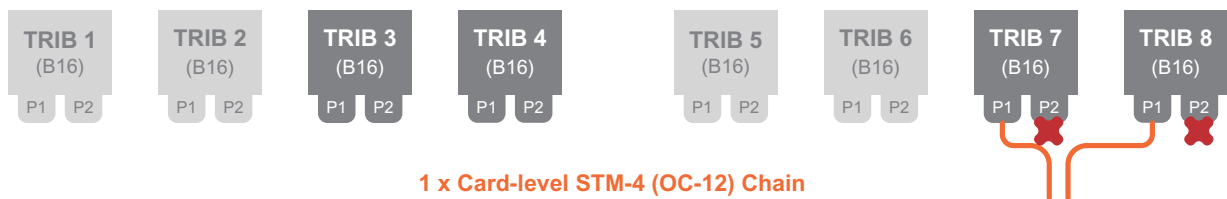
1 x Card-level STM-4 (OC-12) Chain

B2G5 1-channel STM16/OC-48
For O9400R and O9500R HS Slot

Features

- One STM-16/OC-48 channel per chassis
- Port-level or card-level protection
- STM-16/OC-48 mode software configurable
- Full non-blocking cross-connect at VC-11/VC-12/ VC-3/VC-4 levels
- With or without MSP 1+1 protection
- Hot-swappable
- RoHS compliant

Description

The B2G5 plug-in module is also known as an STM-16 and OC-48 interface card. The card is hot-swappable and can be installed on O9500R and O9400R chassis for SDH/SONET path cross-connection and transportation with or without MSP 1+1. The B2G5 plug-in module provides one STM-16/OC-48 channel per O9400R/O9500R's CHAA or CHPA chassis. It is only compatible with tributary slot 3 and 4

Application Illustrations

MSP (1+1) chains with B2G5

1 x Port-level STM-16 (OC-48) Chain Requires one B2G5 card

1 x Card-level STM-16 (OC-48) Chain Requires two B2G5 cards

Plug-in Modules

High-speed (HS) Cards
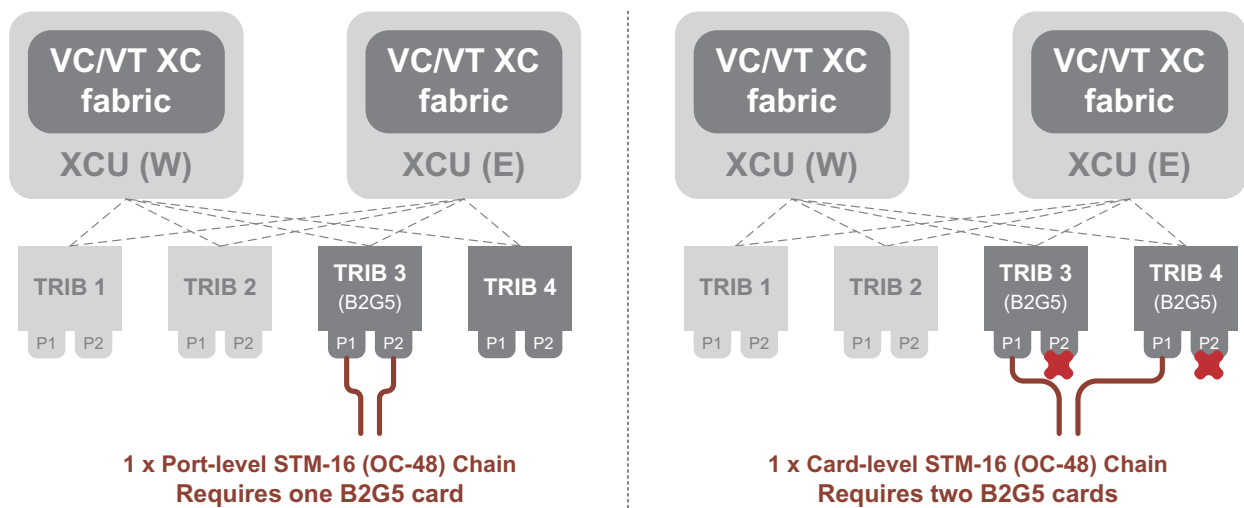
16/32/63-channel E1/T1
For O9400R, O9500R, and V4150 HS Slot

Features

- 16, 32 or 63 ports per card
- E1(120 ohm) / T1 version software-configured
- 75 ohm E1 version
- 1:1 Circuit protection and 1+1 Line protection
- Hot-swappable
- RoHS compliant

Description

The E1/T1 Interface Card is a software selectable plug-in card. Depending upon manufacturing options there are N x E1/T1 ports available, where N=16/32/63TE or N=16/32/63E75. The card is hot-swappable and can be installed on O9500R and O9400R or V4150 chassis when the device is powered up.

Note: The 75 ohm E1 card is an E1 card only. It is not configurable as a T1 card.

E1 (75 ohm) 16, 32 and 63 Ports

E1 (120 ohm) /T1 16, 32 and 63 Ports

Application Illustrations

Card-level 1+1 Line Protection

E1/T1 traffic is copied onto both lines. The remote receiving end only selects traffic from one of the two lines.
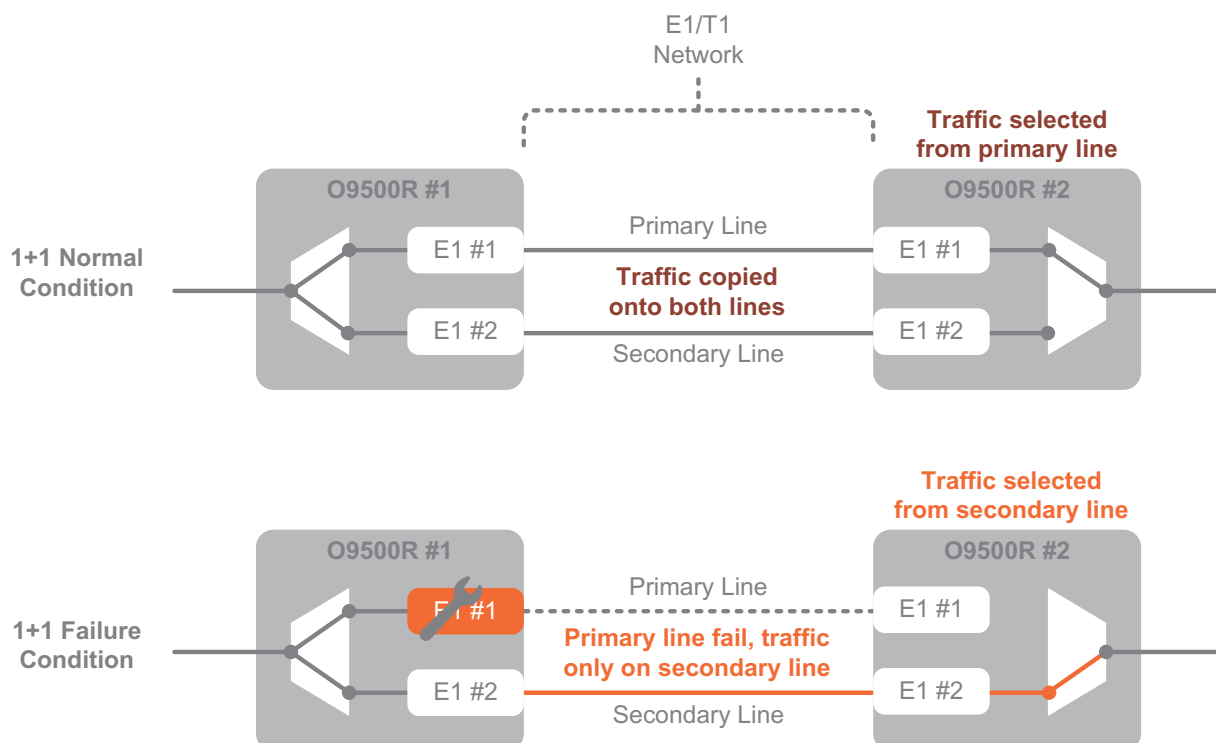
Card-level 1:1 Circuit Protection

E1/T1 traffic at the access side can be protected by a Y-box. A Y-box connects an external E1/T1 circuit onto the same port number of two E1/T1 cards to achieve card-level 1:1 protection. By pairing up two adjacent cards, protection groups are formed. The two members of a protection group must be of the same card type.

Plug-in Modules

High-speed (HS) Cards

3-channel E3/T3
For O9400R and O9500R HS Slot

Features

- Software selectable E3/T3 plug-in card with three ports
- Hot-swappable
- T3 with M13 function
- 1:1 Circuit protection and 1+1 Line protection
- RoHS compliant

Description

The E3/T3 Interface Card is software-configurable and hot-swappable HS plug-in card for O9500R and O9400R. There are three E3/T3 channels per card. T3 mode with M13 function supports 21 E1 or 28 T1 mapping per T3 channel.

Application Illustrations

T3 with M13 function for E1/T1 mapping

E1/T1 traffic is copied onto both lines. The remote receiving end only selects traffic from one of the two lines.

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Card-level 1+1 Line Protection

E3/T3 traffic is copied onto both lines. The remote receiving end only selects traffic from one of the two lines.
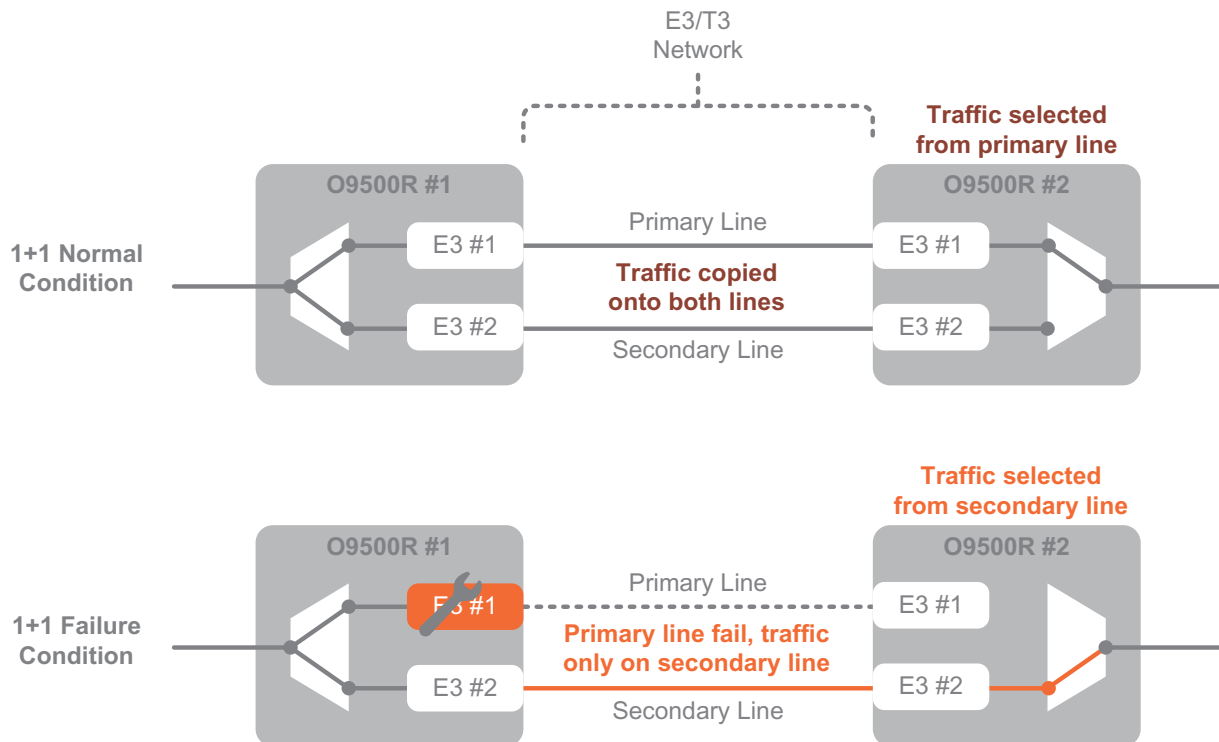
Card-level 1:1 Circuit Protection

E3/T3 traffic at the access side can be protected by a Y-box. A Y-box connects an external E3/T3 circuit onto the same port number of two E3/T3 cards to achieve card-level 1:1 protection. By pairing up two adjacent cards, protection groups are formed. The two members of a protection group must be of the same card type.
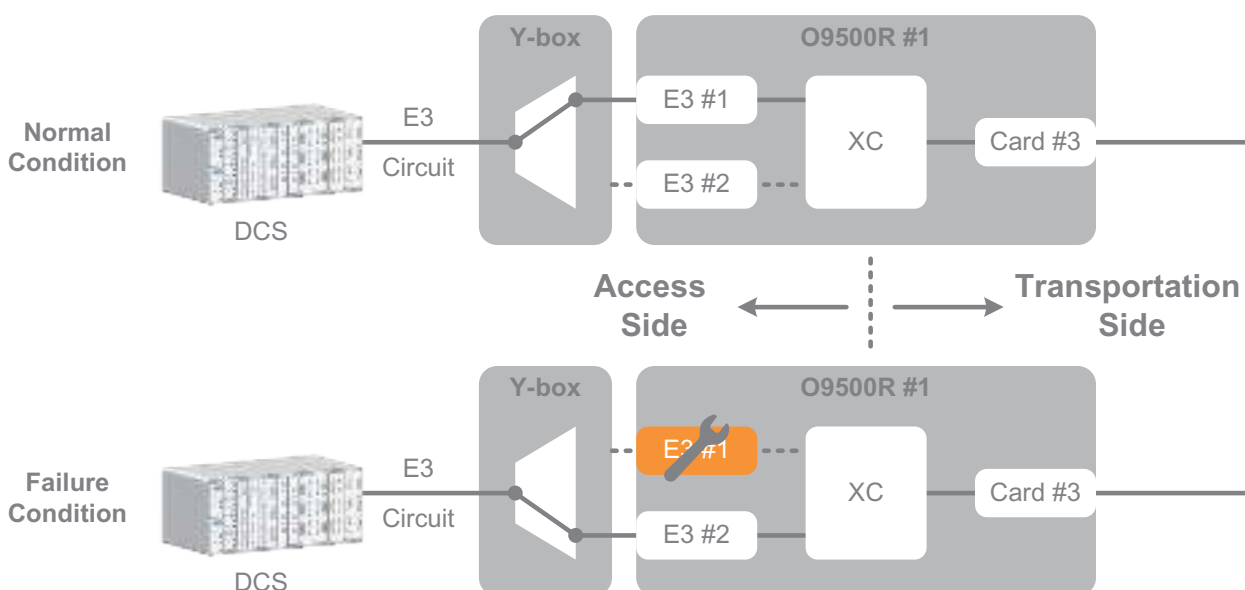
4 GEoSDH Card
For O9400R and O9500R CHAA/CHPA with CC16/CCPA

Features

- Hot pluggable interface card for O9400R and O9500R's CHAA with CC16 and CHPA with CCPA
- Software configurable
- Four GbE Ports
  - Two combo Gigabit Ethernet(GbE) with 2 RJ45 and 2 SFP housing
  - Two Combo 10/100/1000 Base-TX or 100/1000 Base-FX
  - Supports GFP-F with layer 2 switch
    - Ethernet Function
      - 802.1q VLAN
      - 802.1d bridging with MAC learning (up to 16K entries)
    - CoS/QoS
      - 8 priority queue
      - Packet classification based on the 802.1p priority or DSCP (DiffServ).
      - Strictly Priority or Weighted Round-Robin (WRR)
    - Rate limiting
      - Per port rate limiting
      - 2-rate-3-color per flow rate limiting
- Mapping: N x VC11, N x VC12, N x VC3, or N x VC4
- Max. backplane bandwidth: 2.5G
- Jumbo Frame reach up to 9600 bytes
- Processing Protocols: VCAT, GFP, LAPS, BCP, LCAS, and non-LCAS
- L2 switch protocol: RSTP, VLAN, Flow control, MSTP, IGMP snooping, QoS
- RoHS compliant

Description

The 4 GEoSDH Interface Card with an L2 switch is software configurable plug-in card for the O9400R-XCU16 Chassis AA, O9400R CHPA, O9500R-XCU16 Chassis AA and O9500R CHPA device. The card provides 4 GbE with 2 combo plus 2 optical ports. For the SDH side, the card supports GFP-F. With L2 switch support, the function covers VLAN, MAC learning, CoS/QoS and Rate limiting.

The card is hot-swappable and can be installed or removed from the chassis when the Loop device is powered up.

Application Illustrations
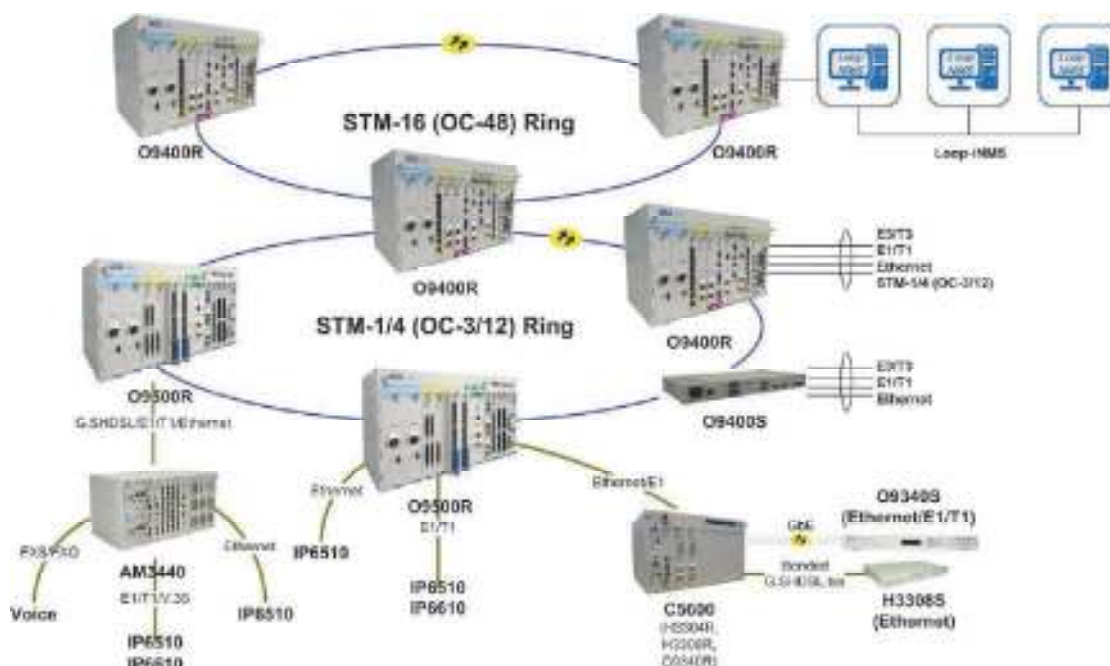
(8GESW) 8-port GbE over SDH/SONET with Switch
For O9500R and O9400R HS Slot

Features

- High-speed (HS) interface card for O9400R/O9500R
- Hot-pluggable and software configurable
- Eight GbE LAN ports
    - Four SFP optical ports with ALS
    - Four electrical ports
    - LED indicators for port and card status
- Jumbo Frame up to 9600 bytes
- Ethernet over SDH/SONET (EoS) technology
    - Virtual Concatenation (VCAT) and VCG
    - Framing/Encapsulation
        - GFP (G.7041),
        - LAPS
        - BCP Layer 2 (RFC2615)
    - LCAS (G.7042) or non-LCAS
- Ethernet Virtual Circuit (EVC) service types
    - 4 EPL
    - 8 EVPL via Q-in-Q
    - E-LAN via max.1024 VLANs and 48 VCGs
- Layer 2 switch
    - MAC Learning
    - MSTP, RSTP
    - Link Aggregation (Trunking)
    - IGMP Snooping
    - QoS
        - CoS or DSCP for priority mapping
        - Per-port 2-rate-3-color or 1-rate-3-color
        - 8 queues per port
        - Strict Priority or WRR for queue scheduling
- 622Mb/s or 2.5Gb/s* backplane

Description

8GESW is a high-speed card specifically designed to transport Ethernet services over SDH/SONET networks (EoS). Customer LAN bridging types supported by 8GESW include EPL (E-line mode), EVPL (Virtual E-line mode), and EPLAN (E-LAN mode). Bridged traffic is encapsulated in SDH/SONET frames via framing protocols (GFP-F, LAPS, or BCP) and Virtual Concatenation (VCAT).

8GESW supports eight Gigabit Ethernet ports and a range of standard L2 switch functions, including VLAN, Q-in-Q, MAC learning, MSTP/RSTP, CoS and QoS, and etc.

An 8GESW's total bandwidth for SDH/SONET transportation is either STM-4/OC-12 or STM-16/OC-48*. Dual 8GESW cards can be mounted simultaneously to achieve card-level protection. Working card failure will trigger protection switch to the backup card without any traffic interruption. SDH/SONET paths can also be protected by SNCP/UPSR ring protection scheme.

* Future Option

Plug-in Modules

High-speed (HS) Cards

Application Illustration

Bridged LAN

Site A   Site B   Site C

8GESW card
- LAN/WAN Switching
- Encapsulation
- Virtual Concatenation

XCU
- VC11/12/VT2/1.5 Cross-Connection

other cards
- STM-n/OC-n Channel

SDH/SONET
STM-1/4/16
OC-3/12/48

O9500R   O9500R

Customer Domain	8GESW		XCU	Transportation	
LAN / Gateway	LAN to WAN mapping	Virtual Concatenation	Cross-connect Mapping	Other modules	SDH/SONET Networks

LAN ports   WAN ports   VCG   VC11/VC12 VT1.5/VT2 fabric   STM-1/4/16 (OC-3/12/48) Channels

VCs

B16, B2G5, XCU ports

WAN

7-port Fiber Optical
For O9400R and O9500R HS Slot

Features

- Hot-pluggable high-speed interface card for O9400R and O9500R
- Aggregate ports
  - 7 aggregate ports with SFP housing, each supports 4 E1s
- Port protection
  - Line 1+1 (requires two cards)
  - Switching time within 50 ms
- Automatic Laser Shutdown (ALS) function
- Single mode and multi-mode fiber modules
- Local and remote FOM alarm indication

Description

The Loop-O9400R or O9500R 7 FOM card is a high-speed module that can connect with the AM3440 series and Loop-O9310-E1 using a Loop proprietary FOM interface. Each card has 7 FOM interfaces. Each FOM interface supports up to 4 E1 aggregate channels. The 7 FOM card is E1 mode configurable and supports tributary line 1+1 protection.

When 1 + 1 protection is enabled, both O9400R-CC4, O9400R-CC16-CHAA and O9400R-CHPA can support up to 28 ports of FOM. Without protection, the O9400R-CC16-CHAA and O9400R-CHPA can support up to 56 ports of FOM and the O9400R-CC4-CHA can support up to 42 ports of FOM. When 1 + 1 protection is enabled, the O9500R-CHAA or O9500R-CHPA can support up to 14 ports of FOM.

Application Illustrations

Point to Point

1 + 1 Protection

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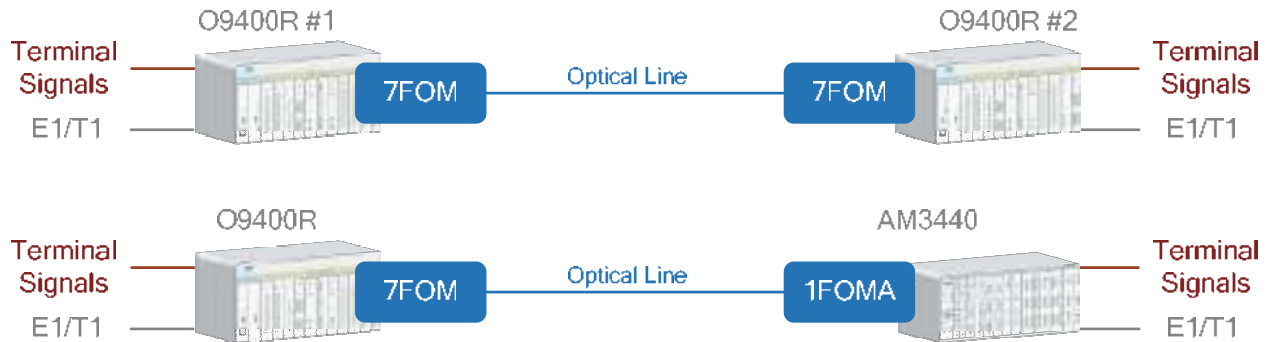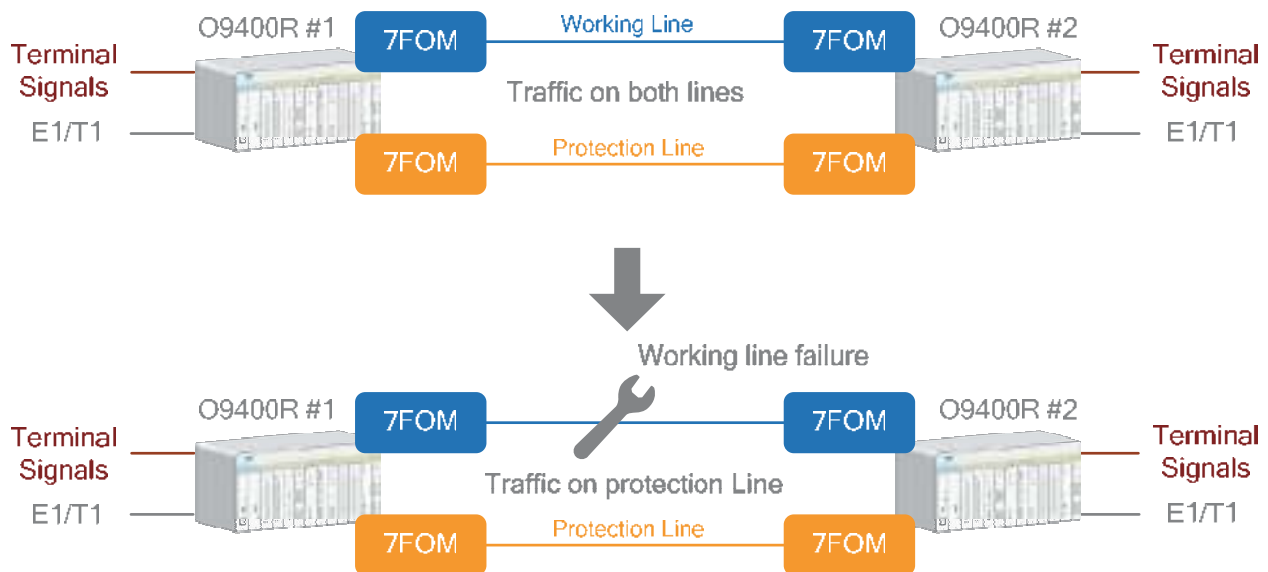
PTN10G Interface Card
For O9500R and O9400R CHPA with CCPA

Description

The PTN10G interface card supports MPLS-TP and Carrier Ethernet for Packet Transport Network (PTN) services, as well as transportation over IP Network. It is an Ethernet switch, an IP router, and an MPLS-TP router all at once. In addition to packet switching and routing, the renowned feature of PTN10G is to act as the Circuit Emulation gateway between PDH/SDH/SONET and Packet Switched Networks (PSNs).

For TDM encapsulation technologies, PTN10G supports TDMoE, TDMoIP, and TDMoMPLS. For Circuit Emulation, PTN10G supports CESoPSN (Nx64K), SAToP (Unframed E1/T1), and CEP (SDH/SONET paths). The capacity of a PTN10G module reaches up to a STM-16/OC-48 worth of TDM traffic groomed from the TDM interfaces mounted on the same O9500R device.

On-board connectivity of each PTN10G module includes three 10GbE SFP+ interfaces, eight 1GbE SFP interfaces, and one STM-16/OC-48 backplane interface. Ethernet and TDM ports from other modules on the same O9500R can be cross-connected by the Controller card and mapped to the PTN10G via the STM-16/OC-48 backplane interfaces. Each of the interfaces can be individually configured as an NNI or a UNI port.

The computational capacity of a PTN10G module reaches up to 100G. The switch/router residing in a PTN10G module works in isolation from any port. With two PTN10G modules simultaneously mounted, traffic from all ports on both PTN10G modules can be merged onto the primary PTN10G card, yielding a total connection of sixteen GbE, six 10GbE, and one STM-16/OC-48 bandwidth. While one PTN10G switch/router is at work, the other may serve as redundancy for protection.

PTN10G provides high availability and reliability of communication systems required in network hauling, power utilities, military and governmental network deployments, and transportation applications. Service continuity and performance can also be monitored via QoS, OAM, and multiple protection schemes. Topology, cross-connection, and management of a large scale PSN can also be achieved remotely via Loop-iNMS and Loop-iNET.

Features

System capacity

- Up to 3 x 10GE/1GE SFP+ ports
- Up to 8 x GE SFP
- 100G Packet Switching capacity per card
- L2 switching, MPLS switching, and L3 routing (Per port setting)
- 1008 x VC12/1344 x VC11 termination to E1/T1
- 1008 x E1/1344 x DS1 SAToP/CES PWE3
- 1008/1344 x PWs for VC12/VC11 CEP (1 x STM-16 worth)
- 2.5G SDH/SONET Bus (backplane)

Ethernet Services

- E-Line, E-LAN, E-Tree services as defined by MEF 9 and 14 using VPWS/VPLS*
- Native Ethernet packets supported
- Encapsulation: PW/LSP (MPLS-TP), VLAN tagging (1Q), VLAN double tagging (Q-in-Q)

L3 Routing

- Static Route
- RIPv1 and RIPv2
- OSPFv2 and OSPFv3

Plug-in Modules

High-speed (HS) Cards

MPLS-TP

- MPLS Transport Profile per RFC-5921
- Any Ethernet port can be configured as NNI (MPLS port) or UNI (Ethernet service port)
- Static MPLS LSP label provisioning via NMS
- Pseudo Wire (PW) services
  - Ethernet Pseudo Wire(VPWS, VPLS, H-VPLS)
  - PDH PWE3 (SAToMPLS, CESoMPLS)
  - SDH PWE3 (CEP)
  - Supports up to 1008 TDM PWs
- MPLS-TP OAM
  - Section/LSP/PW monitoring using BFD (Per IEEE 8113.2)
- MPLS-TP QoS
  - 64K Granularity Rate Limit Per Flow
  - Ingress/Egress TC/EXP Class Mapping
  - TC/EXP Priority-based Queuing (8 Queues)
  - Tunnel Traffic Engineering CIR/PIR and CBS/PBS Policing/Shaping
  - PW Traffic Engineering CIR/PIR and CBS/PBS Policing/Shaping
  - WRED
  - Strictly Priority / WRR

Carrier Ethernet (CE)

- L2 Switching/Bridging
- RSTP/MSTP (IEEE 802.1w/1s)
- VLAN 1Q 802.1q/ Q in Q8 802.1ad
- VLAN Operation: Stack/Switch/Strip
- Link Aggregation (802.3ad): Static/LACP
- CE OAM
  - CFM: Ethernet Service OAM (802.1ag/Y1731)
  - EFM: Ethernet Link OAM (802.3ah)
- CE QoS
  - 64K Granularity Rate Limit Per Flow
  - Ingress/Egress CoS Class Mapping
  - CoS Priority-based Queuing (8 Queues)
  - CIR/PIR and CBS/PBS Policing/Shaping (2R/3C)
  - Hierarchical QoS
  - WRED
  - Strictly Priority/WRR

CoS/QoS

- 8 Priority Queues
- Scheduling: Strict Priority, WRR with Hierarchy
- Ingress Policing & Egress Shaping per service
- CIR / PIR (EIR) 2-rate-3-color
- MPLS: TC/EXP-Inferred-PSC (Per Hop Behavior Scheduling Class) LSP

VPLS

- VPLS bridging
- H-VPLS bridging
- 32K MAC addresses

- 2K VPLS instances per device
- Split horizon to prevent forwarding loops

Network Protections

- MPLS-TP
  - MPLS LSP 1+1/1:1
  - Dual-homing PW Protection*
  - LSP E2E protection switching within sub 50ms
- CE
  - ERPS Ring (G.8032) Protection
  - ELPS (G.8031) Linear Protection
- SDH/SONET
  - STM-n/OC-n MSP 1+1 Protection

Clock Synchronization

- IEEE 1588 v2 PTP
  - Clock modes: Ordinary/Boundary/Transparent clock
  - ToD (Time of Day)
  - PPS (Pulse per Second) output interface
- SyncE
  - Synchronous Ethernet from all GE ports
  - Ethernet SMC per ITU-T (Ethernet Synchronous Message Channel, ESMC)
- TDM Clocks from other modules
  - External Clock input and output (2Mbps/2MHz)
  - SDH/SONET/PDH Line Clocks
  - Stratum 3 Timing

PWE3 Services

- Ethernet over CE*
  - Port-based and VLAN-based services
  - EPL, EVPL, EPLAN, EVPLAN, E-Tree services as defined by the MEF 9&14
  - Encapsulation: VLAN 802.1Q/802.1ad Q in Q
- Ethernet over MPLS
  - Port-based and VLAN-based services
  - VPWS, VPLS, H-VPLS services as defined by the MEF 9 and 14
  - Encapsulation: PW over MPLS-TP
- PDH/SDH/SONET over MPLS/CE/IP
  - Fractional E1/T1 (64K timeslots): CES PW
  - Unframed E1/T1: SAToP PW
  - VCn/TU-n/VT-n/STS-n: CEP
  - PDH Clock Recovery : ACR/DCR/System Clock per PW configurable
  - Supports up to 1008 ACR completions

* Future Option

Application Illustrations

Transcend from PDH and SDH/SONET to 10G

10 GbE
MPLS-TP

10 GbE
Carrier Ethernet

10 GbE
IP Network

**Dual
PTN10G**

~100G Packet Switching
Switch Redundancy Protection
16 x GbE + 6 x 10GbE port

O9500R/O9400R

Circuit Emulation
Up to 1 x STM-16/OC-48
For N x E1/T1, N x 64k,
N x VC-n/VT-n

PDH
Network

SDH/SONET
Network
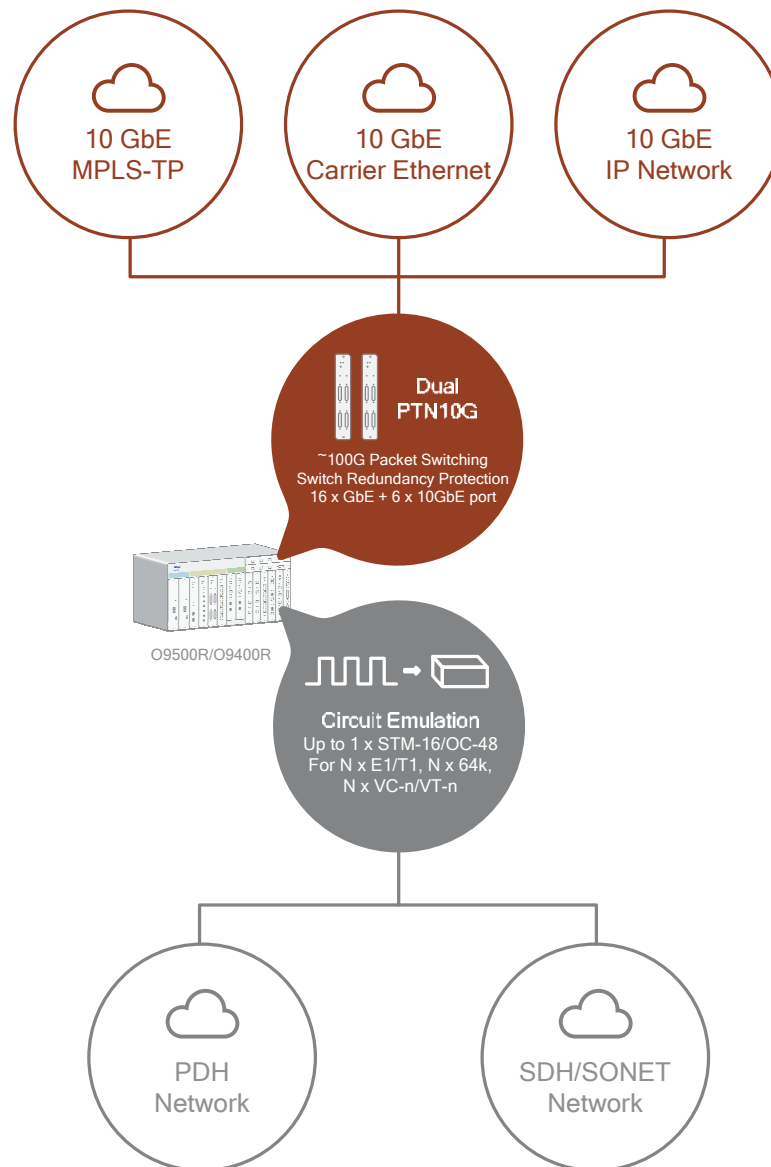
Plug-in Modules

High-speed (HS) Cards

Connectivity and capacity

PTN Side	XCU	Other Modules
Ethernet: 76G (2 x PTN10G) + 20G (2 x PTN Ext) SDH/SONET: STM-16/OC-48/2.5G (XCU)	Cross-connect Mapping	N x DS0/E1/T1 N x STM-n/OC-n Ethernet

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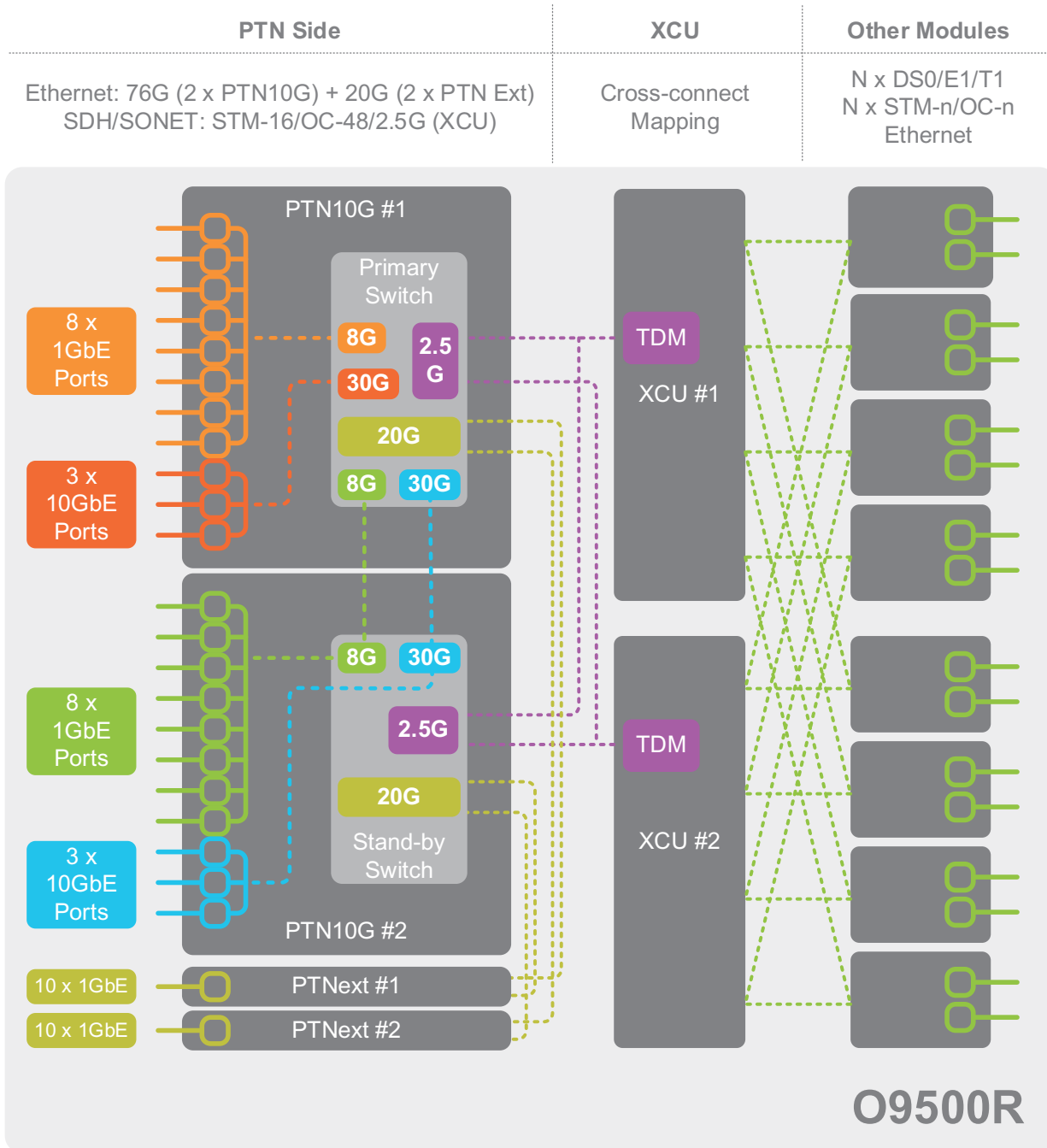
One PTN10G card per Chassis

PTN10G in TRIB 3

eth-3-1
eth-3-2
eth-3-3
eth-3-4
eth-3-5
eth-3-6
eth-3-7
eth-3-8
eth-3-9
eth-3-10
eth-3-11

1GbE ports

Primary Switch

10 GbE ports

STM-16/OC-48 (2.5G) backplane channel

XCU #1

STM-4/OC-12 (622M) backplane channel

HS (622 Mbps) modules in TRIB 4

7FOM
8GESW
B155/622
E1/T1
.
.

XCU #2
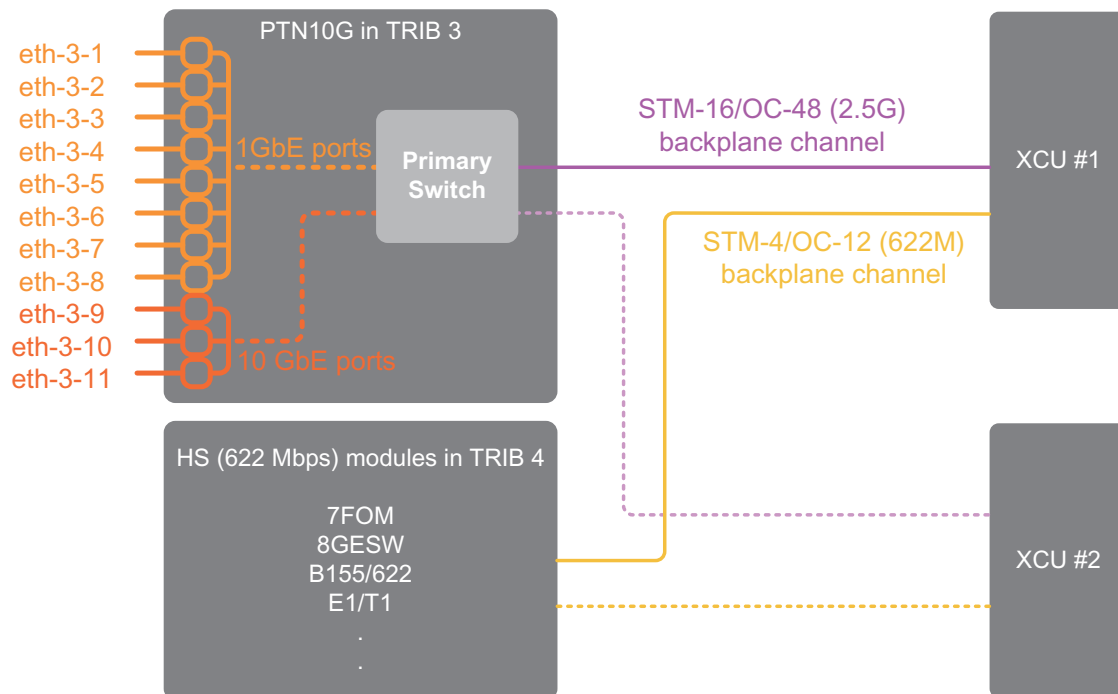
Two PTN10G cards per Chassis

PTN10G in TRIB 3

eth-3-1
eth-3-2
eth-3-3
eth-3-4
eth-3-5
eth-3-6
eth-3-7
eth-3-8
eth-3-9
eth-3-10
eth-3-11

1GbE ports

Primary Switch

10 GbE ports

STM-16/OC-48 (2.5G) backplane channel

XCU #1

eth-4-1
eth-4-2
eth-4-3
eth-4-4
eth-4-5
eth-4-6
eth-4-7
eth-4-8
eth-4-9
eth-4-10
eth-4-11

1GbE ports

Stand-by Switch

10 GbE ports

PTN10G in TRIB 4

XCU #2
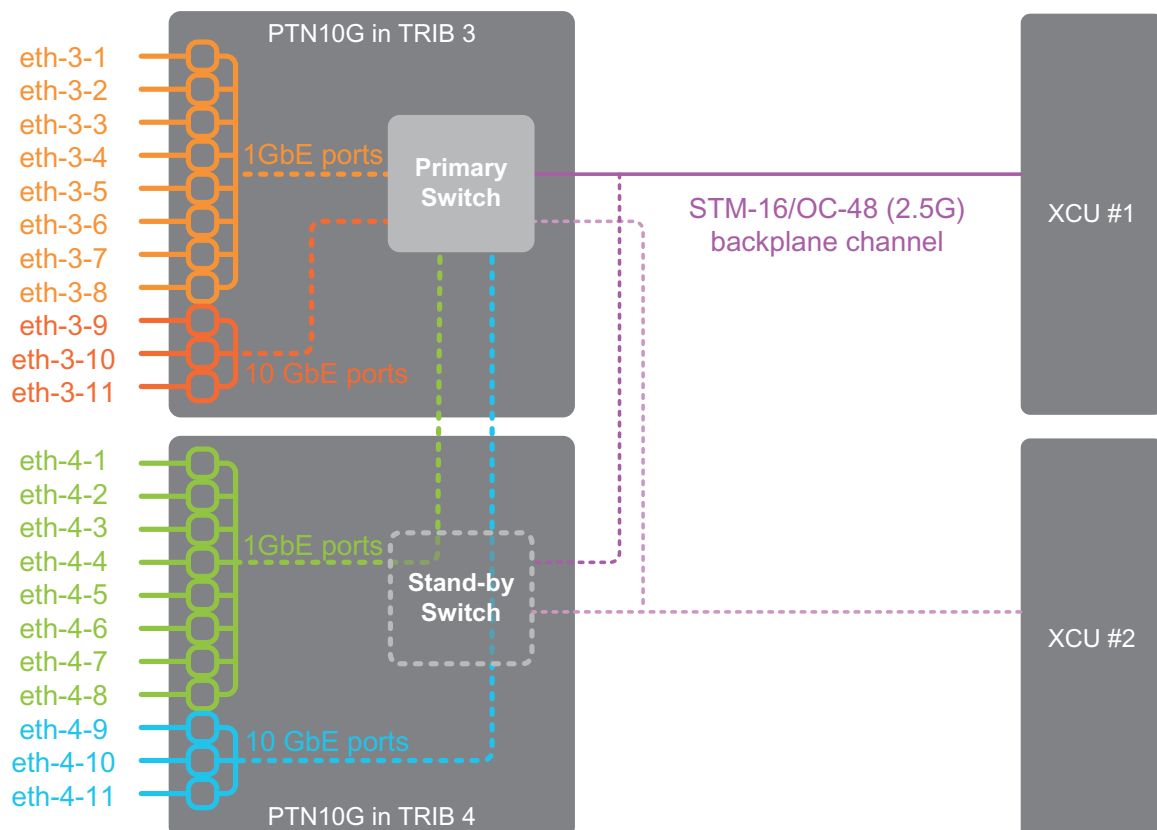
MPLS-TP LSP protection

MPLS-TP network protects traffic by creating a tunnel between remote ends with two label switching paths (LSPs) to achieve **1:1** or **1+1** protection. Remote nodes communicate with each other to ensure **automatic protection switching (APS)** takes place when the working path fails.

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.

Traffic selected from working LSP

1+1 Normal Condition

Traffic copied onto both working and protection LSPs

Traffic from protection LSP discarded

Working LSP failure

1+1 Failure Condition

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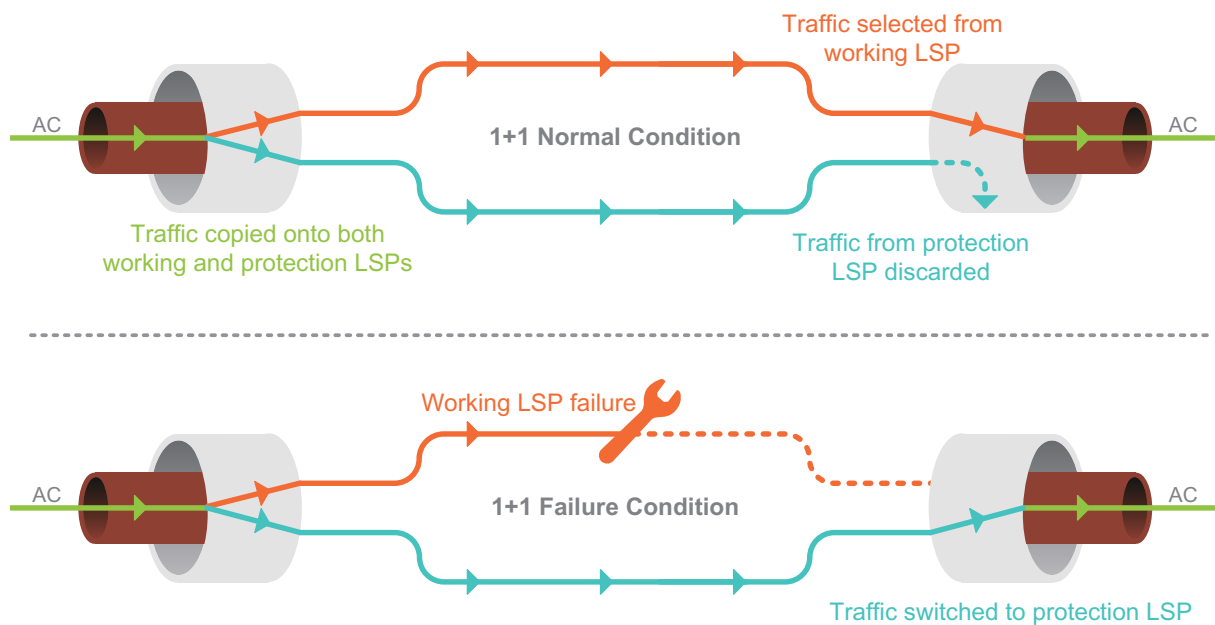
In 1:1 mode, traffic flows only on the working LSP. When a failure occurs on the working LSP, traffic is then switched to the protection LSP within 50 ms.

Traffic selected from working LSP

1:1 Normal Condition

Traffic only transmitted on working LSP

Working LSP failure

1:1 Failure Condition

Traffic switched from working LSP to protection LSP within 50 ms at both ends
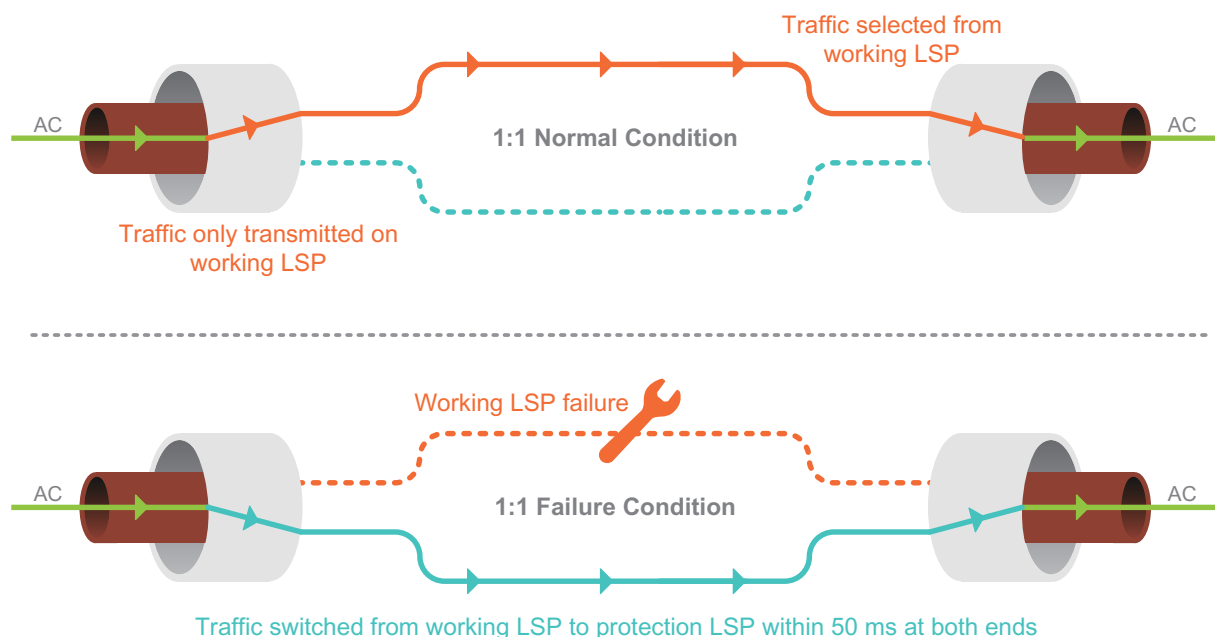
(TDMoG) TDM over GbE
For O9400R CHAA with CC16 and CHPA with CCPA

Description

This is a high density TDMoG card to be used with O9400R-CHAA and O9400R-CHPA. This is one of the TDMoE family products developed by Loop. This card would allow operators to transport up to 252E1 or 336T1 and Ethernet traffic over IP network. This allows cost effective migration to IP network from existing voice and data network using existing TDM based equipment.

The O9400R-CHAA and O9400R-CHPA TDMoG module converts the TDM data stream and timing information from the PDH and SDH/SONET ports on the O9400R-CHAA or O9400R-CHPA into packets through cross connection and transmits to the connected IP/MPLS* or Metro Ethernet network via dual combo Gigabit Ethernet WAN ports with 802.3ad Link Aggregation capability. Another Pseudowire device converts the received packet stream back to original PDH and SDH/SONET data stream along with the original timing information.

The card is hot-swappable and can be installed or removed from a Loop-O9400R-CHAA or O9400R-CHPA chassis when the Loop device is powered up.

Features

- Hot pluggable interface card for O9400R-CHPA and O9400R-CHAA
- WAN Link
  - Two combo Gigabit Ethernet(GbE) with 2 RJ45 and 2 SFP housing
  - IEEE 802.3ad Link Aggregation
  - RSTP/MSTP
- LAN Interface
  - Four 10/100/1000 Base-T Ethernet ports
  - Speed/Half/Full Duplex
- Supports cross-connection from interface cards listed below:
  - CC16 card (STM-1/4/16 or OC-3/12/48)
  - STM-1/4 or OC-3/12 card
  - High density E1/T1 card
  - DS3/E3 card
  - High density Ethernet card
- VLAN
  - VLAN ID support: Max. 4K
  - Support C-VLAN/S-VLAN tag adding and removing on Pseudowire
  - Assign VLAN based on MAC, IP, protocol or flow
  - VLAN based packet filtering
  - 802.1q port-based VLAN
  - Support Q-in-Q

- QoS
  - Ingress rate limiting per Ethernet port
  - Ethernet Network Level:
    - 3-bit Priority Code Point-PCP field within 802.1P/802.1Q Ethernet frame-CoS
  - Packet classification with 8 queues per port
  - IP Network Level:
    - 8 priority queues per port
    - 6-bit DiffServ Code Point-DSCP field-ToS
  - Scheduling Algorithm
    - Strict Priority (SP)
    - Weighted Round Robin (WRR)
    - Deficit Weighted Round Robin (DWRR)
  - Congestion Avoidance
    - Random Early Detection (RED)
    - Weighted Random Early Detection (WRED)
- Pseudowire Capability
- Support SAToP, SDH/SONET CEP, CESoPSN, MEF-8
- Support VC4 transparent/channelized STM-1 and STS3C transparent/channelized OC-3
- Support TDM traffic emulation over MPLS*, UDP/IP and Metro Ethernet Network
- Backplane capacity up to 252E1/336T1
- Maximum 512 Pseudowires
- Up to 32 Pseudowires can apply Adaptive Clock Recovery (ACR) mechanism

Plug-in Modules

High-speed (HS) Cards

- Pseudowire Diagnostics Function
- ARP, Ping and Trace Route
- IP-MAC Table display
- Pseudowire Information
  - Maximum 4K VLAN ID
  - Packet creation Time (ms)
  - Jitter-Tolerance delay (ms)
  - Single-trip delay (ms)
  - Total Frame Length (bytes)
  - Packet per second
  - Required Bandwidth (Mbps)
  - Header Overhead (%)
  - Remaining WAN Bandwidth (Mbps)
  - Remaining Memory
- Jitter and Wander
- PDV compensation depth up to 128 ms
- Jitter Buffer Size up to 256 ms
- PPM version: conforms to G.823/G.824 traffic interface (+/- 1ppm)

- Supports 1+1 card protection
- Support 802.1d Mac learning: maximum 26K
- Per port ingress rate limiting from 8kbps to 1Gbps
- Rate-based and Priority-based rate limiting for LAN
- Support 803.3x Flow control on input ports
- Support 802.1D STP, 802.1w RSTP and 802.1s MSTP
- Support IGMP snooping v2 (RFC 2236)
- Timing sources
  - O9400R system clock
  - Adaptive mode: from WAN (GbE) port
  - External clock through Controller card
- Interworking with Loop TDMoEthernet Series Products
  - IP6704A and AM3440-CCPA on O9500/O9550
- Standard compliance: SAToP, CESoPSN, SONET/ SDH CEP, MEF-8
- RoHS compliant

* Future Option

Application Illustrations
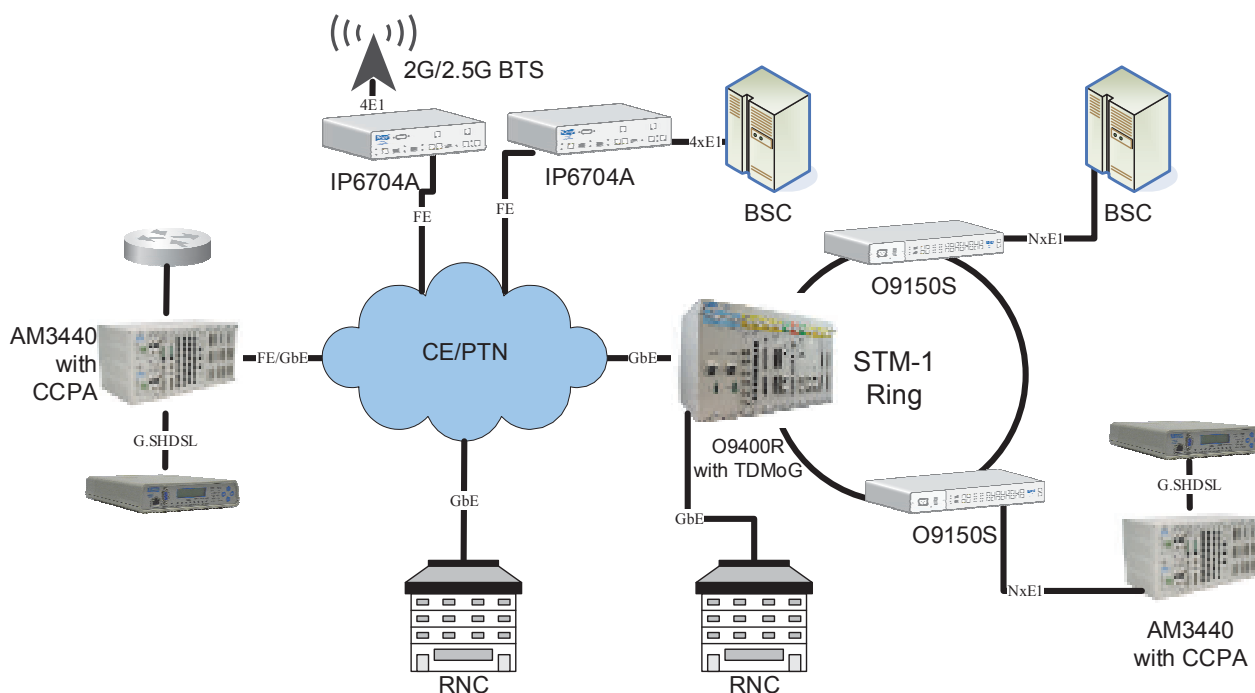
(B155) 1-channel STM-1/OC-3
For V4150 HS Slot

Features

- Single port STM-1 or OC3 plug-in card
- Software configurable STM-1 and OC3 interface card
- Hot-swappable
- MSP 1+1 protection
- RoHS compliant

Description

The B155 plug-in card is also known as an STM-1 and OC3 interface card. It is software configurable. The card is hot-swappable and can be installed or removed from a V4150 chassis when the V4150 device is powered up.

Note: Loop-V4150 Tributary Slots 1, 2, 3, 4, 5, 6, 7 and 8 are used for STM-1 and OC-3.

Application Illustrations

SDH/SONET

O9400R

Up to 8 STM-1/OC3 Uplink

B155

Up to 252 E1/T1 Downlink

V4150

E3/T3

E1/T1

E3/T3 Network

E1/T1 Network

O9500R

AM3440

Plug-in Modules

High-speed (HS) Cards
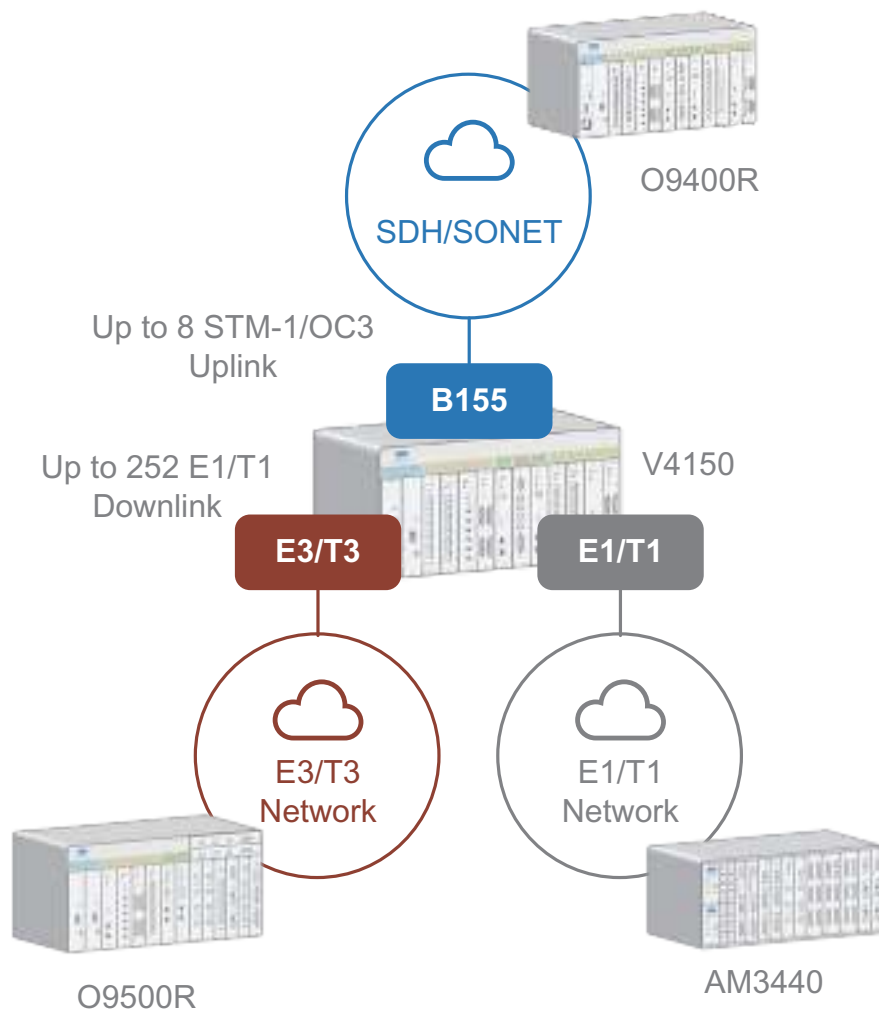
(3T3MX3) 3-channel T3 with M13
For V4150 HS Slot

Features

- 3T3MX3 plug-in card with three ports and MX3 function
- Hot-swappable
- RoHS compliant

Description

The 3T3MX3 Interface Card is a 3 port T3 with MX3 function plug-in card. The card is hot-swappable and can be installed in or removed from a powered-up Loop-V4150 device.

Application Illustrations

Line 1+1 Protection

T3MX3 Card Trib#1		T3MX3 Card Trib#2
Working		Standby

M13 Function

	V4150#1	
E1/T1	XC	T3MX3
T3MX3		E1/T1

T3MX3 (21 E1 or 28 T1)   T3   E1/T1

	V4150#2	
T3MX3	XC	E1/T1
E1/T1		T3MX3
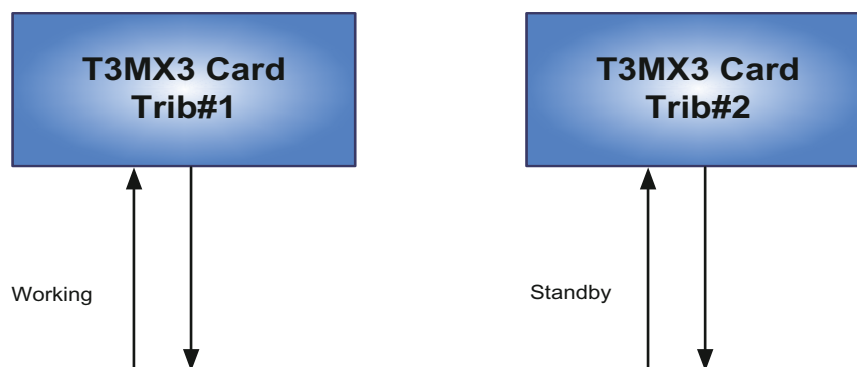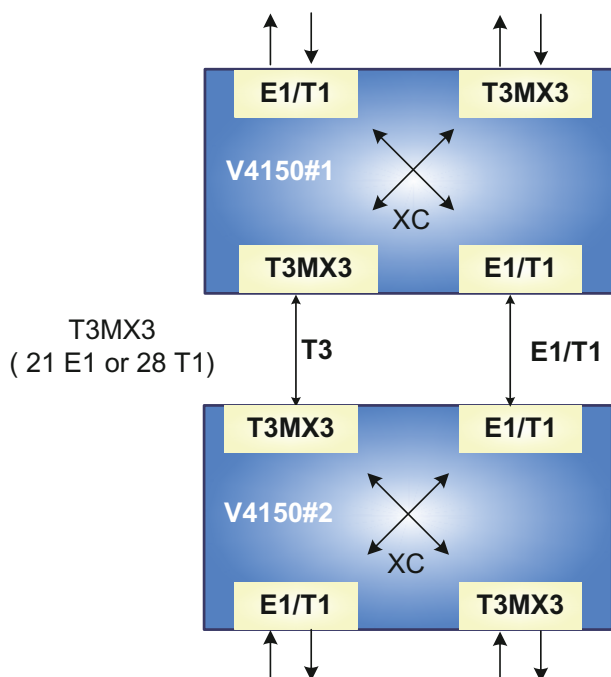
Compatibility and Functional Categories
Low-speed cards for AM3440, O9500R, O9550, and V4200-9

Low-speed (LS) plug-in slots come in two sizes: single slot and mini slot. In this Chapter, the cards are arranged in the order of functional categories.

Functional Category	Card	Size
Transportation	(3E1) 3-channel E1	Single Slot Plug-in cards
Transportation	(3T1) 3-channel T1	Single Slot Plug-in cards
Transportation	(4E1/T1) 4-channel E1/T1	Single Slot Plug-in cards
Transportation	(E1/T1) 1-channel E1/T1	Mini Slot Plug-in cards
Transportation	(M4E1) 4-channel E1	Mini Slot Plug-in cards
Transportation	(M4T1) 4-channel T1	Mini Slot Plug-in cards
Transportation	(TDMoEA) 4-channel TDM over Ethernet	Single Slot Plug-in cards
Transportation	(VoIPGA) Voice over IP	Single Slot Plug-in cards
Transportation	(1FOMA) 1-channel fiber optical with 1+1	Single Slot Plug-in cards
Transportation	(1FOMB) 1-channel fiber optical w/o 1+1	Single Slot Plug-in cards
Transportation	(FOM) 1-channel fiber optical with 1+1	Mini Slot Plug-in cards
Transportation	(2/4GH) 2/4-channel G.SHDSL	Single Slot Plug-in cards
Transportation	(GH) G.SHDSL	Mini Slot Plug-in cards
Serial and Digital Access	(6UDTEA) 6-channel Universal DTE	Single Slot Plug-in cards
Serial and Digital Access	(8UDTEA) 8-channel Universal DTE	Single Slot Plug-in cards
Serial and Digital Access	(1DTE) 1-channel DTE (V.35/EIA530/X.21/RS232)	Mini Slot Plug-in cards
Serial and Digital Access	(6RS232A) 6-port RS232	Single Slot Plug-in cards
Serial and Digital Access	(8RS232) 8-channel RS232 with X.50 subrate	Single Slot Plug-in cards
Serial and Digital Access	(6CDA) 6-channel G.703 at 64 Kbps	Single Slot Plug-in cards
Serial and Digital Access	(8CD) 8-channel G.703 at 64 Kbps	Single Slot Plug-in cards
Serial and Digital Access	(ODP) 1-channel OCU-DP	Mini Slot Plug-in cards
Serial and Digital Access	(ODP) 8-channel OCU-DP	Single Slot Plug-in cards
Serial and Digital Access	(3TS) 3-channel Terminal Server	Mini Slot Plug-in cards
Voice and Analog Access	(12FXOA/FXS/FXSA) 12-channel FXO/FXS	Single Slot Plug-in cards
Voice and Analog Access	(QFXO) 4-channel FXO	Mini Slot Plug-in cards
Voice and Analog Access	(QFXSA) 4-channel FXS	Mini Slot Plug-in cards
Voice and Analog Access	(12MAGA) 12-channel Magneto	Single Slot Plug-in cards
Voice and Analog Access	(QMAGA) 4-channel magneto	Mini Slot Plug-in cards
Voice and Analog Access	(8EMA) 8-channel 2W/4W E&M	Single Slot Plug-in cards
Voice and Analog Access	(QEMA) 4-channel E&M	Mini Slot Plug-in cards
Data Processing	(8DBRA) 8-channel Data Bridge	Single Slot Plug-in cards
Data Processing	(8DC) 8-channel Dry Contact	Single Slot Plug-in cards
Data Processing	(ABRA) Analog Bridge	Mini Slot Plug-in cards
Data Processing	(ECA) Echo Canceller	Mini Slot Plug-in cards
Packet Access	(RT) 2-LAN port/32 WAN port Router	Mini Slot Plug-in cards
Packet Access	(RTA) 2-LAN port/64 WAN port Router-A	Mini Slot Plug-in cards
Packet Access	(RTB) 8-LAN-port/ 64-WAN-port Router-B	Single Slot Plug-in cards
Teleprotection Access	(C37.94) 1/4-channel low-speed optical	Single Slot Plug-in cards
Teleprotection Access	(C37.94) 1-channel low-speed optical	Mini Slot Plug-in cards
Teleprotection Access	(TTA) Transfer Trip card [Note]	Single Slot Plug-in cards
Note: TTA card occupies two adjacent single slots.		

The compatibility between each card and each chassis is summarized in the following tables.

Plug-in Modules

Low-speed (LS) Cards

The compatibility between each card and each chassis is summarized in the following tables.

Functional Category	Single Slot Plug-in cards	AM3440-A	AM3440-B	AM3440-C	O9500R	O9550-A	O9550-C
	Number of slots	12	3	5	6	12	3
Transportation	(3E1) 3-channel E1	√	X	√	√	√	√
Transportation	(3T1) 3-channel T1	√	X	√	√	X	X
Transportation	(4E1/T1) 4-channel E1/T1	√	√	√	√	√	√
Transportation	(TDMoEA) 4-channel TDM over Ethernet	√	√	√	√	√	√
Transportation	(VoIPGA) Voice over IP	√	√	√	*	*	*
Transportation	(1FOMA) 1-channel fiber optical with 1+1	√	√	√	X	√	√
Transportation	(1FOMB) 1-channel fiber optical w/o 1+1	X	X	X	√	X	X
Transportation	(2/4GH) 2/4-channel G.SHDSL	√	√	√	√	√	√
Serial and Digital Access	(6UDTEA) 6-channel Universal DTE	√	√	√	√	√	√
Serial and Digital Access	(8UDTEA) 8-channel Universal DTE	√	√	√	√	√	√
Serial and Digital Access	(6RS232A) 6-port RS232	√	√	√	X	√	√
Serial and Digital Access	(8RS232) 8-channel RS232 with X.50 subrate	√	√	√	√	√	√
Serial and Digital Access	(6CDA) 6-channel G.703 at 64 Kbps	√	√	√	√	*	*
Serial and Digital Access	(8CD) 8-channel G.703 at 64 Kbps	√	√	√	√	√	√
Serial and Digital Access	(ODP) 8-channel OCU-DP	√	X	X	√	√	√
Voice and Analog Access	(12FXOA) 12-channel FXO	√	√	√	√	*	*
Voice and Analog Access	(12FXSA) 12-channel FXS	√	√	√	√	*	*
Voice and Analog Access	(12MAGA) 12-channel Magneto	√	√	√	*	*	*
Voice and Analog Access	(8EMA) 8-channel 2W/4W E&M	√	√	√	√	√	√
Data Processing	(8DBRA) 8-channel Data Bridge	√	√	√	√	√	√
Data Processing	(8DC) 8-channel Dry Contact	√	√	√	√	√	√
Packet Access	(RTB) 8-LAN-port/ 64-WAN-port Router-B	√	√	√	√	√	√
Teleprotection Access	(C37.94) 1/4-channel low-speed optical	√	√	√	√	√	√
Teleprotection Access	(TTA) Transfer Trip card [Note 2]	√	√	√	√	√	√

Note 1: √ = Supported   X = Not Supported   * = Future Option
Note 2: TTA card occupies two adjacent single slots.

Functional Category	Mini Slot Plug-in cards		AM3440 Chassis					O9550 Chassis			V4200-9
			A	B	C	D	E	A	C	D	9
	Number of slots		4	4	4	9	7	4	4	9	9
Transportation	(E1/T1) 1-channel E1/T1		√	√	√	√	√	√	√	√	√
Transportation	(M4E1) 4-channel E1		√	√	√	√	√	√	√	√	X
Transportation	(M4T1) 4-channel T1		√	√	√	√	√	*	*	*	X
Transportation	(FOM) 1-channel fiber optical with 1+1		√	√	√	√	√	√	√	√	√
Transportation	(GH) G.SHDSL		X	X	X	X	*	X	X	X	√
Serial and Digital Access	(1DTE) 1-channel DTE	V.35	√	√	√	√	√	√	*	√	√
Serial and Digital Access		EIA530	√	√	√	√	√	√	*	√	√
Serial and Digital Access		X.21	√	√	√	√	√	√	√	√	√
Serial and Digital Access		RS232	√	√	√	√	√	√	*	√	√
Serial and Digital Access	(ODP) 1-channel OCU-DP		X	√	√	√	X	X	X	X	√
Serial and Digital Access	(3TS) 3-channel Terminal Server		√	√	√	√	√	X	X	X	√
Voice and Analog Access	(QFXO) 4-channel FXO		#	√	√	√	√	√	√	√	√
Voice and Analog Access	(QFXSA) 4-channel FXS		#	√	√	√	√	√	√	√	√
Voice and Analog Access	(QMAGA) 4-channel magneto		#	√	√	*	√	X	X	*	*
Voice and Analog Access	(QEMA) 4-channel E&M		#	√	√	√	√	√	√	√	√
Data Processing	(ABRA) Analog Bridge		√	√	√	√	*	X	X	X	X
Data Processing	(ECA) Echo Canceller		√	√	√	√	√	X	X	X	X
Packet Access	(RT) 2-LAN port/32 WAN port Router		D	D	D	D	X	X	X	X	√
Packet Access	(RTA) 2-LAN port/64 WAN port Router-A		√	√	√	√	√	√	√	√	X
Teleprotection Access	(C37.94) 1-channel low-speed optical		√	√	√	√	√	√	√	√	X

Note: √ = Supported X = Not Supported # = Supported by Chassis CHAK * = Future option D= Discontinued

Plug-in Modules

Low-speed (LS) Cards **Transportation**

(3E1) 3-channel E1
For AM3440-A/C, O9500R, O9550-A/C Single Slot

Features

- Three port E1 plug-in module
- DS0-SNCP protection within 50 ms
- Programmable delay of Time Slot AIS detection for SNCP protection switching
- Synchronization Status Message (SSM) clock mode
- Full Time Slot Interchange (TSI) capability among all time slots in the main unit
- Remote diagnostics
- Single LED indicator per E1 port
- Software field upgradeable
- BNC or RJ48C connectors
- RoHS compliant

Description

The 3E1 plug-in card is designed for the Loop-O9500R, Loop-O9550-A/C and Loop-AM3440 series and provides DS0-SNCP (64 kbps sub-network connection protection). Users can mix the non-SNCP protected traffic with SNCP protected traffic on the same E1 ring. It allows each DS0 time slot in the 3E1 interface to be interchanged and multiplexed onto a digital network.
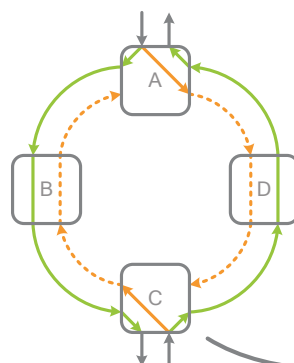
Continuous error checking, performance polling, and in-service diagnostics are provided through the main controller of the Loop-O9500R, Loop-O9550-A/C and Loop-AM3440 series. In addition, LEDs on the plug-in card itself provide status indicators.
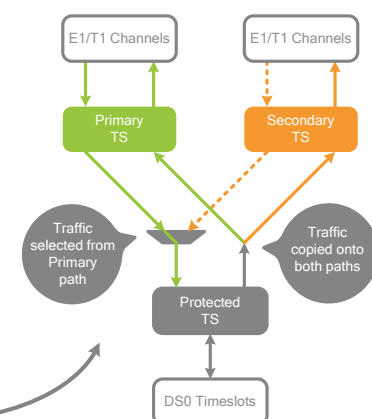
Application Illustration

The DS0 signal travels on both the primary timeslots and secondary timeslots in an SNCP/UPSR. The primary timeslots are by default selected at the Rx end as the working. When a failure occurs on the primary line causing primary timeslots unusable, the selector at Rx will automatically switch to the secondary timeslots.

Normal Condition:
A to C traffic selected from primary path
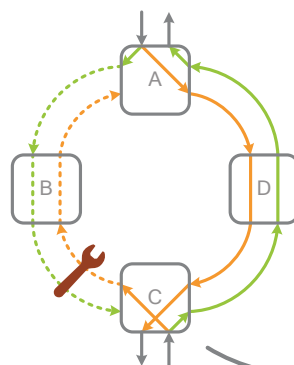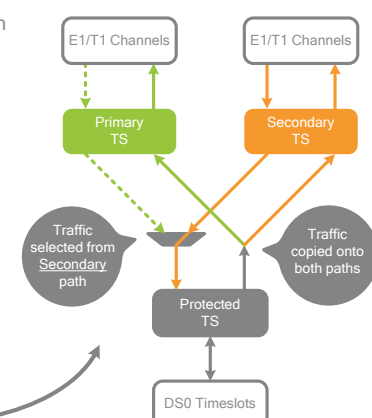C to A traffic selected from primary path

Node C

E1/T1 Channels   E1/T1 Channels

Primary TS   Secondary TS

Traffic selected from Primary path   Traffic copied onto both paths

Protected TS

DS0 Timeslots

Line between B&C failure:
A to C traffic switched to secondary path
C to A traffic still selected from primary path

Node C

E1/T1 Channels   E1/T1 Channels

Primary TS   Secondary TS

Traffic selected from Secondary path   Traffic copied onto both paths

Protected TS

DS0 Timeslots

Primary Path   Secondary Path   Selected Traffic   Unused Traffic   Selector

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(3T1) 3-channel T1
For AM3440-A/C and O9500R Single Slot

Features

- Three port T1 plug-in module
- DS0-SNCP protection within 50 ms
- Programmable delay of Time Slot AIS detection for SNCP protection switching
- Synchronization Status Message (SSM) clock mode
- Full Time Slot Interchange (TSI) capability among all time slots in the main unit
- Remote diagnostics
- Single LED indicator per T1 port
- Software field upgradeable
- RJ48C connectors
- RoHS compliant

Description

The 3T1 plug-in card is designed for the Loop-O9500R, and Loop-AM3440 series and provides DS0-SNCP (64 kbps sub-network connection protection). Users can mix the non-SNCP protected traffic with SNCP protected traffic on the same T1 ring. It allows each DS0 time slot in the 3T1 interface to be interchanged and multiplexed onto a digital network.
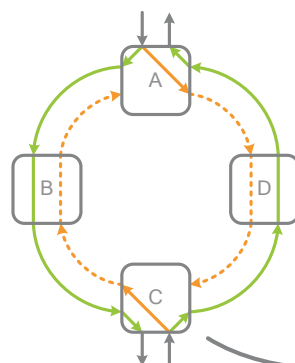
Continuous error checking, performance polling, and in-service diagnostics are provided through the main controller of the Loop-O9500R and Loop-AM3440 series. In addition, LEDs on the plug-in card itself provide status indicators.
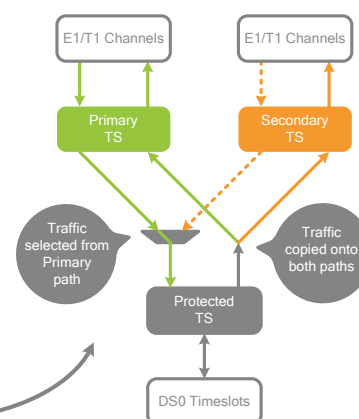
Application Illustration

The DS0 signal travels on both the primary timeslots and secondary timeslots in an SNCP/UPSR. The primary timeslots are by default selected at the Rx end as the working. When a failure occurs on the primary line causing primary timeslots unusable, the selector at Rx will automatically switch to the secondary timeslots.

Normal Condition:
A to C traffic selected from primary path
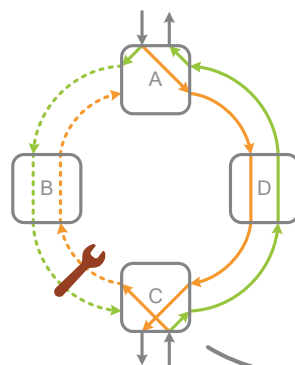C to A traffic selected from primary path

Node C

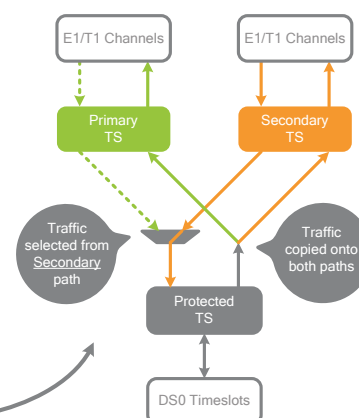E1/T1 Channels   E1/T1 Channels

Primary TS   Secondary TS

Traffic selected from Primary path   Traffic copied onto both paths

Protected TS

DS0 Timeslots

Line between B&C failure:
A to C traffic switched to secondary path
C to A traffic still selected from primary path

Node C

E1/T1 Channels   E1/T1 Channels

Primary TS   Secondary TS

Traffic selected from Secondary path   Traffic copied onto both paths

Protected TS

DS0 Timeslots

Primary Path   Secondary Path   Selected Traffic   Unused Traffic   Selector

Plug-in Modules

Low-speed (LS) Cards   Transportation

(4E1/T1) 4-channel E1/T1
For AM3440-A/B/C, O9500R, O9550-A/C Single Slot

Features

- Four E1/T1 ports per card
- Usable as a CSU/DSU, T1 to E1 converter
- Full DS0 timeslot cross-connection with other modules
- Remote diagnostics
- Single LED indicator per port
- Software upgradable

Description

Loop Telecom's QT1/QE1 plug-in cards are a series of 2 different plug-in cards designed for the Loop-O9500R, the Loop-O9550-A/C, and the Loop-AM3440-A/B/C series. They allow each DS0 time slot in QT1 or QE1 interfaces to be interchanged and multiplexed onto a digital network.

Continuous error checking, performance polling, and in-service diagnostics are provided through the main controller of the Loop-O9500R, the Loop-O9550-A/C, and the Loop-AM3440-A/B/C series. In addition, an LED on the plug-in provides status indication.

Application Illustration
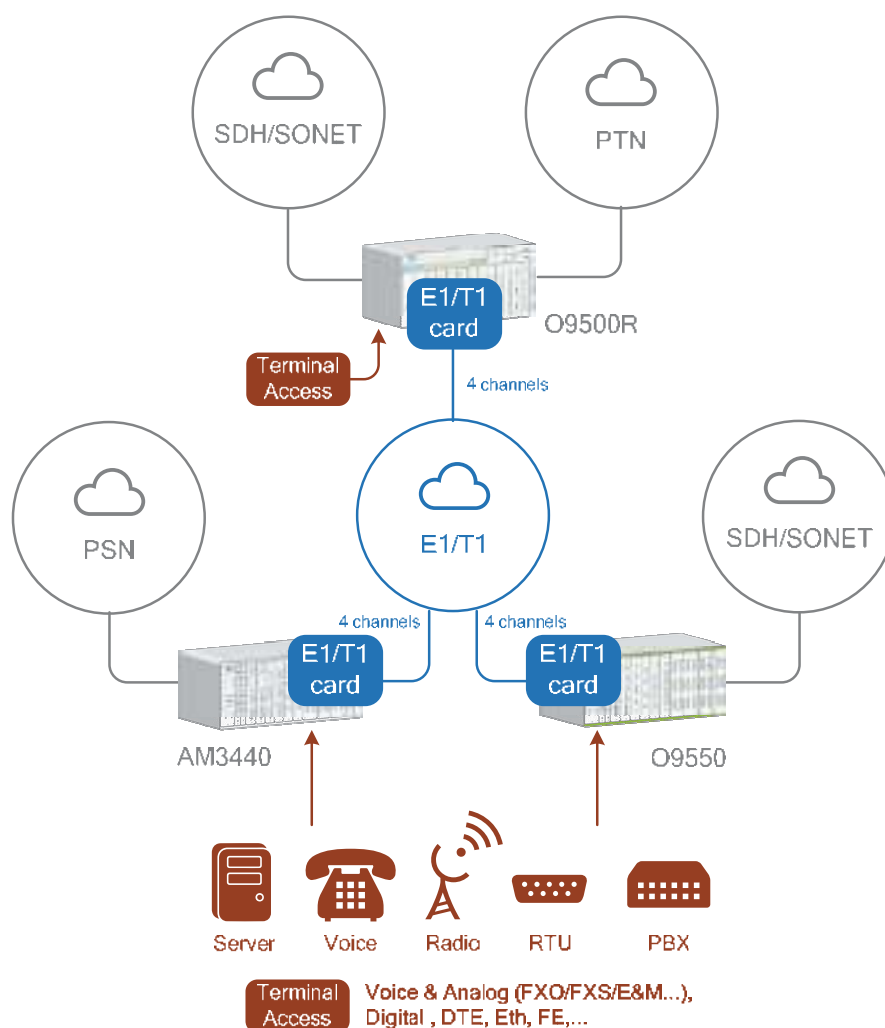
(E1/T1) 1-channel E1/T1
For AM3440-A/B/C/D/E, O9550-A/C/D, V4200-9 Mini Slot

Features

- Usable as a CSU/DSU, T1 to E1 converter
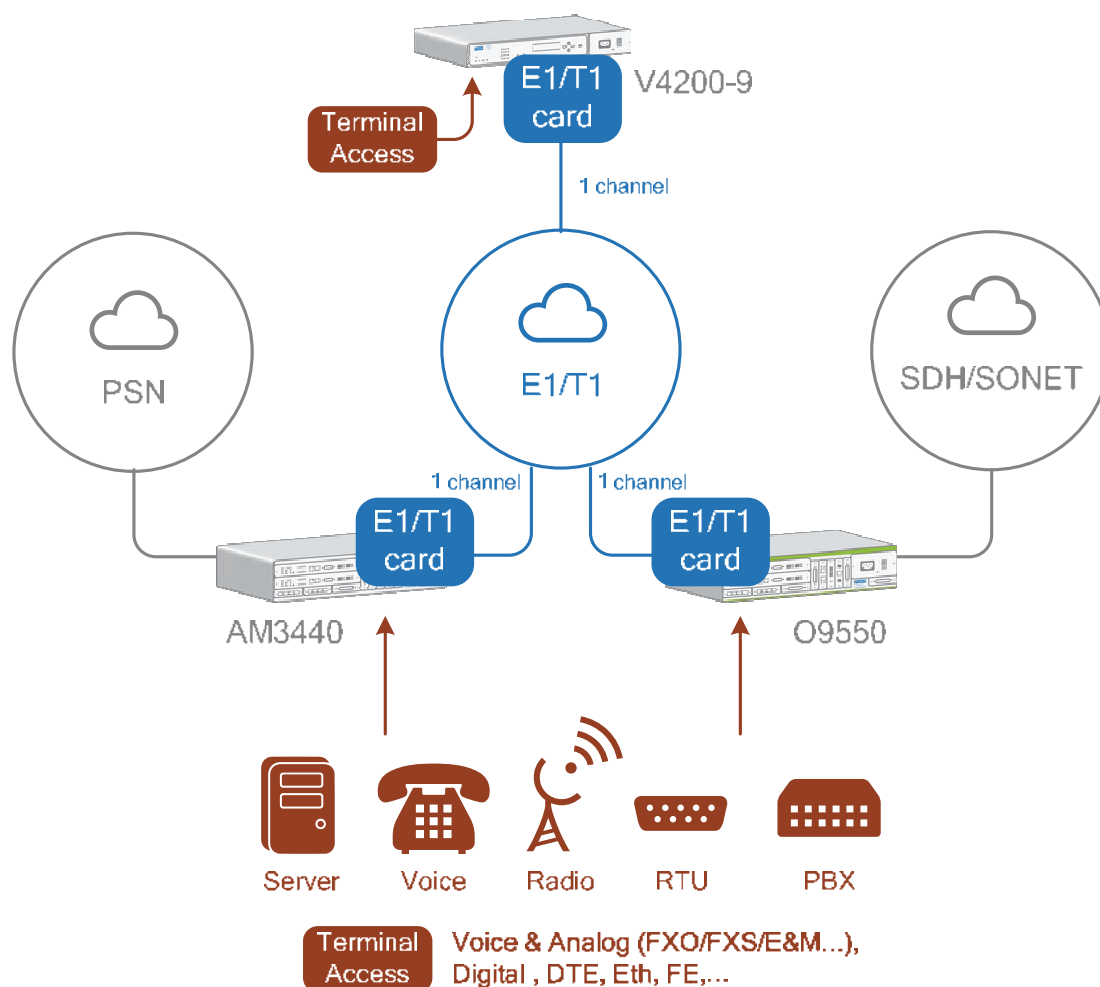- Full TSI capability among all time slots in the main unit
- Remote diagnostics

Description

The E1/T1 plug-in cards are a series of 2 different plug-in cards designed for the Loop-AM3440 Access DCS-MUX series and O9550-A/C chassis. This card allows each DS0 time slot in T1 or E1 interfaces to be interchanged and multiplexed onto a digital network. Clear channel (32 DS0 channels) is also available.

Continuous error checking, performance polling, and in-service diagnostics are provided through the main controller of the Loop-AM3440 Access DCS-MUX series and O9550-A/C chassis. In addition, an LED indicator on the plug in card's front face provides immediate status indication.

Application Illustration

Plug-in Modules

Low-speed (LS) Cards **Transportation**

(M4E1) 4-channel E1
For AM3440-A/B/C/D/E & O9550-A/C/D Mini Slot

Features

- Usable as a CSU/DSU
- Full TSI capability among all time slots in the main unit
- Remote diagnostics
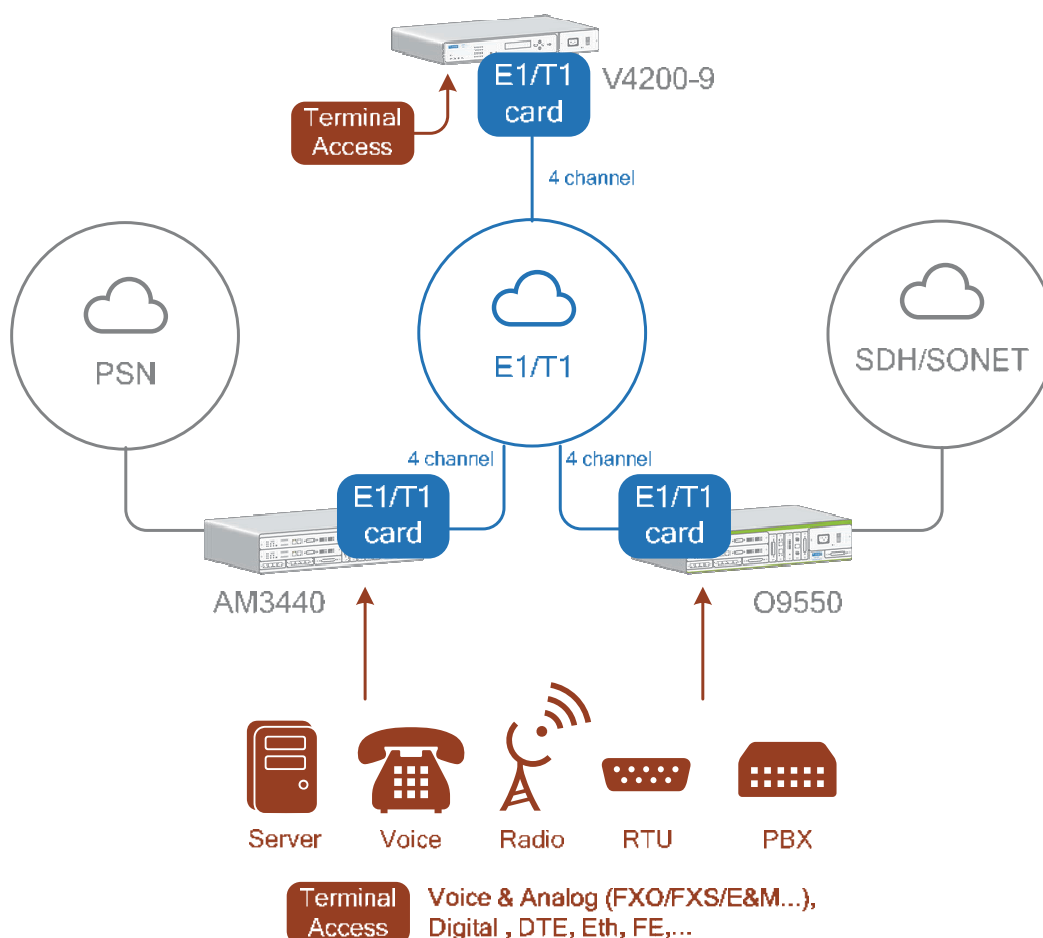- Software field upgradable

Description

The Mini Quad E1 plug-in card is designed for the 1/2 slot of the Loop-AM3440 series and O9550-A/C chassis. It allows each DS0 time slot in the T1 or E1 interfaces to be interchanged and multiplexed onto a digital network.

Continuous error checking, performance polling, and in-service diagnostics are provided through the main controller of the Loop-AM3440 series O9550-A/C chassis.

Great for indoor, inside building E1 connections or drops from a SONET/SDH network. For outside connections where lightning protection is required please use our full Quad E1 interface card.

Application Illustrations

(M4T1) 4-channel T1
For AM3440-A/B/C/D/E

Features

- Usable as a CSU/DSU
- Full TSI capability among all time slots in the main unit
- Remote diagnostics
- Single LED indicator
- Software field upgradable

Description

The Mini Quad T1 plug-in card is designed for the mini slot of the Loop-AM3440 series. It allows each DS0 time slot in the QT1 interfaces to be interchanged and multiplexed onto a digital network.

Continuous error checking, performance polling, and in-service diagnostics are provided through the main controller of the Loop-AM3440 series.

Great for indoor, inside building T1 connections or drops from a SONET/SDH network. For outside connections where lightning protection is required please use our full Quad T1 interface card.

Application Illustrations

Plug-in Modules

Low-speed (LS) Cards   **Transportation**
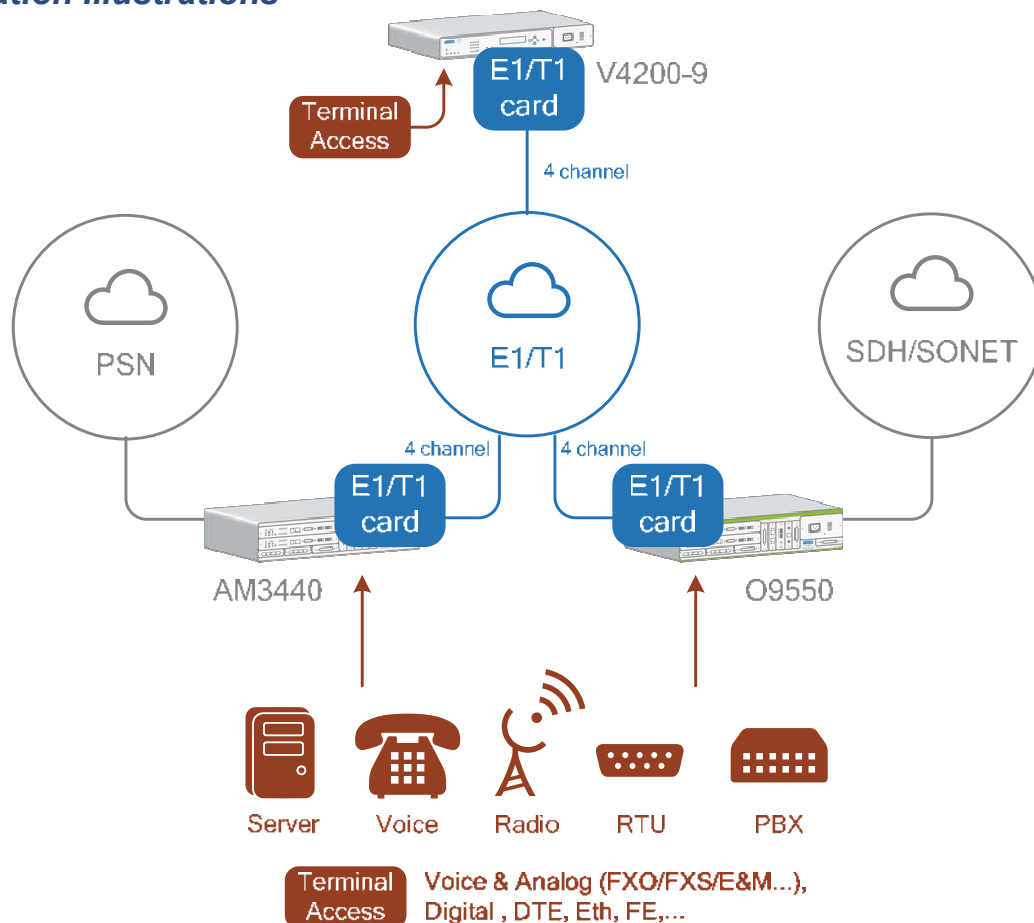
(TDMoEA) 4-channel TDM over Ethernet
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- Hot pluggable interface card for Single Slots
- Four Ethernet ports for WAN or LAN connection
  - Two combo Gigabit Ethernet (GbE) with 2 RJ45 and 2 SFP housing
  - Two 10/100/1000 BaseT Ethernet
  - IEEE 802.3ad Ethernet Link Aggregation
- Support MEF-8, CESoPSN and SAToP encapsulation format for TDM circuit emulation
  - Up to 4 x 2 M TDM bandwidth
  - Support N x DS0 circuit emulation
  - Up to 64 pseudowires per card
  - Packet Delay Variation compensation depth up to 256 ms
  - Support VLAN tag adding and removing on Pseudowires
  - User configurable ToS for each Pseudowire
- L2 switching
  - Maximum 16 VLAN Groups
  - Support 802.1q Port-Based VLAN on Ethernet Port
  - Support Q-in-Q
  - Support 802.1D STP, 802.1s MSTP*, 802.1w RSTP
  - Jumbo Frame reaches up to 10K bytes
  - Support 802.1d MAC learning
- QoS
  - Ingress Rate Limiting per Ethernet port with 64kbps/1Mbps/10Mbps granularity
  - Ethernet Network Level:
    - 3-bit Priority Code Point – PCP field within 802.1P/802.1Q Ethernet frame – CoS
    - 4 priority queues per port
  - IP Network Level:
    - 6-bit DiffServ Code Point -DSCP field – ToS
    - Scheduling Algorithm
    - Strict Priority (SP)
    - Weighted Round Robin (WRR)
- Timing
  - AM3440 system clock (Internal, external, line interfaces)
  - Adaptive Clock Recovery (ACR) for TDM Pseudowires
  - SyncE
- Protection
  - Support protection between two TDMoEA cards for E1/T1 port pseudowire protection
  - Support protection between E1/T1 pseudowires on TDMoEA and E1/T1 ports on QE1/QT1 cards
  - Support Heart Beating Protection
- Jitter & Wander
  - PPM per G.823 Traffic
- Port transmission delay measurement
- RoHS compliant

Description

The TDMoEA plug-in card is designed for the Loop-AM3440-A/B/C, O9500R, and O9550-A/C. This card is used to transport TDM (time division multiplexed) traffic over the IP network in addition to normal Ethernet traffic. As the communications network migrates from TDM to IP, the TDMoEA card provides a flexible and cost effective choice for the transport of legacy TDM signals. Furthermore, the TDMoEA card of the AM3440 can work with IP6702A/ IP6704A/IP6716/IP6763 TDMoE product family and with TDMoEA* card of O9500R.
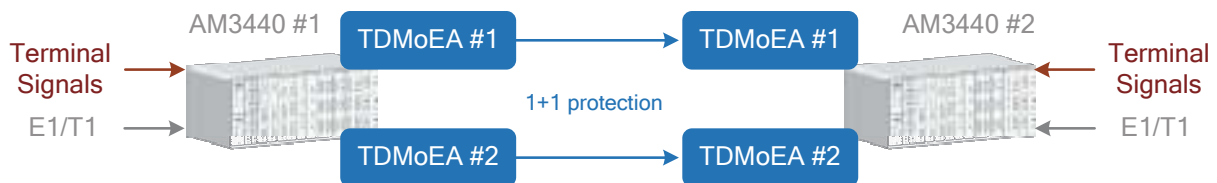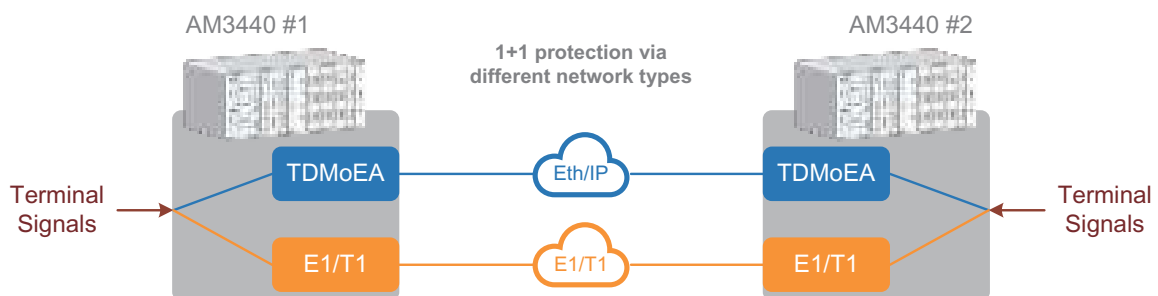
* Future Option

Application Illustrations

TDMoEA emulates and encapsulates TDM traffic (DS0/E1/T1) into packets for IP or Ethernet transportation
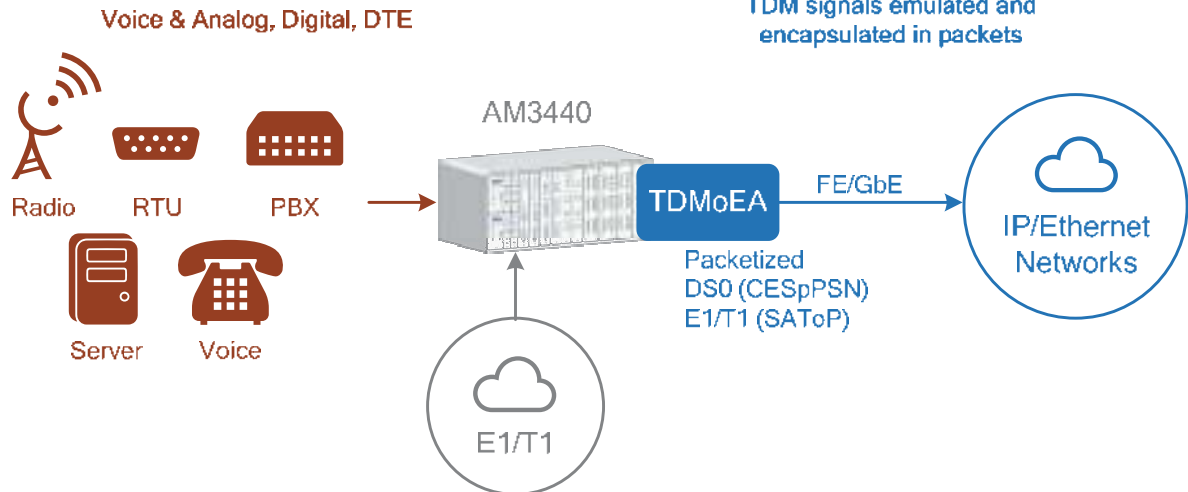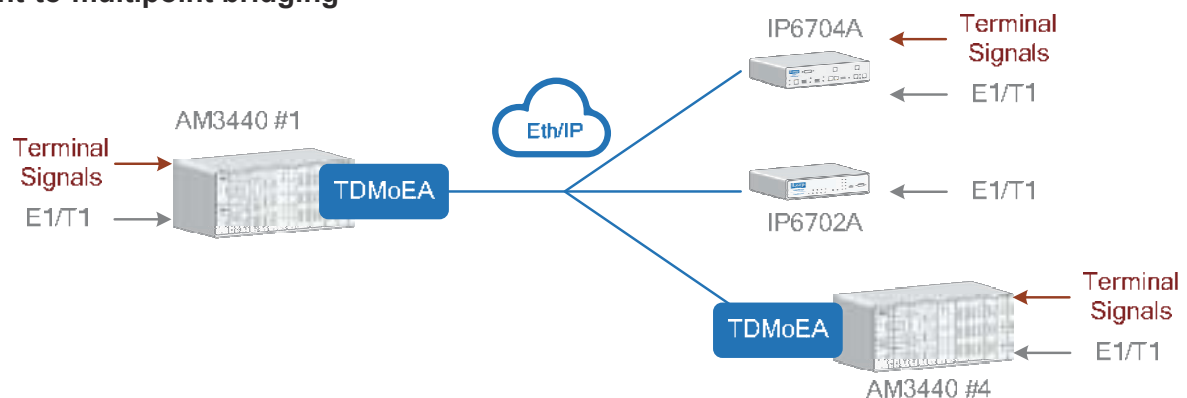

Point-to-point bridging with 1+1 protection
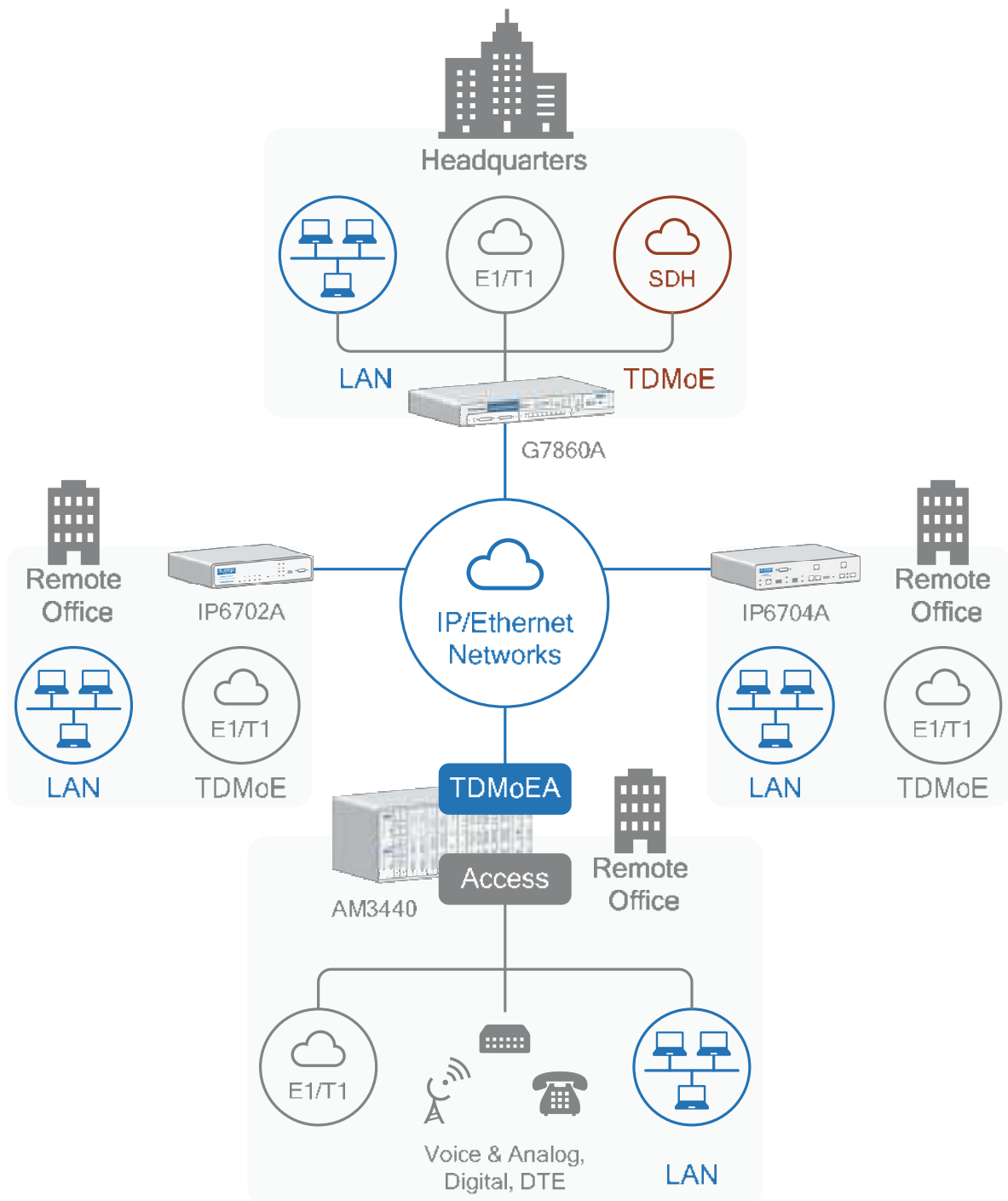

1+1 protection via TDMoEA and QE1/T1

Point-to-multipoint bridging

VPN Corporate Private Network

For a company that needs a Virtual Corporate Private Network to connect remote branches to company headquarters, the Loop TDMoEA line of products can create an E1/T1 lease line for faster connections.

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Heart Beating Protection
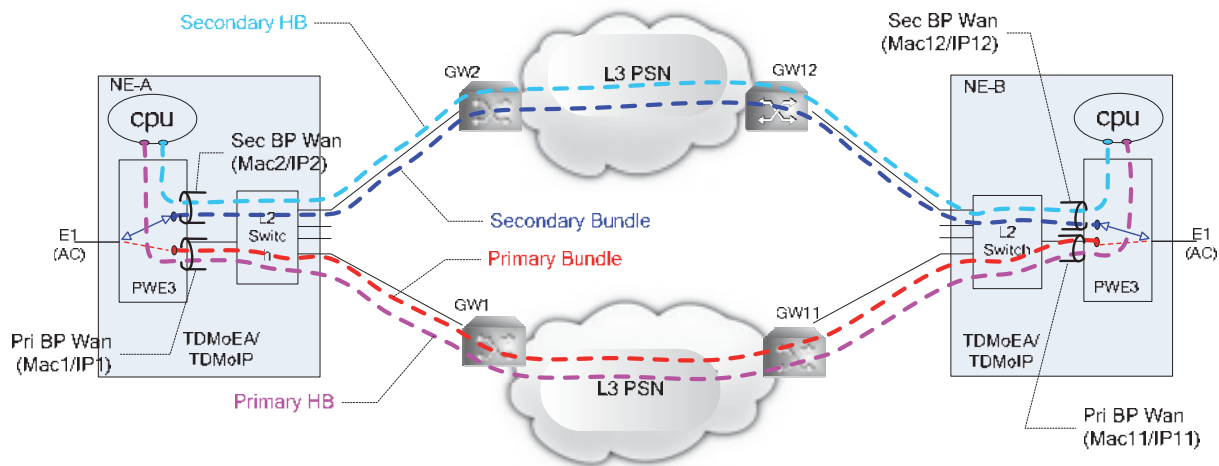
Transmission Delay Measurement

(VoIPGA) Voice over IP
For AM3440-A/B/C Single Slot

Features

- Physical Interfaces
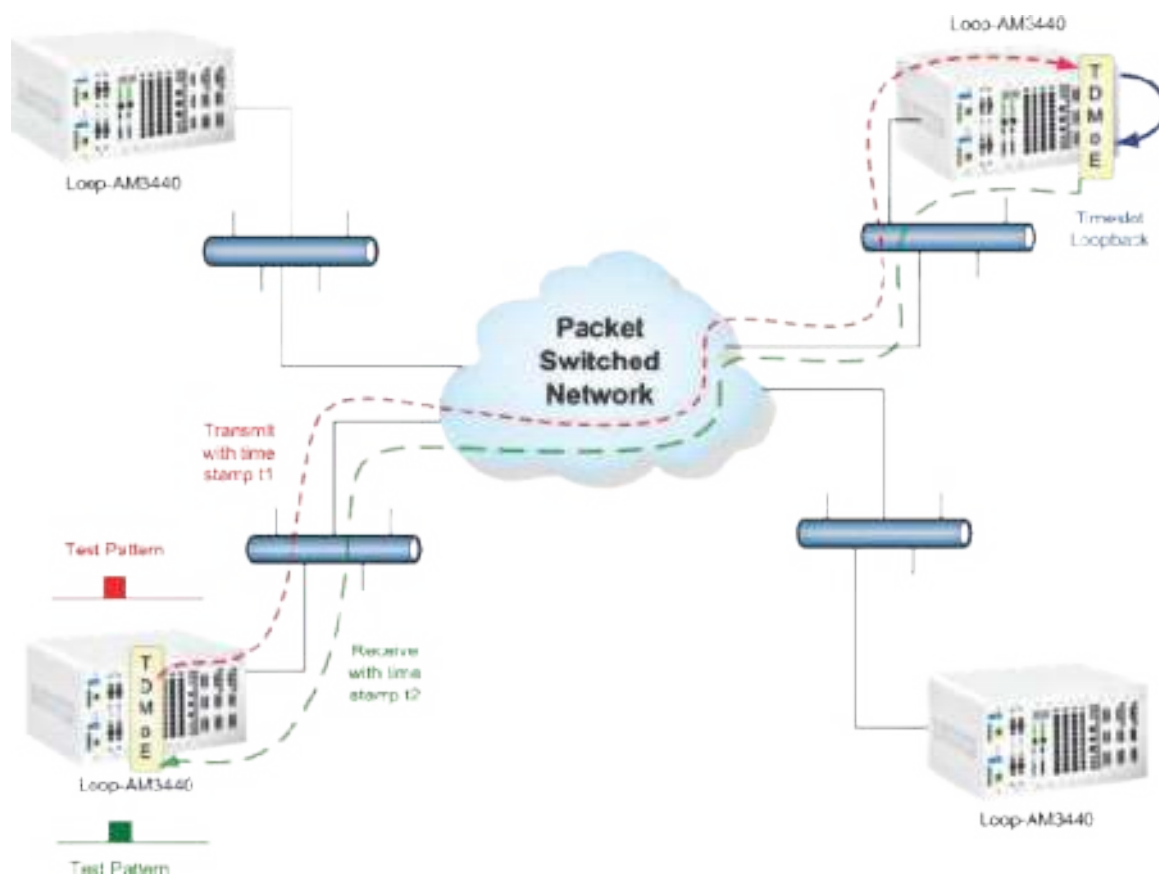 - WAN: 1 x 10/100 Mbps, 1G
  - LAN: 2 x 10/100 Mbps, 1G
- Voice Features
  - G.711 a/μ, G.726(32K), G.729, G.723.1
  - Silence Suppression and Detection
  - Echo Cancellation (G.168)
  - Adjustable jitter buffer
  - Adjustable packet time (by Codec type)
  - Programmable Gain Control[Note]
  - Adjustable call progress tone volume[Note]
- Telephony Specifications
  - In-Band DTMF, Out-of-Band DTMF Relay (RFC2833 or SIP INFO)
  - Caller ID[Note]
  - T.30 FAX passthrough, T.38 Real Time FAX Relay[Note]
- SIP Call Features
  - Peer to Peer Call
  - Call Forward - unconditional, busy[Note]
  - Do Not Disturb[Note]
  - Hot Line and Warm Line
- SIP Account Management
  - By channel registration
  - Invite with Challenge
  - Support RFC3986 SIP URI format
  - Phone Book Function (point-to-point call, and cross-area call without SIP Server)

Note: Configurable only through WEB management.

Description

The VoIPGA plug-in card is designed for the Loop-AM3440-A/B/C. This card serves as a VoIP Gateway that converts up to 60 voice and fax channels to IP networks and in reverse direction. VoIPGA works with FXS, FXO, and E1/T1 interface modules on the AM3440 unit. It uses high-quality embedded DSP chips to provide stable and clear voice quality. It supports G.711 a/mμ-law, G.726-32K, G.729 and G.723.1 voice compression formats to maximize its compatibility with other SIP devices.

VoIPGA provides a cost-effective solution for connecting legacy services to the IP network via VoIP technology.

Application Illustration

Plug-in Modules

Low-speed (LS) Cards **Transportation**
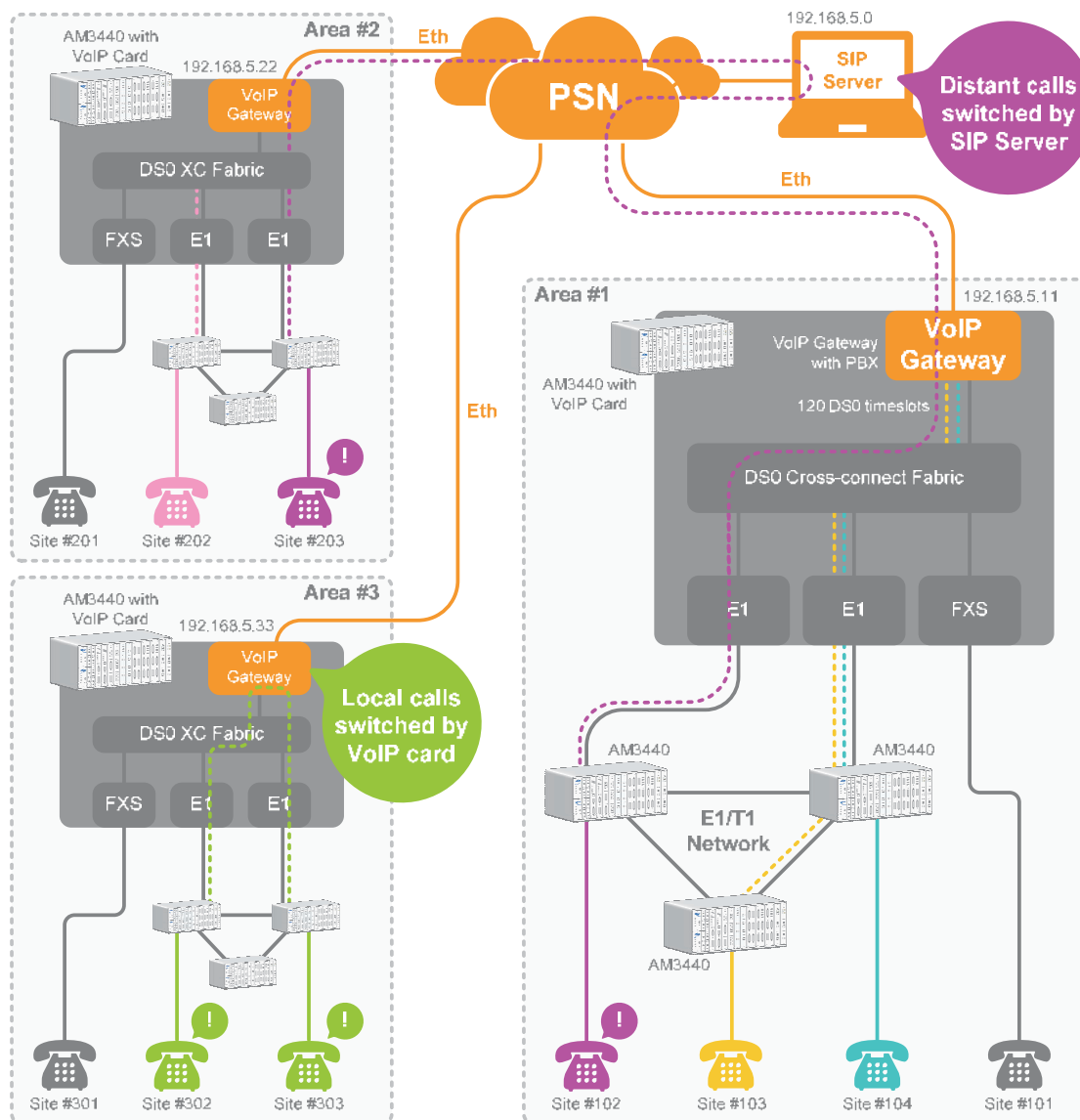
(1FOMA) 1-channel fiber optical with 1+1
For AM3440-A/B/C and O9550-A/C Single Slot

Features

- 1 optical interface port (FOM) to connect with remote O9310-E1, FOM interface for AM3440-A/B/C/D, 7FOM interface for O9400R and O9500R.
- Designed for O9550-A/C and AM3440-A/B/C single slots
- N x 64K bps cross-connection with 4E1 bandwidth
- Performance & Diagnosis
  - Performance monitoring
  - Alarm monitoring
  - Local Bert and loopback
- Protection
  - 1 + 1 protection function
  - FOM ring protection function
  - Supports APSD (Auto Power Shutdown)
- Management
  - Loop View
  - Supports remote management via EOC channel
  - Provide multi-color LED indicator

Description

The 1FOMA fiber optical interface is a plug-in module that can be used in the standard single slots of the O9550-A/C chassis and AM3440-A/B/C chassis. Designed for Loop-O9550 and Loop-AM3440 as an embedded 1 or 4 E1 fiber optical modem, the 1FOMA interface is able to aggregate 1 or 4 E1 channels to single fiber optical interface and connect with Loop-O9310-E1, FOM interface for Loop-AM3440-A/B/C/D, 7FOM interface for O9400R and O9500R.
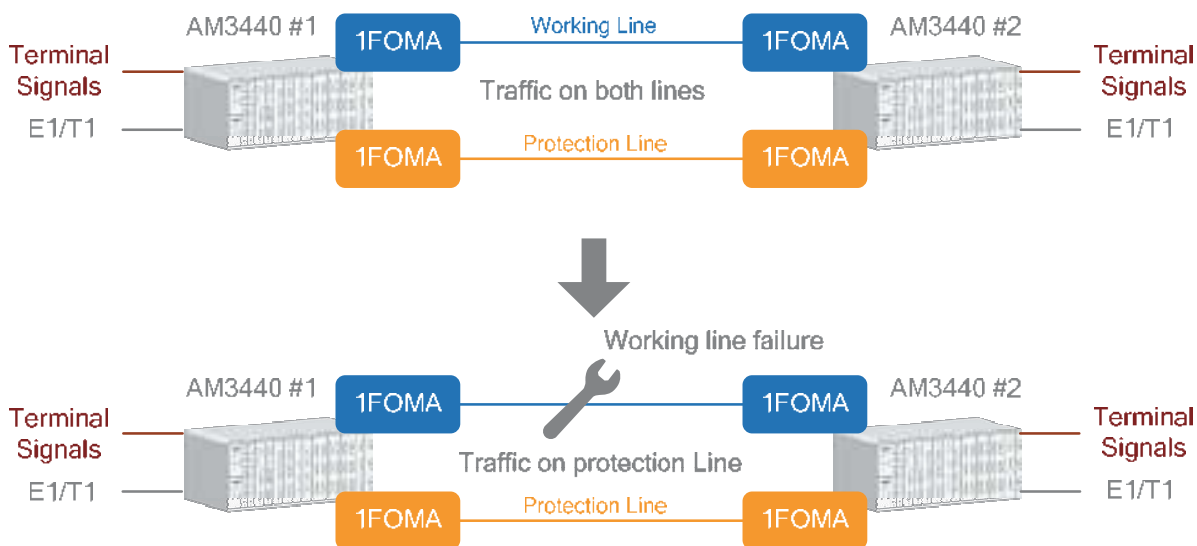
Note: Although the Fiber Optical Interface serves the same hardware function on O9550 and AM3440, they have different firmware.

Application Illustrations

Point to Point

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1 + 1 Protection

Terminal Signals E1/T1

AM3440 #1

1FOMA — Working Line — 1FOMA

Traffic on both lines

1FOMA — Protection Line — 1FOMA

AM3440 #2

Terminal Signals E1/T1

Working line failure

AM3440 #1

1FOMA — 1FOMA

Traffic on protection Line

1FOMA — Protection Line — 1FOMA

AM3440 #2

ULSR protection

Normal Condition:
Traffic flow on Working Ring

A to C traffic
C to A traffic
Working Ring
Protection Ring

QE1
QT1
FOM

Failure Condition:
Traffic affected by the fault rerouted
to Protection Ring

Line Down

A to C traffic
C to A traffic

Plug-in Modules

Low-speed (LS) Cards　　**Transportation**

(1FOMB) 1-channel fiber optical w/o 1+1
For O9500R Single Slot

Features

- One port Fiber Optical Multiplexer interface
- Connect with remote O9310-E1
- Designed for O9500R low speed slots
- N x 64K bps cross-connection with 4E1 bandwidth
- Performance & Diagnosis
  - Performance monitoring
  - Alarm monitoring
  - Local Bert and loopback
- Protection
  - FOM ring protection function
  - Supports APSD (Auto Power Shutdown)
- Management
  - Supports remote management via EOC channel
  - Provide multi-color LED indicator

Description

The one FOMB fiber optical interface is a plug-in module that can be used in the low speed slots of the O9500R chassis. Designed for Loop-O9500R as an embedded 1 or 4 E1 channels over single fiber optical interface and connect with Loop-O9310-E1.
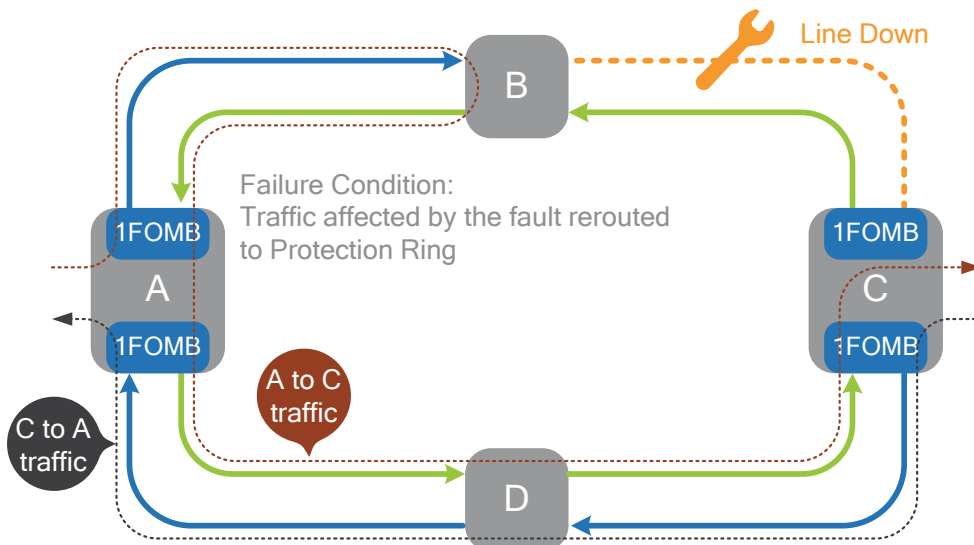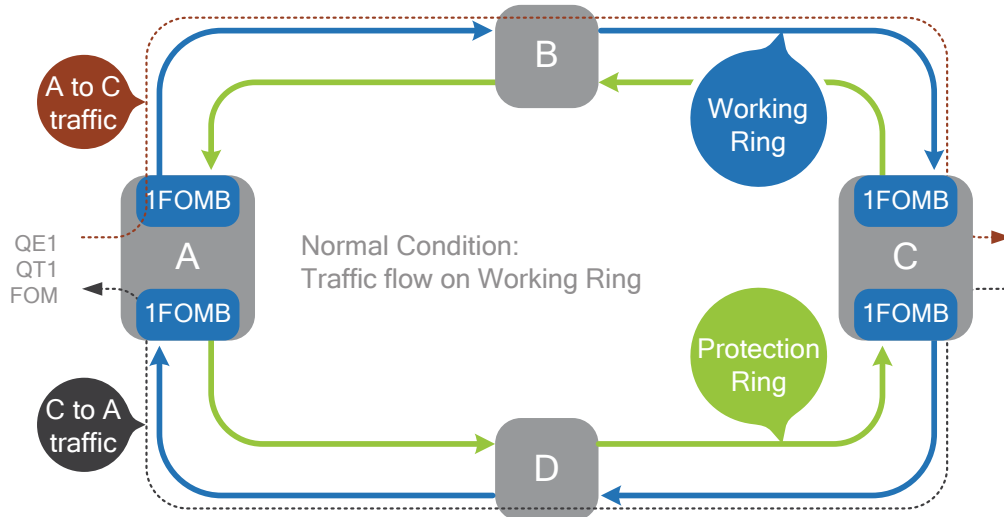
Application Illustrations

Point to Point

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ULSR protection

Normal Condition:
Traffic flow on Working Ring

A to C traffic

C to A traffic

Working Ring

Protection Ring

QE1
QT1
FOM

1FOMB

1FOMB

1FOMB

1FOMB

A   B   C   D

Failure Condition:
Traffic affected by the fault rerouted to Protection Ring

Line Down

A to C traffic

C to A traffic

1FOMB

1FOMB

1FOMB

1FOMB

A   B   C   D

Plug-in Modules

Low-speed (LS) Cards   **Transportation**

(FOM) 1-channel fiber optical with 1+1
For AM3440-A/B/C/D/E and O9550-A/C/D Mini Slot

Features

- Supports 1 + 1 protection functionality
- Supports ring protection functionality
- Supports remote management via EOC channel
- Provides a multi-color LED indicator

Description

The fiber optical interface is designed for Loop-AM3440 and O9550-A/C as embedded 1 or 4 E1 fiber optical modem. This plugged-in card can be used to aggregate 1 or 4 E1 channels to a single fiber optical interface to connect with other Loop-AM3440, O9550-A/C and Loop-O 9310-E1 units.
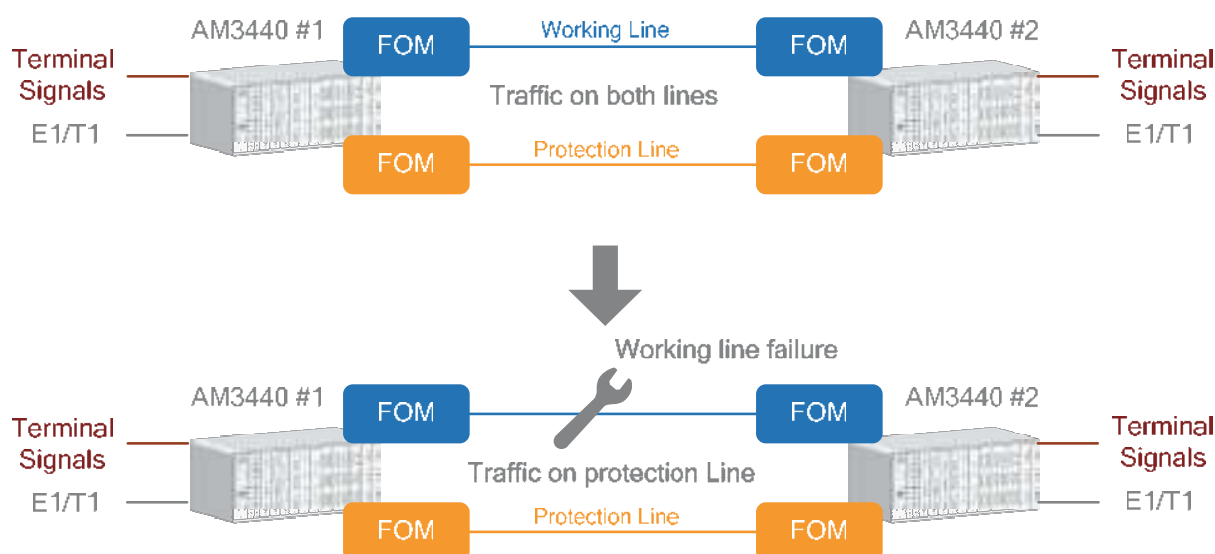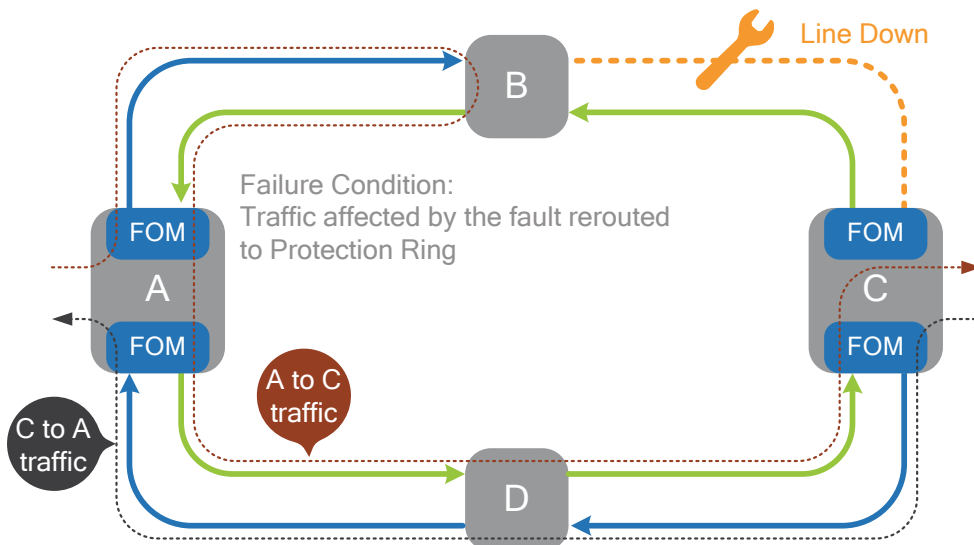
Application Illustrations
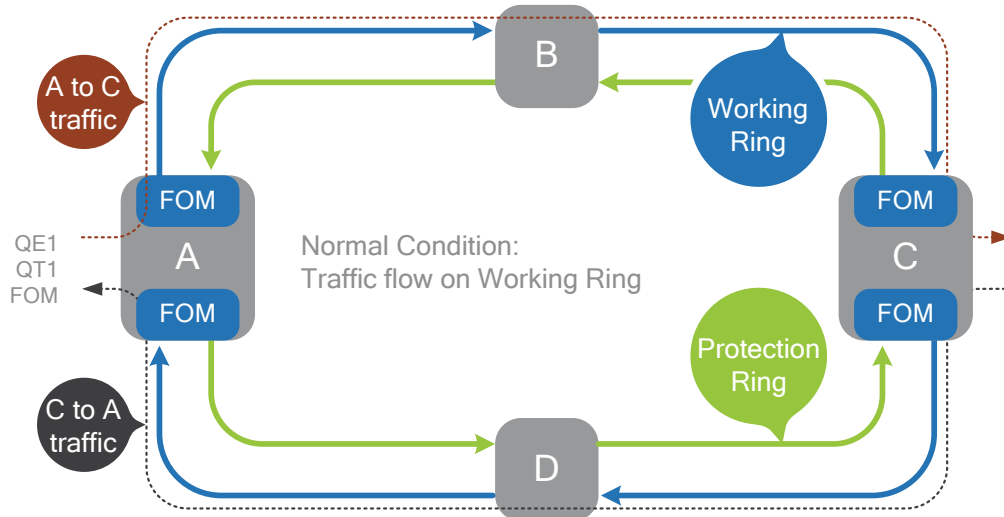
Point to Point

1 + 1 Protection

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ULSR protection

Normal Condition:
Traffic flow on Working Ring

A to C traffic

C to A traffic

QE1
QT1
FOM

Working Ring

Protection Ring

Line Down

Failure Condition:
Traffic affected by the fault rerouted
to Protection Ring

A to C traffic

C to A traffic

Plug-in Modules

(FOM) 1-channel fiber optical with 1+1
For V4200-9 Mini Slot

Features

- 1 E1 channel for one single fiber optical
- Remote management via EOC channel
- Multi-color LED indicator
- Supports 1 + 1 protection function when installed in a Loop-V4200-9 device
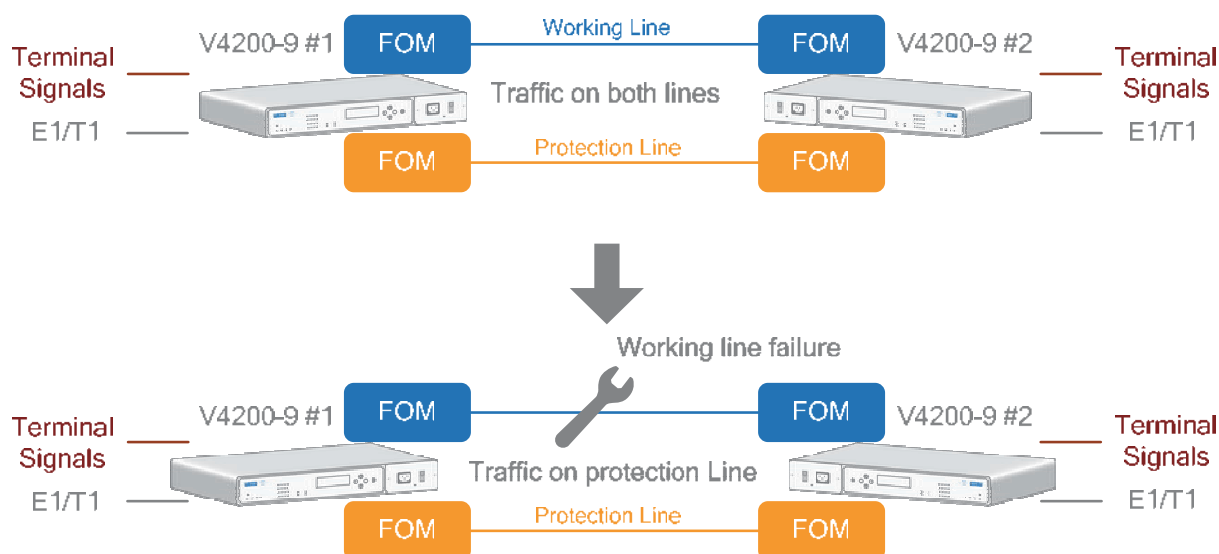
Description

Loop Telecom's 1-port 2 Mbps optical plug-in card is designed for Loop-V4200 device as an embedded 1E1 fiber optical modem. This plug-in card can transport 1 E1 to single fiber optical to connect with other Loop device such as the V4200-9, AM3440-A, or O9310.

Application Illustrations

Point to Point

1 + 1 Protection

(2/4GH) 2/4-channel G.SHDSL
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- Data rate of N x 64 kbps
  - where N can range from 1 to 31
- Distances vary by line rate
- Uses industry standard PAM line format
- Software field upgradable
- One-LED indicator per port
- Two port G.shdsl card supports 1+1 protection

Description

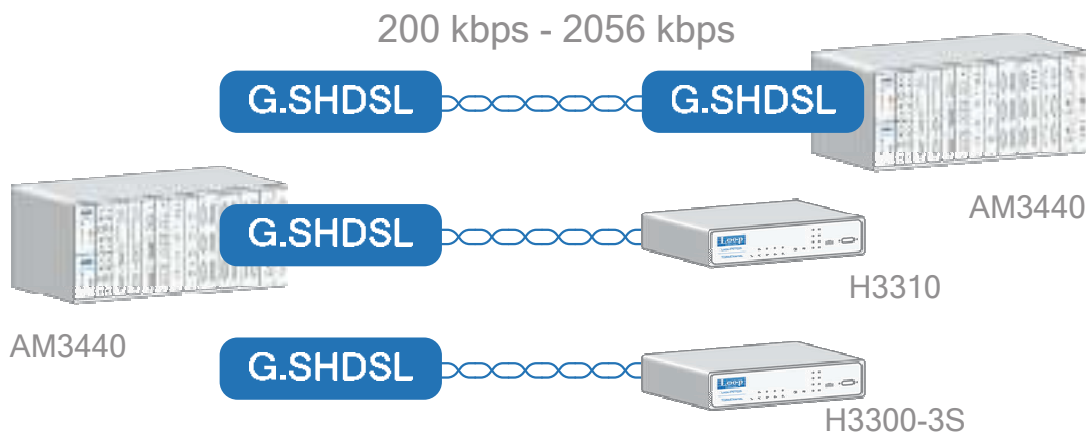The G.SHDSL plug-in card is designed for the Loop-O9500R, Loop-O9550-A/C, and Loop-AM3440 series. This card allows direct connection to wire pairs using 16PAM transmission technology. Versatility of this card comes from the choice of data rates, with the lower data rates applicable to longer reaches. The G.shdsl plug-in card can work with the Loop-H3300-3S and H3310, and is compatible with other G.SHDSL equipment.

The G.SHDSL plug-in card supports configuration and diagnostics using a local or remote terminal connected to the main unit. This allows in-service diagnostics and fault isolation.

Application Illustration

(GH) G.SHDSL
For V4200-9 Mini Slot

Features

- Data rate of n x 64 kbps, n=1 to max n, where max n = 3, 4, 6, 8, 12, 16, 18, 24, 32
- Distances vary by line rate
- Uses industry standard PAM line format
- Software field upgradeable
- One-LED indicator per card

Description

Loop Telecom's G.SHDSL plug-in card is designed for the Loop-V4200 series. This card allows direct connection to wire pairs using 16-TCPAM transmission technology. Versatility of this card comes from the choice of data rates, with the lower data rates applicable to the longer reaches. The G.SHDSL plug-in card can work with the Loop-H3300, and is compatible with other G.SHDSL equipment.

The G.SHDSL plug-in card supports configuration and diagnostics by using a local or remote terminal connected to the main unit. This allows in-service diagnostics and fault isolation.

Application Illustration

200 kbps - 2056 kbps

G.SHDSL — G.SHDSL V4200-9

V4200-9 G.SHDSL — H3310

G.SHDSL — H3300-3S
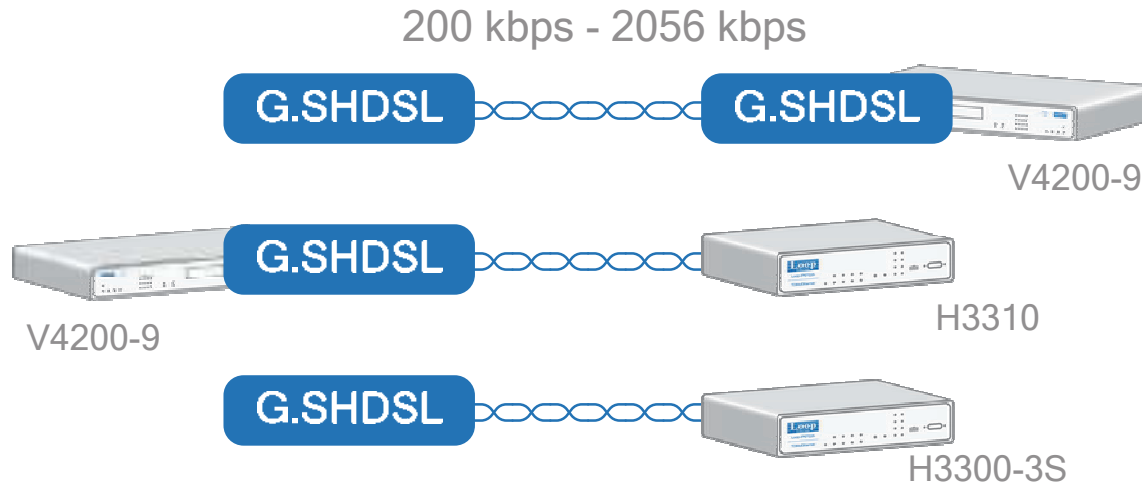
(6UDTEA) 6-channel Universal DTE
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- Supports X.21/RS449/RS422/RS232/V.35/V.36/EIA530
- Supports both synchronous and asynchronous data
- Port 1 to 4: two DB44 connectors
- Port 5 to 6: two RJ48 connectors
- Five software configurable modes
- MODE 1: V.110
  - Supports MUX/NON-MUX Mode for SYNC/ASYNC data
  - Port 1 to 4: RS232/RS422/X.21, SYNC/ASYNC 64kbps and sub-rate with V.110 encoding
  - Port 5 to 6: RS232 for 64kbps and sub-rate, ASYNC only
- MODE 2: N x 64K
  - Port 1 to 4: X.21/RS449/RS422/RS232/V.35/V.36/EIA530 SYNC N*64k (N=1~32)
  - Port 5 to 6: Disabled
- MODE 3: N x 64K + Oversampling
  - Port 1 to 3: X.21/RS449/RS422/RS232/V.35/V.36/EIA530 SYNC N*64k, (N=1~32).
  - Port 4: X.21/RS449/RS422/RS232/V.35/V.36/EIA530 SYNC, N*64k, (N=1~20).
  - Port 5 to 6: RS232 N*64k (N=1~6) oversampling for ASYNC data.
- MODE 4: Clock Pass Through
  - Port 1 to 4: RS232/RS422/X.21/V.35/V.36/EIA530 SYNC 38.4K and subrate
  - Port 5 to 6: Disabled
- MODE 5: N x 64K + Local and Remote Loopback
  - Port 1 to 4: X.21/RS449/RS422/RS232/V.35/V.36/EIA530 SYNC N*64k (N=1~32)
  - Port 5 to 6: Disabled
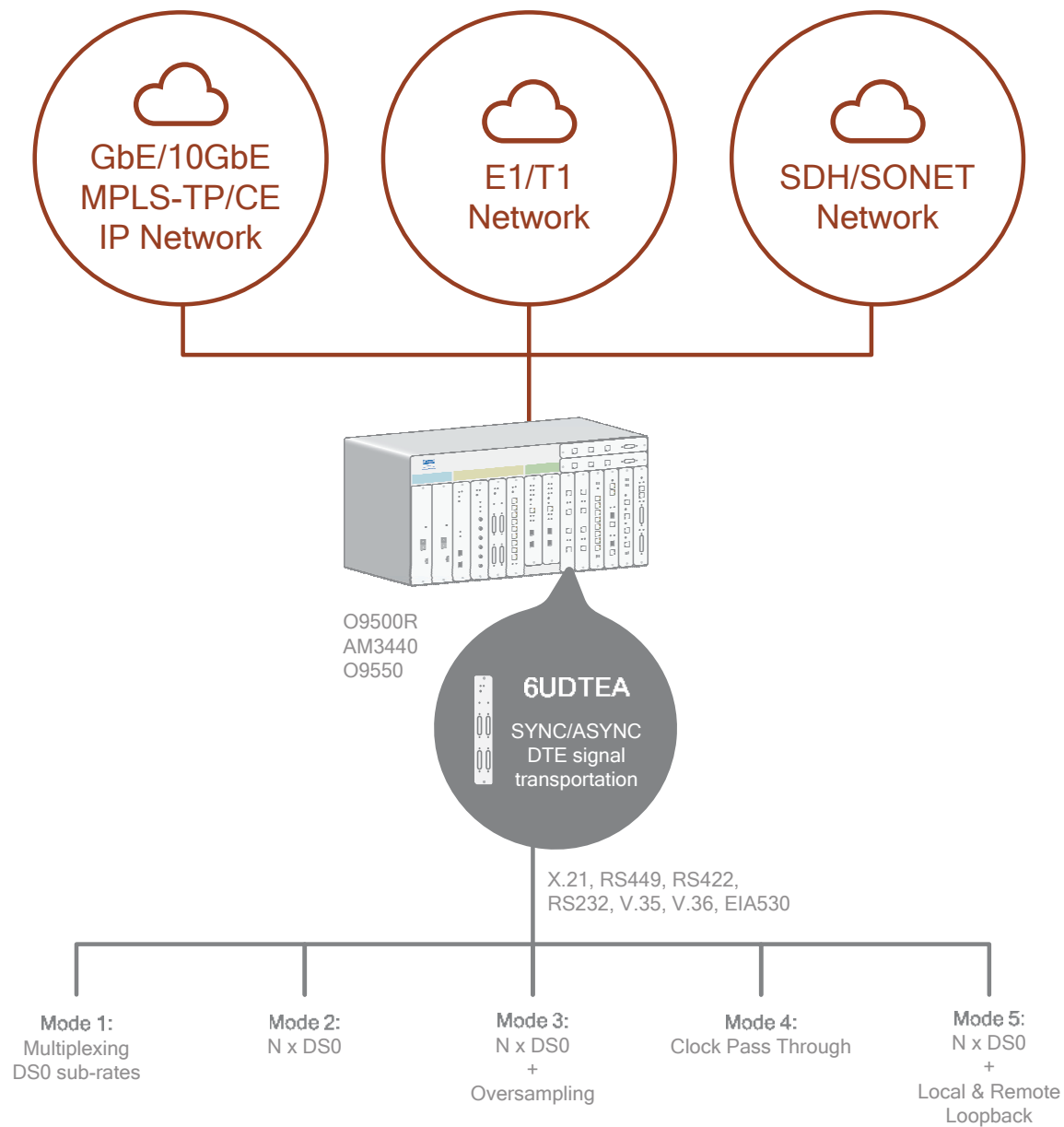 - Local and Remote Loopbacks with BERT, supporting V.54

Description

The 6-port Universal Data Interface Card (6UDTEA) card for single slots is designed to transport DS0 and sub-rate signals. Both SYNC and ASYNC data of X.21, RS449, RS422, RS232, V.35, V.36, EIA530 can be transported on the four ports (i.e. port 1 to 4) of DB44 connector. ASYNC RS232 can be transported on the additional ports (i.e. port 5 and 6) of RJ48 connector. Per-port software configuration is available.

Five modes are designed to provide different requirements of DTE signal transportation.

- In Mode 1, all 6 ports can be MUXed (V.110) into one 64K channel. When the card is set to NON-MUX in Mode 1, asynchronous data rate per channel/port can be up to 38.4 Kbps, and synchronous data rate per channel/port can be up to 64 Kbps.
- In Mode 2, 3 and 5, each of the four ports is able to transport N x 64K synchronous signals. Mode 3 supports additional RS232 asynchronous data, and Mode 5 supports Local and Remote Loopbacks with BERT
- In Mode 4, Clock Pass Through is available for port 1 to 4.

Application Illustration

GbE/10GbE
MPLS-TP/CE
IP Network

E1/T1
Network

SDH/SONET
Network

O9500R
AM3440
O9550

6UDTEA

SYNC/ASYNC
DTE signal
transportation

X.21, RS449, RS422,
RS232, V.35, V.36, EIA530

Mode 1:
Multiplexing
DS0 sub-rates

Mode 2:
N x DS0

Mode 3:
N x DS0
+
Oversampling

Mode 4:
Clock Pass Through

Mode 5:
N x DS0
+
Local & Remote
Loopback

(8UDTEA) 8-channel Universal DTE
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- Single slot card for O9500R, O9550-A/C, and AM3440-A/B/C series
- 8-port universal data interface card supports RS232/RS422/RS485 interface
  - DCE interface per port
  - Per port software configurable
  - RS485 supports 4 wires Full Duplex
  - RS422 supports 4 wires
  - Supports Full-Duplex and Half-Duplex modes (optional)
- Oversampling channel to transmit ASYNC data
- N x 56/64K bps, N = 1 to 6 for DS0 channels to oversample the ASYNC data
- Channel for 56Kbps or 64Kbps is software configurable for each card application
- Card base options are Omnibus, Terminal Server, and Clock Pass Through functions
  - Terminal Server (TS)
    - 8 remote IP address for each physical port
    - Router Mode: 64WANS, RIP-I, RIP-II, Static route
    - Bandwidth for each WAN is N x 64Kbps; N=1 to 32
  - Omnibus (OMNI)
    - Omnibus for data
    - Application of Daisy Chain, Star, Point to Multi-point
    - Maximum 8 groups/per port
  - Clock Pass Through (CPT)
    - Pass through RS232 clock transparently for RADAR application
- Handshaking for RS232 only
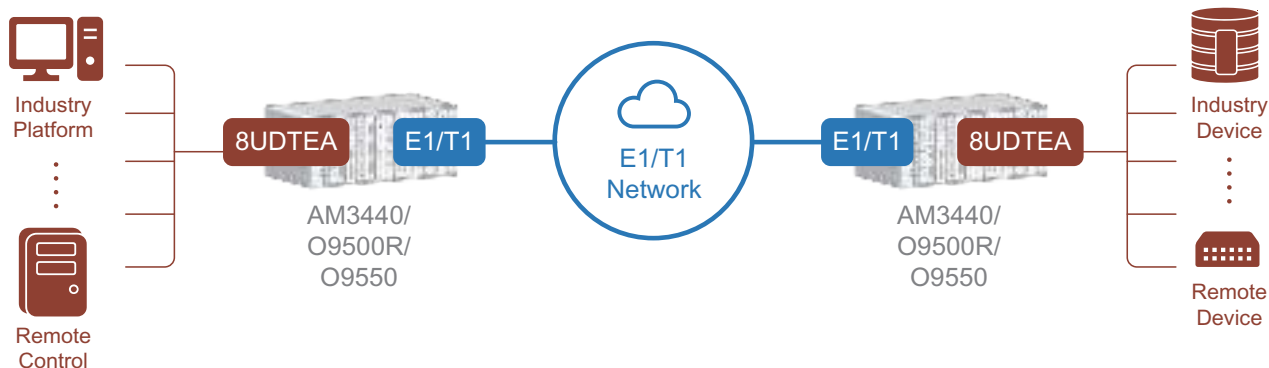- Flow control for RS232 only
- Loopback

Description

The 8UDTEA card of O9500R, O9550 and AM3440 series is 8-port universal data interface card that complies with RS232/RS422/RS485 DCE interface for ASYNC data transmission by oversampling SYNC data channel. It allows multiplexing of n x 56/64Kbps data to multiply of DS0 time slot onto a digital network.
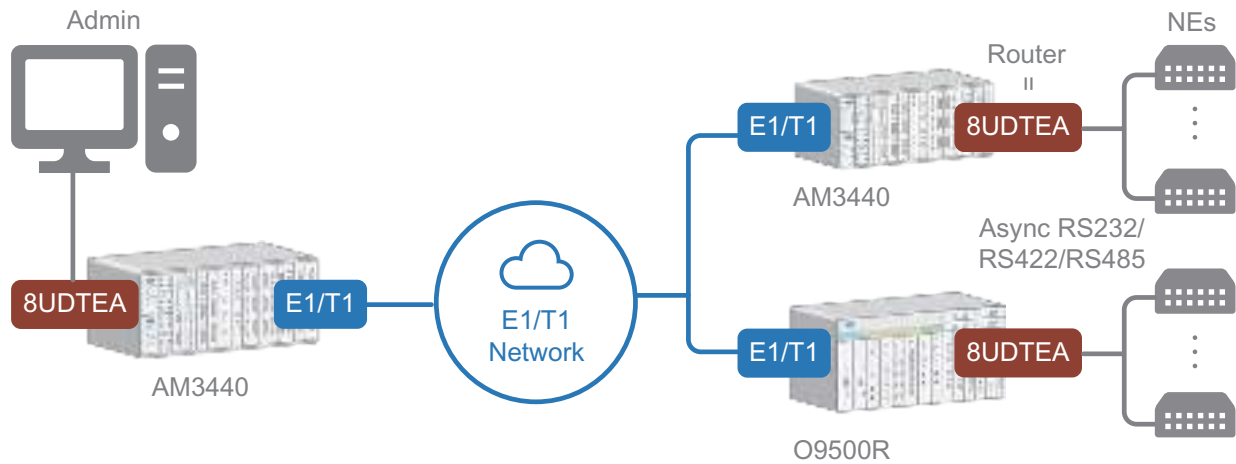
The 8UDTEA card provide oversampling function as basic, it can be set to be Omnibus (OMNI), Terminal Server (TS), or Clock Pass Through (CPT) by card base.

Application Illustration

Universal DTE

Industry Platform

Remote Control

8UDTEA — E1/T1

AM3440/ O9500R/ O9550

E1/T1 Network

E1/T1 — 8UDTEA

AM3440/ O9500R/ O9550

Industry Device

Remote Device

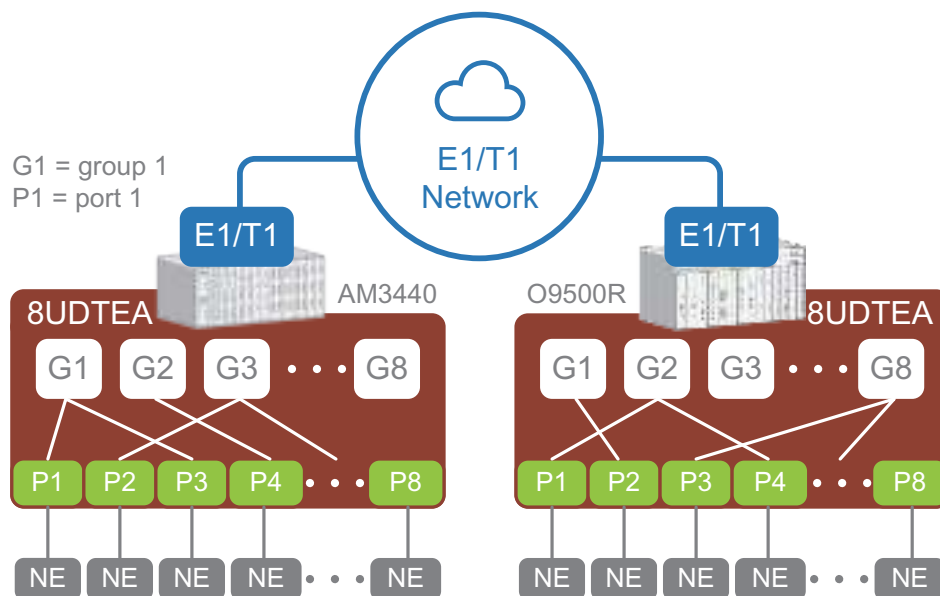# Plug-in Modules

Low-speed (LS) Cards   Serial and Digital Access

Terminal Server: Point-to-Multipoint

Omnibus

(1DTE) 1-channel DTE (V.35/EIA530/X.21/RS232)
For AM3440-A/B/C/D/E and O9550-A/C/D, and V4200-9 Mini Slot
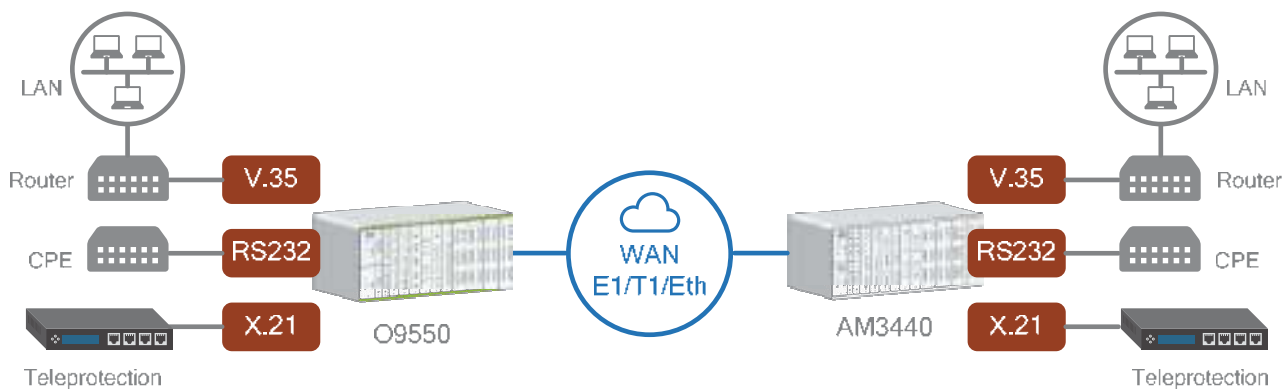
Features

- 1-channel DTE plug-in cards for mini slot (V.35, EIA530, X.21, RS232)
- Maximum date rate
  - V.35, EIA530 and X.21 N x 56 or 64 kbps, N = 1 to 32
  - RS232: N x 56 or 64 kbps, N = 1 to 2
- Mapping to any sequential time slots
- Remote diagnostics

Description

Loop Telecom's 1-channel V.35/EIA530/RS232/X.21 plug-in cards are designed for the mini slot of Loop-AM3440 and O9550 series. It allows multiplexing of N x 64 kbps data to multiples of DS0 time slots onto a digital network. An LED on the front panel of the Loop-AM3440-A/B/C and O9550-A/C chassis provides status indicators.

Application Illustration

Plug-in Modules

Low-speed (LS) Cards | **Serial and Digital Access**

(6RS232A) 6-port RS232
For AM3440-A/B/C and O9550-A/C Single Slot

Features

- 6 RS232 ports per card
- Supports V.110 protocol
- Data rate
  - Sync: 0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 48K, 64K
  - Async: 0.6K, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K
- Mode: MUX or NON-MUX (independent) mode
- RTS remote management
- Two card types:
- 6 RJ48 only card: 6 ports RS232 Async
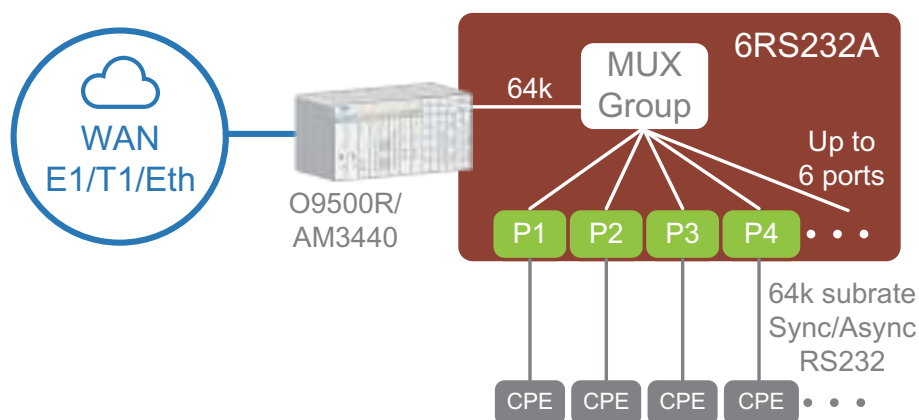- 2 DB44 card: Up to 4 ports RS232 Sync/Async + 2 ports RS232 Async

Description

The 6RS232A card for Loop-O9550 and Loop-AM3440 series has 6 interface ports. For the RJ version, 6 RJ48 connectors are available in Asynchronous mode. For the DB version, 2 DB44 connectors are available in Asynchronous and Synchronous modes, and provide 3 ports each. Two cables are included. Each cable converts from DB44 connector to two DB25 and one DB9 connectors.

For Asynchronous signals, each of the 6 asynchronous ports up to 38.4 Kb/s rate, is assigned a separate 64 Kb/s channel in independent mode. Moreover, each port can be used in either NON-MUX (independent) mode or MUX mode for Sync/Async applications.

The 6RS232A card is designed to allow user to transport subrate signals on a 64Kbps channel and the data will fill into the bit stream. Users are able to have customized MUX configuration as wishes. Also, all 6 ports can be MUXed; only port 1 is in MUX mode at all time, and all the configured MUX ports will be merged to port 1. Furthermore, there will be solely one MUX group and all Mux port kbits cannot be larger than 64kbits.

Application Illustration

Order from: Cutter Networks Inc   Ph: 727-398-5252   www.bestdatasource.com
For the latest product news, updates, technical support and more, please visit our website.

(8RS232) 8-channel RS232 with X.50 subrate
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- Supports X.50 division 2 and X.54
- Single slot
- Two card types:
  - 8 RJ48 only card: 8 ports RS232 Async
  - 2 RJ48 + 2 DB44 card: Up to 4 ports RS232 Sync + 4 ports RS232 Async
- MUX mode: 4 Sync ports at 9.6Kb/s share one 64K
- LED status indicator
- Hot swappable
- Supports Async rates from 600 bps to 38400 bps
- Supports Sync rates from 600 bps to 64000 bps

Description

The 8RS232 interface card for Loop-O9500R, Loop-O9550-A/C, and Loop-AM3440 series has 8 interface ports. For the RJ version, 8 RJ48 connectors are available in Asynchronous/Sync mode. The sync mode method used is oversampling at 64 Kbps, the max data rate for each RJ48 is 19.2 Kbps only available in some ports. For the DB version, 2 RJ48 provide 2 ports and 2 DB44 connectors provide 3 ports each. Two cables are included. Each cable converts from DB44 connector to two DB25 and one DB9 connectors.

For asynchronous signals, the card can be used in either INDEPENDENT mode or MUX mode. In the INDEPENDENT mode, each of the 8 asynchronous ports up to 38.4 Kb/s rate, is assigned a separate 64 Kb/s channel. In the MUX mode, up to 5 ports, each up to 9.6 Kb/s, can share a single 64 Kb/s channel. The remaining 3 ports will be multiplexed to another 64Kb/s channel.

For synchronous signals only four of the ports can be used, leaving another 4 ports as asynchronous. In the INDEPENDENT mode, each of the 4 synchronous ports can be up to 64 Kb/s. The rest of the 4 asynchronous ports, each up to 38.4 Kb/s rate, is assigned a separate 64 Kb/s channel per port. In the MUX mode, the 4 synchronous ports, each up to 9.6 Kb/s, share a single 64 Kb/s channel. The other 3 asynchronous ports will be multiplexed to another 64Kb/s channel.

The 8RS232 interface card uses the multiplexing format defined in ITU-T X.50 Div.2 and in X.54 for rates below 64 Kbps. For 64 Kbps transport, standard RS232 format is used. In the INDEPENDENT mode when only one subrate signal is transported, the unused bandwidth is filled with "1s".

Application Illustrations

Plug-in Modules

Low-speed (LS) Cards **Serial and Digital Access**
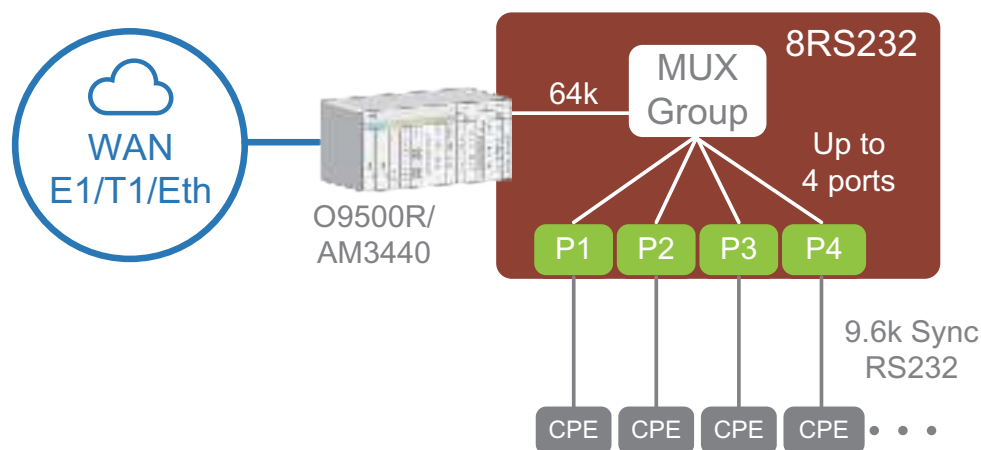
(6CDA) 6-channel G.703 at 64 Kbps
For AM3440-A/B/C and O9500R Single Slot

Features

- 6-port G.703 single slot plug-in card for the AM3440 series
- ITU G.703 64 Kbps Co-directional and Contra-directional
- Per port configurable for Co-directional or Contra-directional interfaces
- Co-directional Alarm: LOS and insert AIS(All 1)
- Contra-directional: LOO (Loss Of Octet)
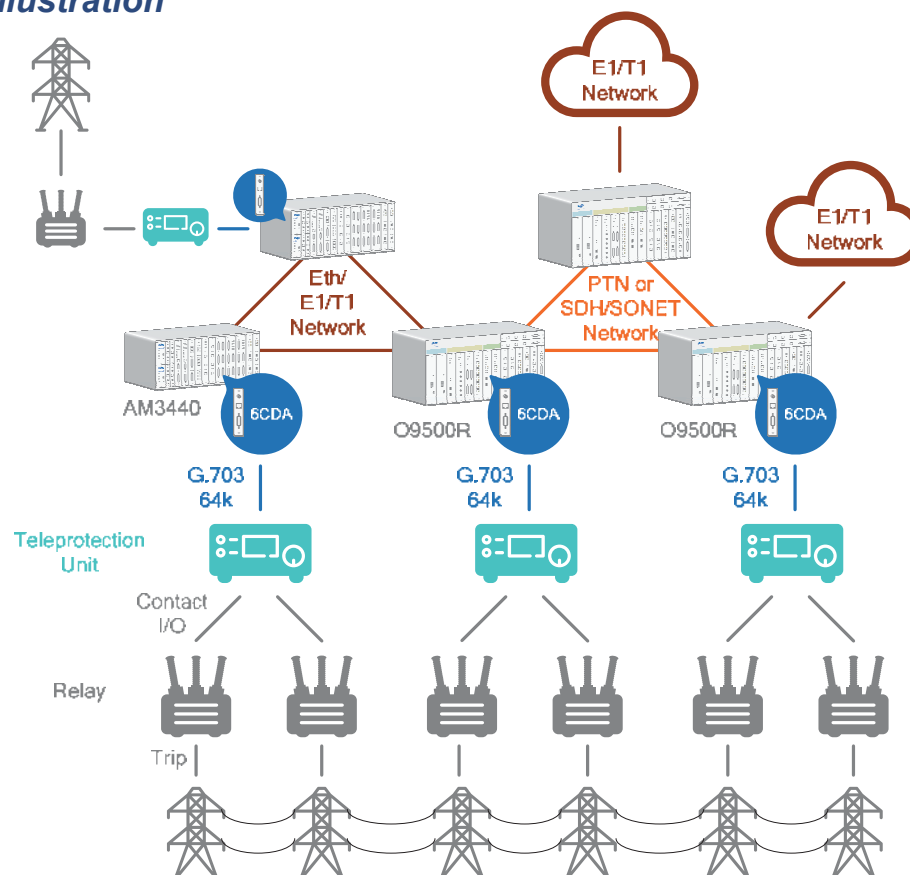- Loop back: DTE Payload Loopback, Local Loopback

Description

The 6CDA plug-in card is designed for the single slot of Loop-AM3440 series. This interface supports 64 kbps data transport using the G.703 co-directional or contra-directional timing standard over a balanced wire.

The 6CDA card provides three co-directional/contra-directional mode options for different field requirements: (a) Co-directional + Contra-directional controlling (DCE) mode, (b) Co-directional + Contra-directional subordinate (DTE) mode, and (c) Mixed mode.

The 6CDA card supports diagnostics and alarms. This allows diagnostics and fault isolation.

Application Illustration

150
Order from: Cutter Networks Inc   Ph: 727-398-5252   www.bestdatasource.com
For the latest product news, updates, technical support and more, please visit our website.

(8CD) 8-channel G.703 at 64 Kbps
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- 8-port G.703 single slot plug-in card for the AM3440 series
- Supports data rate at 64 kbps
- Supports G.703 transmission over balanced wire
- Eight LED indicators per card

Description

The G.703 plug-in card is designed for the single slot of Loop-O9500R, O9550-A/C, and Loop-AM3440 series. This interface supports 64 kbps data transport using the G.703 co-directional timing standard over a balanced wire.

The G.703 plug-in card supports diagnostics and alarm setup by LCD operation or using a local or remote terminal connected to the main unit. This allows in-service diagnostics and fault isolation.

Note: Although the G.703 Interface Cards serve the same hardware function on O9500R, O9550, and AM3440, they have different firmware.

Application Illustration

Plug-in Modules

Low-speed (LS) Cards　　**Serial and Digital Access**
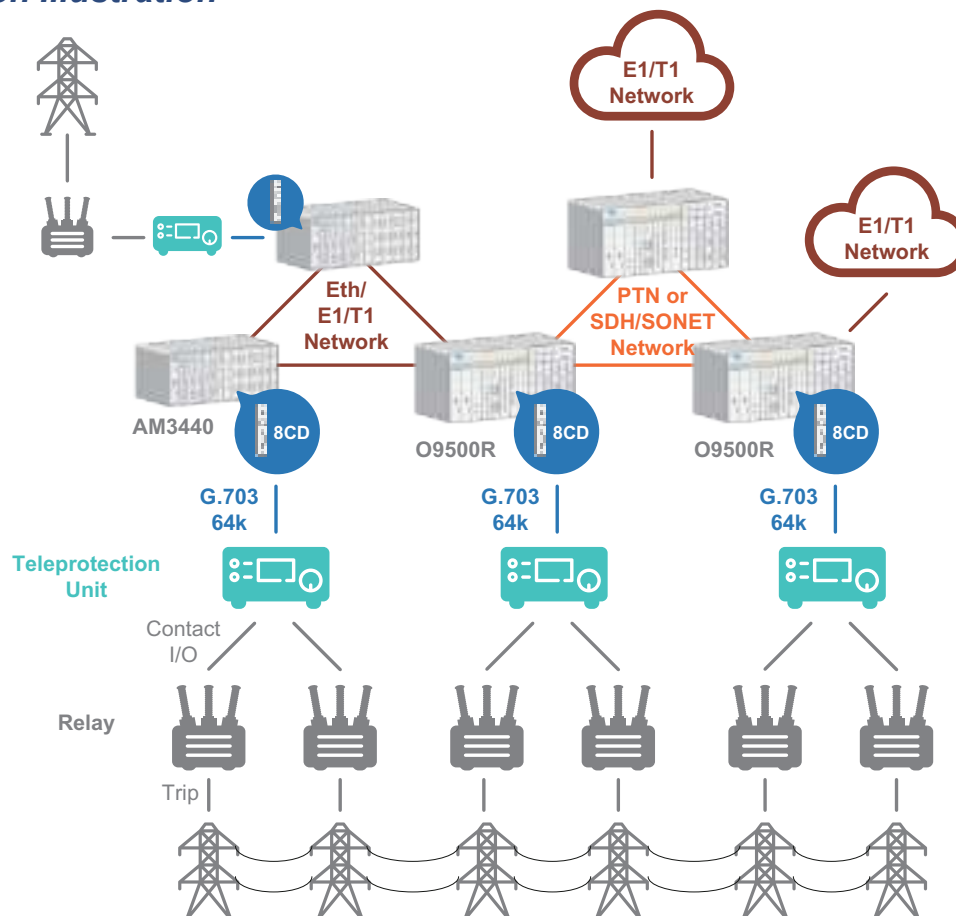
(ODP) 8-channel OCU-DP
For AM3440-A, O9500R, and O9550-A/C Single Slot

Features

- 8 ports per card
- RJ48S & 4-wire non-loaded balanced loop connector
- Supports data transmission sub-rates up to 64 kb/s
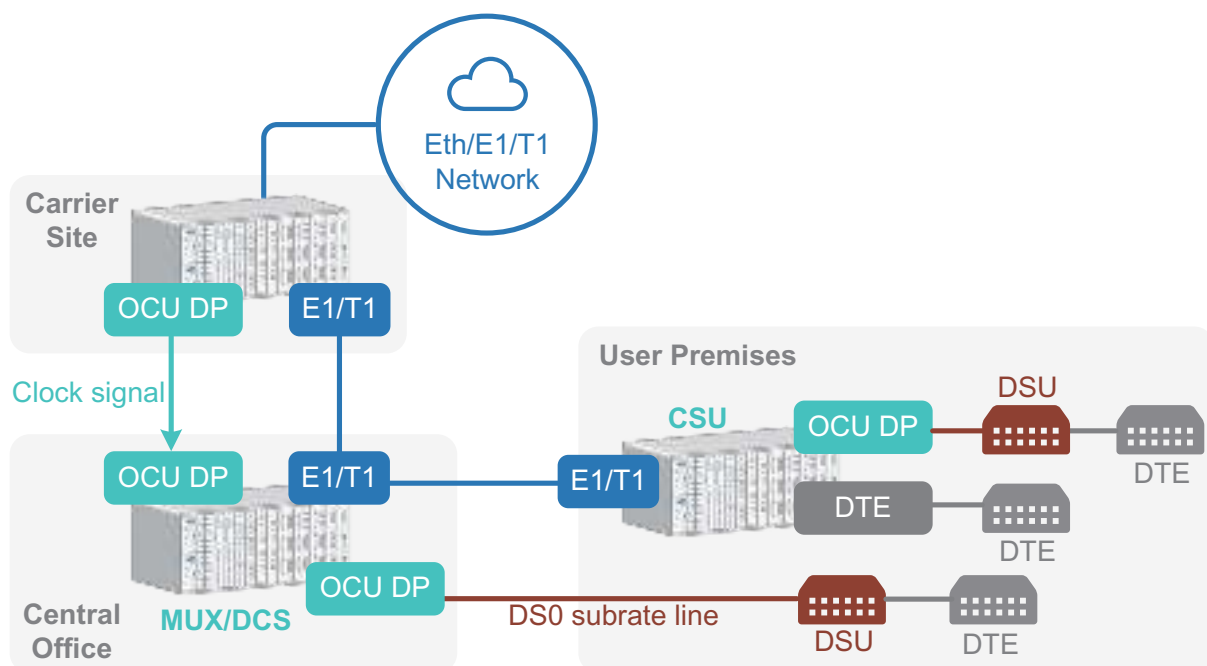- DDS or Switched 56
- Automatic line equalization

Description

OCUDP card is a single-slot interface card designed for 64K signals from switches, frame relay, and etc. with up to 5.5 km reach. OCU-DP is often used for leased lines to provide voice, video, and data service transportation. An AM3440 at the Central Office serves as a multiplexer (MUX) or DCS by connecting via OCUDP cards to user premises equipment for leased lines. At the user premises, an AM3440 can also work as CSU by connecting to the Central Office via E1/T1 cards, and to existing DSUs via OCUDP cards and DTE via DTE cards.

OCUDP serves with different additional functions when facing different sites. At the DDS and DTE sides, it can also provide diagnostic functions by sending test messages at different circuit levels. At the Central Office facing the Carrier side, the OCUDP can be used for clock synchronization by being a Slave Clock and receives clock messages from the OCUDP at the Carrier Sites that serves as a Master Clock.

Application Illustration

(ODP) 1-channel OCU-DP
For AM3440-B/C/D/E and V4200-9 Mini Slot

Features

- RJ45 & 4-wire non-loaded balanced loop connector
- Supports data transmission sub-rates up to 64kbps
- DDS or Switched 56
- Configuration software field upgradeable
- Automatic line equalization
- Can be multiplexed with other ports
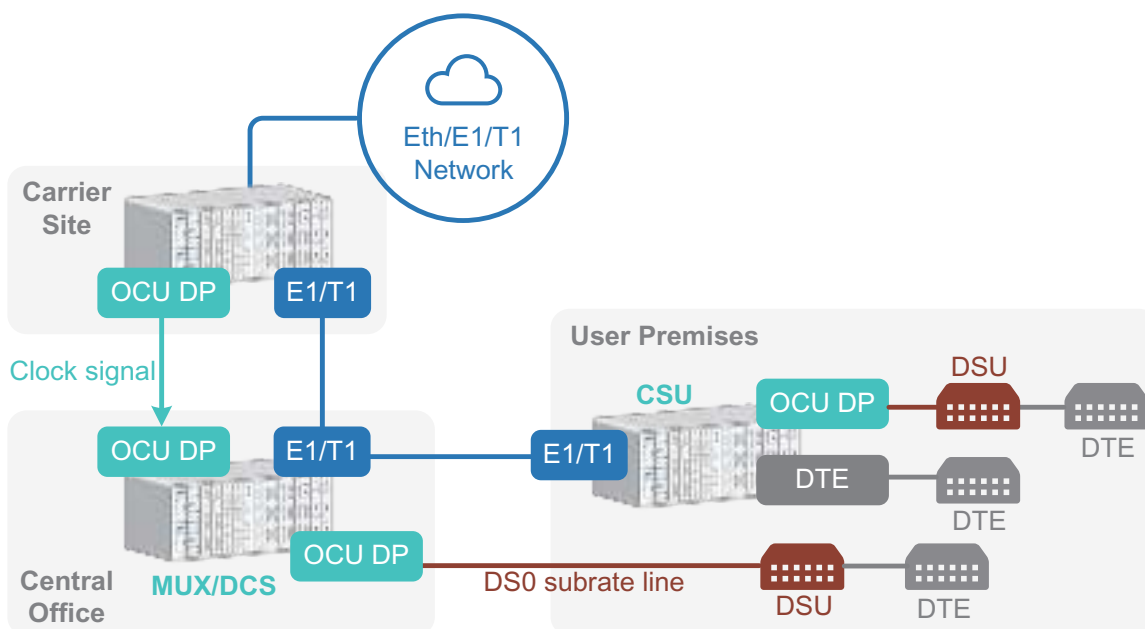- Easy configuration from SNMP, Telnet, and VT-100 terminal

For AM3440-B/C

Description

OCUDP card is a single-slot interface card designed for 64K signals from switches, frame relay, and etc. with up to 5.5 km reach. OCU-DP is often used for leased lines to provide voice, video, and data service transportation. An AM3440 at the Central Office serves as a multiplexer (MUX) or DCS by connecting via OCUDP cards to user premises equipment for leased lines. At the user premises, an AM3440 can also work as CSU by connecting to the Central Office via E1/T1 cards, and to existing DSUs via OCUDP cards and DTE via DTE cards.

OCUDP serves with different additional functions when facing different sites. At the DDS and DTE sides, it can also provide diagnostic functions by sending test messages at different circuit levels. At the Central Office facing the Carrier side, the OCUDP can be used for clock synchronization by being a Slave Clock and receives clock messages from the OCUDP at the Carrier Sites that serves as a Master Clock.

Application Illustration

Plug-in Modules

Low-speed (LS) Cards **Serial and Digital Access**

(3TS) 3-channel Terminal Server
For AM3440-A/B/C/D/E and V4200-9 Mini Slot

Features

- Terminal server functionality
- Up to 2 SYNC ports
- Up to 3 ASYNC ports
- Built-in router functionality
- Supports 5 IP addresses

Description

The Terminal Server module is a plug-in card that has both synchronous and asynchronous interface capability. It allows you to interface with raw RS232 data at the Network Control Center. It is designed for mini slots.

The Terminal Server module can support three RS232 interfaces. One interface (DTE3) is a fixed RS232 ASYNC interface. The other two interfaces (DTE1 and DTE2) can be configured as ASYNC or SYNC interfaces independently.

Router functionality is built inside the plug-in card. The main function of this plug-in is to convert PPP/SYNC, SLIP/ASYNC and raw data to IP packets. The IP packets will be sent to the routing engine on the card, and then sent to T1/E1 DS0 cross-connection on the XCU card.

Application Illustration

Terminal Server: Point-to-Multipoint Application
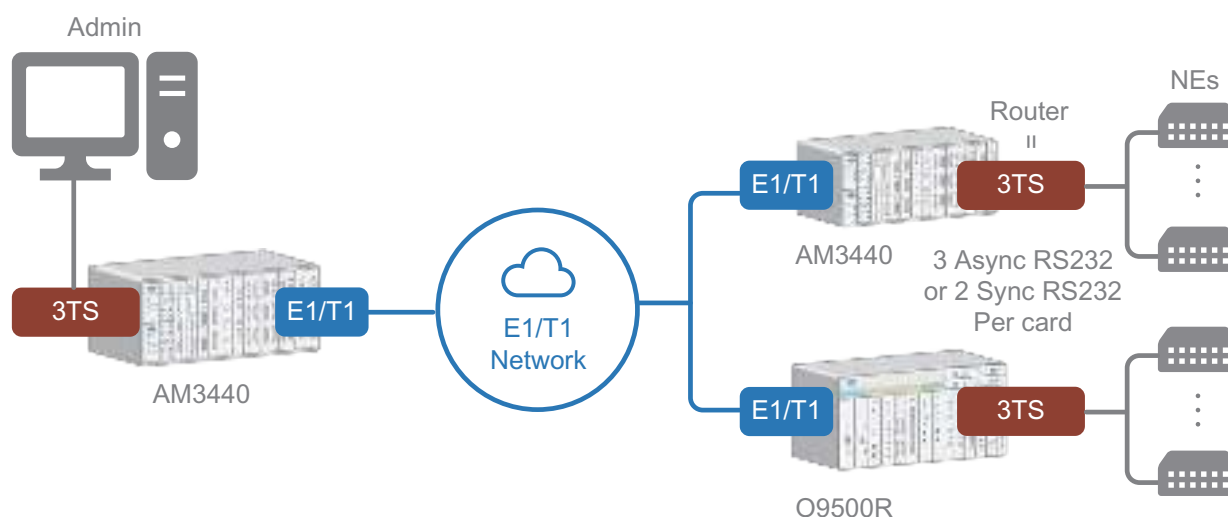
(12FXOA/FXSA) 12-channel FXO /FXS
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- 12 telephone connections for FXS
- 12 central office or PBX line connections for FXO
- Supports PLAR
- Loop start or Loop start/ground start option
- Battery reverse supported
- DID supported
- 12 kHz and 16 kHz metering pulse option
- A, B, C, D signaling bit software programmable
- A-law or µ-law coding
- Most signaling conventions supported
- Multi-color LED indicators for each port

12FXSA   12FXOA

Description

The 12FXSA/12FXOA plug-in cards are designed for the single slot of Loop-AM3440 series. It allows voice frequency interfaces to be multiplexed as a 64 kbps DS0 signal onto a digital network. 12FXSA provides 12 voice Interfaces connect to telephones. 12FXOA provides connections from telephone lines, either from a central office or from a PBX in RJ11 x 12 connectors. Coding is either A-law or µ-law selectable by user. Most popular signaling conventions are supported, including PLAR.

Application Illustration

(QFXSA) 4-channel FXS
For AM3440-A/B/C/D/E, O9550-A/C/D, and V4200-9 Mini Slot

Features

- 4 telephone connections
- PLAR supported
- 3 options supported: Loop Start, Ground Start, Metering Pulse
- Metering Pulse support 12KHz/16KHz
- User programmable signaling Bit A, B, C, D
- User programmable A-law or Mu-law coding
- User programmable gain adjustment
- User programmable balance 600/900 ohm impedance
- Complied with ±48 Vdc (SDB) and AC (SAB) power modules
- Signaling and voice tests
- Status monitoring

QFXSA Card Panel View
(for AM3440-A/B/C & O9550R-A/C)

QFXSA Card
(for AM3440-D/E & O9550R-D)

Description

The QFXSA plug-in card is designed for the Loop-AM3440-B/C and O9550-A/C. It allows voice frequency interfaces to be multiplexed as a 64 kbps DS0 signal onto a digital network. QFXSA provides connections to four telephones and it also provides user programmable A-law or mu-law coding. Most popular signaling conventions are supported, including PLAR (Private Line Automatic Ring down). The QFXSA supports signaling tests, including ring test, battery reverse test, channel swap, metering pulse test, and tip open test. Moreover, it supports status monitoring: line, signaling bit, and jump setting.

Application Illustrations

Plug-in Modules

Low-speed (LS) Cards **Voice and Analog Access**
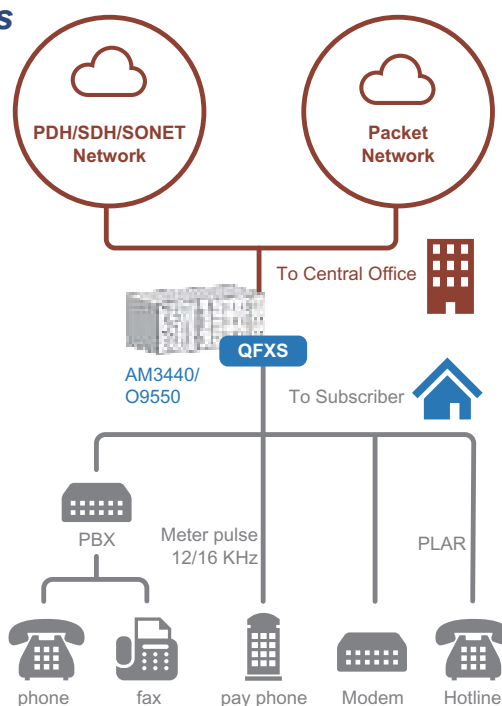
(12MAGA) 12-channel Magneto
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- 12 telephone connections for Magneto
- Supports MRD (manual ring down)
- Supports Magneto to FXS speak PLAR function
- Supports dual type L1/L2 and L1/GND magneto phone or MRD
- Per port software programmable for ringing and ring detection on L1/L2 or L1/GND
- 16 Vrms minimum detectable ring
- Intended for use with 110-220 Vac (SAB) or ±48 Vdc (SD, SDA, SDB, SD125) powered main units

Description

The twelve channel magneto (12MAGA) plug-in card is designed for the low speed single slot of Loop-O9500R, Loop-O9550-A/C, and Loop-AM3440-A/B/C devices. This module allows communications between magneto telephones. With the card set in PLAR mode, communications can take place between a magneto telephone and a regular telephone. All signaling is carried transparently by the digitizing process.

Application Illustrations
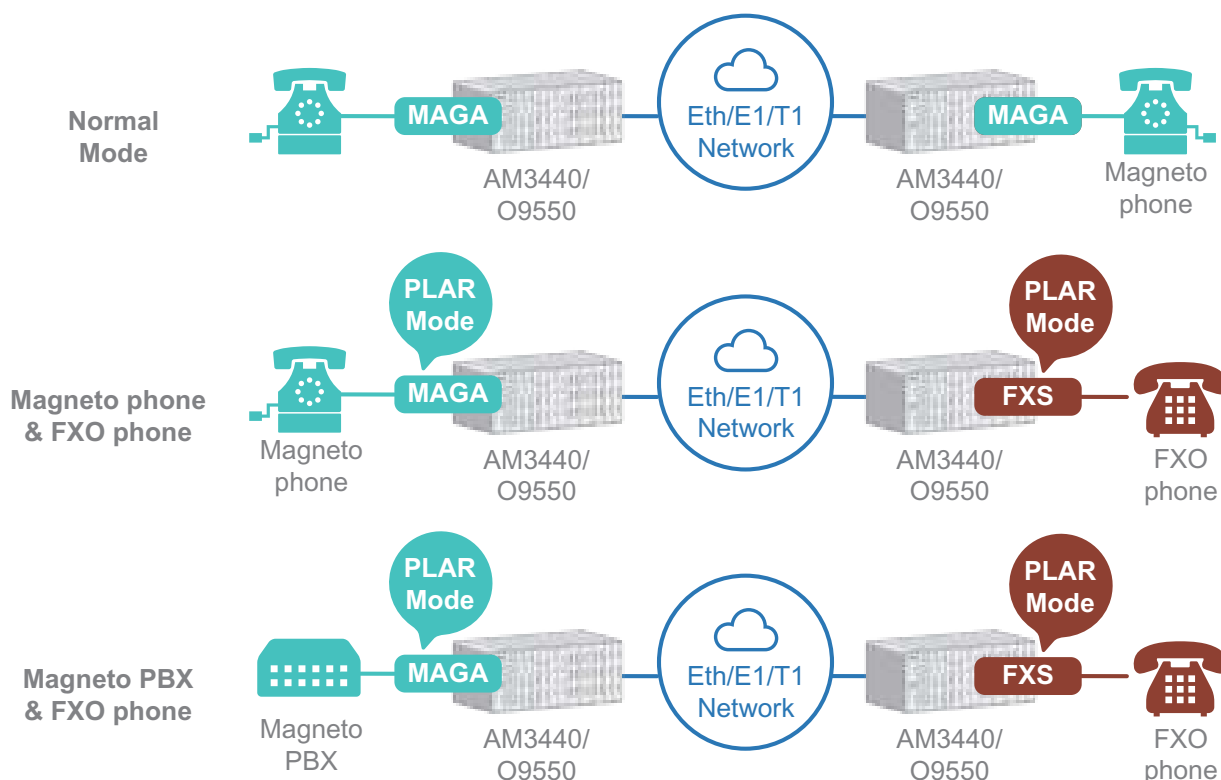
(QMAGA) 4-channel Magneto
For AM3440-A/B/C/E, O9550-D, and V4200-9 Mini Slot

Features

- 4 telephone connections for Magneto
- Supports MRD (manual ring down)
- Supports Magneto to FXS speak PLAR function
- Supports dual type L1/L2 and L1/GND magneto phone or MRD
- Per port software programmable for ringing and ring detection on L1/L2 or L1/GND
- 16 Vrms minimum detectable ring
- Intended for use with 110-220 Vac (SAB) or ±48 Vdc (SD, SDA, SDB, SD125) powered main units

Description

The four channel magneto (QMAGA) plug-in card is designed for mini slot. This module allows communications between magneto telephones. With the card set in PLAR mode, communications can take place between a magneto telephone and a regular telephone. All signaling is carried transparently by the digitizing process.

Application Illustrations

Plug-in Modules

Low-speed (LS) Cards   **Voice and Analog Access**
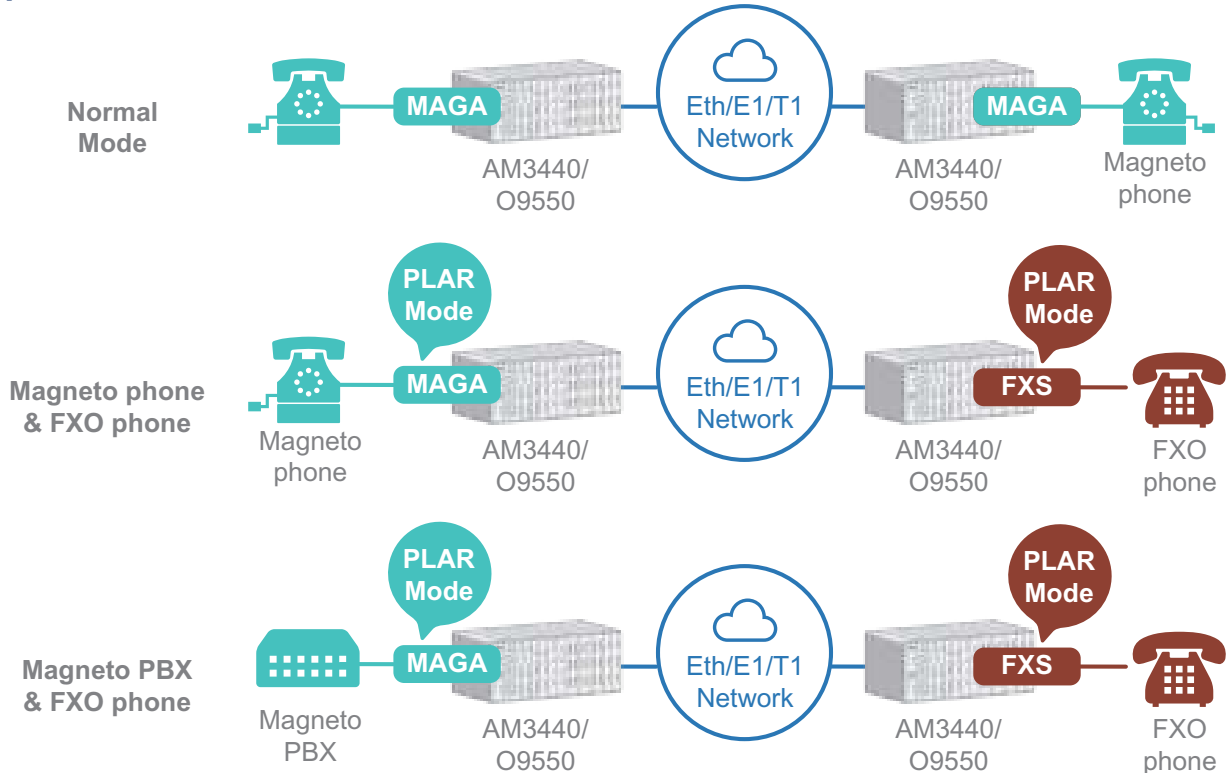
(8EMA) 8-channel 2W/4W E&M
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- Eight RJ45 connectors for E&M
- Supports E&M signaling over Type 1, Type 2, Type 3, Type 4 and Type 5
- Programmable gain setting per-port
- A side and B side supported
  (A side is exchange side, B side is carrier side)
- 2 wire, 4 wire supported
- Transmit only (TO) type supported
- A-law or µ-law coding
- Provides ±24, ±48 or ±125Vdc powered manufacture options

Description

Loop Telecom's E&MA plug-in card is designed for the single slots. It allows 8 ports E&M interfaces to be multiplexed to 64 kbps DS0 signals. It can also be used as TO (Transmit Only). Voice coding can be selected as either A-law or µ-law. Manufacture options are available to use on AM3440 system with ±24, ±48 or ±125Vdc power input.

Application Illustration
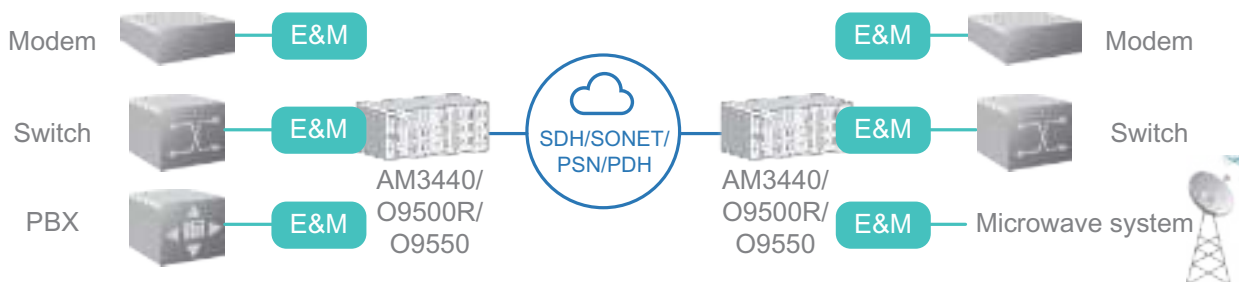
(QEMA) 4-channel E&M
For AM3440-A/B/C/D/E, O9550-A/C/D, and V4200-9 Mini Slot

Features

- Five E&M signaling types are supported: Type I, Type II, Type III, Type IV, and Type V
- Jumpers selectable for Type I, II, III, IV, V or Tx only
- TO (Transmit Only) supported
- A-side and B-side supported: A-side is exchange side; B-side is carrier side
- User programmable A-law or mu-law coding
- User programmable loss adjustment
- User programmable balance 600/900 ohm impedance
- CAS signaling convention
- Jumper selectable: 2/4 WIRE, A/B SIDE
- Support diagnostic functions, including:
  - off hook test
  - loopback test
  - LED display bit for signaling monitoring

QEMA Card (for AM3440-A/B/C & O9550R-A/C)

QEMA Card (for AM3440-D & O9550R-D)

Description

The QEMA card requires an external cable to support 4-RJ45 ports for connecting to PBX tie lines, carrier facilities, or 4-wire modems. Each RJ45 port has 8 pins supporting the following signaling and transmission pairs: E/M, SG/SB, T/R, and T1/R1.

The card can configure different types, A/B side and 2/4 wire options by jump location. Users can utilize additional jumpers enclosed in the package for Type I, II, III, IV, V and TO (Transmit Only) signaling options. Type TO provides dedicated 4-wire transmit and receive paths to lease-line modem equipment. There are choices of two side: Using A side mode, the card can operate as switching equipment. Using B side mode, the card can operate as channel equipment. There are 3 diagnostic functions supported: off hook test, loopback test, and LED display bit for signaling monitoring. Moreover, users could have LEDs provide channel setting and channel status indicators.

Application Illustration

Modem — E&M

Switch — E&M — AM3440/ O9550 — SDH/SONET/ PSN/PDH — AM3440/ O9550 — E&M — Switch

PBX — E&M

E&M — Modem

E&M — Microwave system

Plug-in Modules

Low-speed (LS) Cards   **Data Processing**
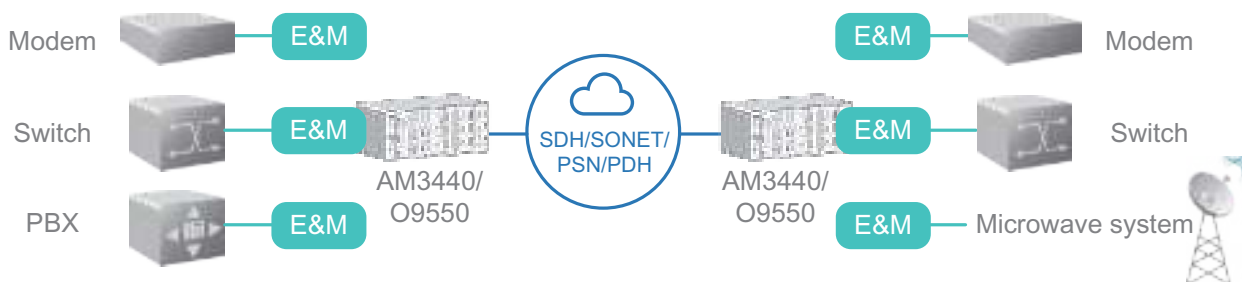
(8DBRA) 8-channel Data Bridge
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- Hot pluggable single slot card for O9500R, O9550, and AM3440 series
- ASYNC RS232 data only
- Two card types, both support 8 ports RS232 ASYNC
  - 8 RJ48C card
  - 2 RJ48C + 2 DB44 card
- Data bridge features
  - Each card supports up to 128 DS0
  - Each port supports bridge functionality to N remote tributary sites (N = 1-20)
  - Works with the other equipment in the transmission of 1200 to 19200 bps asynchronous data via oversampling channel
- Protection
  - 1+1 port protection
  - 1+1 slot protection, switching time < 50 ms
  - Dual Host Data Server
- LED status indicator

Description

The Data Bridge Card for Loop-O9500R, Loop-O9550, and Loop-AM3440 series has 8 RS232 ports. On the Data Bridge Card, each RS232 port uses data bridge function on 1DS0 sync 56 kbps or 64 kbps channel to get the ASYNC data from the host data server (ASYNC data rate ranges from 1.2K bps - 19.2K bps). Then the host data server will broadcast the data to the remote tributary site.

Under operation, 1 to 20 end points per multi-drop circuit go into a logical ended 56K or 64K channel, and the data at the tributary and the host end enters the channel banks through RS232 synchronous interfaces. The primary is then either mapped out the RS232 synchronous port, or is mapped to another upstream DS0. Each port RS232 could support the data bridge function reaching to 20 remote tributary sites. Each tributary is asynchronous data sent over synchronous channel using over-sampling techniques.

Protection can be (a) 1+1 on a pair of ports on the same card which provides line protection, (b) 1+1 on pair of ports on adjacent cards which provides card protection, or (c) 1+1 on a pair of ports on different chassis which provides chassis and site protection.

Note: Although the Data Bridge Cards serve the same hardware function on O9500R, O9550, and AM3440, they have different firmware.

Applications

The host data server is responsible for sending requests to the target tributary site. Only one tributary site is allowed to send data to the host data server at a time. When the tributary site gets the request, it sends ASYNC data through E1/T1 network into the O9500R, O9550, and AM3440 devices. The data from the tributary sites could either travel on separate DS0 within a single E1/T1 Network, or within separate E1/T1 Networks. The data goes into the O9500R, O9550, and AM3440 through the QE1/QT1 card, TSI connect mapping and the Data Bridge Card, then to the host data server.
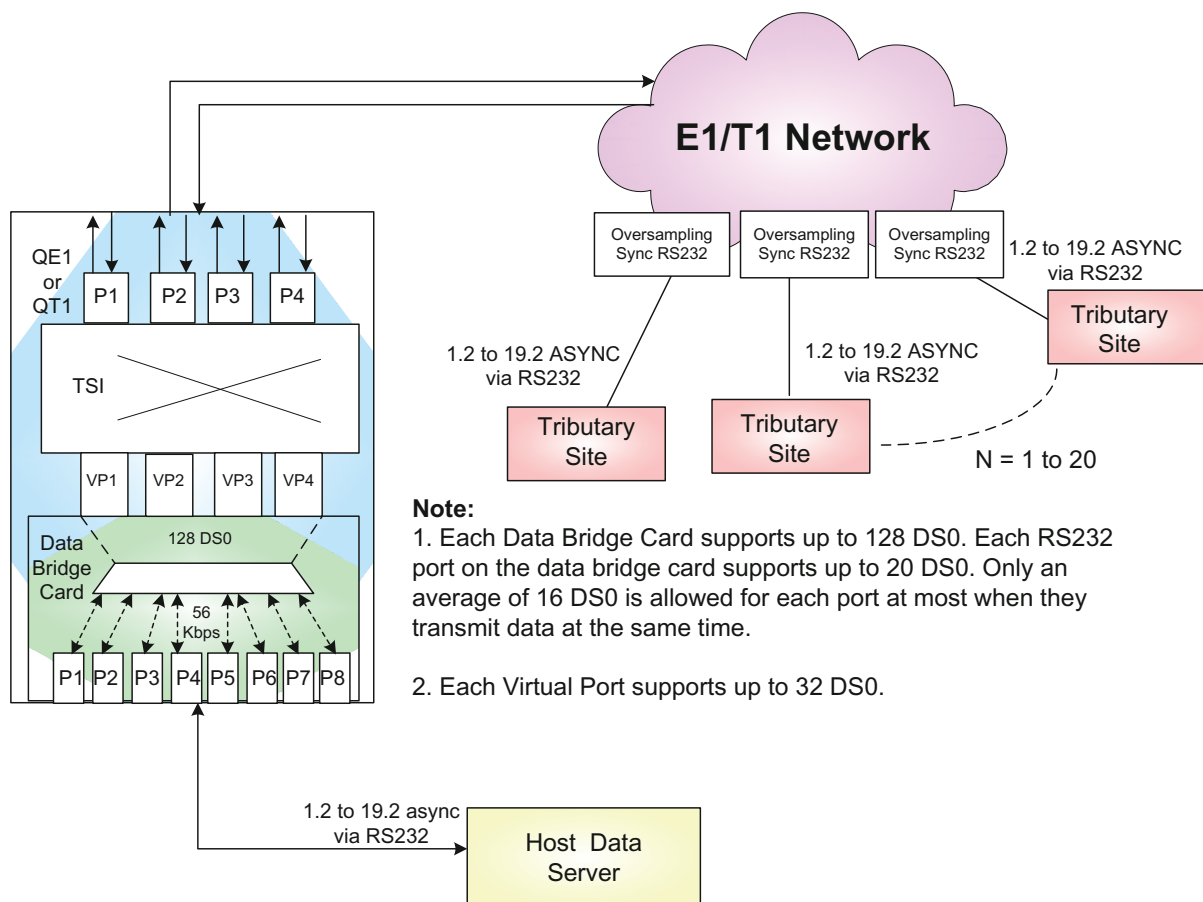
Note:

1. Each Data Bridge Card supports up to 128 DS0. Each RS232 port on the data bridge card supports up to 20 DS0. Only an average of 16 DS0 is allowed for each port at most when they transmit data at the same time.

2. Each Virtual Port supports up to 32 DS0.

Port-level 1 + 1 backup with one card

RS232 port1 and 5, port 2 and 6, port 3 and 7, port 4 and 8 work in pairs to support 1+1 backup function. Port1 to port 4 connects to the active host data server, and port 5 to port 8 connects to the backup host data server.
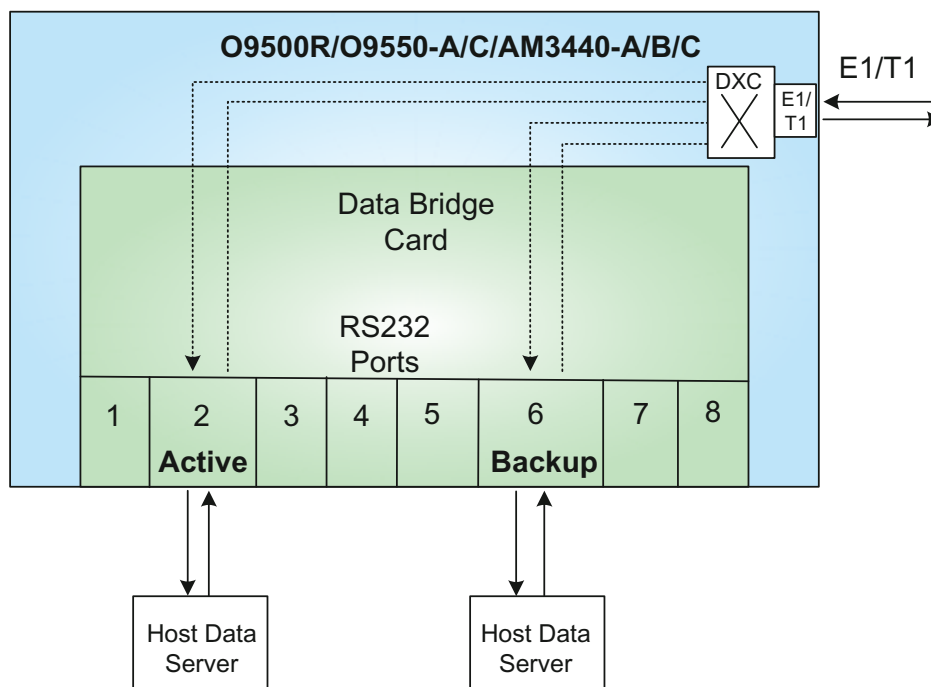
Card-level 1 + 1 backup with two cards

The Data Bridge Cards in slot 1 and 2, slot 3 and 4, slot 5 and 6…slot 11 and 12 work in pairs for card-level 1+1 backup function.
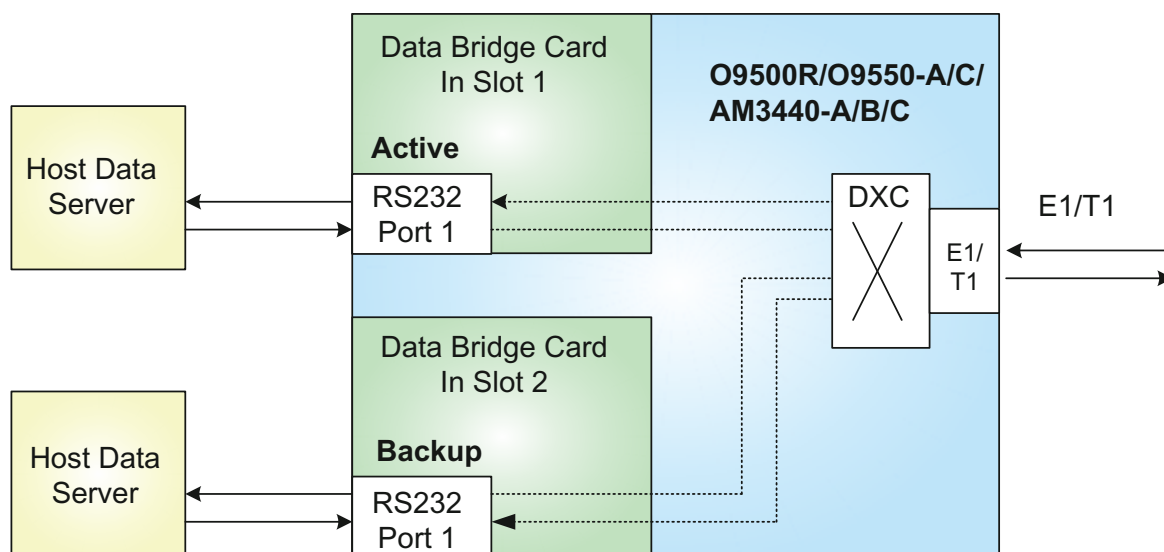
Site-level 1 + 1 backup with two chassis

The data bridge card supports dual host data box function. When one host data server fails, the other host data server takes over and sends the data to the remote tributary data boxes.

Site A (Active)

Site B (Backup)

Plug-in Modules

Low-speed (LS) Cards   **Packet Access**
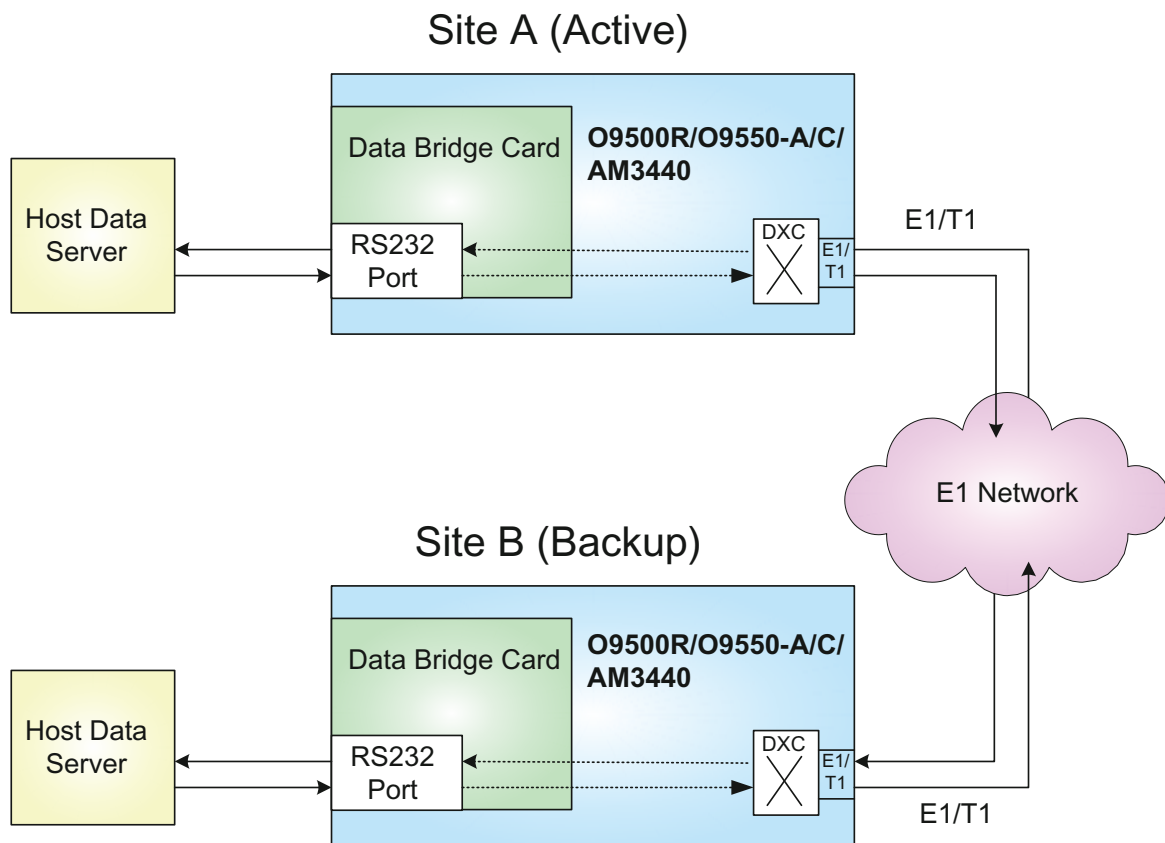
(RT) 2-LAN port/32 WAN port Router
For V4200-9 Mini Slot

Features

- 10 BaseT, 10 /100 BaseT interfaces
- Routing protocols RIP-I, RIP-II
- Software field upgradable
- Data rates channelized N x 64 kbps up to T1/ E1 capacity
- Supports TCP/IP, PPP, HDLC protocols
- Management through VT-100 and SNMP
- RJ45 connectors

Description

The router plug-in card is designed for the Loop-AM3440 Access DCS-MUX series. When used with the Loop-AM3440 series, this card combines the function of a router and one DTE. With this card, access from LAN to WAN is accomplished within one box, saving both space and money.

Application Illustrations

As a router
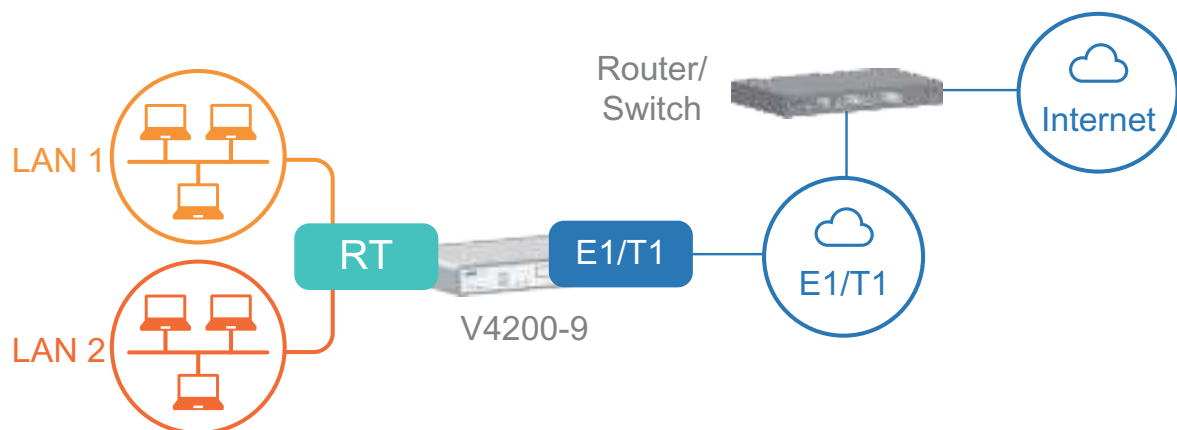
As LAN bridges
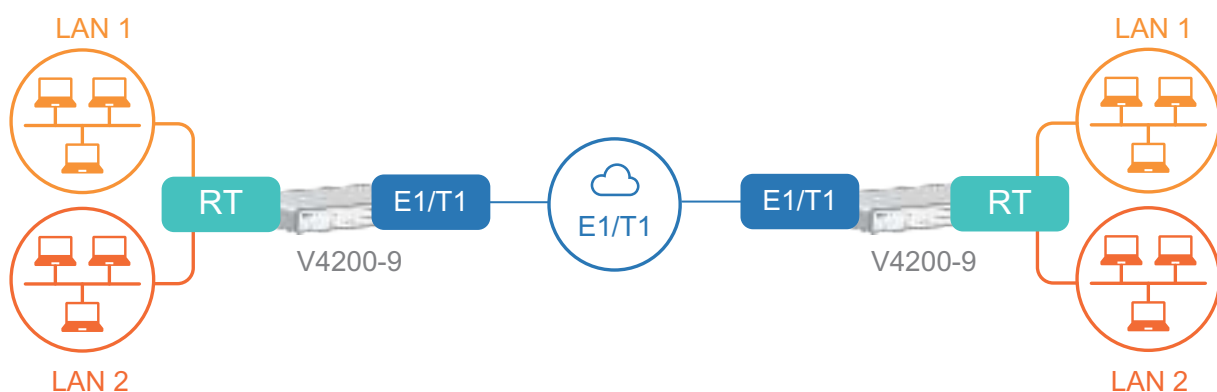
Remote Management via in-band
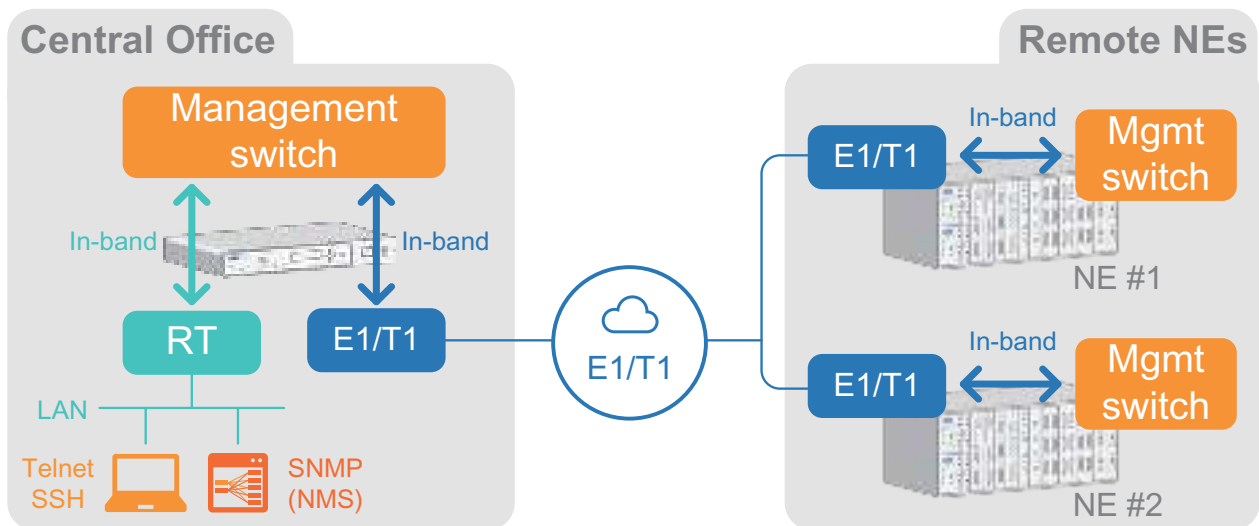
(RTA) 2-LAN port/64 WAN port Router-A
For AM3440-A/B/C/D/E and O9550-A/C/D Mini Slot

Features

- 10/100 Base T interfaces
- Auto MDI/MDI-X crossover
- Routing protocols RIP-I, RIP-II, OSPF, and static
- Remote bridge
- Software field upgradeable
- Supports protocols: PPP, MLPPP, HDLC, Frame Relay, and Cisco compatible HDLC
- VLAN-ID mapping
- Up to 64 WAN ports with aggregate data rate of 4 Mb/s
- Remote bridge support (padding/un-padding Ethernet FCS)
- Supports of QoS (Quality of Service)
- Support IEEE 802.1ad VLAN Q-in-Q

For AM3440-A/B/C & O9550-A/C

For AM3440-D/E & O9550-D

Description

The Router-A card is designed for the one mini slot Loop-AM3440 series and O9550-A/C chassis. When used within the Loop-AM3440 series and O9550-A/C chassis, this card acts as a router, directing Ethernet traffic to and from multiple WAN channels. With this card, access from LAN to WAN is accomplished within one card, saving both cost and space.

Application Illustrations

As a router

As LAN bridges

LAN 1

RT — AM3440/O9550 — E1/T1 — E1/T1 (cloud) — E1/T1 — AM3440/O9550 — RT

LAN 2

LAN 1

LAN 2

Remote Management via in-band

Central Office

Management switch

In-band

In-band

RT

E1/T1

LAN

Telnet SSH

SNMP (NMS)

E1/T1 (cloud)

Remote NEs

In-band

E1/T1 — Mgmt switch

NE #1

In-band

E1/T1 — Mgmt switch

NE #2

Plug-in Modules

Low-speed (LS) Cards   **Packet Access**

(RTB) 8-LAN-port/ 64-WAN-port Router-B
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- Eight ports of 10/100BaseT interfaces
- Auto MDI/MDI-X crossover
- Routing Protocol: RIP-I, RIP-II, OSPF (Open Shortest Path First) and static route
- Remote Software Upgradeable
- Supporting Protocols: PPP, MLPPP, HDLC, Frame Relay, and Cisco compatible HDLC
- VLAN-ID mapping
- Up to 64 WAN ports with aggregate data rate of 8 Mbps
- Remote bridge support (padding/un-padding Ethernet FCS)
- Support of QoS (Quality of Service)
- Support IEEE 802.1ad VLAN Q-in-Q

Description

The Router-B plug-in card is designed for the single slot of Loop-O9500R, O9550-A/C, and AM3440-A/B/C devices. When used within the Loop-O9500R, this card combines the function of a router and directs Ethernet traffic to/from multiple WAN channels. Access from LAN to WAN is accomplished within one card, saving both space and money.

Note: Although the Router-B Interface Cards serve the same hardware function on O9500R, O9550, and AM3440, they have different firmware.

Application Illustrations

As a router

As LAN bridges

LAN 1
LAN 2
RT
E1/T1
E1/T1
E1/T1
RT
LAN 1
LAN 2
AM3440/ O9500R/ O9550
AM3440/ O9500R/ O9550

Remote Management via in-band

Central Office
Remote NEs
Management switch
In-band
In-band
RT
E1/T1
LAN
Telnet SSH
SNMP (NMS)
E1/T1
E1/T1
In-band
Mgmt switch
NE #1
E1/T1
In-band
Mgmt switch
NE #2

Plug-in Modules

Low-speed (LS) Cards   **Teleprotection Access**
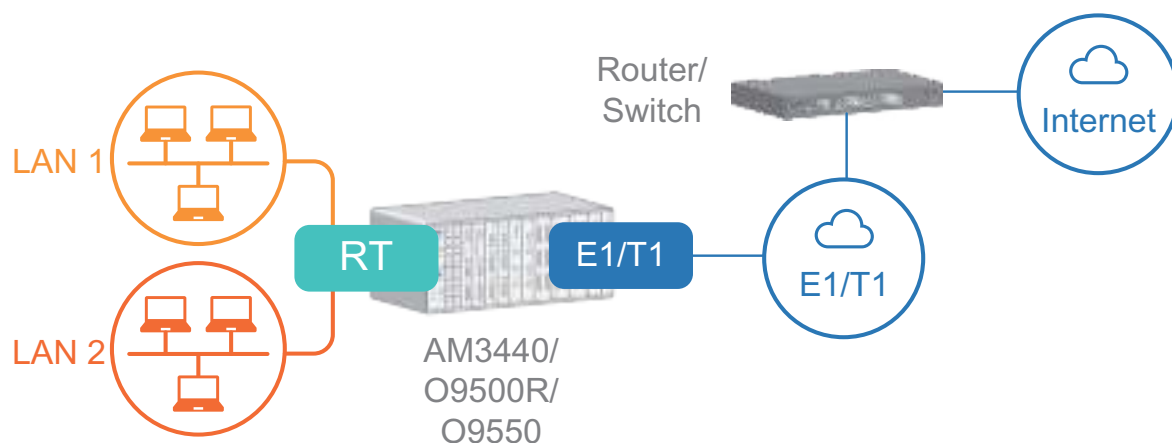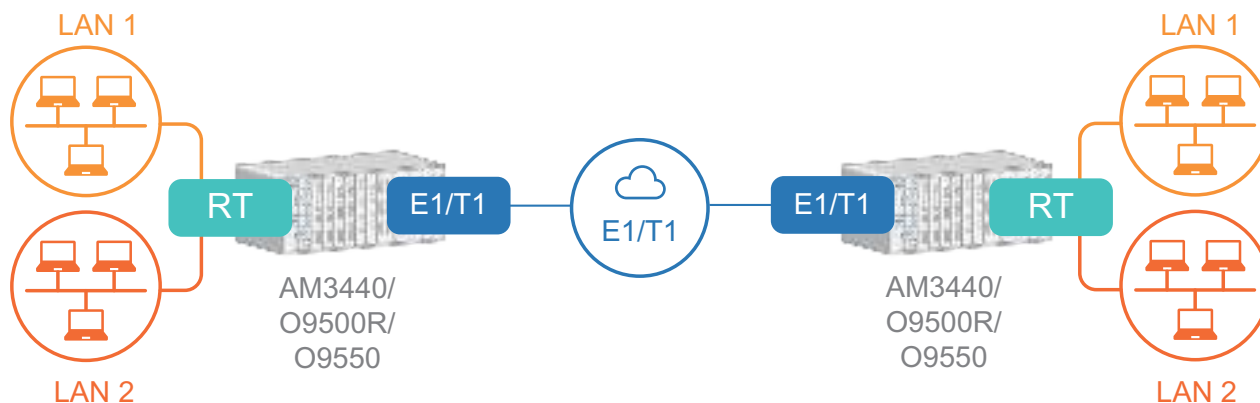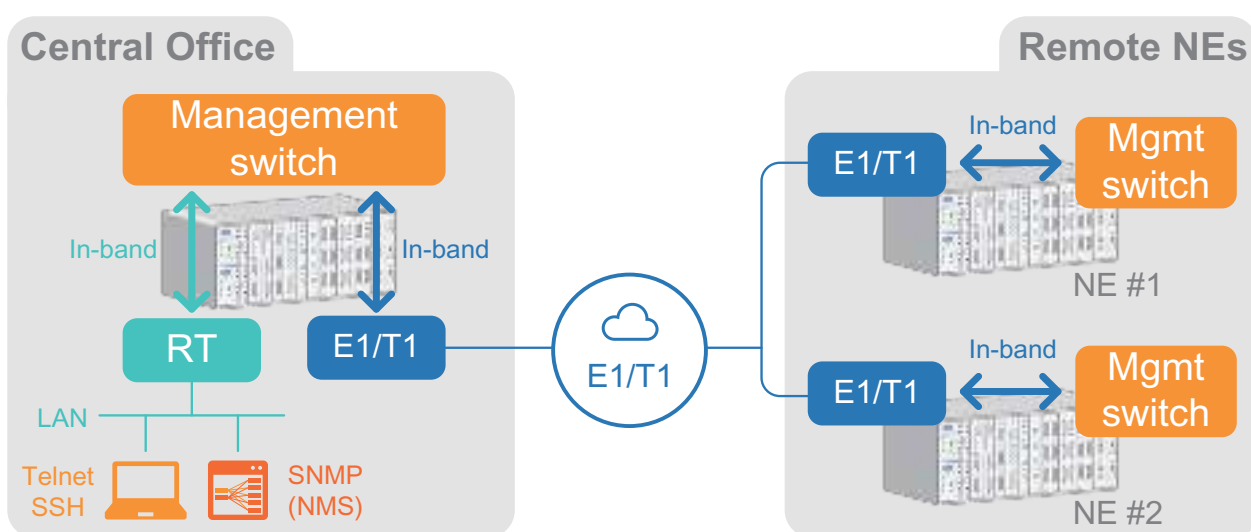
(C37.94) 1/4-channel low-speed optical
For AM3440-A/B/C, O9500R, and O9550-A/C Single Slot

Features

- Optical fiber interface for C37.94 signals
- 1-port or 4-port per card
- Per-port data rate up to 12 x DS0(64kb)
- Loopback and BERT for diagnostics
- Multi-color LED indicators
- With ALS (Automatic Laser Shutdown)

Description

The LS-Fiber Optical interface is a low-speed single-slot plug-in card designed for O9500R series to transport C37.94 teleprotection signals between power substations. Each port of the interface supports a configurable bandwidth of 1 to 12 DS0 (64K), and is protected by Automatic Laser Shutdown (ALS). Teleprotection signals are then cross-connected by the XCU to merge onto E1/T1, SDH/SONET, or Packet Network for transportation. Link and module integrity can be diagnosed via loopback signals.

1-port and 4-port Optical Fiber   4-port SFP

Application Illustration
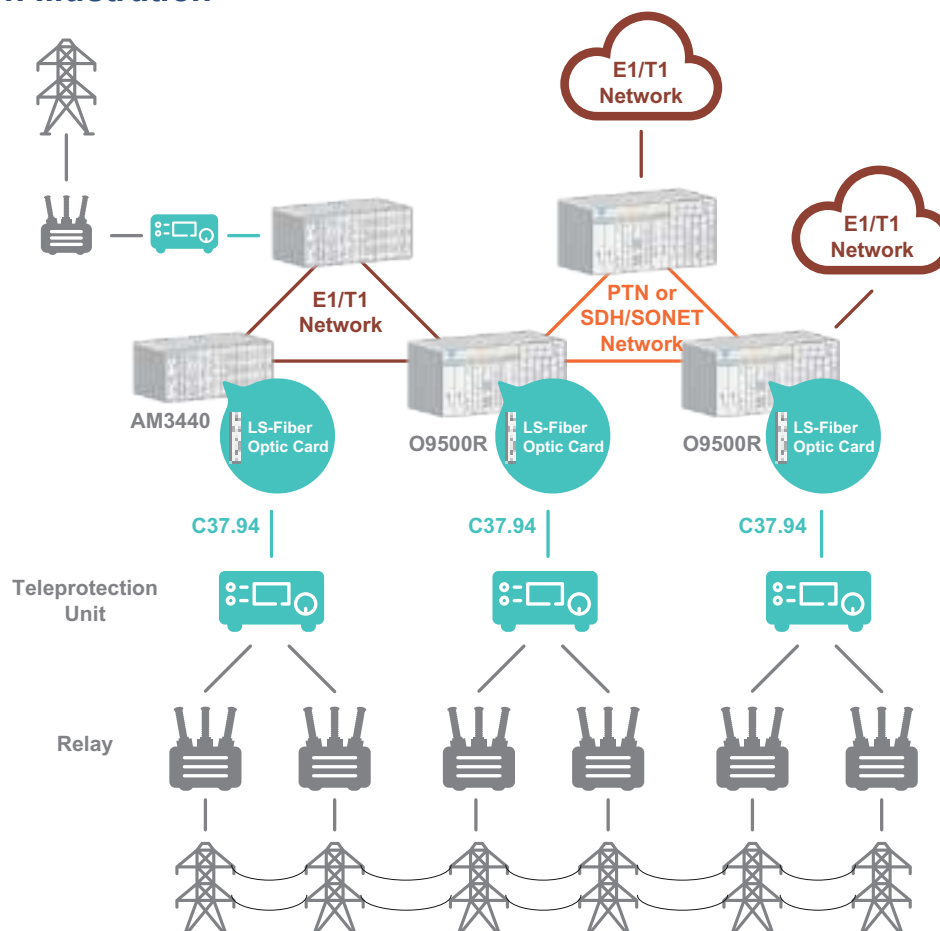
(C37.94) 1-channel low-speed optical
For AM3440-A/B/C/D/E and O9550-A/C/D Mini Slot

Features

- 1 port per card, single slot to AM3440 series
- Supports data rates up to 12x64kb
- Provide multi-color LED indicator
- With ALS (Automatic Laser Shutdown)

Description

The LS-Fiber Optical plug-in mini card is designed for the single slot of Loop-AM3440 series as embedded 1 C37.94 low speed optical interface. This card can aggregate 1 to 12 DS0 channels to single fiber optical interface to connect with another Loop-AM3440 or C37.94 Modem.

Left: for AM3440-A/B/C & O9550R-A/C
Right: for AM3440-D/E & O9550R-D

Application Illustrations

Plug-in Modules

Low-speed (LS) Cards | **Teleprotection Access**
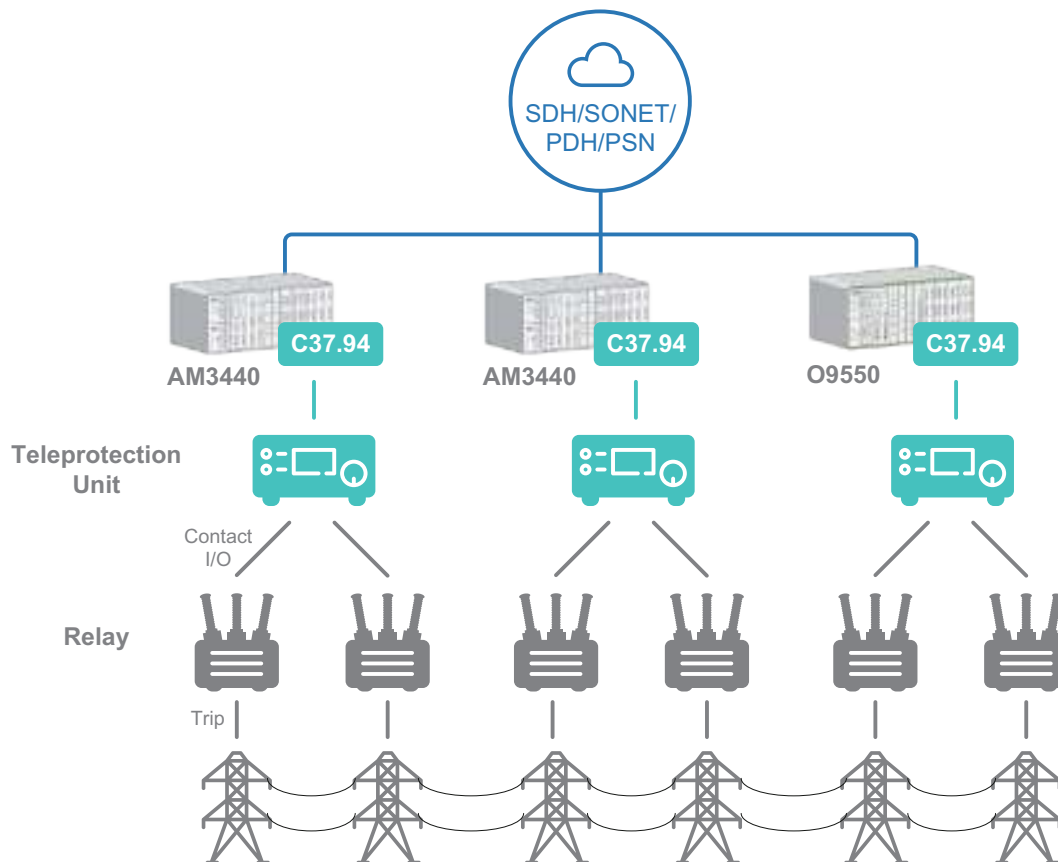
(TTA) Transfer Trip card
For AM3440-A/B/C, O9500R, and O9550-A/C Dual Slot

Features

- Dual slot plug-in module for AM3440-A/B/C
- Four ports for DTT input and output using bi-directional DS0
- Supports point-to-point and point-to-multipoint architectures
- For point-to-point architecture, each input port is associated with one DS0 in a communication link to a remote output port
- For point-to-multipoint architecture, each input port is associated with N X DS0's, where N = 2 or 3, in a communication link to N remote output ports
- Capable of measuring and recording round-trip delay.
- Dependency: 30000 cycle test without command loss.
- Availability: greater than 99.997% up-time.
- Multiplexing up to 4 input signals over one 64K channel
- Can be used for other on/off-type command protection relay schemes such as Permissive*, and Blocking*.

* Future Option

Description

The Transfer Trip Card is designed for the AM3440 series which is for transfer trip function. It can be used in a protection system to send a trip command to remote circuit breakers.

The Transfer Trip card is a dual slot module provides four ports of input and output using bi-directional DS0's.

The Transfer Trip Card is capable of measuring and recording round trip delay. The measurement is run continuously and an alarm is generated if the round trip delay exceeds a user preset value. Besides, the Transfer Trip card provides several user configurable timers to fit application requirement and keep the proper operations of the system.

Application Illustrations
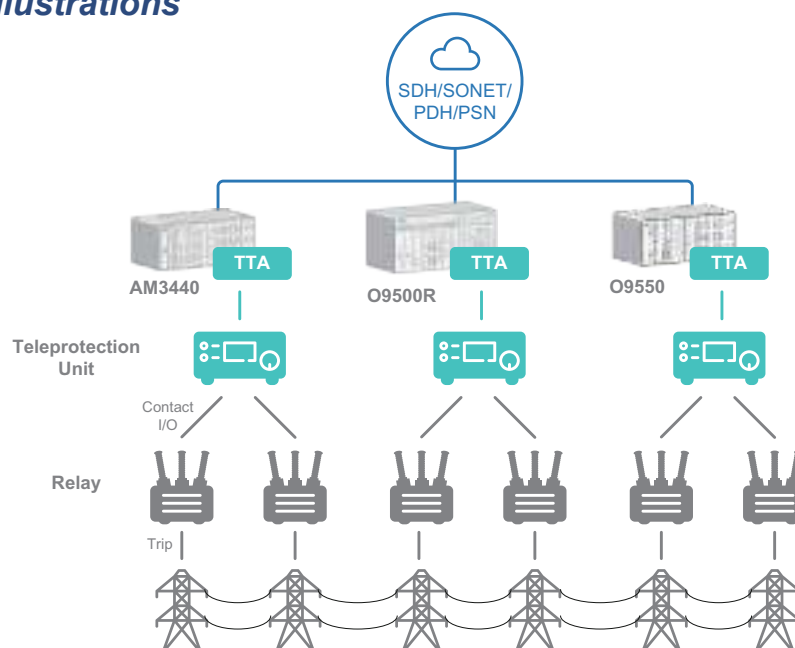
6

Ethernet Access and Switch

Loop-IP6320A L2/L3 Intelligent Switch

Description

The Loop-IP6320A is a high performance Ethernet switch to meet next generation Metro, Data Center and Enterprise Ethernet network requirements designed based on high-end scalable chipset with integration of Layer 2 to Layer 4 packet processing engine, traffic management and fabric interface.

The IP6320A switch provides total 24/48 GbE ports with RJ45 ports. The switch capability of IP6320A supports 120Gbps non-blocking switching for full line speed traffic.

The IP6320A provides advanced L2/L3 features to meet the requirements in Carrier Ethernet and Enterprise network application. IP6320A main features including full IPv4/IPv6 stack, On-chip OAM (802.1ag/CFM/EFM), and Protocol Independent APS (<50ms protect switching).

Features

- Capacity
  - 8 x 10GbE ports
  - 24*/48 GbE ports
  - 120 Gbps Wire-Speed Bi-dir Switching Capacity
- Carrier Ethernet
  - VLAN (IEEE 802.1q)
  - Q-in-Q Vlan stacking (IEEE 802.1ad)
  - Port-based VLAN (IEEE 802.1q)
  - Up to 4K VLAN
  - Port Isolation (Private Vlan)
  - Jumbo frame up to 9600 bytes
  - Ethernet Link OAM – 802.3ah (EFM)
  - Ethernet Service OAM – 802.1ag (CFM)/Y.1731
- CoS/QoS
  - Class-to-Priority Mapping per CoS (802.1p)
  - Ingress Policing & Egress Shaping per service
  - CIR / PIR (EIR) 2-rate-3-color traffic engineering
  - 8 Priority Queues
  - Scheduling: Strict Priority, WRR with Hierarchy
  - IEEE 802.3x Flow Control
- Layer 3
  - ARP, Ping, Traceroute
  - Static Route
  - RIP v1/v2
  - OSPF
  - IGMP v1/v2/v3
  - PIM-SM

- Network Protection
  - ERPS (G.8032) Ethernet Ring Protection with sub-50ms switching
  - ELPS (G.8031) Ethernet Linear Protection
  - STP, RSTP, MSTP
  - LACP, ECMP*
  - VRRP
- Management
  - SNMP (v1, v2, v3)
  - Fully manageable via CLI
  - Security
    - SSH, Telnet
  - Configuration upload/download using TFTP
  - RMON Performance management
  - Syslog, NTP, DNS*
  - Port & Vlan Mirror
- Power Supply
  - DC48: Hot swappable DC48 module for system power, dual for redundancy
  - AC: Swappable wide-range AC module*
  - DC Mux: Swappable DC Mux module can work with 2 external 12VDC inputs for system power
- Miscellaneous
  - Harden environment option (-40 ºC to 70 ºC)*
- RoHS compliance

* Future option

Application Illustration
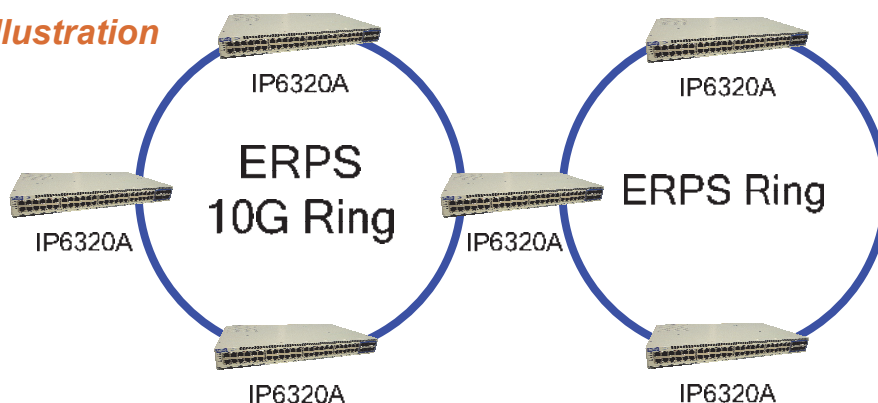
Loop-IP6320B L2/L3 Intelligent Switch

Description

The Loop-IP6320B is a high performance Ethernet switch to meet next generation Metro, Data Center and Enterprise Ethernet network requirements designed based on high-end scalable chipset with integration of Layer 2 to Layer 4 packet processing engine, traffic management and fabric interface.

The IP6320B switch provides total 48 GbE ports with RJ45 ports. The switch capability of IP6320B supports 120Gbps non-blocking switching for full line speed traffic.

The IP6320B provides advanced L2/L3 features to meet the requirements in Carrier Ethernet and Enterprise network application. IP6320B main features including full IPv4/IPv6 stack, On-chip OAM (802.1ag/CFM/EFM), and Protocol Independent APS (<50ms protect switching).

Features

- Capacity
  - 8 x 10GbE ports
  - 48 GbE ports
  - 120 Gbps Wire-Speed Bi-dir Switching Capacity
- Carrier Ethernet
  - VLAN (IEEE 802.1q)
  - Q-in-Q Vlan stacking (IEEE 802.1ad)
  - Port-based VLAN (IEEE 802.1q)
  - Up to 4K VLAN
  - Port Isolation (Private Vlan)
  - Jumbo frame up to 9600 bytes
  - Ethernet Link OAM – 802.3ah (EFM)
  - Ethernet Service OAM – 802.1ag (CFM)/Y.1731
- CoS/QoS
  - Class-to-Priority Mapping per CoS (802.1p)
  - Ingress Policing & Egress Shaping per service
  - CIR / PIR (EIR) 2-rate-3-color traffic engineering
  - 8 Priority Queues
  - Scheduling: Strict Priority, WRR with Hierarchy
  - IEEE 802.3x Flow Control
- Layer 3
  - ARP, Ping, Traceroute
  - Static Route
  - RIP v1/v2
  - OSPF

- IGMP v1/v2/v3
- PIM-SM
- Network Protection
  - ERPS (G.8032) Ethernet Ring Protection with sub-50ms switching
  - ELPS (G.8031) Ethernet Linear Protection
  - STP, RSTP, MSTP
  - LACP, ECMP*
  - VRRP
- Management
  - SNMP (v1, v2, v3)
  - Fully manageable via CLI
  - Security
    - SSH, Telnet
  - Configuration upload/download using TFTP
  - RMON Performance management
  - Syslog, NTP, DNS*
  - Port & Vlan Mirror
- Power Supply
  - DC48: Hot swappable DC48 module for system power, dual for redundancy
  - AC: Hot Swappable wide-range AC module
- Miscellaneous
  - Harden environment option (-40 ºC to 70 ºC)
  - RoHS compliance

* Future option

Application Illustration

Ethernet Access and Switch
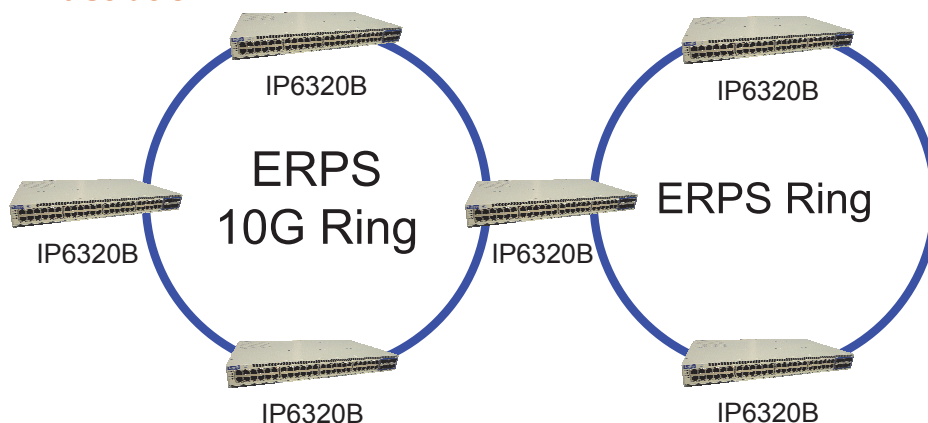
Loop-IP6330 L2 GbE Intelligent Switch

Features

- 1 U height
- 24 GbE ports
  - 24 ports of RJ45 (10/100/1000Mbps-TX) interfaces, Full/Half duplex auto-negotiation
- L2 Switch functions:
  - VLAN
  - Jumbo Frame reach up to 9600 bytes
  - Max. 1024 active VLAN with VID (1 to 4094)
  - Port-based VLAN
  - Rate Control
  - QoS
    - 8 priority queues per port
    - Strictly Priority or Weighted Round-Robin (WRR) scheduling
  - Port Rate limiting for ingress/egress traffic
- Storm control
- MAC table size 8k
- LACP for link aggregation (IEEE 802.3ad)
- IGMP snooping and query
- Software Upgrade
- Event Log
- Management port and interface
  - Embedded SNMP v1, v2c
  - Telnet
  - Web Management (Http)
- IEEE compliance
  - 802.1p
  - 802.3, 802.3u, 802.3ab, 802.3x, 802.3az
- RoHS compliant

Description

The Loop-IP6330 L2 GbE Intelligent Switch is a cost-effective 24-port GbE L2 Ethernet switch that offers high performance and quality service at a very affordable price.

The IP6330 switch provides total 24 GbE ports with 24 RJ45 ports. The switch capability of IP6330 supports non-blocking for full line speed traffic.

The IP6330 supports lots of L2 switch management functions including. 802.1Q VLAN, Rate Control, Port Configuration, Port Mirroring, Port Statistics, QoS functions, ... etc. The console interfaces of IP6330 supports remote management by SNMP, HTTP, HTTPS, and Telnet interfaces.

Application Illustration
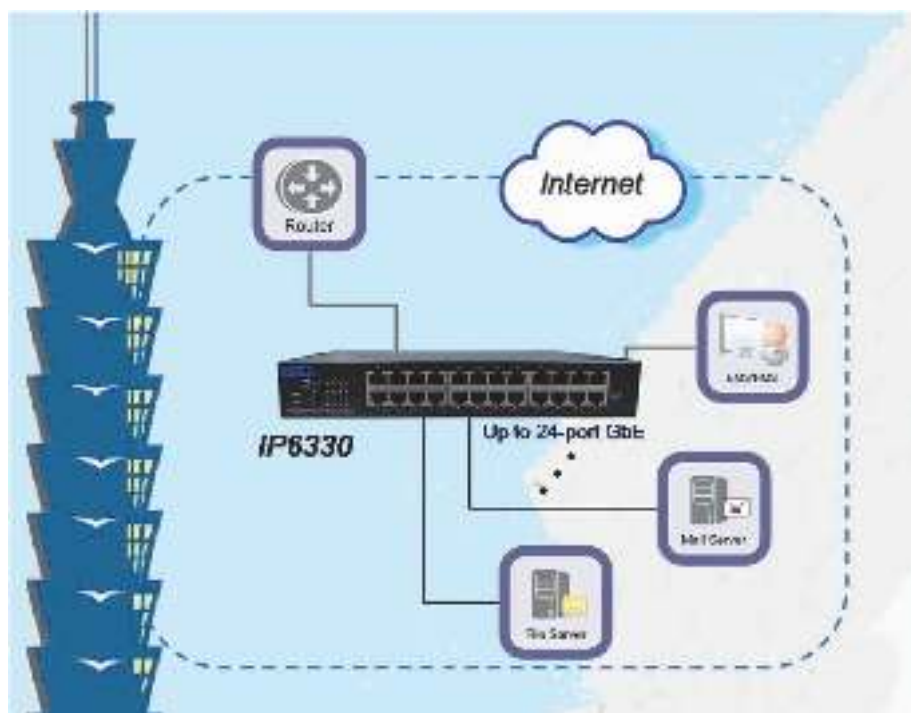
Loop-IP6340 L2 Smart Management Ethernet Switch

Features

- Connector
  - 24 GbE (10/100/1000 Mpbs) RJ45 ports
  - 4 SFP (1000 Mpbs) fiber ports
- Port settings
  - Auto/Full/Half Duplex
  - Auto-negotiation
- L2 Switch functions
  - VLAN
    - Static, port-based, tag-based, Voice OUI
  - Jumbo Frame 64 to 9216 bytes
  - VLAN ID (1 to 4094)
  - Rate Control
  - QoS
    - 8 priority queues per port
    - Strictly Priority (SP) scheduling
    - Weighted Round-Robin (WRR) scheduling
    - Cos, DSCP, IP precedence
    - Port Rate limiting for ingress/egress traffic
- Spanning Tree Protocol (STP) Modes
  - STP
  - Rapid STP (RSTP)
  - Multiple STP (MSTP)
- Device discovery protocol
  - LLDP, LLDP-MED
- IEEE compliance
  - 802.3, 802.3u, 802.3ab, and 802.3x
  - 802.3az EEE enable and disable
  - Flow control
- Management
  - Telnet, HTTP, HTTPS, SNMP
- Security
  - Protected Port
  - Storm Control
  - DoS attack prevention
  - DHCP Snooping
- Diagnostics
  - Port mirroring, Ping test, Copper test
- Firmware configuration upgrade and backup
- Other features
  - MDI/MDI-X auto crossover
  - NWay protocol and auto-detection
  - IGMP Snooping v2/v3
  - LACP port trunking up to 8 static or dynamic groups

Description

The Loop-IP6340 L2 Smart Management Ethernet Switch is equipped with 24 gigabit RJ45 ports and 4 SFP slots. The switch supports high performance, enterprise-level security control & QoS Layer 2 management features. It is a cost-effective product solution for the small and medium business.

The switch supports the Web GUI to control each port status and bandwidth control by port rate limiting. The Storm Control feature protects against Broadcast, Multicast and Unicast Storm. The rich Quality of Service (QoS) & VLAN provides enhanced traffic management capabilities to move your data smoother and faster. The device supports a complete lineup of layer 2 features, including 802.1Q tag VLAN number up to 4094, Port Isolation, Port Mirroring, Port ACL, STP/RSTP/MSTP, Link Aggregation Group and 802.3x Flow Control function. It also supports SNMP management functions.

The switch complies with IEEE802.3az Energy Efficient Ethernet to save power consumption, Support IGMP Snooping v2/v3 function to improve traffic performance. Moreover, the rich diagnostic LEDs on the front-panel provide the operating status of individual port and whole system.

Application Illustration
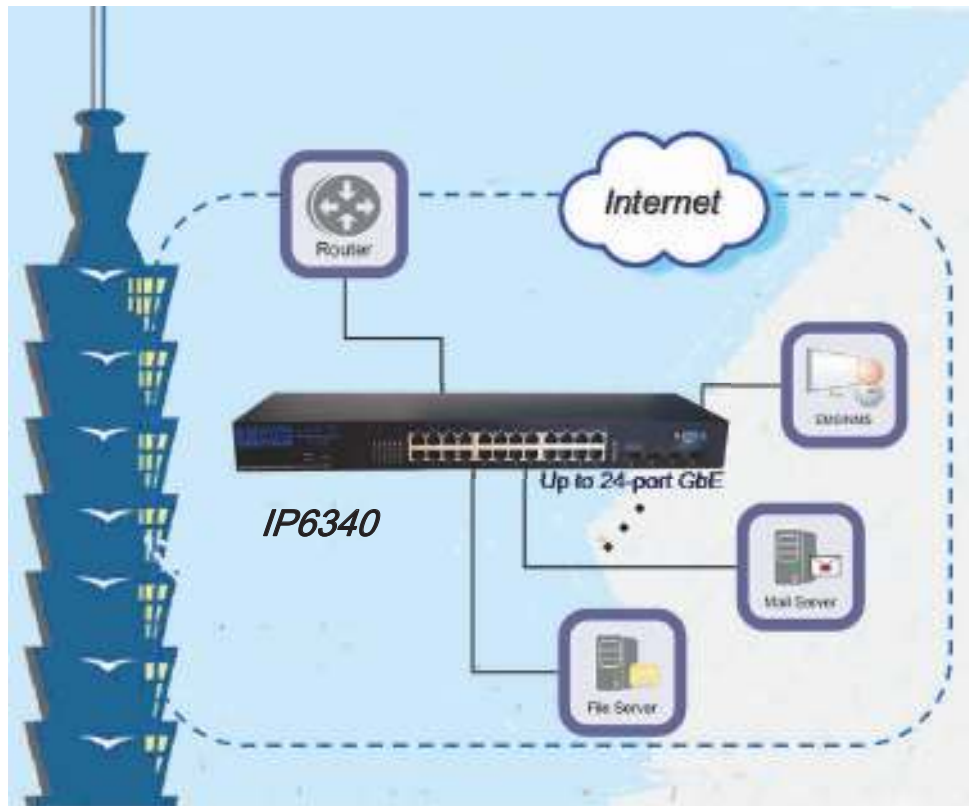
Loop-IP6510 L2/L3 Multiple WAN Router/Bridge

Features

- Supports 10/100 BaseT speed auto-sensing, half/full duplex auto-negotiation and auto MDI/MDI-X crossover
- WAN interfaces
  - 2 built-in 10/100BaseT WAN interfaces for uplink
  - cold plug-in slots supporting any 2 of the following cards:
    - E1 card: 2 ports per card, up to 4 ports per system
    - T1 card: 2 ports per card, up to 4 ports per system
    - Electrical RJ45 Ethernet card: 1 port per card, up to 2 ports per system
    - Optical SFP Ethernet card: 1 port per card, up to 2 ports per system
- LAN interfaces
  - Four 10/100BaseT LAN interfaces for downlink
- RS232 console port
- Supports SNMP management
- Supports Telnet and SSH remote management
- Supports remote software upgrade
- Supports 802.1a, 802.1w, 802.1q and 802.1ad
- Supports remote bridges
- Supports router

Description

The Loop-IP6510 L2/L3 Router/Bridge provides remote bridge connectivity from 4 Ethernet ports to 2 fixed WAN ports and also to 2 optional WAN slots. Whereas the 2 fixed WAN ports are always Ethernet, choices are available for the 2 optional WAN slots. Each of the 2 optional slots can accept one of 4 choices of plug-in cards, which are

(a) a card with dual T1 port
(b) a card with dual E1 port
(c) a card with one 10/100 BaseT fast Ethernet port
(d) a card with one SFP (mini-GBIC) housing for 100M-FX fast Ethernet port

Using the optional dual E1/T1 card, up to 4 E1/T1 lines can be used for WAN connectivity, either separately or in a single bundle.

All Ethernet, WAN, and LAN ports have speed auto-sensing, half/full duplex auto-negotiation, and auto MDI/MDI-X crossover features. All serial (E1/T1) WAN interfaces support PPP, MLPPP, Frame Relay, Cisco-compatible HDLC and HDLC protocols.

The Loop-IP6510 L2/L3 Router/Bridge has a DB9S console port, which allows users to execute in-service diagnostics and fault isolation from a local terminal. It also allows users to manage remotely via Telnet, SSH and SNMP through Ethernet or WAN ports. Multicolor LED indicators and an ACO (Alarm Cut Off) button are provided on the front panel.

Application Illustrations
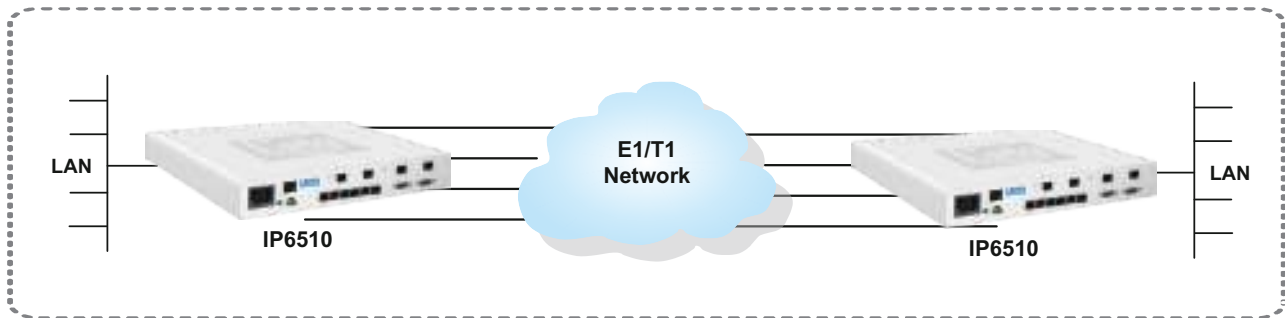
Multiple WANs
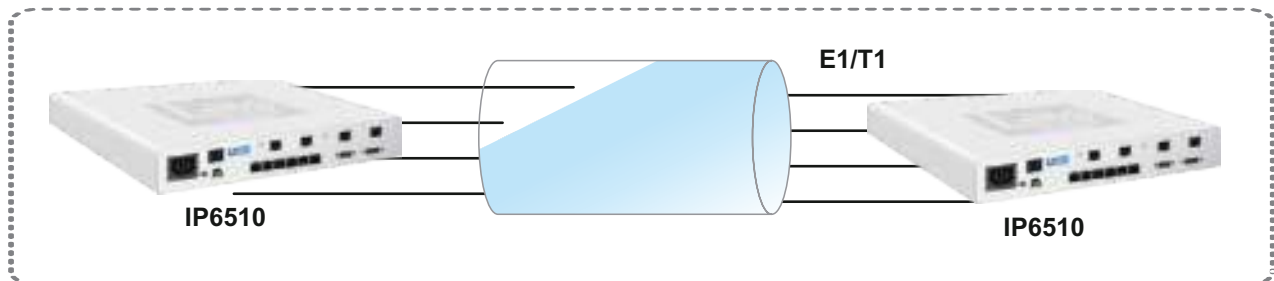
MLPPP Bundle
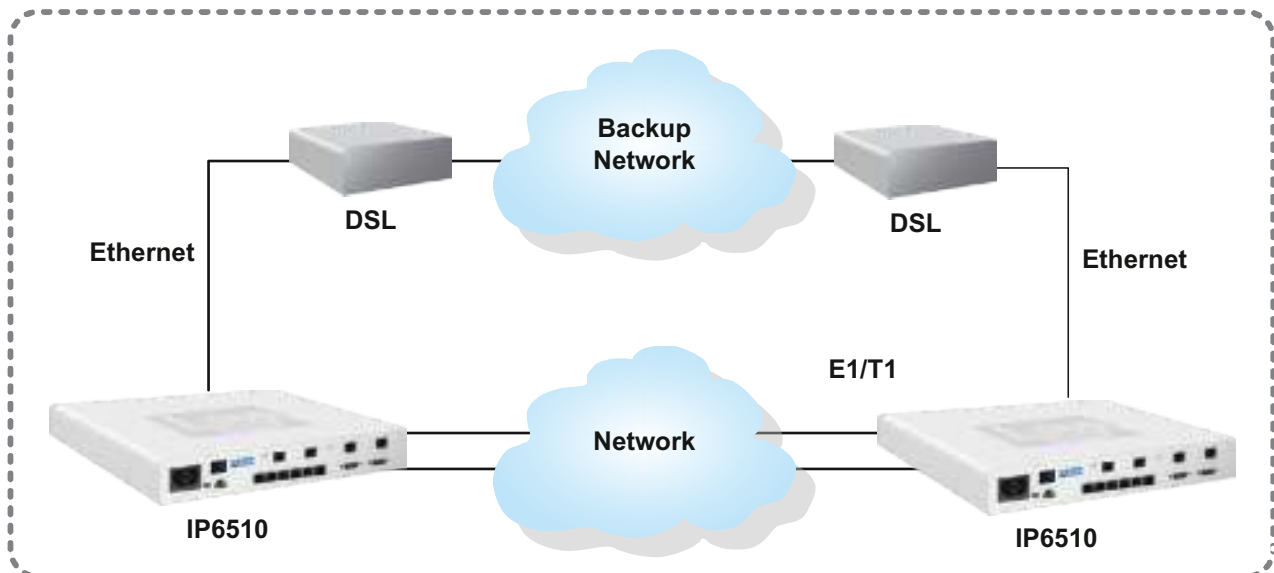
Ethernet as a backup link

Loop IP6510-LN L3 Multiple WAN Router

Description

The IP6510-LN L3 Multiple WAN Edge Router has IPv4/IPv6 dual stack functionality and Level 3 Routing in a single unified device. It is suitable for large deployments that require only moderate bandwidth and a small port density but a very competitive CapEx. The LN stands for Linux, which backs up the Loop-OS architecture inside the IP6510-LN. The new Loop-OS includes many advanced features with more functionality to help you improve your network.

These features inside the Loop-OS include IPv4/IPv6 dual stack routing capability, software bridging*, serial-to-IP/UDP terminal services*, and network security features. With RIPng, OSPFv3 and BGP-4, the IP6510-LN is able to build a reliable IPv6 routed network.

All WAN ports and LAN ports can be configured into bridge mode*, router mode, or combinations of both. WAN interfaces including Ethernet, E1/T1 and Serial RS232/RS485 provide flexibility for any access network.

Using VPN connectivity over IPSec included in the Loop-OS software suite allows a highly secure and reliable connection over an IP-based network to any location.

* Future option

Features

- Mechanical and Electrical
  - 2 Tributary Slots for WAN interfaces
  - Power Module
    - AC and DC coexist
    - AC power: 100 to 240 Vac, 0.8 A
    - DC power: -36 to -72 Vdc, 1.2 A
  - Commercial unit: 0°C to 50°C; Industrial unit: -20°C to 70°C
- WAN Interface
  - Tributary Slots
    - 2 ports
    - Cold-swappable
    - Plug-in card types:
      - E1 card: 2 ports per card, Nx64k
      - T1 card: 2 ports per card, Nx64k
      - Ethernet card: 1 port per card, electrical RJ45
      - Ethernet card: 1 port per card, optical SFP
  - Built-in 2 Ethernet ports
  - Multiple WANs per fractional E1/T1 interface is supported, up to 64 WAN per system (maximum 16 WAN supports PPP encapsulation)
- LAN Interface
  - 4 Ethernet ports
- All Ethernet Interfaces
  - 10/100BaseT
  - Speed and duplex-mode auto-negotiation
  - Auto MDI/MDI-X cross-over
- Layer 2 Encapsulation Protocols
  - PPP, MLPPP, Cisco HDLC, raw HDLC
- Management
  - Telnet and SSHv1/v2 (up to 4 concurrent sessions)
  - SNMPv3
  - Multilevel login privilege control
  - Syslog
  - NTP Client for IPv4, up to 4 NTP server

- QoS
  - Policy based Egress Rate Limiting
  - Traffic Classification based on
    - Outbound direction
    - IPv4 or IPv6
    - Source/Destination IP Address Range
    - TCP/UDP Port Number
    - (DSCP+ENC) 1byte field / ToS 1 byte field
    - Any Protocol Type
- Layer 3
  - IPv4/IPv6 dual stack
  - Routing Protocols: Static Route, RIPv1/v2, RIPng, OSPFv2/v3, BGP4.
  - Multicast protocols: IGMPv1/v2/v3
  - VLAN Routing based on Static Route, RIPv1/v2, RIPng, OSPFv2/v3.
  - Address Translation
    - NAT
    - Port Forwarding Table for NAPT (Virtual Service)
    - IP-VPN connectivity over IPSec
- Security
  - IPSec
    - Encryption: DES, 3-DES, AES-128/AES-256
    - Authentication: MD5, SHA-1
    - Key Management
      - IKEv1/v2 (pre-shared key or RSA certificate)
    - Up to 64 concurrent tunnels per interface
  - IP-VPN connectivity over IPSec
  - Access Control
    - Packet-Filtering based on policy type:
      - Inbound/Outbound direction
      - Source/Destination IP Address Range
      - Any Protocol Types (ICMP, TCP, UDP, etc.)
      - TCP/UDP Port Number Range
  - 1 control list per interface
  - Up to 100 rules per control list

- 802.1x port-based authentication*
- Multilevel login privilege control
- Radius Client is supported, up to 3 Radius servers available for addressing.
- SSHv1/v2
- SNMPv3
- DHCP
  - DHCP Server/Relay for IPv4/IPv6
  - BOOTP compatible for IPv4
- Software Bridging
  - Frame size up to 1916 bytes*
  - IEEE 802.2x Flow Control*
  - STP(802.1d)*, RSTP(802.1w)*, MSTP(802.1s)*

- Up to 16K MAC Table*
- User-configurable MAC aging time*
- Ethernet FCS padding/unpadding*
- 802.1x port-based authentication*
- VLAN*
  - Support up to 4094 VLANs*
  - VLAN ID mapping*
  - Support Q-in-Q*
  - Support VLAN Routing

* Future option

Application Illustrations

(up to 4 E1/T1 links)

MLPPP Bundle

LAN

IP6510-LN   **IP6510-LN**

LAN

Multilink PPP

IP6510-LN   **IP6510-LN**

IPv6 Network

IPv4 Device   **IPv4 Device**
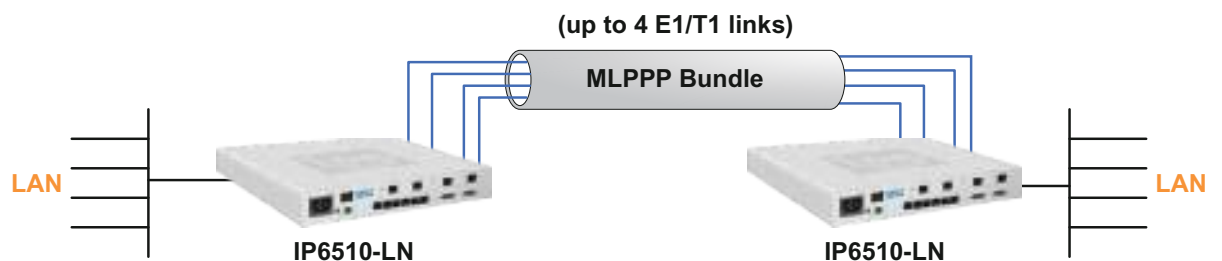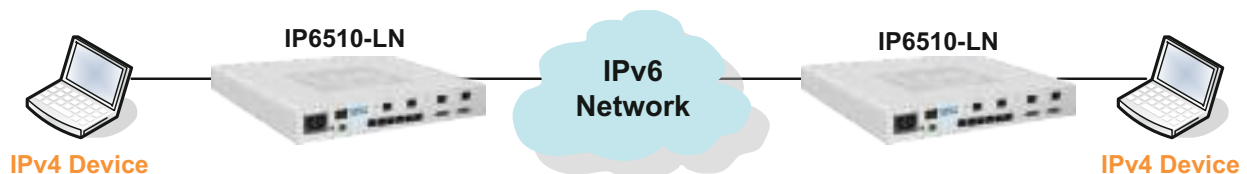
IPv4 and IPv6 Interworking

Loop-IP6608 CE2.0 Switch

In Development

Features

- 4 × 1G RJ45 Ports + 6 × 1G SFP Ports
- Carrier Ethernet 2.0 compliant
- 99.999% availability
- ITU-T G.8031/G.8032 protection switching
- ITU-T G.8262 Synchronous Ethernet with SSM
- IEEE 1588v2 Boundary and Transparent Clock with nanosecond accuracy
- ITU-T G.8275.x PTP Telecom Profile supported on Boundary Clock and Transparent Clock
- Comprehensive Ethernet OAM supported: IEEE 802.1ag CFM, 802.3ah EFM, and ITU-T Y.1731
- Service Activation Testers incorporated: RFC2544, Y.1564
- Non-blocking wire-speed switching

Description

The IP6608 is specifically built to fulfill the requirements of modern carrier grade Ethernet Services which includes unmatched resiliency, superb accuracy of timing / synchronization solution, and ease & low cost operation with a range of different port configurations. With ultra-low power consumption and the fan-less design, IP6608 is highly reliable and able to ensure the system achieving 99.999% availability.

By incorporating ITU-T G.8031 ELPS and G.8032 ERPS as well as IEEE 802.3ad LACP, 802.1s MSTP, and 802.1w RSTP, CES-100G supports highly resilient network topologies with sub-50ms failover.
In order to fulfill extremely accurate timing and synchronization that LTE/LTE-A required, IP6608 implements the IEEE 1588v2 and ITU-T G.8262 Synchronous Ethernet with dedicated hardware that ensures the demands been perfectly satisfied and with no harm to other features such as OAM.

The Ethernet OAM feature suite in IP6608 family provides thorough link, service, network monitoring, as well as performance metrics. IEEE 802.1ag CFM, 802.3ah EFM, ITU-T Y.1731 Performance Monitoring are all included in IP6608 OAM feature suite, furthermore, both IETF RFC 2544 and ITU-T Y.1564 hardware-based tester are also embedded into CES-111G which enables the operation center the ability of performing diagnostics and performance testing remotely. This capability effectively reduces service personnel costs and ensures outstanding user experiences.

Application Illustration

Ethernet Access and Switch
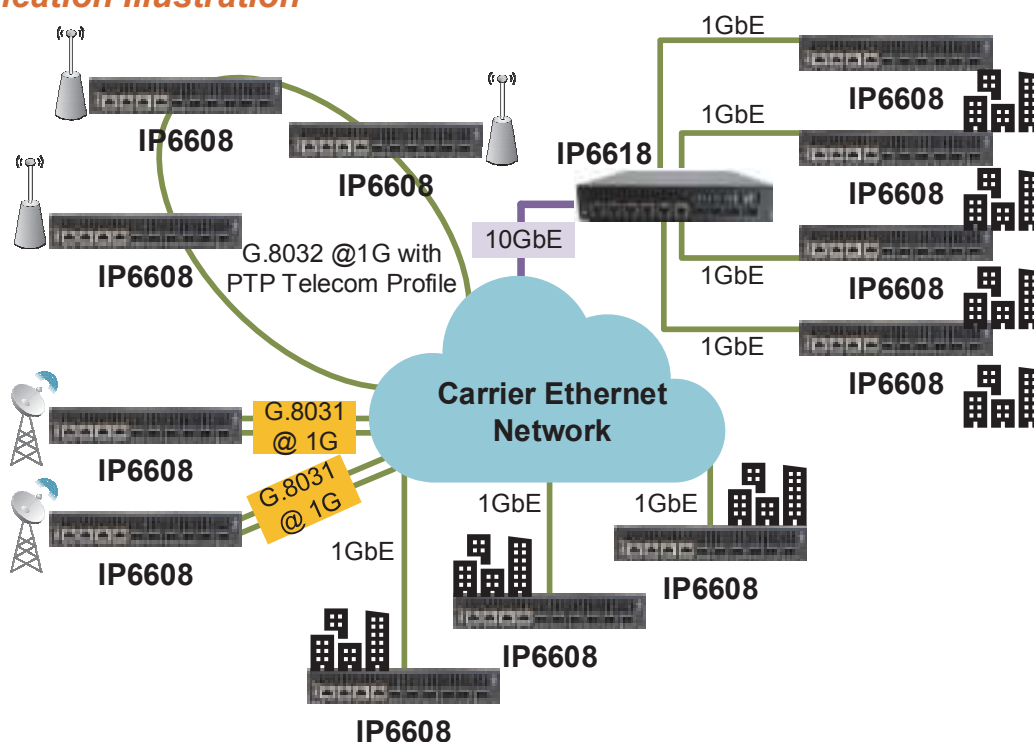
Loop-IP6610 L2/L3 E1/DS1/DTE/DCE/ Router/Bridge Box

Features

- Supports 1 or 4 Ethernet LAN ports
- Supports 1 WAN port for multiple interfaces: E1, DS1, and DTE (V.35, V.36, EIA530, RS449, RS232, X.21, RS422)
- Supports 1 DCE (V.35) port
- Supports 10/100 BaseT speed auto-sensing and half/full duplex auto-negotiation
- Supports Router or Bridge mode
- Multicolor LED indicators
- Local control and diagnostic via DB9S console port
- Local/remote management through local console, LAN, or WAN
- Supports CLI (command line interface)
- Supports SNMP management
- Industrial series: -40°C to 70°C; Commercial series: 0°C to 50°C.

Description

The Loop-IP6610 L2/L3 Router/Bridge provides connectivity from 10/100 BaseT to E1, DS1, DTE or DCE in a small metal box.

The Loop-IP6610 L2/L3 Router/Bridge contains a DB9S console port, which allows users to execute in-service diagnostics and fault isolation from a local or remote terminal. The Loop-IP6610 L2/L3 Router/Bridge also allows remote access to Telnet via Ethernet or WAN port. The IP6610 L2/L3 Router/Bridge series also provides multicolor LED indicators on the front panel and an ACO (Alarm Cut Off) button.

Application Illustrations

Basic Use

10/100 BaseT　　　　**E1/DS1/DTE**　　　**WAN**

LAN

Loop-IP6610

Ethernet to Data Transmission Application

DCE (V.35)　　　　**Ethernet**　　　**IP Network**

Customer Router　　　**Loop-IP6610**

Mobile ATM Solution

CDMA Network

Bank ATM Server

Loop-IP6610
CDMA/GSM Modem
Mobile ATM

Loop-IP6610
CDMA/GSM Modem
Mobile ATM
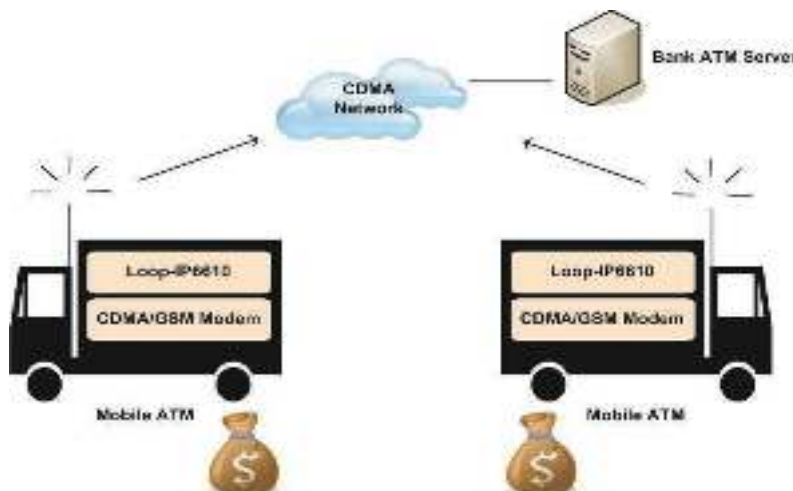
Loop-IP6618 CE2.0 Switch

In Development

Features

- 4 × 1G RJ45 Ports + 2 × 1G SFP Ports + 2 × 10G SFP Ports
- Carrier Ethernet 2.0 compliant
- ITU-T G.8031/G.8032 protection switching
- ITU-T G.8262 Synchronous Ethernet with SSM
- IEEE 1588v2 Boundary and Transparent Clock with nanosecond accuracy
- ITU-T G.8275.x PTP Telecom Profile supported on Boundary Clock and Transparent Clock
- Comprehensive Ethernet OAM supported: IEEE 802.1ag CFM, 802.3ah EFM, and ITU-T Y.1731
- Service Activation Testers incorporated: RFC2544, Y.1564
- Non-blocking wire-speed switching

Description

Loop-IP6618 leverages the purpose-built silicon technologies to fulfill the needs that modern Carrier Class Ethernet services require with ultra-low power consumption. The standard compliant features bring hassle free operations with the benefits of unmatched resiliency, superb synchronization accuracy, and comprehensive OAM.

As the SLA (Service Level Agreement) is at the center part of the Carrier Ethernet services, and the Ethernet OAM protocol suite is the key to enable the services. The IP6618 NIDs embed the hardware Ethernet OAM engines for ensuring the real time monitoring can be achieved. The protocol suite covers link status, service level, network monitoring, as well as performance metrics. IEEE 802.1ag CFM, 802.3ah EFM, ITU-T Y.1731 Performance Monitoring are all included in the OAM feature suite, furthermore, both IETF RFC 2544 and ITU-T Y.1564 hardware-based tester are also in place which enables the operation center the ability of performing diagnostics and performance testing remotely. This capability effectively reduces service personnel costs and ensures outstanding user experiences.

The PTP (IEEE 1588v2) has become the de facto synchronization solution that has been widely adopted in different application scenarios which requires precision timing mechanism. By incorporating the OCXO better than what Stratum 3 required, the IP6618 NIDs perfectly maintain the 1588v2 accuracy within nano-second scale. The Sync-E (ITU-T G.826x) assisted 1588v2 delivers not only the accuracy, but with outstanding stability persistently. The importance of synchronization grows drastically as the mobile traffic grows with unprecedented speed. The exceptional PTP performance on IP6618 effectively satisfies such synchronization requirements the LTE & LTE-Adv. base-stations needed. The 1588v2 capabilities delivered by IP6618 ensure what LTE & LTE-A requested, and potentially what the 5G technology will need can be perfectly fulfilled.

ERPS, the ITU-T G.8032 Ethernet Ring Protection Switching, is firmly built inside IP6618 NIDs as the foundation that provides sub-50ms switching capabilities. No need to worry about incidentally operation interruptions any longer that drastically reduces the OpEx of the network operators. The ERPS feature is assisted by dedicated hardware engine embedded in the silicon; hence, it ensures the consistent performance on the switching time whenever the interruption happens. In addition to ERPS, other protection related protocols are all supported, such as IEEE 802.1d STP, 802.1w/s RSTP & MSTP, and 802.3ad LACP, etc.

Application Illustration
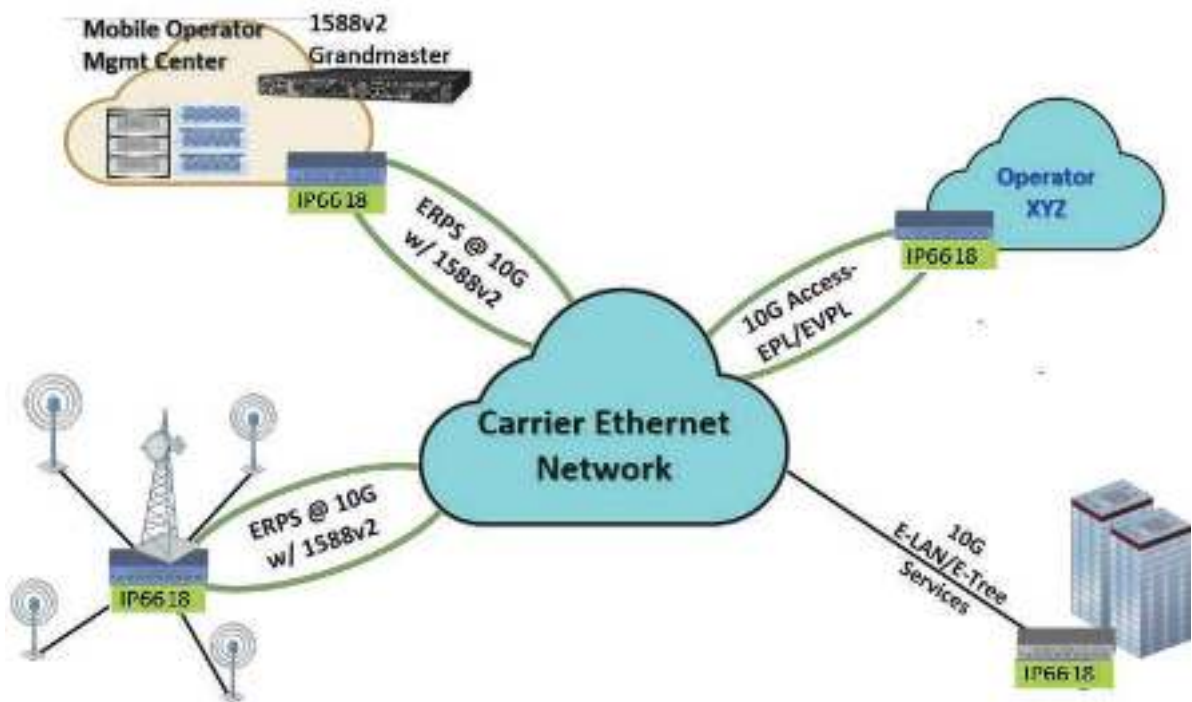
Loop-IP6808 L2 Unmanaged 8-Port Industrial Secure Gigabit Switch

Features

- 6 x 10/100/1000 BASE-T(X) RJ45 ports
- Additional 2x 10/100/1000M BASE-T(X) RJ45 ports or 2x1000 BASE-X SFP slots supporting MACsec encryption.
- 99% of throughput guaranteed, no additional latency
- Ideal for a plug-and-play local area network protection. Embedded MACsec Key Agreement allows high-protection with no configuration.
- IP30 aluminum housing, DIN-Rail or Wall mount
- Works from -20°C~70°C
- Prioritizes Profinet Packets according to 802.1q

Description

Secure the information flowing through your Local Area Network! IP6808 Smart Secure Gigabit Switch uses MACsec technology to Encrypt all data flowing from the secure ports to any other MACsec-capable device. This will protect your network also from Insider's Threats, such as information gathering through wiretapping, or unintentional commands sent by impersonation.

IP6808 provides Standard 6-Gigabit RJ45 ports and additional 2-Secure Gigabit RJ45 ports or 2-Secure Gigabit SFP uplink slots. Being Encryption hardware-based, there is no additional latency and 99% of the Gigabit throughput is guaranteed.

This Smart Secure Switch is the simplest Local Area Network solution and the only "Plug-n-Play" solution available! IP6808 will autonomously negotiate the encryption key with any other MACsec device

Its modern, small and compact design makes the device installation possible on virtually any surface. It provides an Advanced level of EMC protection as well as MIL-STD-810F shock, drop, vibration protection. IP6808 is hence suitable for the majority of the industrial applications. Its operating temperature ranges from -20°C to 70°C.

IP6808 Unmanaged MACSec Gigabit Ethernet Switch is compliant with the essential sections of EN 60950, UL/IEC 60950 , MIL-STD- 810F covering operating temperature, power input voltage and vibration.

Application Illustrations

Ethernet Access and Switch
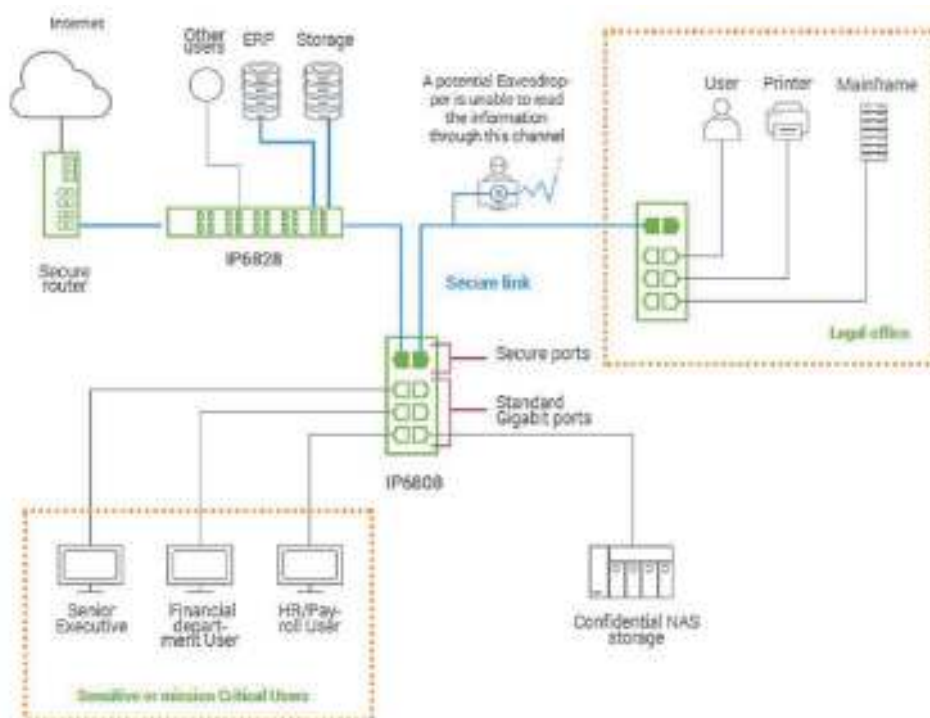
Loop-IP6810 L2 FE Switch Self-Healing Ring NTU

Features

- Full frontal access (ETSI) unit complies with IP30 standard
- Desktop, wall, or DIN Rail mounting
- Compact intelligent FX packet optical ring with Layer 2 switching capabilities
- WAN port with OA&M functionality
  - Dual SFP optical housing interfaces
  - Dual RJ45
- Tributary ports
  - 3 ports 10/100 BaseT Ethernet (with PoE option available in DC 48 only)
  - 2 ports RS232/485 interfaces, user selectable via 2-port DIP switch
  - 2 dry contact for input and 2 dry contact for output; support point-to-point and point-to-multi-point
- Power modules
  - On-board fixed single AC supply
  - On-board fixed single/dual DC modules with dual feed
- Auto-discovery topology, auto-diagnostic and remote-configure for easy plug-and-install (up to 64 units)
- Supports SNTP
- Ethernet Functionality
  - Loop Ethernet Automatic Protection Switching (LEAPS)
    - Fault recovery time: less than 50 ms
    - Point-to point: fault recovery time less than 8 ms
    - Up to 15 units: fault recovery time less than 25 ms
  - IEEE 802.1w RSTP, 802.1s MSTP*
  - IEEE 802.3x Flow Control, 802.1q Port Base VLAN / Port Isolation
- Up to 1024 MAC addresses
- Built-in BERT
- High speed, asynchronous RS232/RS485 for point-to-point, point-to-multi-point, or omnibus-like applications
- Master/Slave units setting by using DIP switch
- Auto-negotiating or forced speed for speed and full/half duplex for Ethernet ports
- Full/half duplex for tributary Ethernet ports
- Alarm relay and ACO (Alarm Cut Off) button
- Remote firmware download via TFTP & Z modem
- Remote configuration upload & download via TFTP
- Management port and interface
  - In-band management
  - RS232 console via DB9 connector
  - SNMP v1, v3
  - SSH v2
  - Telnet
- IEEE 1613, IEC61850-3 (for DC -48 Vdc only)
- RoHS compliant

* Future Option

5 Years Warranty

Description

The Loop-IP6810 is a self-healing ring network termination unit (NTU) with a built-in L2 FE switch. It can be desktop, wall or DIN rail mounted. LEAPS, RSTP, or MSTP* Ethernet Ring protection or point-to-point protection is made possible in 100 Base-FX networks with the IP6810.

All end equipment can be either in packet format via Ethernet ports or serial data via RS232/485 interfaces which will be converted into packet format within the IP6810. The IP6810 has two WAN optical and electrical interfaces, two RS232/485 DTE interfaces, three Ethernet LAN interfaces, two sets of dry contact IN/OUT interfaces, and one alarm relay connector. The IP6810 comes in an industrial hardening mode to support temperatures from -20°C to 70°C (-4°F to 158°F).

The IP6810 supports auto-discovery to locate all units on the ring, and also supports remote configuration for ease of installation.

Single AC, single DC or dual DC is supported based on field requirements. Power over Ethernet (PoE) option is also available.

The IP6810 facilitates automation systems, SCADA systems, surveillance systems, traffic control systems, transportation systems and IP networking with robust protection in ring, point-to-point, or omnibus-like topology. Easy installation and configuration make maintenance and further expansion more efficient and cost-effective.

Application Illustrations

Point-to-Multi-Point Application
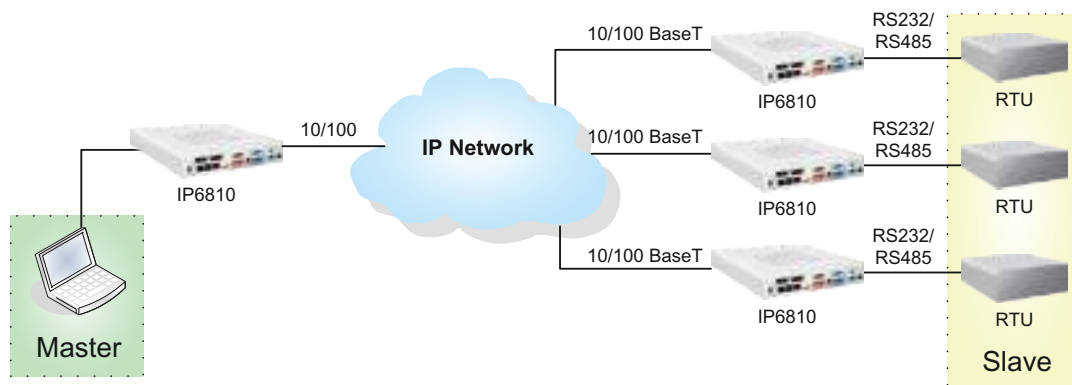
Optical Fast Ethernet Ring
With LEAPS Protection
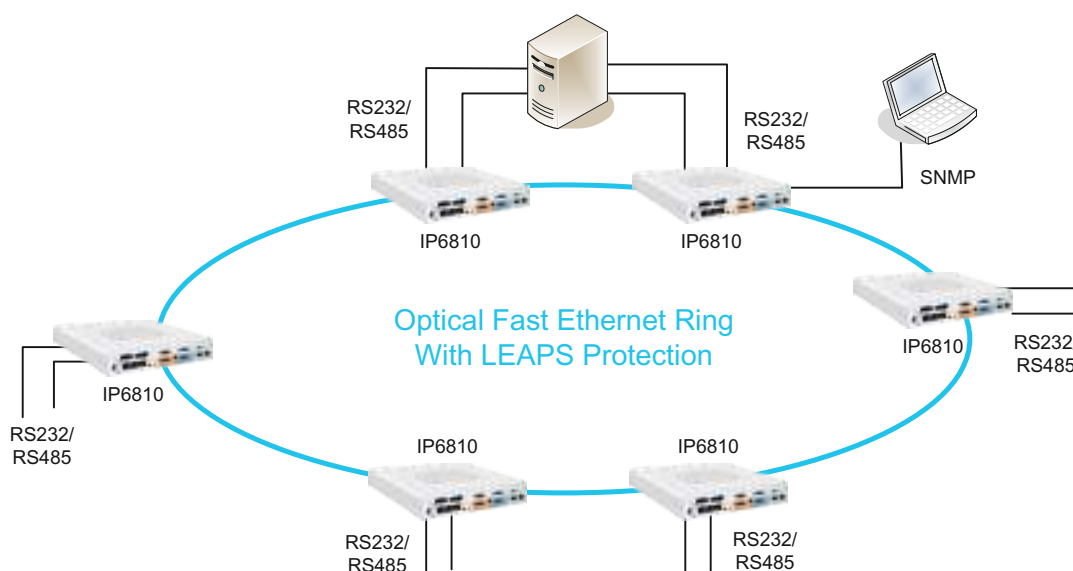
Local SCADA
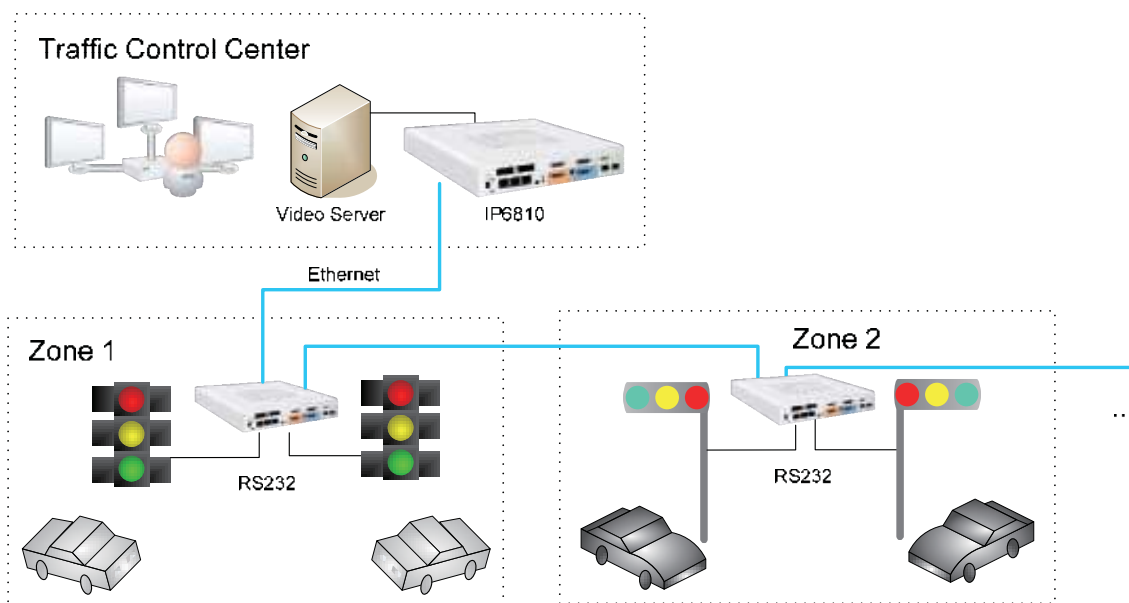
Traffic Light Management

Local SCADA

Remote SCADA

Up to 64 remote units

(1)

(2)
Master

Same installation as Site #1
Site #5

(4)

(3)
Site #1

(5)

Site #4
Same installation as Site #1

Site #2
Same installation as Site #1

Site #3
Same installation as Site #1

- - - - - - - - Master-to-slave Message Broadcast

————— Optical Fast Ethernet Ring
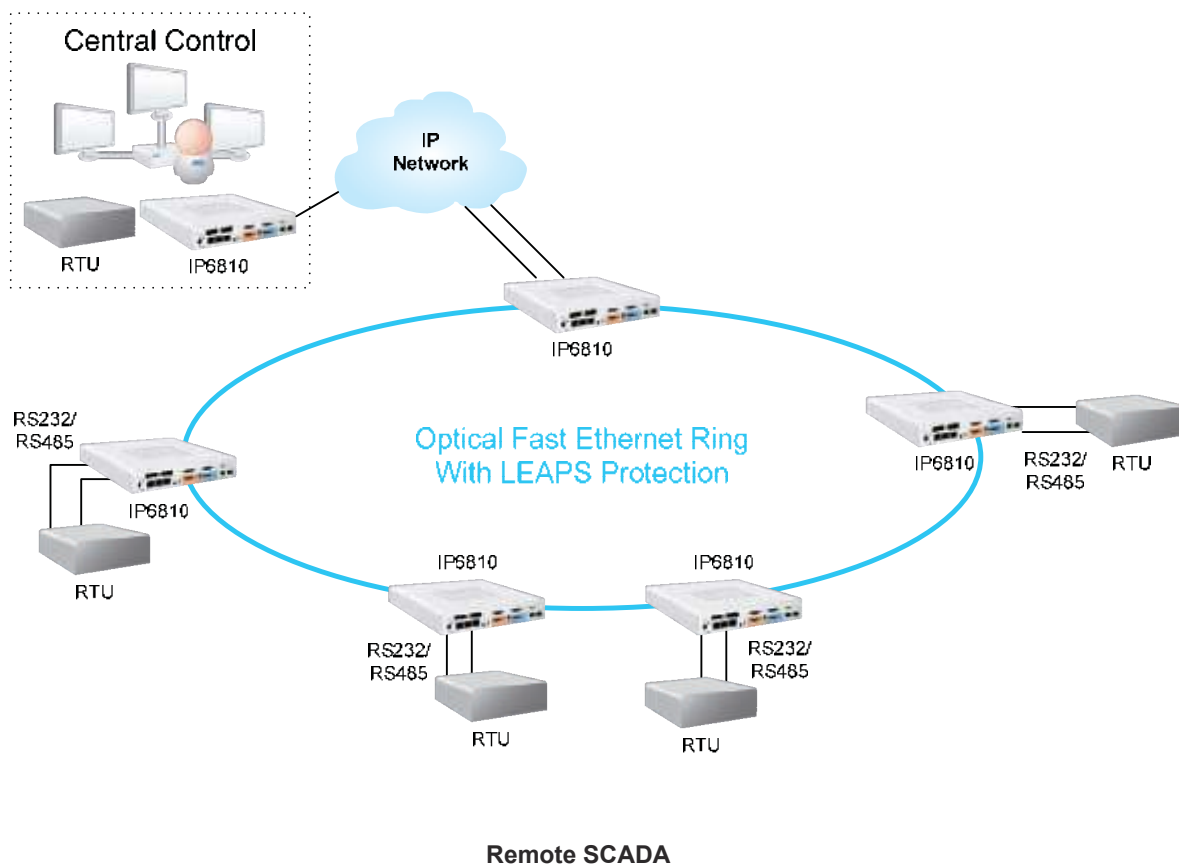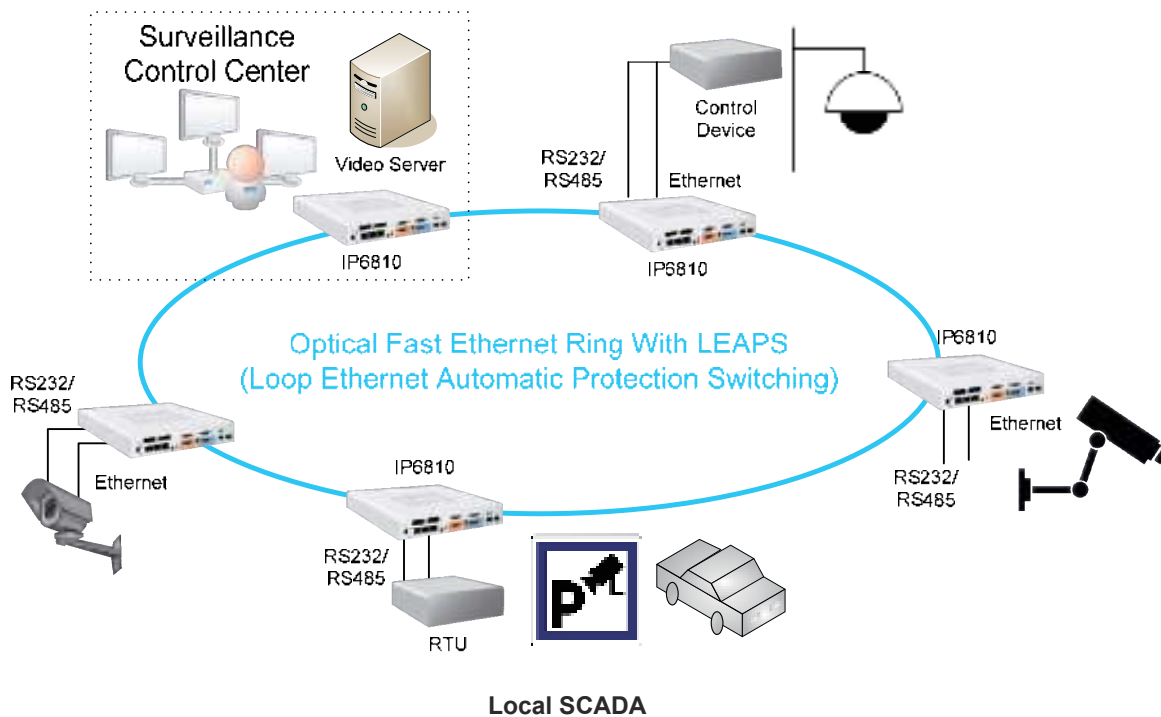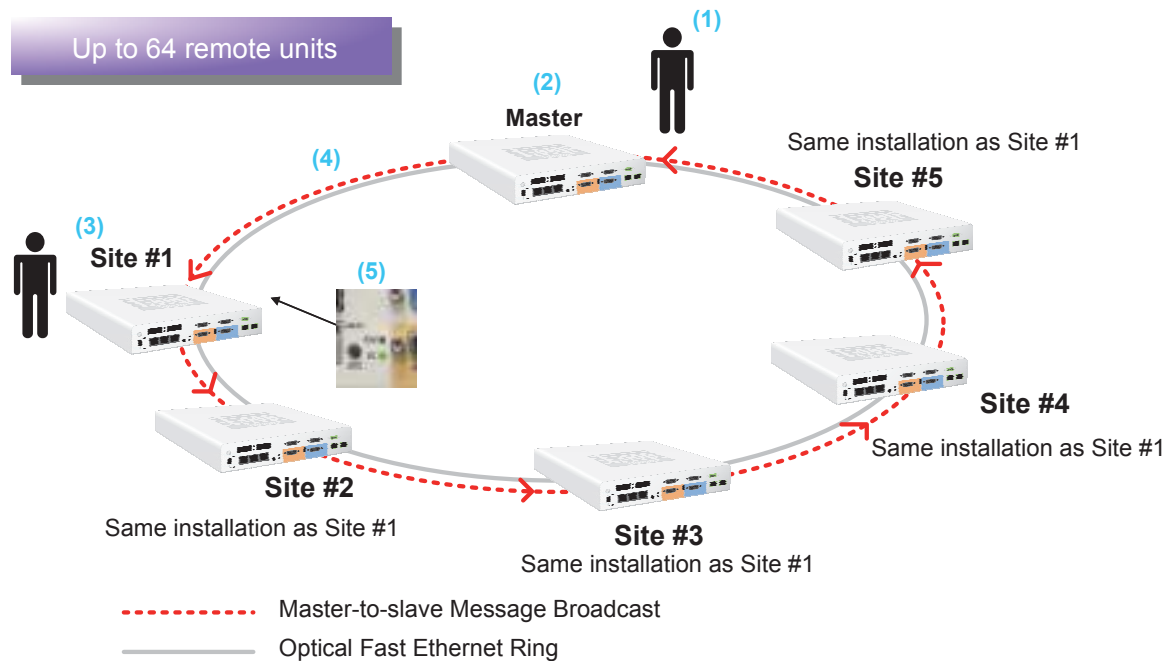
No Configuration
Necessary in Advance for Installation

Setup Procedure:

(1) Set DIP switch to Master, connect both WAN ports and power up the unit

(2) On VT100, set the master unit's Auto-Discovery function to ENABLE

(3) On remote site, set the unit's DIP switch to Slave, connect both WAN ports and power up the unit

(4) The master unit will automatically detect the slave unit and show the information on VT100 screen

(5) BC LED will turn GREEN, which indicates the Link between Master and Site 1 is ON

Auto-Configure (Plug-and-Play)

Ethernet Access and Switch

Loop-IP6820 L2 GbE
Switch Self-Healing Ring NTU

Description

5 Years Warranty

The Loop-IP6820 is a gigabit Ethernet self-healing ring network termination unit (NTU). An important protocol supported is G.8032 Ethernet Ring Protection on its WAN ports. For ring topologies the IP6820 supports auto-discovery to discover up to 128 units on the ring as well as remote configuration for easy installation.

All end devices can be in packet format via Ethernet ports or serial data via RS232/422/485 interfaces, which are converted into packets within the IP6820. The device has two WAN optical interfaces, two LAN optical interfaces, four electrical LAN interfaces, and one alarm relay interface. Manufacturing options include four additional electrical LAN interfaces, four or eight RS232/422/485 interfaces, and two sets of Dry Contact in/out interfaces

With an embedded GbE L2 switch chip, the IP6820 also supports RSTP and MSTP for all Ethernet ports. It can be powered by a single or dual DC power supply, depending on field requirements. PoE (Power over Ethernet) and PoE+* are available as manufacturing options. Physical DIN rail mounting is also supported.

The IP6820 can be used in automation, SCADA, surveillance, traffic control, transportation, and IP networking. Network topologies include ring protection, point-to-point, and point-to-multipoint. Easy installation and configuration simplifies the IP6820's maintenance and expansion.

Features

- Mechanical, Electrical, Environmental
  - Full frontal access (ETSI) unit complies with IP30 standard
  - DIN Rail mounting
  - Alarm relay and ACO (alarm cutoff) button
  - Power: Single/dual DC modules with dual feed
  - Input voltage monitoring, instant voltage monitoring, and temperature monitoring
  - RoHS Compliant
  - IEEE 1613, IEC61850-3 (for DC -48 Vdc only)
- Interface Ports
  - WAN port with OA&M functionality
    - Dual SFP optical housing interfaces
  - Tributary ports
    - Up to Eight ports 10/100/1000 BaseT Ethernet
    - Two SFP housing ports
    - PoE and PoE+* options available in DC48 only for LAN ports 3-10 (RJ45)
    - Up to 8 RS232/RS422/RS485 interface ports supporting full or half duplex mode
    - Auto-negotiating or forced speed for speed and full/half duplex for tributary Ethernet ports
- Other Features
  - Jumbo frame: Up to 9600 bytes
  - Synchronization
    - NTP V4 client
    - PTP IEEE 1588v2*
    - Synchronous Ethernet
  - Dry contact interface
    - Two alarm inputs and two relay outputs
    - Supports point-to-point and point-to-multipoint applications

- Ethernet Functionality
  - G.8032 Ethernet Ring for WAN ports
  - IEEE 802.1d STP, 802.1w RSTP, 802.1s MSTP
  - IEEE 802.3x Flow Control, 802.1q port based VLAN and port isolation, 802.1p QoS
  - IEEE 802.3ad Link Aggregation Control Protocol (LACP), also known as port trunking
  - IEEE 802.1X Radius Client
  - Auto-discovery, auto-diagnostic, and remote configuration for easy installation (up to 128 units)
  - Master/Slave units setting via DIP switch
  - Loop Ethernet Automatic Protection Switching (LEAPS)* for WAN ports
  - IEEE 802.1ad VLAN Stacking (Q-in-Q)
  - IGMP snooping v1 and v2
- OAM Protocols
  - IEEE 802.3ah OAM Ethernet in First Mile (EFM)
    - Supports dying gasp functionality
  - IEEE 802.1ag OAM
    - Connectivity Fault Management (CFM)
  - Y.1731 OAM (available on WAN ports only)
- Management
  - SSH v2, Telnet
  - SNMP v1/v2/v3
  - Web-based management via Loop-iNET
  - Remote configuration upload/download via TFTP
  - Download firmware upgrades via TFTP

* Future option

Application Illustrations

Industrial Automation at Semiconductor Factory

SCADA in Nuclear Power Plant

Ethernet Access and Switch

Server Rack in a Cluster

IP6820 consumes little power and dissipates heat well

High speed connections for data intensive applications

Console monitor and SSH / Telnet for remote access

Main Power

G.8032, MSTP, RSTP, and backup DC power create a stable, fault-tolerant network

Backup Power

IP6820

IP6820

Numerous LAN tributary ports for a plethora of servers

Server 1

Server 2

Ethernet or Gigabit Ethernet
Fiber Optics
DC Power

Railroad Automation and Monitoring

Optical
Ethernet

G.8032 Ring Protection

Railroad Control Center

Mountain Tunnel

50 km

Smoke Detector

10 km

IP6820

25 km

Siren or Loudspeaker

Vehicle Crossing

Gate Control

IP6820

RSTP

Existing IP6610 or other infrastructure

Railroad Station

IP6820

2 km

IP6610

IP6610

IP6610

IP Camera

Siren or Loudspeaker

PLC   Arbitrary Control

LEAPS Ring Protection
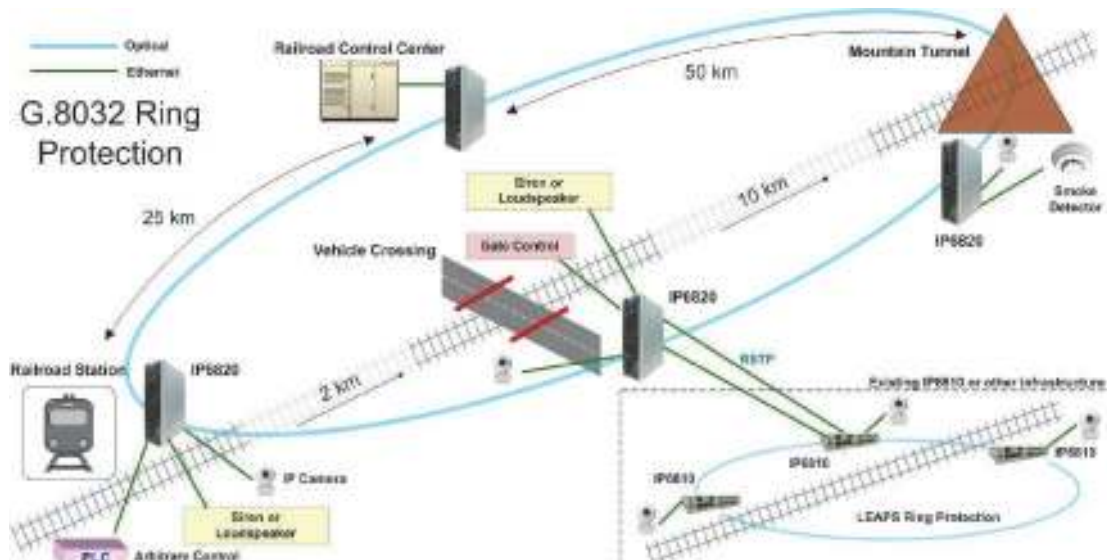
Security Monitoring at an Airport

Inside the Terminal – Waiting Area, Security Checkpoint, Baggage Claim

IP Camera

Interior ring monitors terminal, Exterior ring monitors runways and perimeter over WAN

IP6820

IP6820

Gate Control for Runway Access

Exterior Perimeter Cameras

Gigabit Ethernet ports for HD cameras to transmit high quality video quickly

IP6820

IP6820

IP6820

Security Control Room

Optical

Ethernet

Ethernet Access and Switch

Loop-IP6818 8-port Industrial L2/L3 Managed Gigabit PoE/PoE+ Switch

Description

Loop-IP6818 is an Industrial Grade L2/L3 Managed Gigabit Ethernet PoE/PoE+ Switch, specifically designed to provide a highly reliable, fault-tolerant, extremely fast network connection in harsh environments.

Within its compact DIN-Rail housing design, the Loop-IP6808A allows you to choose between different port combinations: 10/100/1000 BASE-T(X) RJ45 port, 1000 BASE-X SFP port and IEEE 802.3af/at complaint PoE/PoE+ RJ45. Layer-3 routing version supports IPv4 static routing, RIP v1/v2 and OSPFv2.

This is the right choice if you want to set up a Reliable network environment with its intelligent features and keep equipment connected all the time, even in case of temporary network breakdowns through RSTP, ERPS Rings redundancy. MAC-based Black List/White List, IEEE 802.1x, RADIUS, TACACS+, etc., and keep your network safe.

* Future option

Features

- 4 10/100/1000 BASE-T(X) RJ45 ports and 4 1000 BASE-X SFP slots.
- Up to 4 802.3af/ 802.3at Power over Ethernet ports, with maximum 30W
- PoE/PoE+ power per port and maximum 120 W device power budget.
- Powerful Layer-3 Switching, supporting IPv4 Static, RIPv1/v2 and OSPFv2
- Layer-2 Redundancy, with ERPS, RSTP, MSTP*.
- EN50121-4 Certified for Railway applications
- Operational between -20°C~70°C

Application Illustration
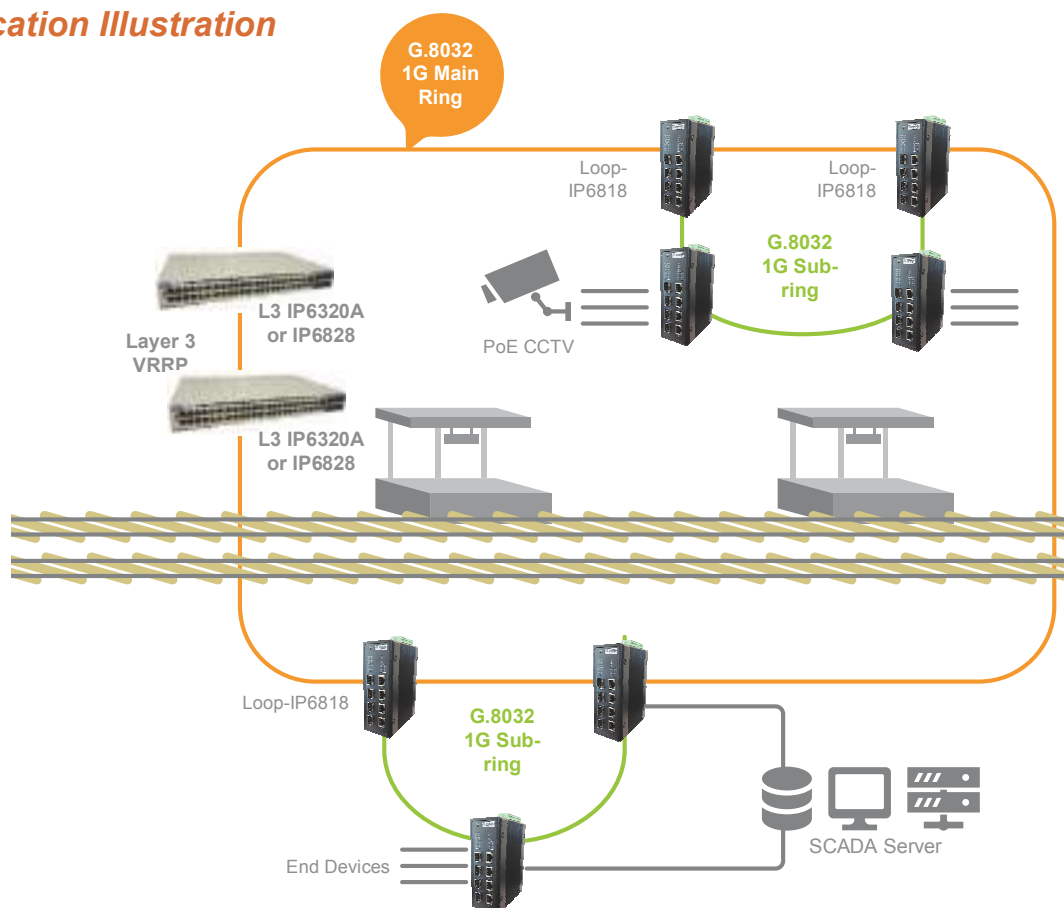
Loop-IP6828 L2/L3 Industrial Rack-Mount Managed Modular Gigabit Ethernet PoE Switch

Features

- Maximum 64Gbps switching capacity, 95.24Mpps throughput
- Rugged industrial design for -40~75°C harsh environment operation
- Flexible modular configuration, 3 Module-dedicated slots
- Up to 24 PoE/PoE+ ports, with maximum 720W of PoE/PoE+ power budget
- 4 x 1 Gigabit or 4 x 10 Gigabit SFP Uplink slots
- ITU-T G.8032 ERPS Ring, RSTP redundancy
- RIP, OSPF, Static Routing, PIM supported Layer-3 switching

Description

This high-density IP6828 Managed Rack-mount switch will provide you the flexibility your application needs. You will be able to choose among 6 different Layer-3 Routing Core versions (based on power supply and uplink port configurations) and five different 4/8-Port modules and customize your device in a very simple way.

IP6828 supports up to 24 Gigabit ports in any 8 or 4-port multiple configuration. Specifically designed for bringing power through Ethernet cable virtually anywhere, a maximum output Power over Ethernet of 720W over the 24 ports is allowed (PoE/PoE+ configuration - 802.3af/at). Available in 3 power input variants, it is EN 60950-1:2006 certified and designed to handle the harshest environments. Its fanless design and EMC Level 3 protection guarantee operations within -40 and +75°C, with 24 PoE/PoE+ ports running full power and makes it suitable to be used for almost every application.

IP6828 supports IPv4 Static Routing, RIPv1/v2, OSPFv2, IGMP, IGMP Snooping, PIM Dense Mode* and Sparse Mode* and VRRP for Routing Redundancy. Then, it is allowing (through ERPS) network self-recovery down to 50ms on full load. Almost any redundant ring topology is supported, such as ITU-T G.8032 ERPS Ring, IEEE802.1D-2004 RSTP, STP, MSTP and many compatible rings. Endless additional features are provided.

The first Industrial Managed Secure Switch ! Protect your LAN from Eavesdropping and impesronation through 802.1AE MACsec. With no additional latency and 100% Gigabit Throughput guarantee, dedicated modules can provide you the internal ultimate security solution.

*Future Option

Application Illustration
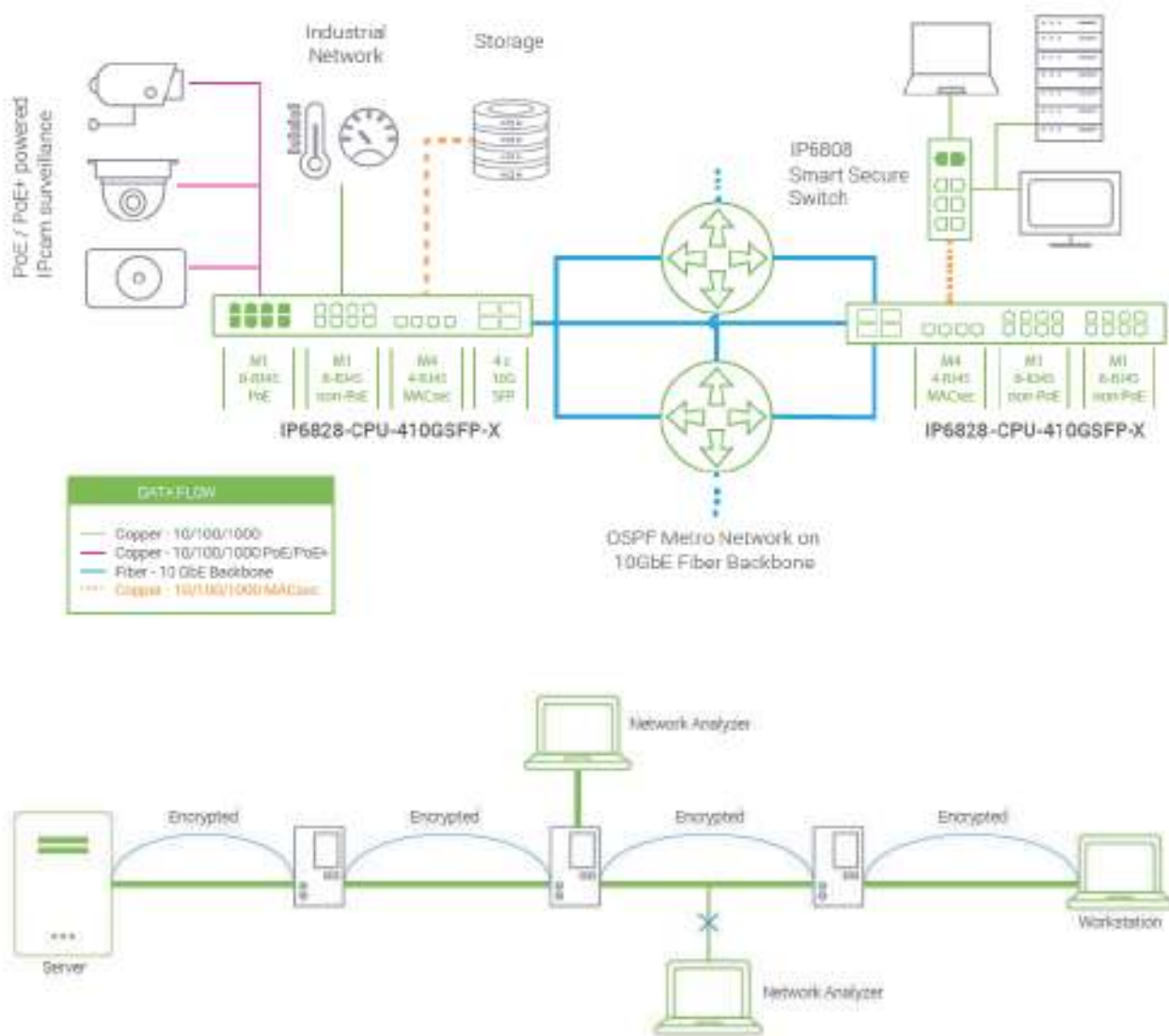
Loop-IP7925 L2 Carrier Ethernet Transport with CFM & ERPS

Description

The Loop-IP7925 is a L2 Carrier Ethernet Transport with CFM & ERPS. G.8032 standard for Ethernet ring protection is supported for its two SFP WAN interfaces. Six GbE LAN interfaces are provided, 2 SFP and 4 RJ45 LAN. STP, RSTP, and MSTP for all Ethernet ports on the IP7925. Ring auto-discovery and coexistent AC/DC are additional features.

The IP7925 facilitates automation systems, SCADA systems, surveillance systems, traffic control systems, transportation systems, and IP networking. Network topologies include robust ring protection, point-to-point, and point-to-multipoint applications. Quick, easy installation and configuration make maintenance and further expansion efficient and cost-effective.

Features

- Mechanical, Electrical, Environmental
  - ANSI unit complies with IP30 standard
  - Alarm relay and ACO (alarm cutoff) button
  - Power: AC and DC module coexistent
  - Input voltage monitoring, instant voltage monitoring, and temperature monitoring
  - RoHS Compliant
- Interface Ports
  - WAN port with OA&M functionality
    - Dual SFP optical housing interfaces
  - Tributary ports
    - Four ports 10/100/1000 Base-T Ethernet
    - Two SFP housing ports
    - Auto-negotiating or forced speed for speed and full/half duplex for tributary Ethernet ports
- OAM Protocols
  - IEEE 802.3ah OAM, Ethernet in first mile (EFM)
    - Supports dying gasp functionality
  - IEEE 802.1ag OAM
    - Connectivity Fault Management (CFM)
  - Y.1731 OAM (available on WAN ports only)
- Ethernet Functionality
  - G.8032 Ethernet Ring for WAN ports
  - IEEE 802.1d STP, 802.1w RSTP, 802.1s MSTP
  - IEEE 802.3x Flow Control, 802.1q port based VLAN and port isolation, 802.1p QoS

- IEEE 802.3ad Link Aggregation Control Protocol (LACP), also known as port trunking
- IEEE 802.1X Radius Client
- Auto-discovery, auto-diagnostic, and remote configuration for easy installation (up to 128 units)
- Master/Slave units setting via DIP switch
- Loop Ethernet Automatic Protection Switching (LEAPS)* for WAN ports
- VLAN Q-in-Q 802.1ad
- Other Features
  - Jumbo frame: Up to 9600 bytes
  - IGMP (256 groups) Snooping
  - Synchronization
    - NTP v4
    - PTP IEEE 1588v2*
    - Synchronous Ethernet
- Management
  - SSH v2, Telnet
  - SNMP v1/v2/v3
  - Web-based management via Loop-iNET
  - Download firmware upgrades, remote configuration upload/download via TFTP

*Future Option

Application Illustrations

Customer Premises | **Carrier Network**

Six LANs

Two WAN ports

IP Network Carrier Ethernet

10/100/1000TX

IP7925

1000SX / LX

Service OAM (IEEE 802.1ag / Y.1731)

Link OAM (IEEE 802.3ah)

Link OAM (802.3ah)

Customer Premises

GbE

LAN   **IP7925**

Gigabit Ethernet

Access Node

PSN, Ethernet, or IP Network

Customer Premises

GbE

IP7925   LAN

Access

Service Coverage
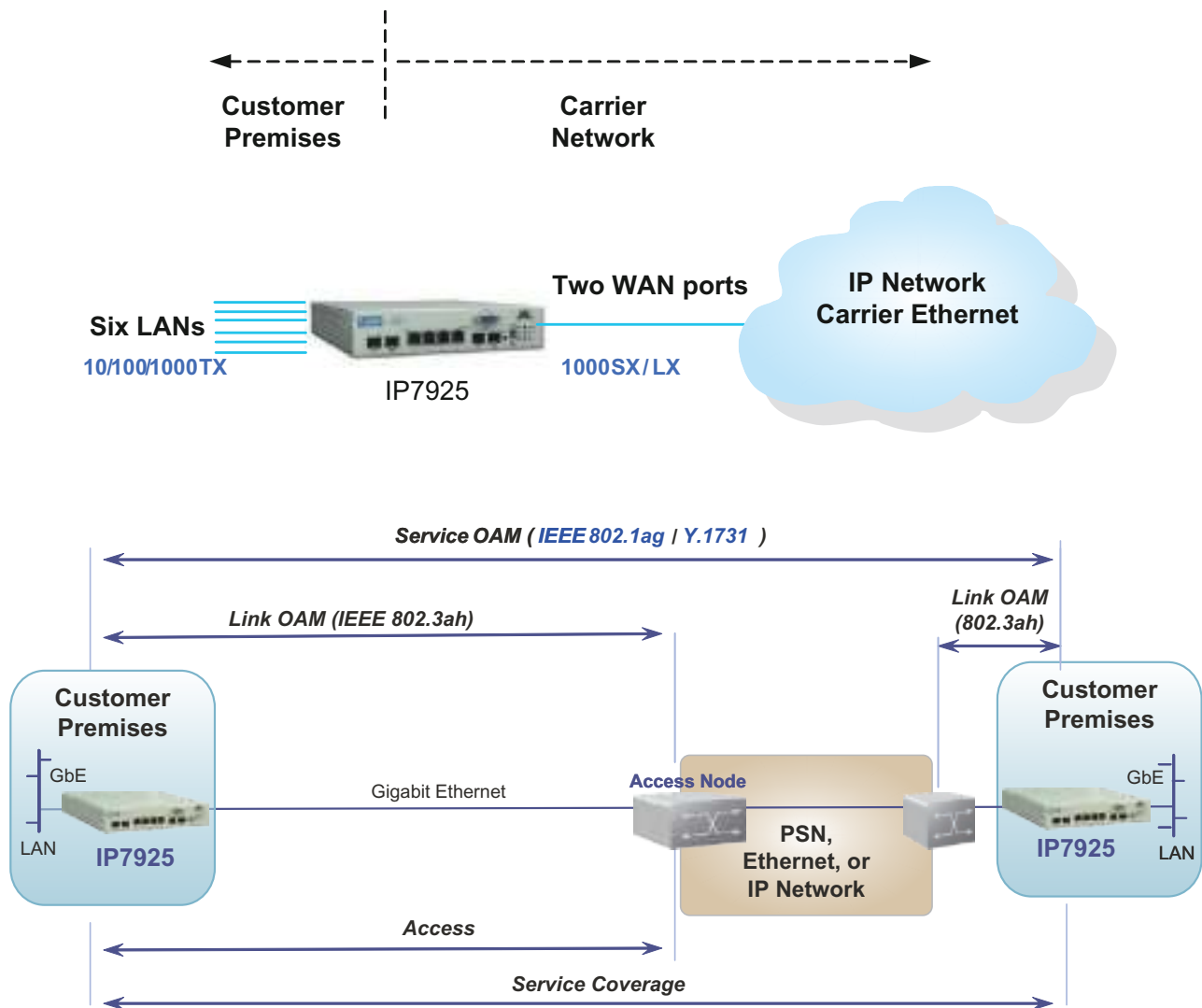
Loop-IP7930-B/F/S/T L2 Ethernet Demarcation Device

Description

The Loop-IP7930 is an L2 Ethernet Demarcation Device at the Customer Premises to enforce the Ethernet traffic policing policies, such as rate limiting*, QoS, and VLAN tagging functions. Advanced features for Bonding and Tapping applications are also available on IP7930.

Loop-IP7930 EDD is capable of Ethernet demarcation, Bonding, and Tapping; it assures the service provider having a clean and well-organized traffic from customer into the network. With optional 100/1000M-SX/LX optical uplink interface, the IP7930 EDD can be located far away from the central access device.

Loop-IP7930-B/S/T

Loop-IP7930-F*

Supported Link OAM per IEEE 802.3ah and End-2-end OAM per ITU Y.1731 /IEEE802.1ag, the IP7930 EDD is capable of supporting Carrier grade Ethernet Service realtime monitoring. In addition, Loop-IP7930 supports advanced functions, included Bonding and Tapping.

*Future Option

Features

- Mechanical, Electrical, Environmental
  - Complies with ANSI/ETSI units
  - Power: AC and DC module coexistent
  - Temperature Sensor and overheat alarm
  - RoHS Compliant
- Interface Ports
  - IP7930-S
    - Support rich functions of ECFM Ethernet, OAM, and Electrical bypass
    - Multiple user ports configurable by user
      - 2 GbE WAN ports with 1 Combo GbE (RJ45+SFP housing) and 1 SFP optical housing (WAN2 is future option)
      - 1 GbE LAN port with Combo (RJ45+SFP housing) interface
      - Electrical Ethernet bypass during power outage
    - 1 SNMP port
  - IP7930-T
    - Support Tapping/monitoring function
- Management (For IP7930-B/S/T/F*)
  - CLI through SSH v2, Telnet
  - SNMP v1/v2/v3
  - Web-based management via Loop-iNet
  - Download firmware upgrades, remote configuration upload/download via TFTP
- Ethernet Functionality (For IP7930-B/S/F*)
  - IEEE 802.1q VLAN Tagging, 802.1p QoS
  - Support 256 configurable VLAN tags
    - TM (Throughput Measurement)
      - OOS Throughput Measurement
      - IS (In-Service) Throughput Measurement
      - Round-trip Throughput Measurement
      - One-way Throughput Measurement
    - Diagnosis Management

- BERT
  - Built-in Ethernet BERT Generation/Detection
  - OOS (Out-of-Service) Ethernet E2E Diagnosis
- Loopback
  - Auto-Loopback for ETH-TEST
  - Support ACL (Access Control List) Loopback
  - Support definable Loopback Mac swapping
  - Support IP swapping
- MAC Capacity Test
- MTU Measurement
- Bonding (For IP7930-B)
  - Agg ports can be bonded and combined to increase effective Bandwidth for a specific service
  - Packet sequence reordering timeout: 100ms ~ 500ms
  - Discard or forward for out of sequence packets
  - differential delay between two Aggregate Ports < 500ms
  - Support Ethernet CFM Connectivity Check (CC)
- Tapping (For IP7930-T)
  - Monitor WAN/LAN data
- CoS/QoS
  - 8 Priority queues
  - Strictly Priority or Weighted Round-Robin (WRR)
  - 802.1P CoS bits, IPV4 ToS (DiffServ) bits
  - IP7930-B
    - Support Bonding feature
    - Bonding Agg1 and Bonding Agg 2, both with Combo GbE (RJ45+SFP housing) interface
    - 1 Bonding User port
  - IP7930-F*
    - Support all optical interface for link aggregation applications
    - 2 WAN ports with SFP (mini-GBIC) GbE optical housing
    - 2 LAN ports with SFP (mini-GBIC) GbE

optical housing
- Optical by-pass function during power outage
- 1 SNMP port
- 1 Monitor port
- Protection (For IP7930-S/F*)
  - WAN Port
    - 802.3ad Link Aggregation*
    - ITU G8031* 1:1 or 1+1 Linear protection
- OAM Protocols (For IP7930-B/S/F*)
  - IEEE 802.3ah OAM, Ethernet in First Mile (EFM)
    - Support Active & Passive modes
    - EFM Dying Gasp Alarm
    - EFM diagnosis (OOS Link Diagnosis)
    - EFM In-service performance monitoring
      - RFC1757 RMON (Remote Network Monitoring MIB)
      - Per port or per VLAN (up to 128 VLANs)
      - 64-bit counter used for performance parameter
  - IEEE 802.1ag OAM, (CFM)
    - CCM -- Connectivity (heartbeat) Check
    - Link Trace (Trace Route)
    - CFM Ping
    - Support 128 (<1sec) / 512 (1sec) MEPs for IP7930-S & IP7930-F
    - Support 16 (<1sec) / 512 (1sec) MEPs for IP7930-B & IP7930-T
  - Y.1731 OAM (CFM+)
    - Fault management
    - LM (Loss Measurement)
      - Y.1731 LM of user data
      - Synthetic LM using CCM statistics

- Performance Monitoring
- DM (Delay Measurement)
  - Round-trip Delay Measurement
  - One-way Delay Measurement
- Other Features
  - DHCP Client
  - ACL (Access Control List) Loopback
  - Jumbo frame: Up to 9600 bytes
  - Synchronous Ethernet
  - Synchronization
    - IETF NTP v3
  - Ping to the user domain PCs
    - IETF RFC792 ICMP (Internet Control Message Protocol)

*Future Option
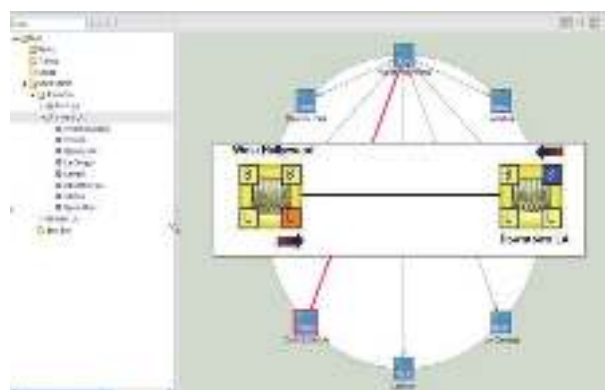
Application Illustrations

The Application for IP-7930-S
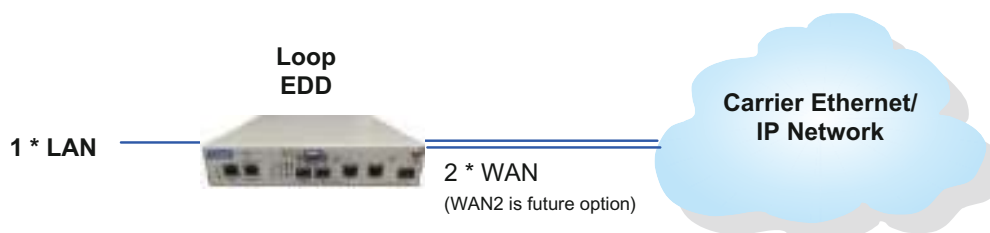
EDD to support carrier-grade Ethernet services
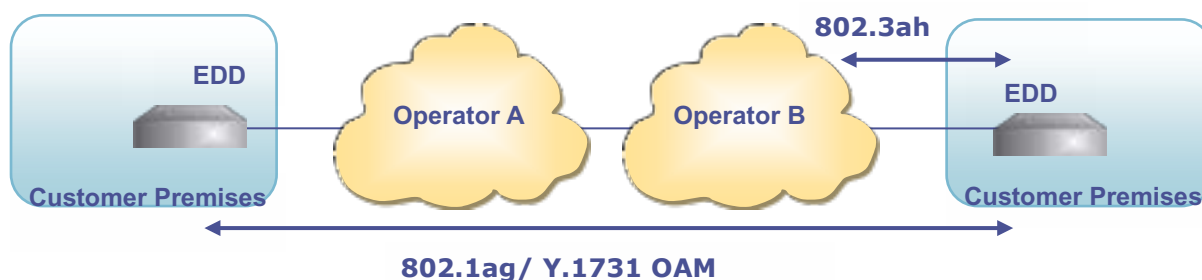
802.3ad Link Aggregation Redundancy

EDD

1 * LAN ——— 2 * WAN
(WAN2 is future option)

NE   **PSN**

802.3ad
Link Aggregation Mode

ITU G.8031 1+1 Redundancy

EDD

1* LAN ——— 1+1 WAN port

NE   **PSN**
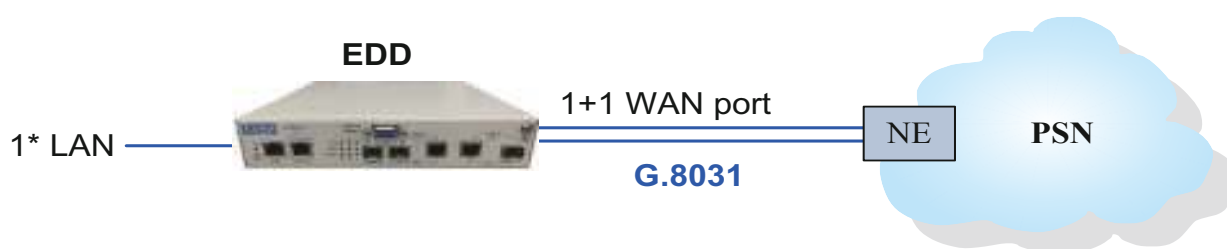
G.8031

The Link Bonding Application Using IP-7930-B

Pause Frame

User Port   **IP7930-B**

Pause Frame
Agg1
Agg2
Pause Frame

satellite

microwave
link

Pause Frame

Pause Frame   **IP7930-B**

Pause Frame

802.3ah   **802.3ah**

802.1ag/ Y.1731 Service OAM
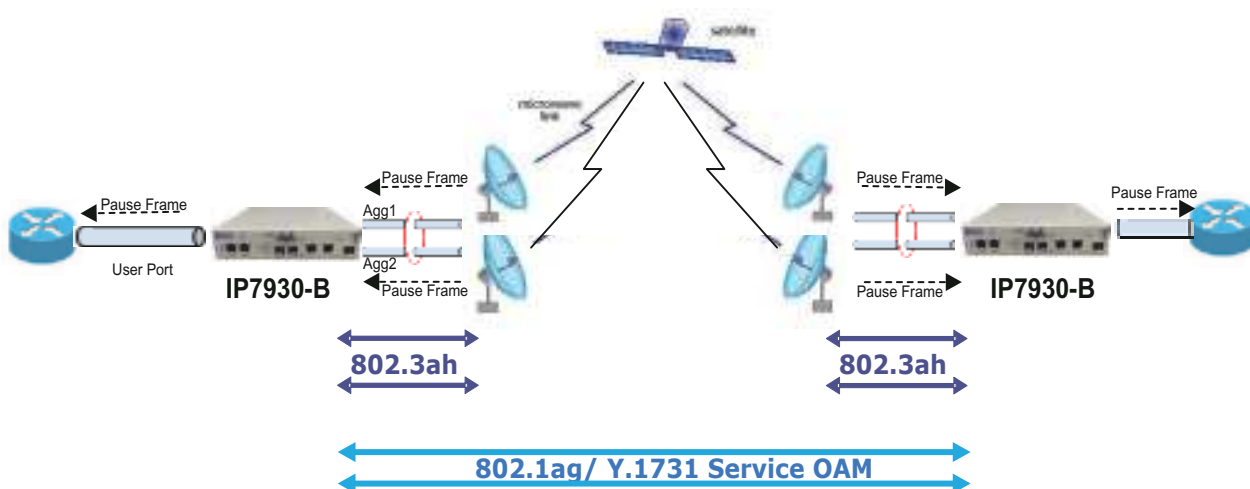
Dual-homing Redundancy Using G.8031

EDD

1 * LAN ——— **2 * WAN**

NE1

Dual Homing mode

PSN

NE2
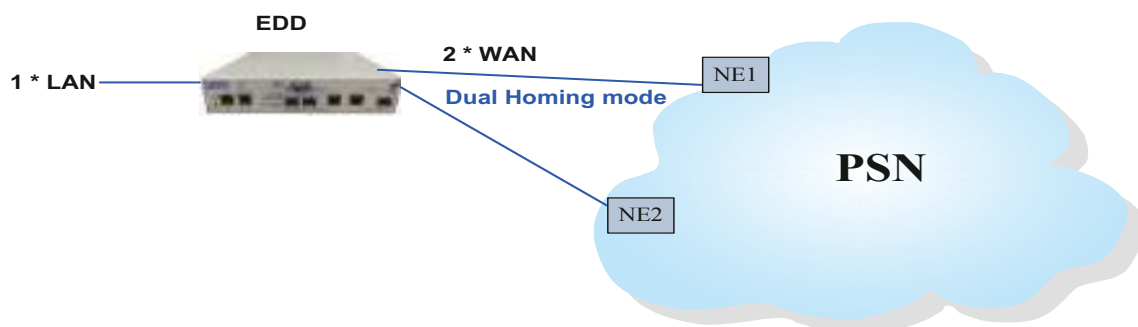
The Tapping Monitor Using IP-7930-T

Optical
Splitter

IP7930-T

IP7930-T

WireShark/
Packet Sniffer

WireShark/
Packet Sniffer
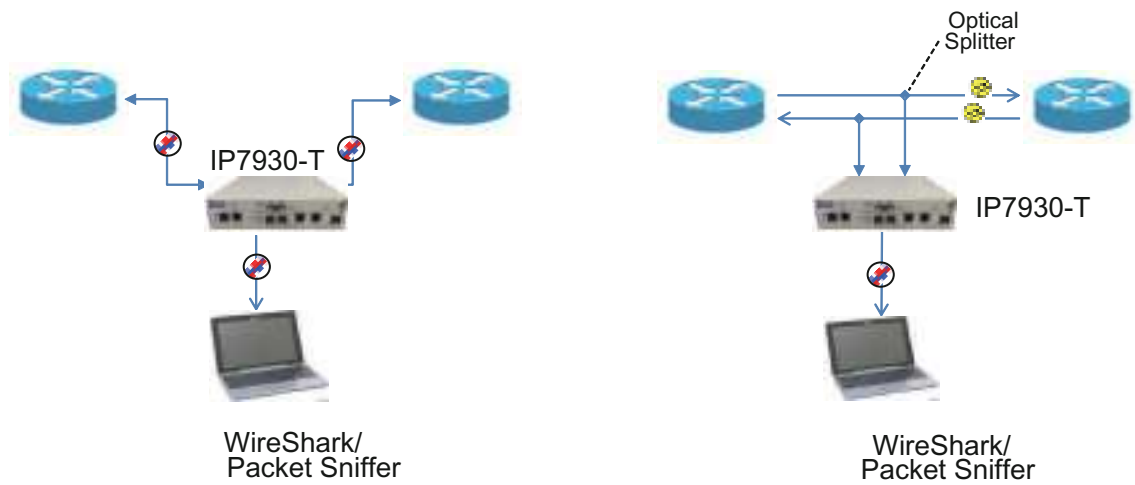
Loop-G7820 L2/L2.5/L3 Intelligent Switch

Description

The Loop-G7820 is a high performance Ethernet switch to meet next generation Metro, Data Center and Enterprise Ethernet network requirements designed based on high-end scalable chipset with integration of Layer 2 to Layer 4 packet processing engine, traffic management and fabric interface.

The G7820 switch provides a total of 48 GbE RJ45 ports. The switch capability of G7820 supports 120Gbps non-blocking switching for full line speed traffic.

The G7820 provides advanced L2/L3 features to meet the requirements in Carrier Ethernet and Enterprise network application. G7820 main features including full IPv4/IPv6 stack, On-chip OAM (802.1ag/CFM/EFM), and Protocol Independent APS (<50ms protect switching).

Features

- Capacity
  - 8 x 10GbE ports
  - 48 GbE ports
  - 120 Gbps Wire-Speed Bi-dir Switching Capacity
- MPLS-TP
  - Any Ethernet port can be configured as NNI (MPLS port) or UNI (Ethernet service port)
  - Bi-directional LSP
  - Static LSP/PW provisioning via NMS
  - MPLS-TP OAM per ITU G.8113.2
- Carrier Ethernet
  - Ethernet OAM – 802.3ah*, 802.1ag/Y.1731
  - IEEE 802.1d STP, 802.1w RSTP, 802.1s MSTP
    - IEEE 802.3x Flow Control, 802.1q port based VLAN and port isolation, 802.1p QoS
    - IEEE 802.3ad Link Aggregation Control Protocol (LACP)
    - IEEE 802.1ad VLAN Stacking (Q-in-Q)
- Network Protection
  - LSP 1+1 protection (send two, pick one) per RFC6378, based on TP OAM as fault detection
  - LSP 1:1 protection (RFC6378)
  - ERPS (G.8032) Ring Protection based on Ethernet OAM as fault detection
  - End to end protection switching within sub 50ms
- Management
  - Fully manageable via SNMP (v1, v2, v3)
  - Fully manageable via CLI
    - Serial port
    - SSH, Telnet via Ethernet
  - Account Security
    - Two types of privileges: Operator (read only) and Administrator (read and write)
    - Radius Client Authentication
  - Upload/Download NE configuration
  - Syslog, NTP
- Layer 3
  - ARP, Ping, Trace route
  - VRRP
  - Static Route

- RIP v1/v2
- OSPF
- NTP server/client
- IGMP v2/v3
- PIM-SM
- Ethernet Services
  - E-Line, E-LAN, E-Tree services as defined by MEF 9 and 14 and using VPWS/VPLS
  - Native Ethernet packets supported
  - Encapsulation: PW/LSP (MPLS-TP), VLAN tagging (1Q), VLAN double tagging (Q-in-Q)
- VPLS
  - VPLS bridging
  - H-VPLS bridging
  - 32K MAC addresses
  - 2K VPLS instances per device
  - Split horizon to prevent forwarding loops
- CoS/QoS
  - 8 Priority Queues
  - Scheduling: Strict Priority, WRR with Hierarchy
  - Ingress Policing & Egress Shaping per service
  - CIR / PIR (EIR) 2-rate-3-color
  - MPLS: TC/EXP-Inferred-PSC (Per Hop Behavior Scheduling Class) LSP
- Timing
  - IEEE 1588 v2*
    - PTP Clocks: Ordinary/Boundary/Transparent
    - ToD (Time of day)
    - PPS (Pulse per second) output interface
  - SyncE
    - Synchronous Ethernet from all GbE ports (not on FET ports)
    - ESMC per ITU-T (Ethernet Synchronous Message Channel)
- Network Protection
  - LSP 1+1 protection (send two, pick one) per

* Future option

Application Illustrations
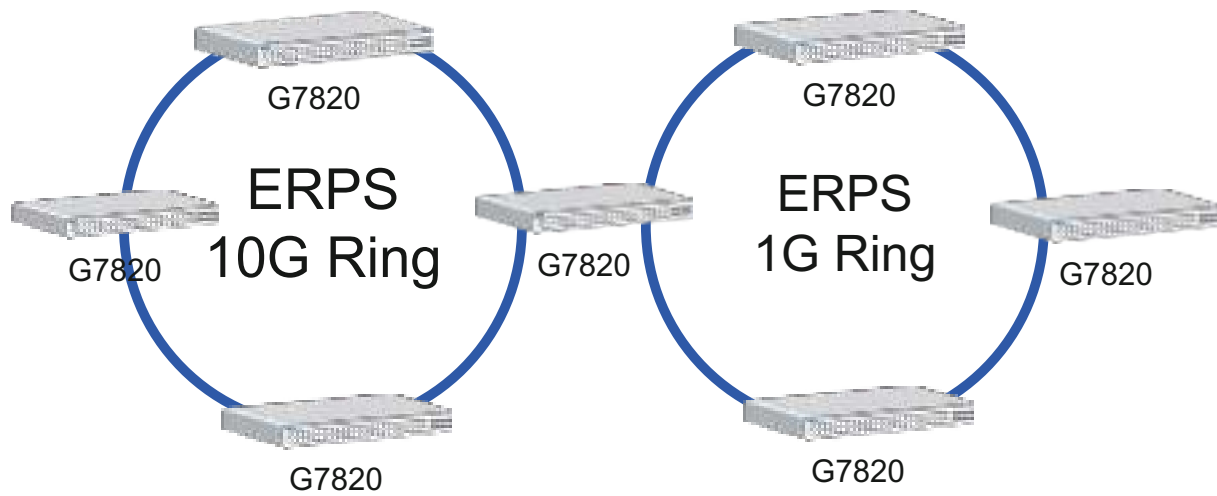
Figure 1 Ethernet Ring Protection Switching (ERPS) network

7

TDM over Ethernet

TDM over Ethernet

Loop-IP6702A TDMoEthernet

Description

TThe Loop-IP6702A device allows operators to transport Unframed/Framed 1 E1/FE1 (1 Unframed/Framed T1/FE1) data stream with timing information over PSN (Packet Switched Network) via Pseudowire Protocol – SAToP or CESoPSN . Another IP6702A converts the received packet stream back to original E1/FE1 or T1/FE1 data stream with original timing information. This allows cost-effective migration from existing legacy TDM networks to Packet Switched Network.

Features

- Mechanics and Electrics
  - ANSI shelf
  - Power:
    - Fixed AC
    - Fixed DC
    - Combined AC and DC (AoD)
- Ethernet Interface
  - Four Ethernet ports for WAN or LAN port assignment
    - One Fast Ethernet with 1 SFP housing
    - Three 10/100 BaseT Ethernet
- User Tributary Interface
  - TDM Tributary interfaces: up to 1 E1 or 1 T1 Unframed mode/Framed mode
  - DTE interface: 1 RS422/V.11
- L2 Switching
  - Jumbo frame size up to 2048 bytes
  - VLAN:
    - Maximum 4K VLAN ID
    - Maximum 16 con-current VLAN Groups
    - Support C-VLAN/S-VLAN tag adding and removing on Pseudowire
    - Support 802.1q Port-Based VLAN on Ethernet/ SNMP Port
  - Support 802.1d MAC Learning
  - Support 803.3x Flow control on input ports
  - Packet Transparency
- Pseudowire Capability
  - Support SAToP and CESoPSN
  - Support E1/T1 traffic emulation over UDP/IP Network
  - Maximum 16 Pseudowires
  - 1 E1/T1 can support up to 16 pseudowires
  - PDV Compensation Depth: up to 256 ms
  - Jitter Buffer Size: up to 256 frames

- Pseudowire Diagnostic Function
  - Built-in BERT for E1/T1 to Line or WAN direction
  - IP – MAC Table Display
- Jitter & Wander
  - PPM version: conforms to G.823 Traffic Interface (+/- 1ppm)
- Timing Reference
  - Internal (4.6 ppm)
  - Line (E1/T1)
  - Adaptive Clock Recovery: 4 ACR clock servos can recovery clock from any 4 Pseudowires
- OAM Capability
  - Support 1 SNTP timing reference
  - LOS, LOF, LCV*, RAI, AIS, FEBE*, BES, DM*, ES, SES, UAS and LOMF*
  - Multi-color LED indicators
  - Alarm relay
  - ACO (Alarm Cutoff) button
- Management Interfaces
  - 1 user-selectable Ethernet/SNMP port
  - SNMP v1/v3 with 5 SNMP trap IP
  - DB-9 Console port with VT-100 menu
  - Telnet and SSH v2
  - C-VLAN tag on management traffic
- Standards Compliance
  - SAToP and CESoPSN
  - MEF8*

* Future Option

Application Illustrations

Point to Point Application

IP6702A
E1/T1
ETH
10/100 BaseT
or 100 FX
ETH
ETH
10/100 BaseT
IP
Network
IP6702A
E1/T1
ETH
ETH
10/100 BaseT
Management

Fractional E1 Point to Multipoint Application

IP6702A
FE1/T1
RS422
64K, Pseudowire #1
ETH
10/100 BaseT
ETH
Management
64K, Pseudowire #2
IP Network
IP6702A
FE1/T1
ETH
ETH
IP6702A
RS422
ETH
ETH
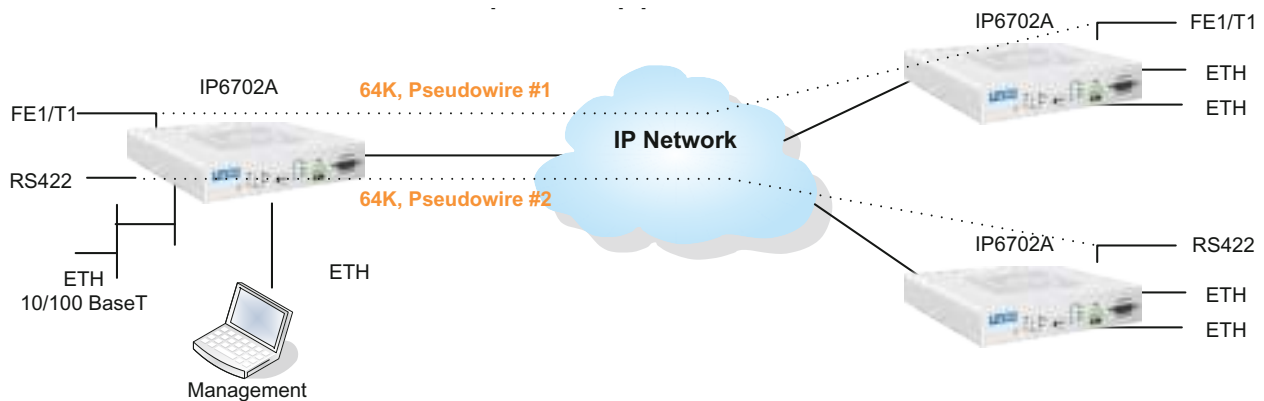
E1/LAN Ethernet Radio Application

Wireless
Ethernet
IP6702A
E1   ETH   ETH
Wireless
Ethernet
IP6702A
E1   ETH   ETH

TDM over Ethernet
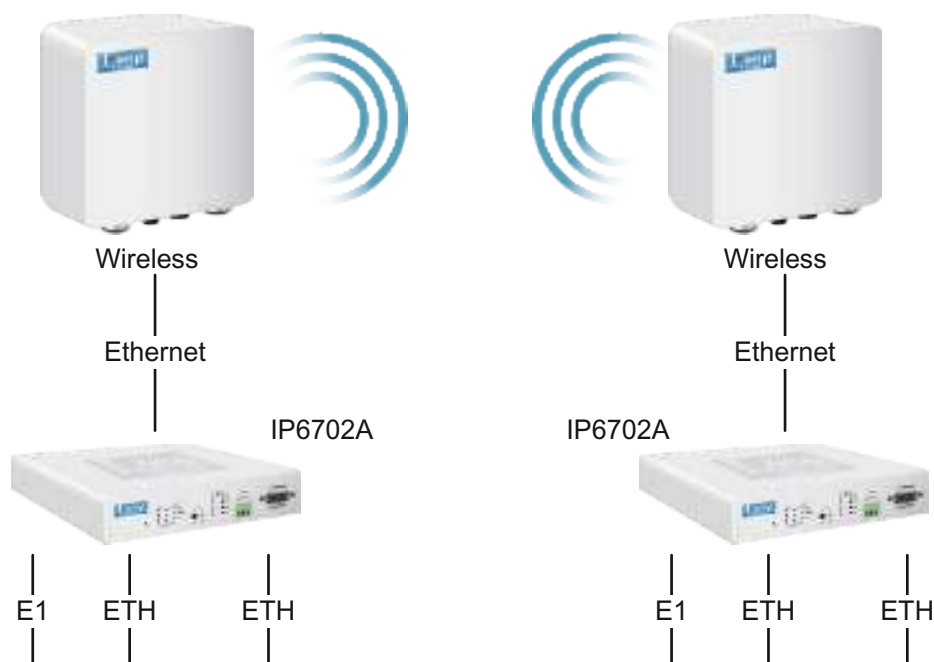
Loop-IP6704A TDMoEthernet

Description

The **Loop-IP6704A TDMoEthernet** is an ideal solution for service providers to build their network and achieve a fast return on investment. Currently providers need to transport both TDM and Packet traffic. These can be achieved using the E1/FE1,T1/FT1 and Gigabit Ethernet tributary ports of the IP6704A.

The Loop-IP6704A device allows operators to transport E1/FE1, T1/FT1, E&M, X.21, RS232, V.35, EIA530, QFXSA or QFXO, G.703, C37.94 data stream with timing information over PSN (Packet Switched Network) via Pseudowire Protocol – SAToP/CESoPSN/MEF8. Another IP6704A converts the received packet stream back to original E1/FE1, T1/FT1, E&M, X.21, RS232, V.35, EIA530, QFXSA or QFXO , G.703, C37.94 data stream with original timing information. This allows cost-effective migration from existing legacy TDM networks to existing PSN**.**

For transport of TDM signals, the Jitter and Wander adheres to G.823/G.824 Traffic Interface.

Features

- Mechanical and Electrical
  - 1U height,1/2 19" rack width. ANSI shelf.
  - Power module
    - Up to two DC plug-in modules or Hybrid 100 to 240 Vac and -48 Vdc (-36 to -72 Vdc) coexist fixed power supply or Single 125Vdc power plug-in module*
  - Temperature range from 0° to 55°C
- Ethernet Interface
  - Four Ethernet ports for WAN or LAN port by software configuration
    - Two Gigabit Ethernet (GbE) with 2 SFP housing
    - Two 10/100/1000 BaseT Ethernet
  - IEEE 802.3ad Ethernet Link Aggregation*
- Timing
  - Internal/Line
  - Adaptive Clock Recovery for TDM Pseudowires
    - Jitter and Wander conforms to G.823/824 for Traffic Interface
  - SyncE
- Management
  - SNMPv1/v3
  - DB-9 Console port with VT-100 menu
  - Telnet and SSH v2
  - iNET GUI
- L2 Switching
  - VLAN
    - Maximum 4094 concurrent VLAN Groups
    - Support C-VLAN/S-VLAN tag adding and removing on Pseudowire
    - Support 802.1q Port-Based VLAN on Ethernet/ SNMP Port
    - Support Q-in-Q
  - Support 802.1d MAC Learning
  - Support 803.3x Flow control* on input ports
  - Support 802.1D STP, 802.1w RSTP, 802.1s MSTP*
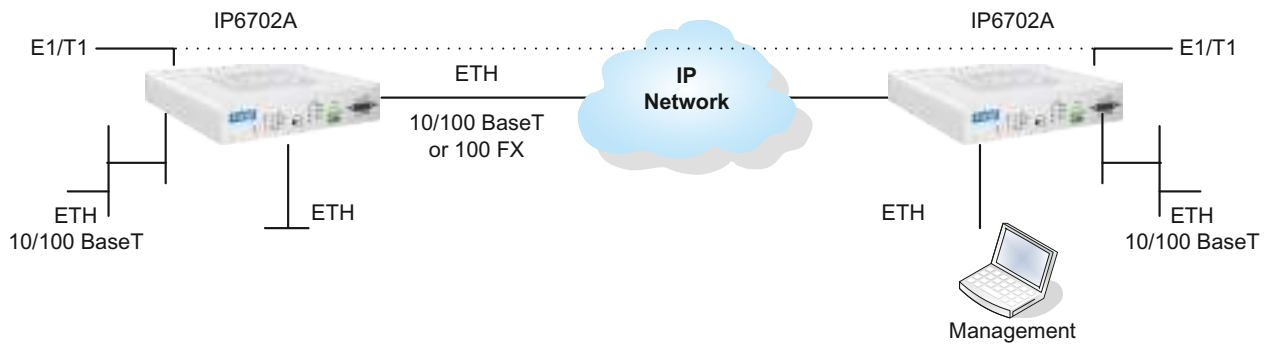 - Support IGMP Snoopingv2 (RFC 2236)*
  Jumbo frame up to 10k bytes
  - IS-IS Packet transparency*

- Tributary Interface
  - Up to four T1 ports or four E1 ports.
  - Up to two single port DTE modules:
    - X.21 or RS232/V.24 or V.35 or EIA530
  - Up to 2 voice modules**:**
    - Four ports E&M
    - Four ports FXS
    - Four ports FXO
    - Four ports Magneto*
    - Supports Echo Cancellation*
- OAM
  - E1/T1 OAM
    - RFC-2495: LOS, LOF, LCV*, RAI, AIS, FEBE*, BES, DM*, ES, SES, UAS and LOMF*
- QoS
  - Ingress Rate Limiting* per Ethernet port with 64kbps/1Mbps/10Mbps granularity
  - Ethernet Network Level:
    - 3-bit Priority Code Point – PCP field within 802.1P/802.1Q Ethernet frame – CoS
    - 4 priority queues per port
  - IP Network Level:
    - 6-bit DiffServ Code Point -DSCP field – ToS
  - Scheduling Algorithm
    - Strict Priority (SP)
    - Weighted Round Robin (WRR)
- Pseudowires
  - TDM Pseudowires
    - Up to 16 concurrent pseudowires
    - 1 E1/T1 can support up to 16 pseudowires.
    - Pseudowire protocols
      - SAToP
      - CESoPSN
      - MEF-8 (CESoETH)
    - Packet Delay Variation Compensation Depth up to 256 ms
- Diagnostics
  - E1/T1 BERT & Loopback

* Future option

Application Illustrations

Tributary ports

IP6704A
TDMoEthernet

Electrical Ethernet
or
Optical Ethernet
(GbE)

IP6704A
TDMoEthernet

E1/T1
E1/T1
DTE
DTE

IP
Network

E1/T1
E1/T1
DTE
DTE

(10/
100/1000
BaseT)

(10/
100/1000
BaseT)

SNMP
(10/100/1000
BaseT)

Management
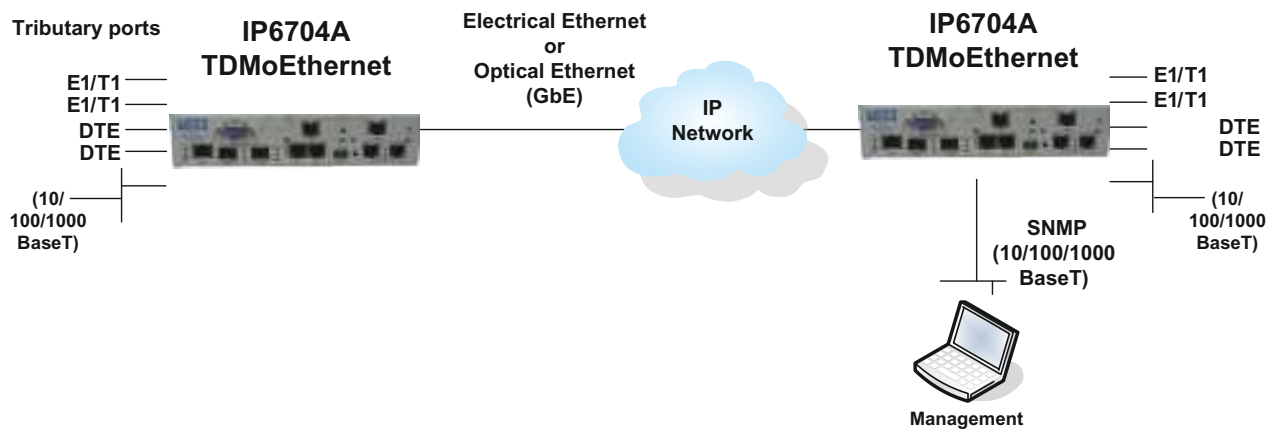
IP6704A Point-to-Point Application.

Building A

X.21

X.21

Building A

Building B

E1

WAN/VPN
Network

E1

Building B

Building C

4E&M

10/100/1000 BaseT
100/1000 BaseFx

4E&M

Building C
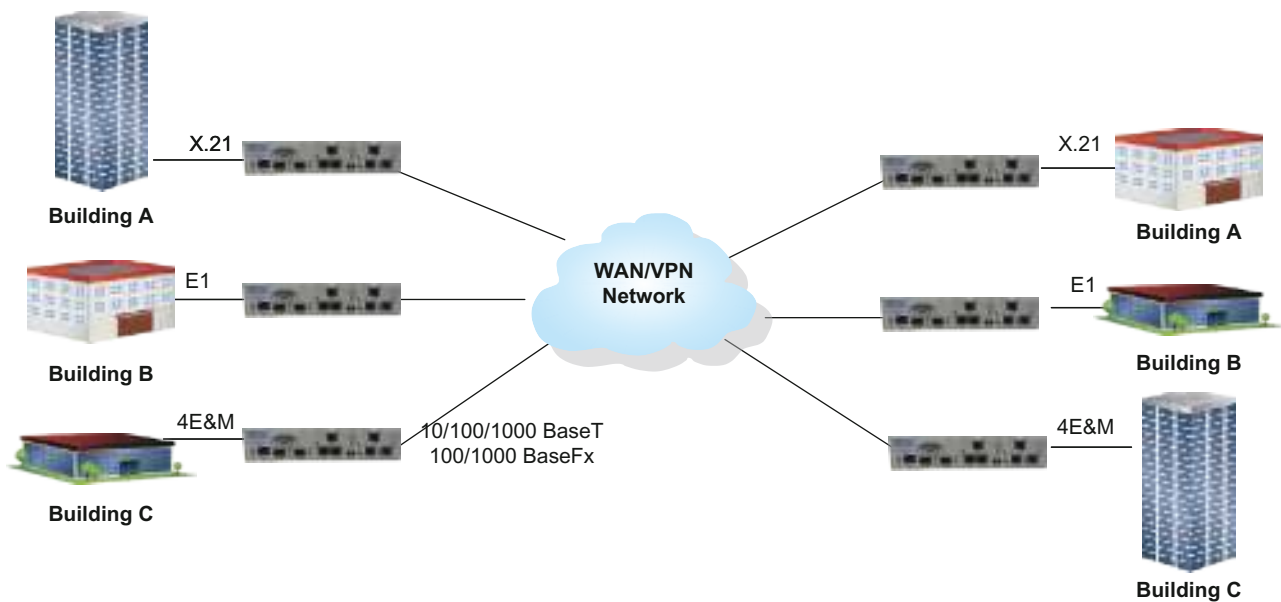
IP6704A on VPN Network

Loop-IP6750 Service Aggregation & Access Device

ANSI Front View

ETSI Front View

Description

The **Loop-IP6750 Service Aggregation & Access Device** is an effective way for service providers to build their network and achieve a fast return on investment. Currently providers need to transport both TDM and Packet traffic. These can be achieved using the E1/T1 and Gigabit Ethernet tributary ports of the IP6750.

In addition to working now, service providers also have to build the network to meet *future requirements*.

The IP6750 can handle temperature ranges of 0° to 65°C. It supports many protocols such as MEF-8 CESoETH, SyncE and IEEE1588v2 Precision Timing, G.8031 Ethernet Linear Protection Switching, and a RFC2544 built-in traffic generator.

The IP6750's durability and capabilities make it an important device for your network to meet the requirements of a carrier-grade Service Level Agreement (SLA).

Product Features

- Mechanical and Electrical
  - 1U height, 19" width ANSI/ETSI
  - Power module
    - AC/DC dual feed slots
    - Hot swappable
  - Industrial series with temperature range from 0° to 60°C
- WAN Aggregate Interface
  - 2 GbE ports with SFP housing
  - IEEE 802.3ad Ethernet Link Aggregation
  - G.8032 v1/v2 – Ethernet Ring Protection Switching (ERPS)
  - G.8031 Ethernet Linear Protection Switching (ELPS)*
  - Compliant with MEF 9, 10.2, 14, 18, and 19*
- Timing
  - Internal/Line
  - External BITS I/O with RJ connector: 2 Mbps, 2 MHz composite clock
  - Adaptive Clock Recovery for TDM Pseudowires
    - Jitter and Wander conforms to MEF 18, ITU-T G.8261, and G.823/824 for Traffic Interface
  - SNTPv4
  - SyncE (ITUT-G.8261) GE interfaces
  - IEEE 1588v2 slave/boundary/transparent clock
  - Internal stratum 3 clock (hold-over state)
  - TOD interface
  - 1PPS interface
- L2 Switching
  - 5G non-blocking switching capacity
  - Jumbo frame size up to 10K bytes
  - Maximum 4K VLANs
  - 802.1d MAC Table Learning (maximum 32K)*
  - 802.1d STP, 802.1w RSTP, 802.1s MSTP*

- IGMP Snooping v2 RFC 2236 and v3 RFC4604*
- L3 Routing for Management
  - OSPFv2/OSPFv3*
  - Static Routing
- Management
  - SNMPv1/v2c/v3
  - CLI command line interface
  - Telnet and SSHv1/v2
  - 802.1x (port access protocol) *
  - RADIUS Client (User Authentication)
- Tributary Interface
  - 4 hot-swappable slots for the following cards:
    - CGbE: Combo Gigabit Ethernet card
      - 2 port groups per card, (1 SFP optical, 1 electric) up to 8 port groups per system
    - E1 / T1 card
      - 4 ports per card, up to 16 ports per system
      - E1/T1 software configurable per card
- OAM
  - Ethernet OAM
    - 802.1ag / Y.1731
    - 802.3ah
  - Syslog and Dying Gasp alarm
- QoS
  - Ingress Rate Limiting per port
  - Ethernet Network Level
    - 3-bit Priority Code Point – PCP field within 802.1p / 802.1q Ethernet frames – CoS
    - 8 priority queues per port
  - IP Network Level
    - 6-bit DiffServ Code Point – DSCP field – ToS
  - Scheduling Algorithms
    - Strict Priority (SP)
    - Weighted Round Robin (WRR)

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- Congestion Avoidance
  - Weighted Random Early Detection (WRED) *
- Policing algorithm
  - Two-Rate Three-Color
  - Token Bucket
- Pseudowires
  - TDM Pseudowires
    - Up to 64 concurrent pseudowires (256 concurrent pseudowires*)
  - Pseudowire protocols
    - SAToP
    - CESoPSN
    - MEF-8 (CESoETH)

- Packet Delay Variation Compensation Depth up to 256 ms
- Ethernet Pseudowires (MPLS-TP)
  - Port-based and VLAN based*
  - Supports Q-in-Q*
  - Native Ethernet packets supported*
- Diagnostics
  - Built-in traffic generator to support RFC2544/ Y.1564 and Y.1731 testing
  - E1/T1 BERT & Loopback
  - Ethernet loopback

Future option

Application Illustrations

IP6750   Aggregation Protection Pair   **IP6750**

16 E1/T1 or 8 GbE   **16 E1/T1 or 8 GbE**

Point to Point Application

IP6750

8 E1/T1 or 2 GbE

IP6750

IP6750

8 E1/T1 or 2 GbE

16 E1/T1 or 4 GbE

Metro Ethernet Network

16 E1/T1 or 4 GbE

16 E1/T1 or 4 GbE

Multistage Multiplexer Application

IP6750

IP6750

Metro Ethernet Network

**16 E1/T1
or
8 GbE**

**8 E1/T1
Or
4 GbE**

**8 E1/T1
or
4 GbE**

Single Stage Multiplexer Application

**Core Network
IP/MPLS, ATM,
SDH/SONET**

**Video
Headend**

Switch

Mainframe

**Video
Hub Office**

**Hosted
ASP/CSP Content**

**Metro
Ethernet**

Video Serving / Central Office

DSLAM

O9340

Media Gateway

BRAS

DSL

Fiber

PSTN

ISP

DSLAM

Museum

Access Devices

O9340

Offices

Bridge

Metro Ethernet Application

8

Fiber Optical Multiplexer (FOM)

Fiber Optical Multiplexer(FOM)

Loop-O9210S PDH Fiber Optical Mux

Features

- 19" unit (1U), standalone, wall mount, and rack mount
- Aggregate port
  - One optical interface
- Tributary ports:
  - Fixed on main board
    - One 4E1 or
    - One 4E1 with 100M bps Ethernet
  - Optional daughter card fixed on panel
    - One 4E1
- Supports multiple optical fiber transmission distances
- Single/dual pair optical fiber modules selectable
- Optical line rate: 150Mbps
- BNC/RJ48C connectors for E1s
- LED indicators for alarms and loopbacks
- RS-232 (DB9) Console port
- Local and remote loopbacks
- Power
  - AC or DC (not available at the same time)

Note: Only non-RoHS compliant and non-CE certified model
available.

Description

Loop-O9210S is a point-to-point optical transmission device developed from VLSI that provides not only a choice of fixed 4E1 or 4E1 plus 100M Ethernet bridge, but also the expansion of another 4 E1 links for multiplex transmission over an optical fiber. It provides longer reach without repeaters and superior performance compared to copper media.

Loop-O9210S has a strong alarm monitoring system, and also local/remote loopbacks controlled by the console or DIP switch. With its high integration, low power consumption, stability, and desktop-mount design, installation and operation is easy and convenient.

Application Illustration

Combination of Tributary ports

Aggregate port

Combination of Tributary ports

4E1
8E1
4E1 + 1 Ethernet
8E1 + 1 Ethernet

Loop Tech O9210S

Optical Link

Loop Tech O9210S

4E1
8E1
4E1 + 1 Ethernet
8E1 + 1 Ethernet
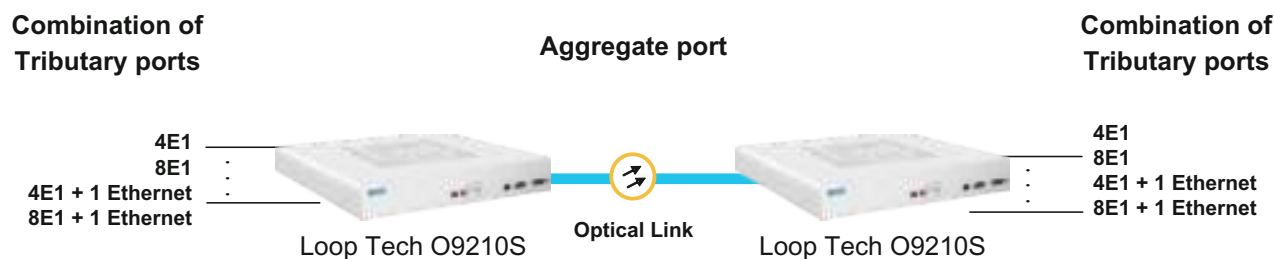
Loop-O9310 4E1 or 4T1 Fiber Optical Mux

CPU Version

Non-CPU Version

Features

- Up to 4 E1 or 4 T1 links on one fiber
- Optical 1+1 protection
- 10/100 BaseT Ethernet: Bridge mode, maximum transmission bandwidth 22Mbps (optional)
- One V.35, X.21, RS449/V.36, RS232/V.28, EIA530, or EIA530(A) interface
- Console and Ethernet port for SNMP management
- Management via SNMP
- Remote slave unit can be managed through Embedded Operation Channel (EOC)
- Non-manageable model configurable via DIP switches
- LED indicators
- Alarm relay and alarm cut off
- BNC or RJ45 connectors for 4 E1s (manufacturing option)
- RJ45 connectors for 4 T1s (manufacturing option)
- Multiple optical fiber transmission distances
- Single mode and multi-mode fiber modules

Description

Loop Telecom's Loop-O9310 Fiber Optical Mux product family provides ideal solutions for building fiber-based E1 or T1 networks. The Loop-O9310 can multiplex up to 4 E1 or 4 T1 signals for transmission over an optical fiber, resulting in longer reach without repeaters and superior performance compared to copper media.

The E1 model supports an optional 1+1 protection, an optional 10/100 BaseT Ethernet port, an optional V.35, X.21, RS449/V.36, RS232/V.28, or EIA530 or EIA530(A). It is available in two versions: (1) SNMP manageable and (2) non-manageable. The SNMP manageable model has a master unit with CPU for managing a slave unit, and a slave unit without CPU that is managed by the master unit through EOC. A basic non-manageable model without CPU provides system setup and loopback by DIP switches setting. Applications include interconnections for LAN, WAN, SONET/SDH, ATM, and DLC.

The T1 model is a basic non-manageable model without CPU. DIP switches are used for system setup and loopback settings. Applications include interconnections for ATM and DLC.

Application Illustration

Fiber Optical Multiplexer(FOM)
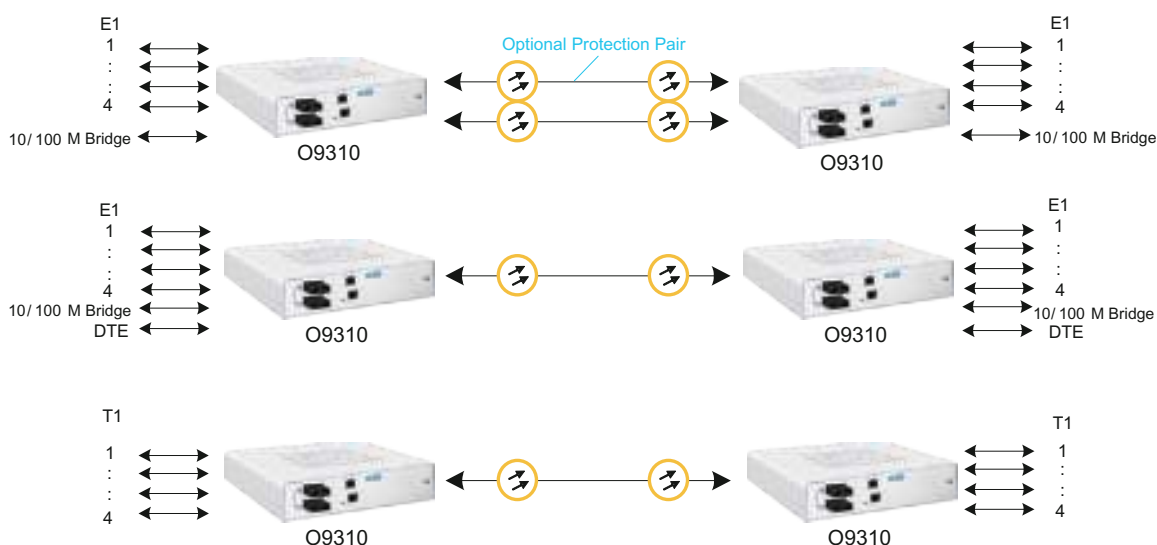
Loop-O9340S Multi-Services Gigabit FOM

Features

- 1U height, ETSI shelf (full frontal access) or ANSI shelf (front and rear access)
- Rack mount, wall mount, and standalone
- Aggregate ports
  - 2 Gigabit Optical Interface with SFP housing
  - (1+1) protection
  - Protection Switching time within 50 ms
  - Manual or automatic protection switch
- Proprietary Optical Aggregate throughput: at least 860 Mbps
- Tributary ports:
  - Hot-swappable
  - 4 slots
  - E1/T1 card
    - 4 or 8 E1/T1 ports
    - Up to 16 E1/T1 ports per system
    - E1/T1 per card software configurable
  - GbE card
    - 2 Combo Gigabit Ethernet (GbE) port groups (RJ45 or SFP housing)
    - Up to 8 Combo Gigabit Ethernet (GbE) ports per system
    - Diagnostics (Loopback and BERT)
    - L2 Functions:
      - Packet Transparency: BPDU packet transparency; IEEE 802.1q VLAN, 802.1ad (Q-in-Q)
      - QoS: 4 priority queues for packet classification; 256K bytes of packet buffer per priority queue, IEEE 802.1p CoS
      - Traffic Rate Control: Rate limited with 256K bps granularity; pause frame according to IEEE 802.3X standard.
- Power modules (hot swappable)
  - DC -48V (-36 to -75 Vdc), dual for redundancy
  - AC 100 to 240 Vac, dual for redundancy
- Alarm relay
- Firmware download to the local and remote unit
- Configuration upload and download
- Management port and interface
  - LCD with keypad on ANSI-shelf
  - Console port (RS232, DB9), VT100 menu-driven
  - SNMP Ethernet port
  - SNMP v1, v2c
  - Telnet via SNMP port
  - In-band management in traffic bandwidth
- RoHS compliant

Description

The Loop-O9340S Multi-Services Gigabit FOM is a flexible, cost-effective fiber optical modulator (standalone) which provides an ideal solution for 2G/3G BTS and buildings with fiber-based E1/T1 and Ethernet networks. With a hot-pluggable platform, it allows service providers to carry up to 16 E1/T1, 32 E1, 8 Combo Gigabit Ethernet (GbE) or a mix with both interface signals over a proprietary Gigabit optical pipe.

To select the protection level, users can choose dual pair fiber for the line (1+1) in the point-to-point application and dual power supplies for power protection.

The Loop-O9340S can be managed through a console port, Ethernet port, Telnet, and SNMP agents. It supports local control and diagnostics using console port. The unit also supports local and remote monitoring and diagnostics. Contacts for office alarms are available.

Applications for Loop-O9340S include interconnections for LAN, WAN, SONET/SDH, ATM and DLC.

Application Illustration

Point-to-point application

Tributary ports

Aggregate ports

Tributary ports

Up to 4 slots, combination of 4E1/T1, 8E1 or 2 Combo GbE plug-in card

Loop O9340S

Loop O9340S

Up to 4 slots, combination of 4E1/T1, 8E1 or 2 Combo GbE plug-in card

Protection Line (optional)

9

mPTN MPLS/Carrier Ethernet

Loop-G7860 mPTN
MPLS/CE Packet Transport Network

Description

The Loop-G7860 mPTN (MPLS/CE Packet Transport
Network) is a new and cost-effective solution for
transmitting various data service types, including
traditional TDM circuit-based traffic, over a packet-based transportation network.

Front View

By adopting MPLS-TP (Multi-Protocol Label Switching Transport Profile) and Carrier Ethernet technologies,
the G7860 can transport Ethernet (EPL, EVPL, ELAN, EVC defined in MEF), and E1/T1 TDMoE.

The unit is also equipped with OAM tools to perform diagnosis on the LSPs (Label Switched Paths), pseudowires as well
as Ethernet CFM. The Loop-G7860 series is a perfect packet transport platform for IP-Mobile and lease-line applications
containing hub, ring and mesh topologies.

Features

- Mechanical and Electrical
  - 1U height, 19" width ETSI unit (front access)
  - Power supply: hot swappable DC/AC, dual for
    redundancy
  - Harden environment option (-20 ºC to 55 ºC)*
- System capacity
  - Up to 4 x 10GbE SFP+ ports
  - Up to 16 x 1GbE Base-T
  - Up to 22 x 1GbE SFP
  - Up to 80 x E1/T1 ports
  - Up to 8 x STM-1 ports or 2 x STM-4 port
- MPLS-TP
  - Any Ethernet port can be configured as NNI (MPLS
    port) or UNI (Ethernet service port)
  - Bi-directional LSP
  - Static LSP/PW provisioning via NMS
  - Any Ethernet and PDH (CESoP and SAToP)
    service over MPLS-TP
  - MPLS-TP OAM per ITU G.8113.2
- Carrier Ethernet
  - Ethernet OAM – 802.3ah, 802.1ag/Y.1731
  - IEEE 802.1d STP, 802.1w RSTP, 802.1s MSTP
  - IEEE 802.3x Flow Control, 802.1q port based
    VLAN and port isolation, 802.1p QoS
  - IEEE 802.3ad Link Aggregation Control Protocol
    (LACP)
  - IEEE 802.1ad VLAN Stacking (Q-in-Q)
- Network Protection
  - LSP 1+1 protection (send two, pick one) per
    RFC6378, based on TP OAM as fault detection
  - LSP 1:1 protection per RFC6378
  - ERPS (G.8032) Ring Protection based on Ethernet
    OAM as fault detection
  - End to end protection switching within sub 50ms
- Management
  - Fully manageable via SNMP (v1, v2, v3)
  - Fully manageable via CLI
  - Security
    - Two types of privileges: Operator (read only)
      and Administrator (read and write)
    - Radius Client Authentication
    - SSH, Telnet

  - Upload/Download NE configuration
  - Performance management
  - Syslog, NTP
- TDM Services
  - E1/T1 Circuit Emulation per IETF-PW3 SAToP and
    CESoP
  - Timing recovery: ACR/DCR/System
  - Encapsulation: PW/LSP (over MPLS-TP), "Dry
    martini", MEF 8 (TDM over Ethernet), TDM over IP
  - Support PDH cross-connection to SDH/SONET*
- Ethernet Services
  - E-Line, E-LAN, E-Tree services as defined by MEF
    9 and 14 and using VPWS/VPLS
  - Native Ethernet packets supported
  - Encapsulation: PW/LSP (MPLS-TP), VLAN tagging
    (1Q), VLAN double tagging (Q-in-Q)
- VPLS
  - VPLS bridging
  - H-VPLS bridging
  - 32K MAC addresses
  - 1K VPLS instances per device
  - Split horizon to prevent forwarding loops
- CoS/QoS
  - 8 Priority Queues
  - Scheduling: Strict Priority, WRR with Hierarchy
  - Ingress Policing & Egress Shaping per service
  - CIR / PIR (EIR) 2-rate-3-color
  - MPLS: TC/EXP-Inferred-PSC (Per Hop Behavior
    Scheduling Class) LSP
- Timing
  - IEEE 1588 v2 PTP
    - Clock modes: Ordinary/Boundary/Transparent
    - ToD (Time of day)
    - PPS (Pulse per second) output interface
  - SyncE
    - Synchronous Ethernet from all GbE ports (not
      on FET ports)
    - ESMC per ITU-T (Ethernet Synchronous
      Message Channel)
  - Stratum 3 timing
  - External clock input (2 Mbps / 2 MHz)

Future option

MPLS-TP Ring Application

SDH/PDH

MPLS or Ethernet

STM-1/4

GE/10GE

G7860

G7860

G7860

G7860

G7860

G7860

IP6750

IP6750

MPLS-TP Ring

16 E1   6 GbE

16 E1   6 GbE
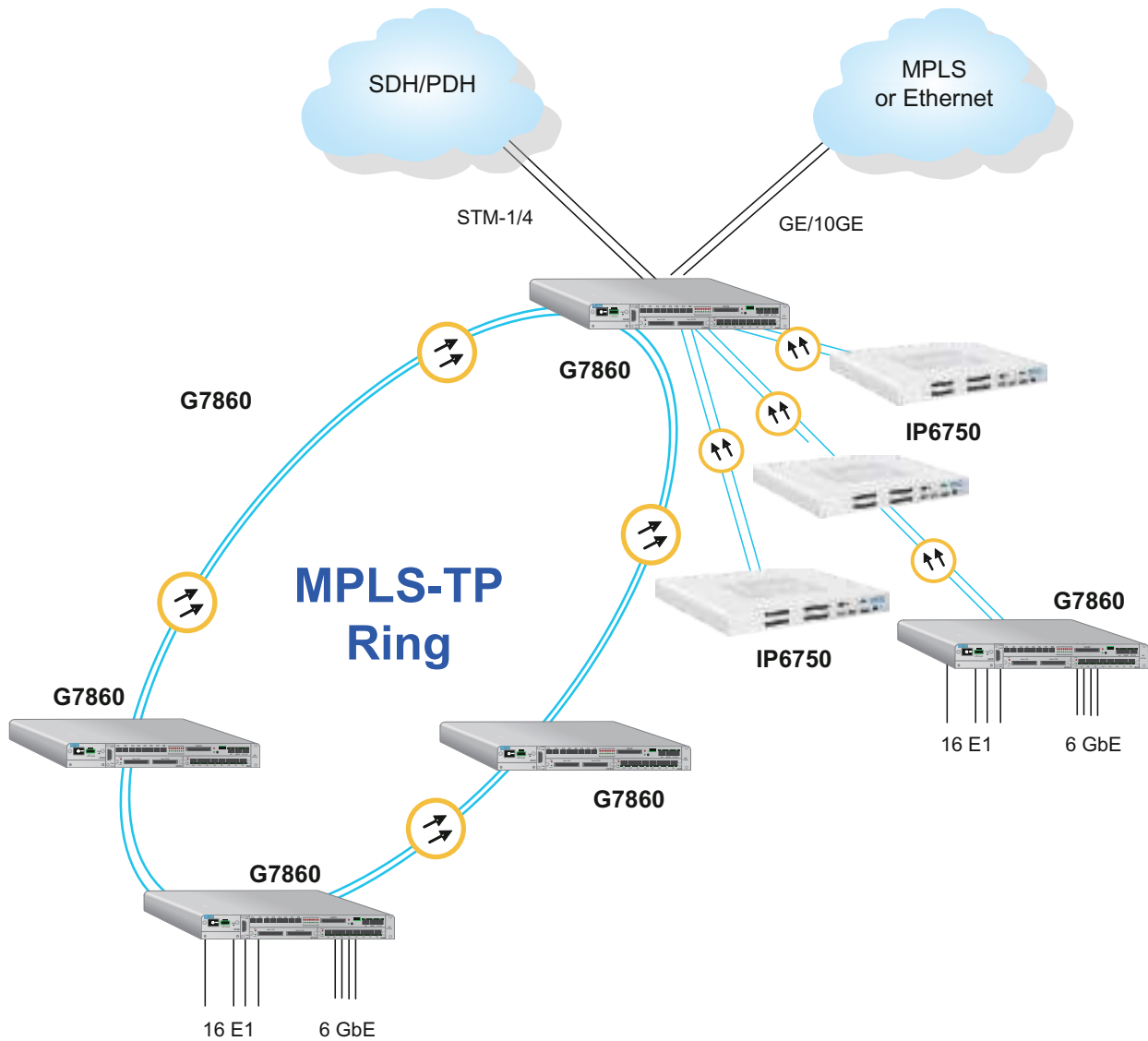
Loop-G7860A mPTN
MPLS/CE Packet Transport Network

Description

G7860A supports both MPLS-TP and Carrier Ethernet (EPL, EVPL, EPLAN, EVC defined in MEF) for packet transportation. In addition to native Ethernet transport, G7860A can be used as the gateway for PDH and SDH/SONET networks to enter PSNs using Circuit Emulation and Encapsulation technologies. Encapsulation technologies include TDMoE, TDMoIP, and TDMoMPLS. Circuit Emulation include CESoPSN (NxDS0/64K), SAToP (Unframed E1/T1), and CEP (SDH/SONET paths). Pseudowires make grooming and multiplexing DS0, E1/T1, and SDH/SONET paths easier, and service integrity can also be monitored and protected via packet network protection schemes.

ETSI Front View of G7860A

One G7860A with up to 85G packet switching capacity supports six 10GbE SFP+ and four 1GbE SFP built-in interfaces along with 16 E1/T1 built-in ports. With the two hot-swappable plug-in slots, the system capacity can be scaled up with additional E1/T1 ports, STM-n/OC-n, or GbE electrical/optical interfaces.

G7860A provides high availability and reliability required by Carrier, Power Utility, Military, Government and Transportation applications by supporting MPLS-TP LSP 1:1/1+1 protection and ERPS, with protection switching time <50ms. Ethernet and MPLS section and end-to-end OAM are also provided for monitoring service integrity and performance. The compact G7860A is only 1U height, but its powerful functions enable customers to provision a service-grooming hub, ring, or mesh 10G packet network with ultimate ease.

Features

- Mechanical and Electrical
  - 1U height, 19" width ETSI unit (front access)
  - Power supply: hot swappable DC/AC, dual for redundancy
  - Operating Temperature: -20 ℃ to 65 ℃
- System Capacity
  - Up to 6 x 10GbE SFP+ ports
  - Up to 16 x 1GbE Base-T
  - Up to 20 x 1GbE SFP
  - Up to 80 x E1/T1 ports
  - Up to 8 x STM-1/OC-3 ports or 2 x STM-4/OC-12 ports
  - Up to 4 x STM-1/OC-3 MSP pairs or 2 x STM-4/ OC-12 pairs
  - 16 x E1/T1 ports with SCSI interface
- MPLS-TP
  - Any Ethernet port can be configured as NNI (MPLS port) or UNI (Ethernet service port)
  - Bi-directional LSP
  - Static LSP/PW provisioning via NMS
  - Ethernet (VPWS, VPLS, H-VPLS) and TDM (CESoPSN, CEP, and SAToP) services
  - MPLS-TP OAM and QoS
  - TDM PW Support:
    - 32 TE1 card: up to 256 pseudowires
    - MB E1/T1: up to 256 pseudowires
    - B16 card: up to 512 pseudowires
- Carrier Ethernet
  - L2 Switching/Bridging
  - STP, RSTP, MSTP
  - Port based VLAN and port isolation
  - VLAN Stacking (Q-in-Q)

- CE OAM
  - CFM: Ethernet Service OAM (802.1ag/Y1731)
  - EFM: Ethernet Link OAM (802.3ah)
- Flow Control
- Link Aggregation Control Protocol (LACP)
- Jumbo Frame (MTU) = 9600
- Network Protection
  - MPLS-TP
    - LSP 1+1/1:1
    - LSP E2E protection switching < 50ms
    - Based on TP OAM for fault detection
  - CE
    - ERPS Ring (G.8032) Protection
    - ELPS (G.8031) Linear Protection
  - SDH/SONET
    - STM-n/OC-n MSP 1+1 Protection
- Management
  - Fully manageable via SNMP (v1, v2, v3)
  - Fully manageable via CLI
    - Serial port
    - SSH, Telnet via Ethernet
  - GbE Interface in-bands
  - Account Security
    - Two types of privileges: Operator (read only) and Administrator (read and write)
    - Radius Client and 802.1x Authentication
  - Upload/Download NE configuration
  - Syslog, NTP
- TDM Pseudowire Services
  - Circuit Emulation
    - DS0 (64K timeslots): CES & multiframe PW
    - Unframed E1/T1: SAToP PW
    - VC-3/4/11/12, VT-1.5/2, STS-1/3: CEP PW
  - PDH Timing recovery: ACR/DCR/System

- ACR/DCR support
  - 32TE1 card: up to 32 instances
  - MB E1/T1: up to 16 instances
  - B16 card: up to 256 instances
- SDH Circuit Emulation over Packet (CEP)
- Encapsulation
  - PW/LSP (TDM over MPLS-TP),
  - "Dry martini", MEF 8 (TDM over Ethernet),
  - TDM over IP
- PDH cross-connection to SDH/SONET*
- Ethernet Pseudowire Services
  - E-Line, E-LAN, E-Tree services as defined by MEF 9 and 14 and using VPWS/VPLS
  - Native Ethernet packets supported
  - Encapsulation: PW/LSP (MPLS-TP), VLAN tagging (1Q), VLAN double tagging (Q-in-Q)
- VPLS
  - VPLS bridging
  - H-VPLS bridging
  - 32K MAC addresses
  - 2K VPLS instances per device
  - Split horizon to prevent forwarding loops

- CoS/QoS
  - 8 Priority Queues
  - Scheduling: Strict Priority, WRR with Hierarchy
  - Ingress Policing & Egress Shaping per service
  - CIR / PIR (EIR) 2-rate-3-color
  - MPLS: TC/EXP-Inferred-PSC (Per Hop Behavior Scheduling Class) LSP
- Timing
  - SSM quality level compatible
  - IEEE 1588 v2 (via SyncE only)
    - PTP Clocks: Ordinary/Boundary/Transparent
    - ToD (Time of day)
    - 1-PPS (One Pulse per second) output interface
  - SyncE
    - Synchronous Ethernet from all built-in and plug-in GbE, 10GbE ports
    - ITU-T Ethernet Synchronous Message Channel (ESMC)
  - Stratum 3 timing
  - TDM line clock: E1/T1 and STM/OC ports
  - External clock input and output (2 Mbps / 2 MHz)

* Future option

Application Illustration

Loop-IP6750 Service Aggregation & Access Device

ANSI Front View

ETSI Front View

Description

The **Loop-IP6750 Service Aggregation & Access Device** is an effective way for service providers to build their network and achieve a fast return on investment. Currently providers need to transport both TDM and Packet traffic. These can be achieved using the E1/T1 and Gigabit Ethernet tributary ports of the IP6750.

In addition to working now, service providers also have to build the network to meet *future requirements*.

The IP6750 can handle temperature ranges of 0° to 65°C. It supports many protocols such as MEF-8 CESoETH, SyncE and IEEE1588v2 Precision Timing, G.8031 Ethernet Linear Protection Switching, and a RFC2544 built-in traffic generator.

The IP6750's durability and capabilities make it an important device for your network to meet the requirements of a carrier-grade Service Level Agreement (SLA).

Features

- Mechanical and Electrical
  - 1U height, 19" width ANSI/ETSI
  - Power module
    - AC/DC dual feed slots
    - Hot swappable
  - Industrial series with temperature range from 0° to 60°C
- WAN Aggregate Interface
  - 2 GbE ports with SFP housing
  - IEEE 802.3ad Ethernet Link Aggregation
  - G.8032 v1/v2 – Ethernet Ring Protection Switching (ERPS)
  - G.8031 Ethernet Linear Protection Switching (ELPS)*
  - Compliant with MEF 9, 10.2, 14, 18, and 19*
- Timing
  - Internal/Line
  - External BITS I/O with RJ connector: 2 Mbps, 2 MHz composite clock
  - Adaptive Clock Recovery for TDM Pseudowires
    - Jitter and Wander conforms to MEF 18, ITU-T G.8261, and G.823/824 for Traffic Interface
  - SNTPv4
  - SyncE (ITUT-G.8261) GE interfaces
  - IEEE 1588v2 slave/boundary/transparent clock
  - Internal stratum 3 clock (hold-over state)
  - TOD interface
  - 1PPS interface
- L2 Switching
  - 5G non-blocking switching capacity
  - Jumbo frame size up to 10K bytes
  - Maximum 4K VLANs
  - 802.1d MAC Table Learning (maximum 32K)*
  - 802.1d STP, 802.1w RSTP, 802.1s MSTP*
  - IGMP Snooping v2 RFC 2236 and v3 RFC4604*
- L3 Routing for Management
  - OSPFv2/OSPFv3*
  - Static Routing
- Management
  - SNMPv1/v2c/v3
  - CLI command line interface
  - Telnet and SSHv1/v2
  - 802.1x (port access protocol) *
  - RADIUS Client (User Authentication)
- Tributary Interface
  - 4 hot-swappable slots for the following cards:
    - CGbE: Combo Gigabit Ethernet card
      - 2 port groups per card, (1 SFP optical, 1 electric) up to 8 port groups per system
    - E1 / T1 card
      - 4 ports per card, up to 16 ports per system
      - E1/T1 software configurable per card
- OAM
  - Ethernet OAM
    - 802.1ag / Y.1731
    - 802.3ah
  - Syslog and Dying Gasp alarm
- QoS
  - Ingress Rate Limiting per port
  - Ethernet Network Level
    - 3-bit Priority Code Point – PCP field within 802.1p / 802.1q Ethernet frames – CoS
    - 8 priority queues per port
  - IP Network Level

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www.bestdatasource.com

- ● 6-bit DiffServ Code Point – DSCP field – ToS
- Scheduling Algorithms
  - ● Strict Priority (SP)
  - ● Weighted Round Robin (WRR)
- Congestion Avoidance
  - ● Weighted Random Early Detection (WRED)*
- Policing algorithm
  - ● Two-Rate Three-Color
  - ● Token Bucket
- ● Pseudowires
  - TDM Pseudowires
    - ● Up to 64 concurrent pseudowires (256 concurrent pseudowires*)
    - ● Pseudowire protocols
      - SAToP

- CESoPSN
- MEF-8 (CESoETH)
- ● Packet Delay Variation Compensation Depth up to 256 ms
- Ethernet Pseudowires (MPLS-TP)
  - ● Port-based and VLAN based*
  - ● Supports Q-in-Q*
  - ● Native Ethernet packets supported*
- ● Diagnostics
  - Built-in traffic generator to support RFC2544/ Y.1564 and Y.1731 testing
  - E1/T1 BERT & Loopback
  - Ethernet loopback

* Future option

Application Illustrations
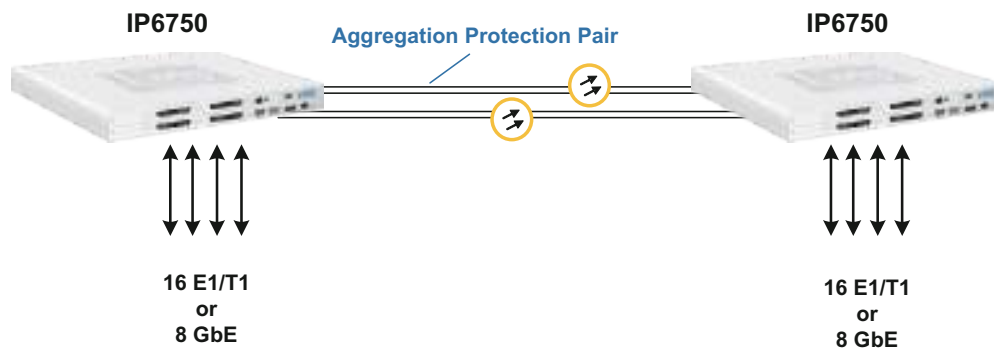
Point to Point Application

Multistage Multiplexer Application

IP6750

IP6750

**Metro
Ethernet Network**

**8 E1/T1
Or
4 GbE**

**16 E1/T1
or
8 GbE**

**8 E1/T1
or
4 GbE**

Single Stage Multiplexer Application

**Core Network
IP/MPLS, ATM,
SDH/SONET**

**Video
Headend**

Switch

Mainframe

**Video
Hub Office**

**Hosted
ASP/CSP Content**

**Metro
Ethernet**

Video Serving / Central Office

DSLAM

O9340

Media Gateway

BRAS

DSL

Fiber

PSTN

ISP

DSLAM

O9340

Museum

Access Devices

Offices

Bridge
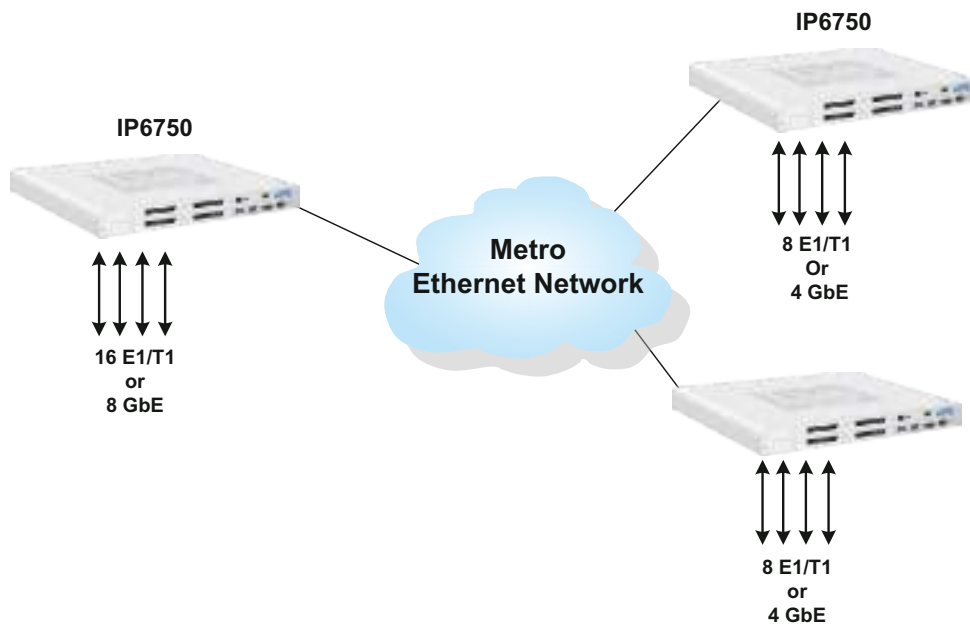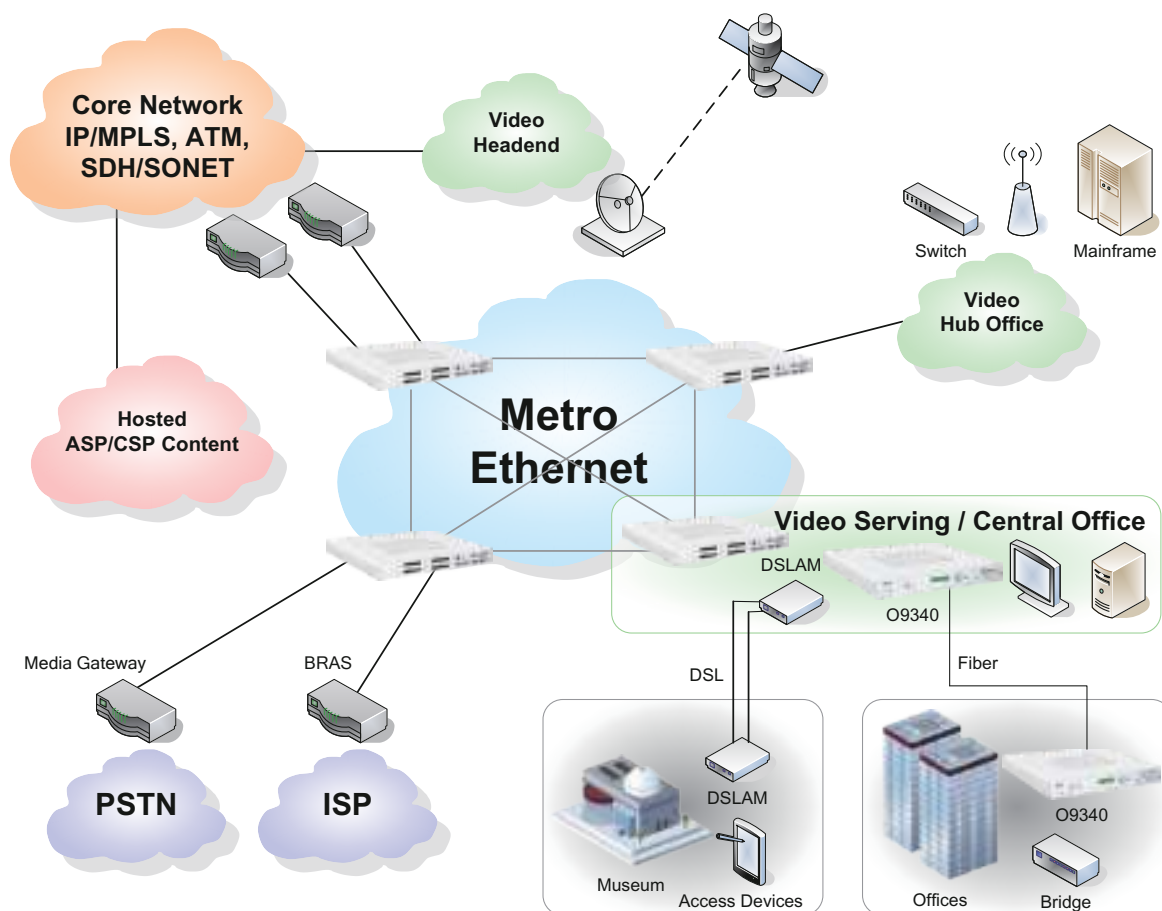
Metro Ethernet Application

Loop-O9400R PTN/SDH/SONET ADM/TM

Supporting PTN, SDH & PDH

Features

- 6U height, full front access (ETSI) shelf support up to 2.5G Mbps backplane
- SDH/SONET VCn/VTn Cross-Connect Capacity: 15Gbps bidirectional non-blocking
- PTN (CE and MPLS-TP) Switching Capacity: 100Gbps bidirectional non-blocking
- Modular design, Hot-swappable cross-connect modules, tributary modules, SFP and SFP+ optical
- Hot-swappable cross-connect modules, tributary modules and power modules
- Temperature-controlled fan tray
- Aggregate cross-connect modules (controller modules)
  - Up to STM-1/4/16 (OC-3/12/48) aggregate lines with software configuration (CCPA)
- Tributary modules: 8 tributary slots
  - Two ports STM-1/4 (OC-3/12) or One port STM-4 (OC-12) module
  - Three ports E3/T3 module
  - 16/32/63 ports E1/T1 tributary module
  - One port STM-16 (OC-48)
  - 1 GbE and 8 FE tributary module with L2 switch
  - 1 GbE or 8 FE tributary module without L2 switch
  - 7 FOM tributary module
  - 4 GEoSDH with L2 switch tributary module

- TDMoG tributary module
- PTN10G module (Three 10G or Eight 1G ports)
- PTNext (One 10G or Ten 1G ports)
- DC Power Module (-40 to -72 Vdc), 500W
  - Dual power (1+ 1) protection
- Protection
  - Controller cross-connect unit (CCPA) protection, MSP (1+1), SNCP/UPSR Ring
  - Tributary protection
    - E1/T1: Card/Port (1:1) using Y-box, Line (1+1)
    - E3/T3: Line (1+1)
    - B155/622: MSP, SNCP/UPSR
    - Ethernet
    - FOM: Line (1+1)
    - 4GEoSDH: Card
    - TDMoG: Card
    - PTN Switch Fabric 1:1
- Network Protection
  - MSP 1+1
  - SNCP/UPSR
  - Ethernet Ring Protection (ERPS G.8032)
  - Link Aggregation (Inter and Intra board)
  - LSP Linear Protection (1+1/1:1) sub 50ms
- External/Internal/Line timing source with SSM
  - SyncE
  - IEEE 1588
  - TDM clocks
- TM, ADM, and cross-connect
- Full cross-connect at VC11/VC12/VC3/VC4 levels
- External/Internal/Line timing source with SSM
- Ethernet supports GFP, LAPS, VCAT, BCP, LCAS and non-LCAS
- Management
  - Console port, VT100 menu-driven
  - SNMP port: Both v1 and v3 supported
  - Telnet, SSH, and Radius
  - Centralized management with Loop's EMS/iNMS over DCC channel
  - Loop-iNET GUI Element Management System
  - TMN management (Loop-iNMS) with full FCAPS and end-to-end circuit management
- RoHS compliant

Description

The Loop-O9400R is a standards-compliant high density SDH/SONET/PTN ADM/TM with a full T1/E1 cross-connect rack system.

With up to 4 STM-1/4/16 (OC-3/12/48) aggregate interfaces on cross-connect modules and 16 STM-1 (OC-3) interfaces on tributaries, the Loop-O9400R offers the service provider a versatile protection scheme including SNCP (UPSR), and MSP (1+1) protection for network topology.

With a PTN10G interface card mounted, the O9400R transports SDH/SONET over PSN network. With O9400R as a gateway between SDH/SONET and PTN, existing SDH/SONET network users will be able to migrate from SDH/SONET/PDH to PTN network smoothly and seamlessly.

mPTN MPLS/Carrier Ethernet

All interfaces are fully compliant with the relevant ETSI standards and ITU recommendations. The Loop-O9400R provides powerful Operation, Administration, Maintenance and Provisioning (OAM&P) functionality, including fault management, performance monitoring, configuration management, and network security management. Through a console port, LAN port and DCC channel, OAM&P can be achieved both locally and remotely via SNMP or menu-driven interfaces.

The Loop-O9400R provides a complete set of operation interfaces that are consistent with the Telecommunication Management Network (TMN) concept (ITU Recommendation M.30, G.784) for SDH/SONET Network Element/Operations System (NE/OS), NE/NE, and NE/Craft communications. Users can easily operate the Loop-O9400R locally or remotely for centralized management.

O9400R Tributary Module Description and Capacity

Module	Description		Maximum Capacity
PTN10G	3 x 10GbE + 8 x 1GbE MPLS-TP plug-in module		1 x STM-16 4 x STM-4 16 x STM-1 24 x E3/T3 504 x E1/T1 64 x 10/100M BT 8 x GbE EoS 56 x FOM 4 x TDMoG 6 x 10GbE 16 x 1GbE
PTNext	1 x 10GbE + 10 x 1GbE MPLS-TP plug-in module		
B155/622	STM-4 (OC-12) tributaries	2 STM-4 MSP 1+1 or 1 STM-4 Sub-ring SNCP or 2 STM-4 without protection	
	STM-1 (OC-3) tributaries	4 STM-1 MSP 1+1 or 4 STM-1 Sub-ring SNCP or 8 STM-1 without protection	
B2G5	STM-16 (OC-48) software configurable interface plug-in module without SFP (mini-GBIC) optical modules		
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		
Ethernet	8 GbE Ethernet over SDH card with L2 switch (8GES4SWA/8GES16SWA*)		
4GEoSDH	4GbE Ethernet over SDH card with L2 switch		
7FOM	7 port FOM tributaries		

Loop-O9400R Front Panel

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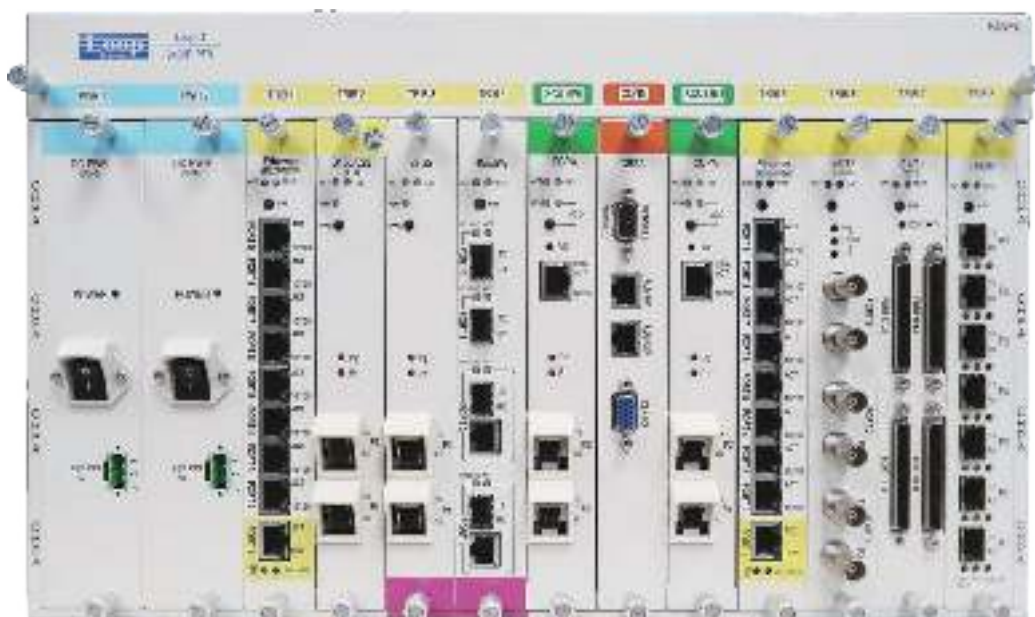
Module Schematics
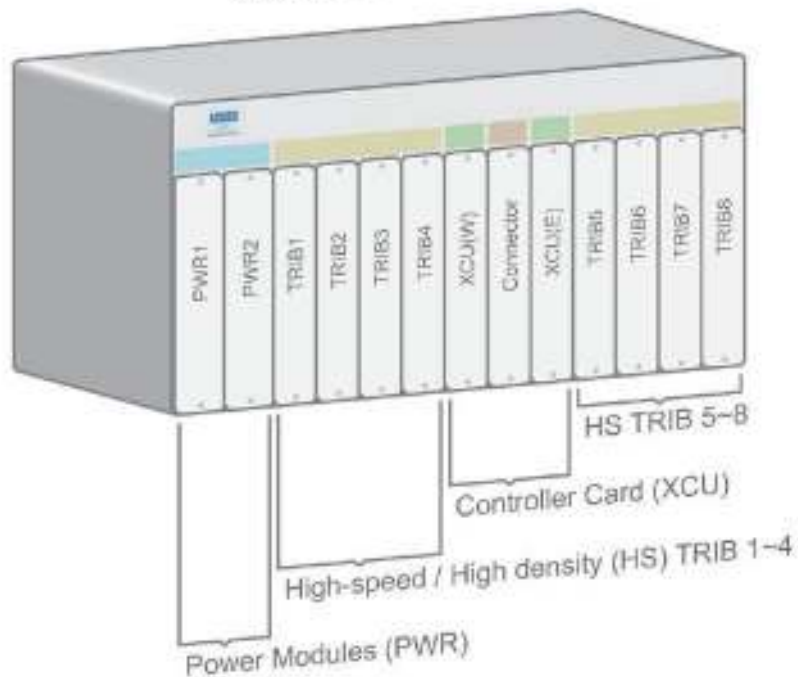
O9400R Tributary Modules

Table 1 High-speed Configuration without protection

Channel	Tributary (Plug-in Modules)								Controller Cards XCU-CC16	
	TRIB 1	TRIB 2	TRIB 3	TRIB 4	TRIB 5	TRIB 6	TRIB 7	TRIB 8	XCU 1	XCU 2
Global payload SDH	4 x 155M	N/A	4 x 155M	N/A	4 x 155M	N/A	4 x 155M	N/A	2 x 2.5G	2 x 2.5G
	2 x 155M	2 x 155M	2 x 155M	2 x 155M	2 x 155M	2 x 155M	2 x 155M	2 x 155M		
	4 x 155M	N/A	16 x 155M	N/A	4 x 155M	N/A	4 x 155M	N/A		
	2 x 155M	2 x 155M	16 x 155M	N/A	2 x 155M	2 x 155M	2 x 155M	2 x 155M		
Link without protection	2xSTM-1	2xSTM-1	2xSTM-1	2xSTM-1	2xSTM-1	2xSTM-1	2xSTM-1	2xSTM-1	2xSTM-1/4/16	2xSTM-1/4/16
	STM-4	N/A	STM-4	N/A	STM-4	N/A	STM-4	N/A	2xSTM-1/4/16	2xSTM-1/4/16
E1	63 E1	63 E1	63 E1	63 E1	63 E1	63 E1	63 E1	63 E1	N/A	N/A
E3	3 E3	3 E3	3 E3	3 E3	3 E3	3 E3	3 E3	3 E3	N/A	N/A
Ethernet 10/100/ 1000BT	8x10/100/1000BT	8x10/100BT	8x10/100BT	8x10/100BT	8x10/100BT	8x10/100BT	8x10/100BT	8x10/100BT	N/A	N/A
FOM	7 FOM	7 FOM	7 FOM	7 FOM	7 FOM	7 FOM	7 FOM	7 FOM	N/A	N/A
4GEoSDH Note 2	N/A	N/A	2.5GbE	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TDMoG Note 3	622M	N/A	622M	N/A	622M	N/A	622M	N/A	N/A	N/A
PTN10G Note 2	N/A	N/A	3 x 10G/ 8 x 1G	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PTNext	10 x 1G	10 x 1G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PTNext	1 x 10G	1 x 10G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

mPTN MPLS/Carrier Ethernet

Table 2 High-speed Configuration with protection

Channel	Tributary (Plug-in Modules)								Controller Cards XCU-CC16	
	TRIB 1	TRIB 2	TRIB 3	TRIB 4	TRIB 5	TRIB 6	TRIB 7	TRIB 8	XCU 1	XCU 2
Link with protection	2xSTM-1	**(B)**	2xSTM-1	**(B)**	2xSTM-1	**(B)**	2xSTM-1	**(B)**	2 x STM-1/4/16 Ring	
	STM-4	**(B)**	STM-4/16 Note 2	**(B)**	STM-4	**(B)**	STM-4	**(B)**		
E1	63 E1	**(B)**	63 E1	**(B)**	63 E1	**(B)**	63 E1	**(B)**	N/A	N/A
E3	3 E3	**(B)**	3 E3	**(B)**	3 E3	**(B)**	3 E3	**(B)**	N/A	N/A
Ethernet 10/100/ 1000BT*	8x10/100BT	**(B)**	8x10/100BT	**(B)**	8x10/100BT	**(B)**	8x10/100BT	**(B)**	N/A	N/A
FOM	7 FOM	**(B)** 7 FOM	7 FOM	**(B)** 7 FOM	7 FOM	**(B)** 7 FOM	7 FOM	**(B)**	N/A	N/A
4GEoSDH Note 2	N/A	N/A	2.5GbE	**(B)** 2.5GbE	N/A	N/A	N/A	N/A	N/A	N/A
TDMoG Note 3	622M	**(B)**	622M	**(B)**	622M	**(B)**	622M	**(B)**	N/A	N/A
PTN10G Note 2	N/A	N/A	3 x 10G/ 8 x 1G	**(B)**	N/A	N/A	N/A	N/A	N/A	N/A

*Future Option

(B) signifies backup/protection

Note 1: With MSP (1+1) protection, the protection pairs on XCU (W) and XCU (E) are as follows:
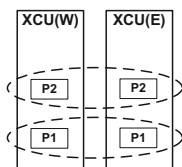
XCU(W) port 1 and XCU(E) port 1
XCU(W) port 2 and XCU(E) port 2
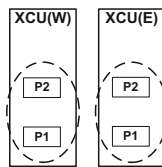
XCU(W) port 1 and XCU(W) port 2
XCU(E) port 1 and XCU(E) port 2

Note 2: 4GEoSDH, B2G5, and PTN10G modules can only be mounted in tributary slot 3 and 4 on CHAA Chassis with XCU-CC16, the backplane of which supports up to 2.5G Mbps mapping bandwidth.

Note 3: The backplane bandwidth for the TDMoG card is 622M. When TDMoG module is mounted to on tributary slots 1, 3, 5, or 7 without protection, slot 2, 4, 6, or 8 will be blocked from use.

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Application Illustration

O9400R and O9500R as a node in PTN network

O9500R

O9400R

PTN (MPLS/CE) 10 GbE Network

G7860

10G

10G

G7860

O9400R and O9500R as an Emulation Gateway

O9500R

O9400R

SDH/SONET STM-1/4/16 OC-3/12/48 Network

SDH/SONET STM-1/4/16 OC-3/12/48 Network

O9500R

VC12/VC11 XC fabric to replace old SDH Network

O9500R

PDH, T1/E1,DS3, STM-n(OC-n), GbE

O9500R

PTN 10G Ring and SDH/SONET Ring Application

Loop-O9500R PTN/SDH/SONET/PDH IMAP
(CHPA chassis & CCPA Controller)

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, B2G5: MSP 1+1, SNCP/UPSR
  - Ethernet: ELPS, ERPS
  - FOM: Line (1+1)
  - EoS: Card
  - PTN10G Switch Fabric 1:1
  - MPLS tunnel LSP (1+1/1:1), switch time <50ms
- 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 768 DS0 timeslots, which equal to 24 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) 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*)
	4GEoSDH	4 GbE Ethernet over SDH card with L2 switch
	7FOM	7 port FOM tributaries
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
	8CD	8-channel G.703 card at 64 Kbps data rate
	1C37/4C37	1 or 4 channel C37.94 (low-speed optical)
	8RS232	8-channel RS232/V.24
	8DC	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

Module Schematics
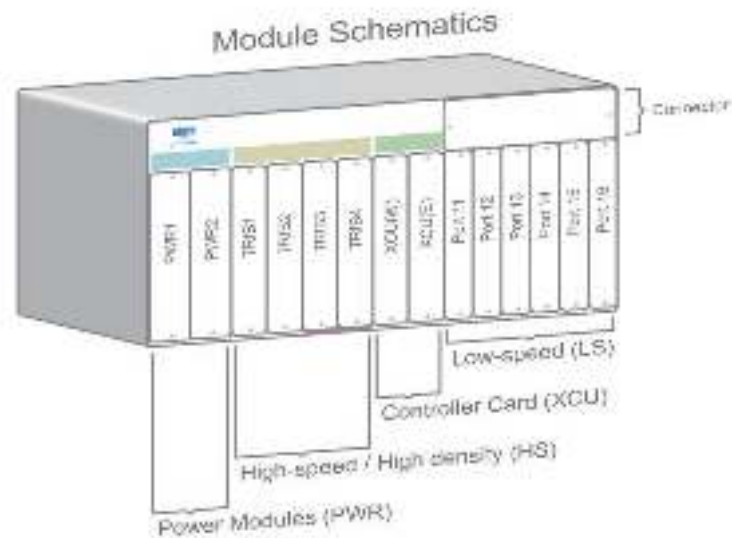
Tributary Module: Maximum Capacity without Protection

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
4GEoSDH	GbE	N/A	N/A	4	4	8
B155/622	STM-1	2	2	2	2	8
B155/622	STM-4	1	1	1	1	4
B2G5	STM-16	N/A	N/A	1	N/A	1
PTN10G	10GE	N/A	N/A	3	3	6
PTN10G	1GE	N/A	N/A	8	8	16
7FOM	FOM	7	7	7	7	28

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
8CD	G.703	8	48
1C37/4C37	C37.94	1/4	4/24
8DC	Dry Contact	8	48
8DCB	Dry Contact	8	48
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

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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 premium license.

Note 2 MSP (1+1) chains on XCU (W) and XCU (E) can be paired as follows:
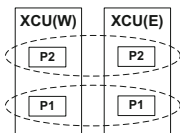
Card-level protection (horizontal):
XCU(W) port 1 and XCU(E) port 1
XCU(W) port 2 and XCU(E) port 2
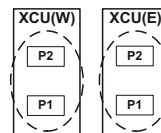
Port-level protection (vertical):
XCU(W) port 1 and XCU(W) port 2
XCU(E) port 1 and XCU(E) port 2

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	Ea3/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	switch	O	N/A	N/A	1	(B)
	10GbE	X	N/A	N/A	3	3
	1GbE	X	N/A	N/A	8	8
PTNext Note 2	1GbE	X	10	10	N/A	N/A
	10GbE	X	1	1	N/A	N/A
7FOM	Fiber Optical	X	7 optical ports	7 optical ports	7 optical ports	7 optical ports
		O	7 optical ports	(B)	7 optical ports	(B)

(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: The 1GbE ports and the 10GbE port are mutually exclusive.

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).
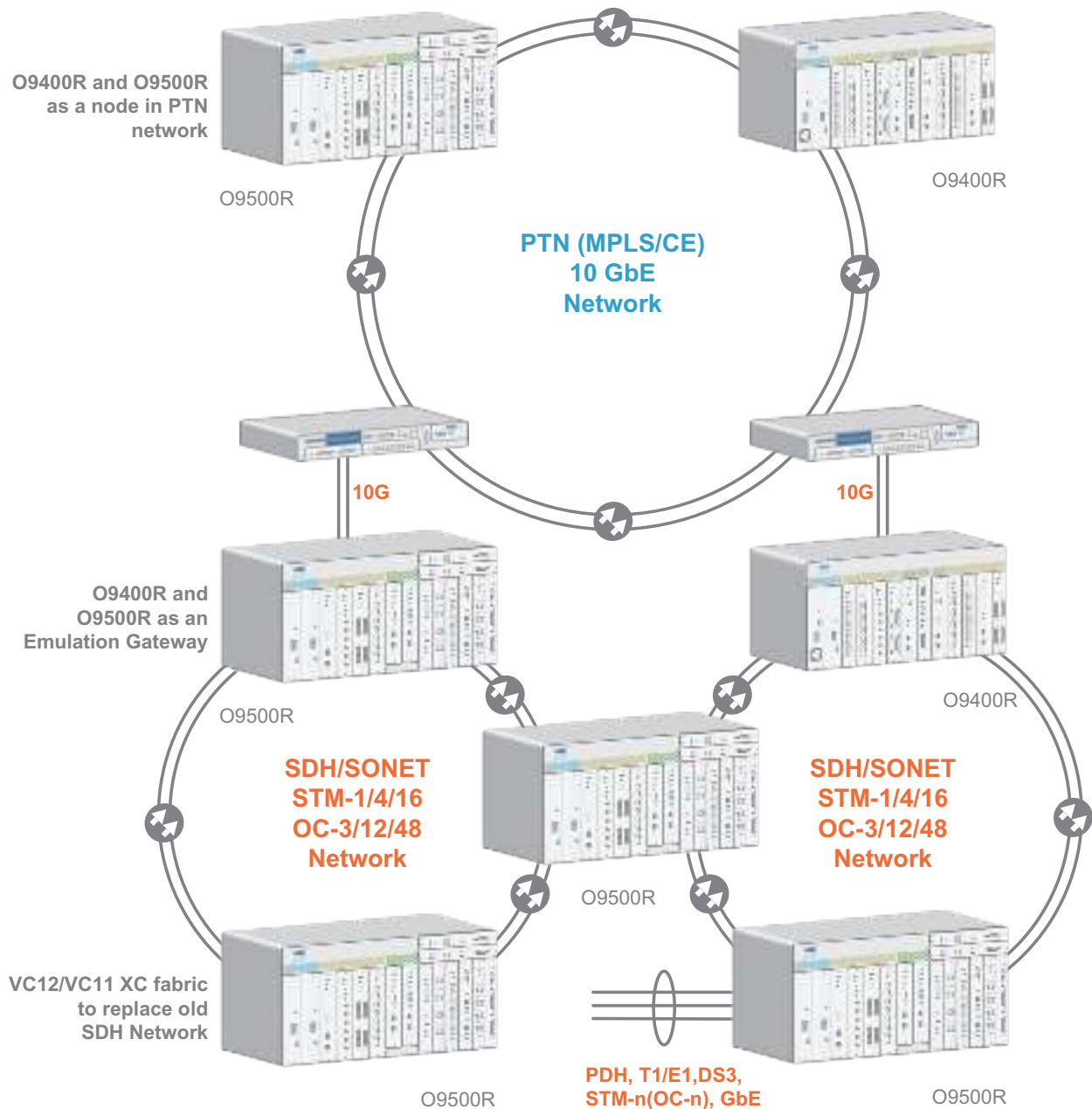
Dual Ring and Triple Role

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.

O9500R = **SDH/SONET ADM** + **MPLS LER/LSR, CE Switch, IP router** + **PDH MUX/DCS**

Loop iNMS

O9500R
as MPLS LER/LSR,
Switch and router

**PTN (MPLS/CE) or IP
10 GbE
+
SDH/SONTET
STM-16(OC-48)**

O9500R
=ADM

O9500R
=PDH MUX/DCS

**Voice, DTE
DS1, DS3
E1/T1, E3/T3
Eth, FE, GbE**

O9500R
as MPLS LER/LSR,
Switch and router

AM3440

Server   Voice   Radio   RTU   PBX
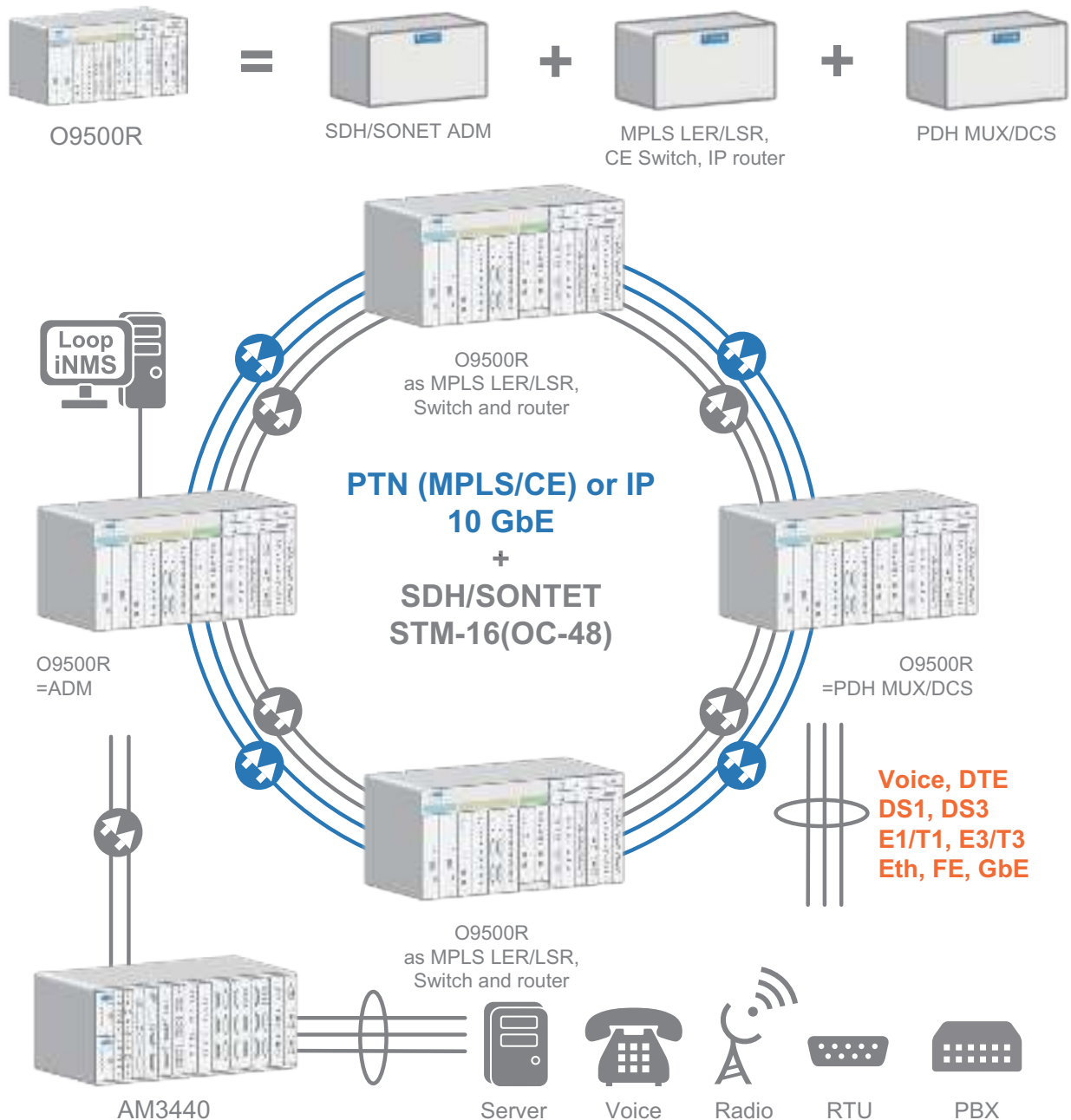
10

Wavelength Division Multiplexer

WDM1800
Wavelength Division Multiplexing Multi-Service Platform

Features

- Full frontal access (ETSI) Shelf
- Two rack-mountable chassis types:
  - CHAa (5U):
    - 2 x Controller Slots
    - 2 x Power Module Slots
    - 1 x FAN Module Slot
    - 15 x Tributary Module Slots
  - CHBa (2U):
    - 2 x Controller Slots
    - 2 x Power Module Slots
    - 1 x FAN Module Slot
    - 6 x Tributary Module Slots
- Dual controller modules, dual power modules for redundancy
- Support console (RS232/USB) and Ethernet (RJ45/SFP) for local and remote management
- Support Web, Telnet, SSH, and SNMP v1/v3 management
- Compatible with SNMP-based GUI network management systems and supported by LoopiNET and Loop iNMS
- Plug-in Module Types (all are hot-pluggable)
  - Transponder Modules
  - Muxponder Modules
  - Wavelength Division Multiplexing Modules
  - Optical Link Protection Modules
  - Amplifier Modules

WDM1800-CHAa (5U)

WDM1800-CHBa (2U)

Description

The Loop-WDM1800 Wavelength Division Multiplexing Multi-Service Platform is designed to deliver a number of client data channels by multiplexing/demultiplexing several different wavelengths into/from an optical fiber. The WDM1800 platform provides up to 15 universal plug-in slots for mounting different modules, including Transponder, Muxponder, WDM filters, OLP modules and amplifier modules. Modular design of the WDM1800 platform makes it easier to select suitable modules for current needs and upgradable for future requirements.

Modular redundancy, enabled when dual controller modules and dual power modules are installed in the chassis, makes the WDM1800 an excellent fit for critical applications.

The WDM1800 supports local control and diagnostics by using a VT-100 terminal connected to the console port, and Ethernet and SFP ports for Web, Telnet, SSH, and SNMP v1/v3 management as well. Furthermore, optical supervisory channel can be accessed via Transponder and/or Muxponder modules through the backplane for remote management.

Application Illustration

Transponder

WDM modules with OLP

Single Fiber for Tx/Rx
Dual Bi-directional path protection

11
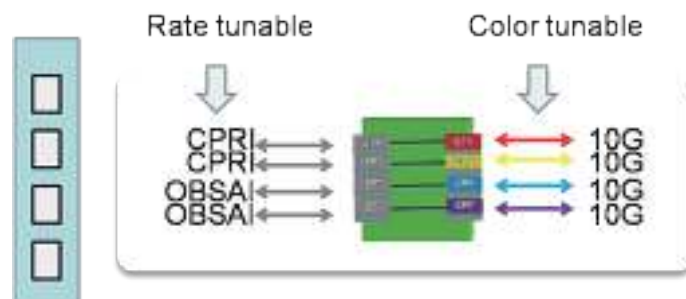
Line Extender Converter
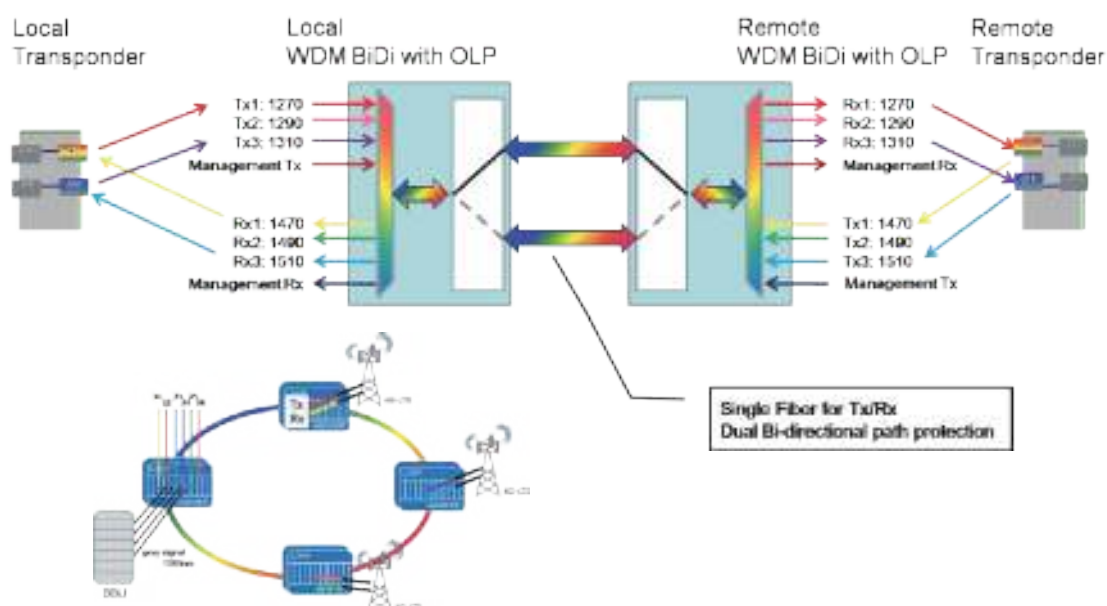
Line Extender Converter

G.SHDSL

Loop-H3300-3S Series G.SHDSL Standalone

Features

- 1-pair/2-pair/1+1 G.SHDSL mode selectable
- 1 pair G.SHDSL.bis
- Dying Gasp report function on 2-pair G.SHDSL Mode (manufacturing option)
- STU-C(master) or STU-R(slave) mode selectable
- E1 (120 ohm) /T1 software configurable
- Supports router or bridge mode
- Built in self-test, loopback and QRSS functions interface hybrid co-existence in one chassis
- Local/remote management through console port, LAN, or WAN
- Log-in and password security protection
- VT100 firmware download
- Supports configuration upload/download
- SNMP and Telnet are supported
- Multi-color LED indicators
- Optional front panel keys and 2-line by 16-character LCD display
- Standard compliance:
  - G.SHDSL: ITU-T G.991.2 Annex A,B
  - G.SHDSL.bis: ITU-T G.991.2 Annex F

Description

The Loop-H3300-3S is part of the H3300 family of CPE products based on the G.SHDSL transmission standard. It uses the standard 16/32-TCPAM line format over twisted copper pairs to provide digital transport for a variety of data formats and data rates.

The distances that this technology can span without repeaters are dependent on the data rate. The Loop-H3300-3S provides high speed transport for a T1/E1 link plus an additional Ethernet bridge, V.35 data transport over one (1) or two (2) twisted copper pairs.

The H3300-3S works as a pair (master and slave unit) or as a slave unit to the one of the three master units: AM3440's G.SHDSL card, H3300 rack and H3300-3S standalone. The master unit is usually a rack-mounted model located in the central office. The slave unit is usually a standalone model located at the customer's premises.

Application Illustrations

One-Loop (For G.shdsl.bis)

Line Rate: 200 - 5704 Kbps

E1/T1
DTE
Ethernet

H3300-3S Master

E1/T1
DTE
Ethernet

H3300-3S Slave

Data Rate :
E1 : 2048 Kbps
T1 : 1536 Kbps
DTE: 2304K / 5696 Kbps

One - Loop (For G.shdsl)

Line Rate: 200 - 2312 Kbps

E1/T1
DTE
Ethernet

H3300-3S Master

E1/T1
DTE
Ethernet

H3300-3S Slave

Data Rate :
E1 : 2048 Kbps
T1 : 1536 Kbps
DTE: 2304K / 5696 Kbps

Two - Loop (For G.shdsl)

Line Rate: 200 - 2312 Kbps

E1/T1
DTE
Ethernet

H3300-3S Master

E1/T1
DTE
Ethernet

H3300-3S Slave

Data Rate :
E1 : 2048 Kbps
T1 : 1536 Kbps
DTE: 4608 Kbps

Loop-H3300R G.SHDSL Rack Card

Features

- Hot-pluggable interface card for Loop-C5500 shelf
- E1/ DTE speed of n x 64 Kbps, n=1 to max n, where max n= 3, 4, 6, 8, 12, 16, 18, 24, 32 for 1 line, and n= 3, 4, 6, 8, 12, 16 for 2 lines.
- T1 speed of n x 64 Kbps, n=1 to max n, where max n= 3, 4, 6, 8, 12, 16, 18, 24 for 1 line, and n= 3, 4, 6, 8, 12 for 2 lines.
- Distances vary by line speeds, wire thickness and environmental factors, depending on max n.
- V.35, X.21 DTE interface, E1 interface, or T1 interface.
- Uses industry standard 16PAM line format.
- A pair of Loop-H3300s can be configured as DTE at one end and E1/T1 at the other in a bridge application.
- Each rack card has 12 LEDs for status, console port for terminal operation.
- Optional front panel keys and 2-line by 16-character display.
- Each unit can be set to be either master or slave.
  - Standard compliance for G.SHDSL, G.991-2, G.994-1

Description

The Loop-H3300 provides high speed digital transport over twisted copper pairs using 16PAM technology. Versatility of this series comes from a choice of digital interfaces and a choice of data rates, with the lower data rates applicable to longer reaches. Repeaters are available for extending the reach beyond a single span.

This rack version is for central office use, while a stand-alone version is intended for customer premises installation. Either version, installed in pairs, can provide (a) an E1 link, with E1 interfaces, (b) a high speed data link with DTE interfaces, or (c) a data access to E1/T1 with DTE interface at one end and E1/T1 at the other, as shown in the application illustrations.

From the shared common controller card of the rack cage, the H3300 supports configuration and diagnostics using keypads and LCD display on the front panel, or from a local/remote terminal. This enables users to execute in-service diagnostics and fault isolation.

Application Illustrations

Two-Loop

E1/DTE: 1032 - 200 Kbps
T1:   776 - 200 Kbps

E1/T1 — Loop-H3300 Master ... Loop-H3300 Slave — E1/T1

E1/T1 to E1/T1

E1/DTE: 1032 - 200 Kbps
T1:   776 - 200 Kbps

E1/T1 — Loop-H3300 Master ... Loop-H3300 Slave — DTE/Router

E1/T1 to DTE/Router

One-Loop

E1/DTE: 2056 - 200 Kbps
T1: 1544 - 200 Kbps

E1/T1 — Loop-H3300 Master ... Loop-H3300 Slave — E1/T1

E1/T1 to E1/T1

E1/DTE: 2056 - 200 Kbps
T1: 1544 - 200 Kbps

E1/T1 — Loop-H3300 Master ... Loop-H3300 Slave — DTE/Router

E1/T1 to DTE/Router

Line Extender Converter
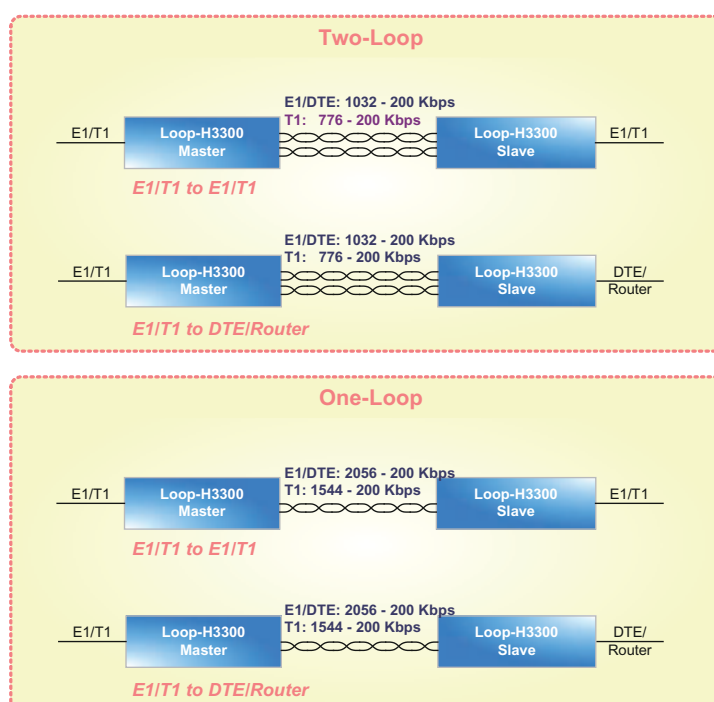
Loop-H3304RA High Density G.SHDSL.bis Rack Card

Features

- Hot pluggable interface card for C5600 shelf
- Ethernet and E1 over SHDSL application
- WAN port
  - 4-port G.SHDSL/G.SHDSL.bis
    - Up to four 1-pair G.SHDSL or G.SHDSL.bis
    - Up to two 2-pair G.SHDSL or G.SHDSL.bis
    - Up to two G.SHDSL/G.SHDSL.bis 1+1 protection
  - Line rate
    - For 1-pair and 2-pair G.SHDSL, the maximum line rate per pair is 2.312M bps
    - For 1-pair and 2-pair G.SHDSL.bis, the maximum line rate is 5.704M bps
  - Sealing current (optional)
  - Using 16/32-TCPAM
  - STU-C (master) mode
  - Supports auto-adaptive rate
- Tributary port
  - Two 10/100M fast Ethernet
    - VLAN (IEEE 802.1Q, 802.1p, 802.1ad (Q-in-Q))
    - QoS
    - RSTP (IEEE 802.1d/802.1w)
    - Supports E-Line dedicated connection between LAN1-WAN1 and LAN2-WAN2
  - 4 E1 ports (optional)
- For C5600 shelf with one controller card:
  - Up to 14 (2Ethernet + 4E1) and 1 (2Ethernet only) H3304RA cards
- Diagnostics: Loopback and BERT test pattern
- Firmware download
- Configuration upload and download
- Standards compliance:
  - ITU-T G.991.2 (G.SHDSL Annex A and B for 1-pair/ 2-pair), (G.SHDSL.bis Annex F for 1-pair/2-pair)
- ITU-T G.994.1

Description

The Loop-H3304RA G.SHDSL.bis plug-in card provides high-speed digital transport over wire pairs by using 16-TCPAM, 32-TCPAM technology for Ethernet and E1 point to point and point to multipoint applications. H3304RA supports 2 fast Ethernet ports on the main card and optional 4 E1 ports over 1-pair/2-pair DSL. A choice of line rates is available with the lower line rates applicable to the longer reaches. The distance that this technology can span without repeaters is dependent on the data rate. The H3304RA plug-in card can work with the H3310 remote unit.

For WAN ports, the H3304RA has four G.SHDSL/G.SHDSL.bis lines which can be grouped into different combinations. For example, combinations can be 4 ports of 1-pair line, or 2 ports of the 2-pair line, or 1+1 protection. For tributary ports, the H3340RA provides 2 fast Ethernet ports and optional 4-port E1 tributary cards.

The rack card is intended to be plugged into the Loop-C5600 multi-services shelf for use in central offices. The H3304RA supports configuration, diagnostics, and fault isolation by using a local terminal, remote Telnet or SNMP management via the controller of the C5600 shelf.

Application Illustration
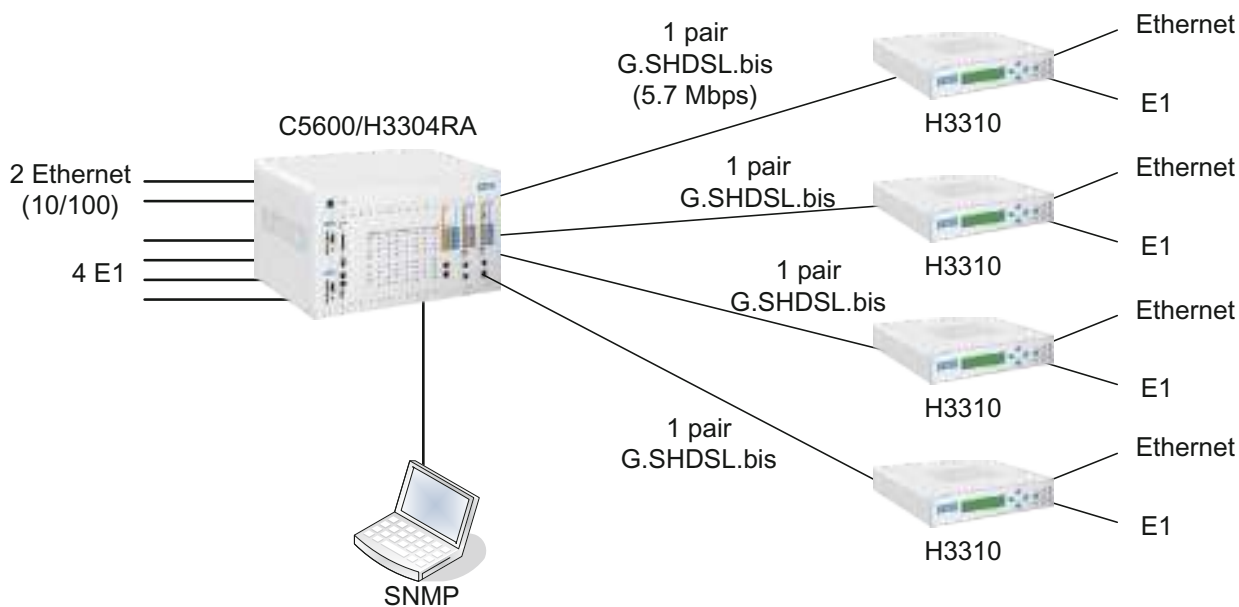
1 pair
G.SHDSL.bis
(5.7 Mbps)

C5600/H3304RA

2 Ethernet
(10/100)

4 E1

H3310

Ethernet

E1

1 pair
G.SHDSL.bis

H3310

Ethernet

E1

1 pair
G.SHDSL.bis

H3310

Ethernet

E1

1 pair
G.SHDSL.bis

H3310

Ethernet

E1

SNMP

Ethernet and E1 Share 1-pair G.SHDSL.bis (5.7 Mbps)

C5600/H3304RA

2 Ethernet
(10/100)

4 E1

H3310

Ethernet

E1

2 pair
G.SHDSL.bis
(11.4 Mbps)

2 pair
G.SHDSL.bis
(11.4 Mbps)

H3310

Ethernet

E1

SNMP

Ethernet and E1 Share 2-pair G.SHDSL.bis (11.4 Mbps)

Line Extender Converter
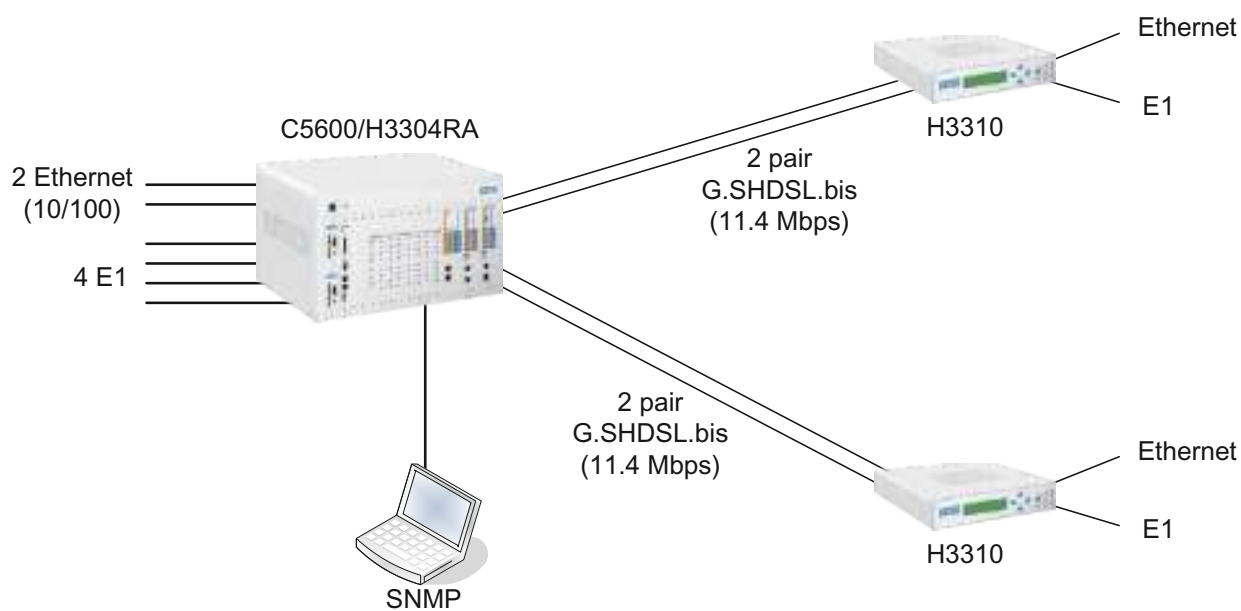
G.SHDSL

Loop-H3310-S G.SHDSL Standalone

Features

- Point to point application
- WAN port
  - 1-pair/2-pair/1+1 G.SHDSL mode selectable
  - 1 pair G.SHDSL.bis
  - 1-pair/2-pair G.SHDSL.bis with hardware bridge option only
  - STU-C (master) or STU-R (slave) mode selectable
- Tributary port
  - Supports up to 2-pair G.SHDSL
    - One E1 port
    - One V.35 DTE port
    - One X.21 DTE port
    - One E1 and two Ethernet ports (Router/SNMP Mode)
    - One E1 and two Ethernet ports (Bridge/SNMP Mode)
    - Two Ethernet ports (Bridge/SNMP Mode)
    - Two Ethernet ports (Router/SNMP Mode)
  - Supports up to 1-pair G.SHDSL.bis
    - One E1 port
    - One V.35 DTE port
    - One X.21 DTE port
    - One E1 and two Ethernet ports (Router/SNMP Mode)
    - One E1 and two Ethernet ports (Bridge/SNMP Mode)
    - Two Ethernet ports (Bridge/SNMP Mode)
    - Two Ethernet ports (Router/SNMP Mode)
  - Supports up to 2-pair G.SHDSL.bis
    - One E1 and two Ethernet ports (hardware Bridge/SNMP Mode) with QoS function
    - Two Ethernet ports (hardware Bridge/SNMP Mode) with QoS function
- Power:
  - Fixed AC (100 to 240 Vac)
  - Fixed DC (-48 Vdc, -42 to -72 Vdc)
  - Fixed AC (100 to 240 Vac) and DC (-48 Vdc, -42 to -72 Vdc)
- Local and remote firmware download
- Local configuration upload/download
- Multi-color LED indicators
- Local/remote management through console port, LAN, or WAN
- Management port and interface
  - LCD and keypad (optional)
  - Console port with VT-100 menu
  - SNMP
    - Embedded SNMP
    - Telnet
- Standards compliance
  - ITU-T G.991.2 (G.SHDSL Annex A, B) and G.994.1
  - ITU-T G.991.2 (G.SHDSL.bis Annex F) and G.994.1

Description

The Loop-H3310-S provides high-speed digital transport over a single copper pair using standard 16 TCPAM/32 TCPAM technology. Versatility of this series comes from a choice of digital interfaces and a choice of line rates, with the lower line rates applicable to longer reaches.

This standalone version is intended for customer premises installation only. The H3310-S provides a high-speed data link with DTE interfaces: E1, V.35, E1 plus 2 Ethernets (Bridge or Router mode), 2 Ethernets (Bridge or Router mode). With the hardware bridge option, the H3310 supports up to 2-pair G.SHDSL.bis with QoS. The H3310-S supports configuration and diagnostics from a local or remote terminal. This allows execution of in-service diagnostics and fault isolation.

Application Illustrations

G.SHDSL Solution

Single E1 Option

For 1-pair or 2-pair:
200Kbps - 2056 Kbps

E1 — H3310 Master — H3310 Slave — E1

Single DTE (V.35 or X.21) Option

For 1-pair or 2-pair:
200Kbps - 2.3 Mbps (per pair)

DTE — H3310 Master — H3310 Slave — DTE

Ethernet Option

For 1-pair or 2-pair:
200Kbps – 2.3 Mbps (per pair)

E1
Ethernet/SNMP
Ethernet/SNMP
— H3310 Master — H3310 Slave —
E1
Ethernet/SNMP
Ethernet/SNMP

For 1-pair or 2-pair:
200Kbps – 2.3 Mbps (per pair)

Ethernet/SNMP
Ethernet/SNMP
— H3310 Master — H3310 Slave —
Ethernet/SNMP
Ethernet/SNMP

Ethernet Hardware Bridge Option

For 1-pair or 2-pair:
200Kbps – 2.3 Mbps (per pair)

E1
Bridge/SNMP
Bridge/SNMP
— H3310 Master — H3310 Slave —
E1
Bridge/SNMP
Bridge/SNMP

For 1-pair or 2-pair:
200Kbps – 2.3 Mbps (per pair)

Bridge/SNMP
Bridge/SNMP
— H3310 Master — H3310 Slave —
Bridge/SNMP
Bridge/SNMP

G.SHDSL.bis Solution

Single DTE (V.35 or X.21) Option

For 1-pair (G.shdsl.bis)
200Kbps - 5704 Kbps

DTE ———— H3310 Master))))) H3310 Slave ———— DTE

Ethernet Option

For 1-pair (G.shdsl.bis)
200Kbps - 5704 Kbps

E1		E1
Ethernet/SNMP		Ethernet/SNMP
Ethernet/SNMP		Ethernet/SNMP

H3310 Master   H3310 Slave

For 1-pair (G.shdsl.bis)
200Kbps - 5704 Kbps

| Ethernet/SNMP | | Ethernet/SNMP |
| Ethernet/SNMP | | Ethernet/SNMP |

H3310 Master   H3310 Slave

Ethernet Hardware Bridge Option

For 1-pair (G.shdsl.bis)
200Kbps - 5704 Kbps

E1		E1
Bridge/SNMP		Bridge/SNMP
Bridge/SNMP		Bridge/SNMP

H3310 Master   H3310 Slave

For 1-pair (G.shdsl.bis)
200Kbps - 5704 Kbps

| Bridge/SNMP | | Bridge/SNMP |
| Bridge/SNMP | | Bridge/SNMP |

H3310 Master   H3310 Slave

For 2-pair (G.shdsl.bis)
200Kbps - 5704 Kbps (per pair)

E1		E1
Bridge/SNMP		Bridge/SNMP
Bridge/SNMP		Bridge/SNMP

H3310 Master   H3310 Slave

For 2-pair (G.shdsl.bis)
200Kbps - 5704 Kbps (per pair)

| Bridge/SNMP | | Bridge/SNMP |
| Bridge/SNMP | | Bridge/SNMP |

H3310 Master   H3310 Slave

Order from: Cutter Networks Inc   Ph: 727-398-5252   www.bestdatasource.com
For the latest product news, updates, technical support and more, please visit our website.

Loop-E1500-2S CSU/DSU Series Standalone

Features

- DSU functionality integrated with an intelligent CSU in a compact package
- Supports up to 2 customer equipment interfaces including E1 ICSU, serial DTE, router, and Alarm Input
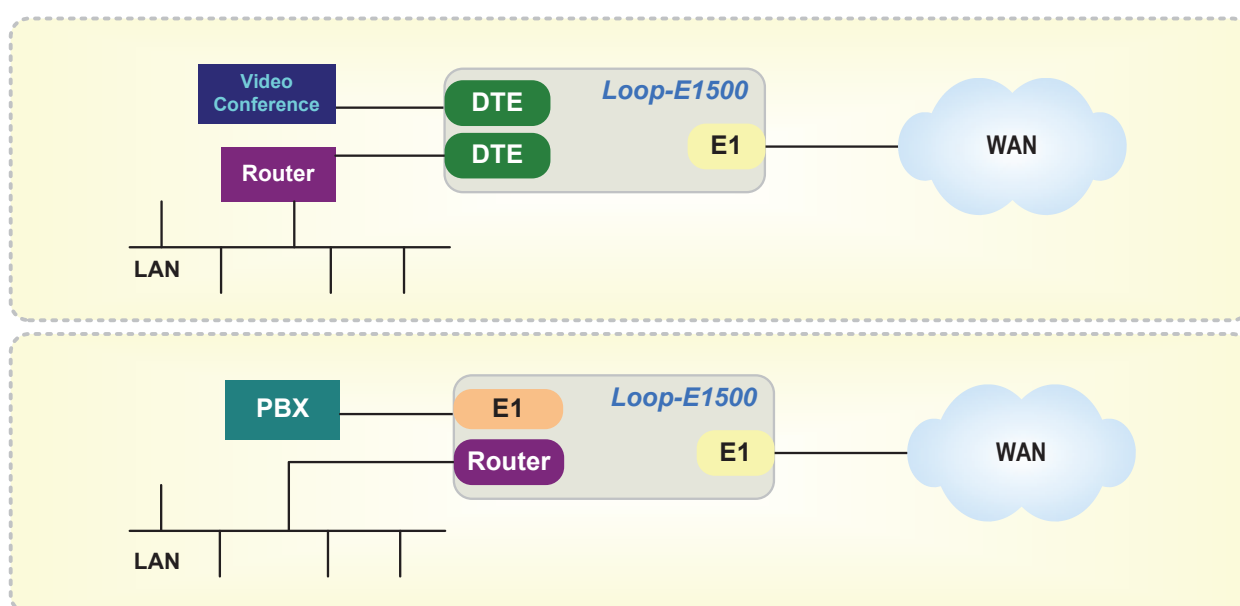- Up to 31 WAN ports with aggregate data rate of 2.048 Mbps
- Supports SNMP Network Management Systems
- Supports In-band Management
- Connects to LAN/WAN, CAD/CAM, or Hosts to E1 Network Services
- Local control and diagnostic via RS232 port or 2-line by 16-character LCD & keypad
- Router - 10/100 BaseT auto selection
- Multicolor LED indicators

Description

Loop Telecom's Loop-E1500 CSU/DSU product series provide an economic solution to E1 network access when not all 31 DS0 channels is needed. Clear channel (32 DS0 channels) is also available. This product series support High Density Bipolar 3 (HDB3) coding and provide continuous error checking, performance polling, and in-service diagnostics. Customer equipment interfaces include E1 ICSU, serial DTE, Alarm Input, and routers. With a DTE port operating from 56 Kbps to 2048 Kbps, Loop-E1500 CSU/DSU allows users to interconnect LANs and WANs, CAD and CAM, video conference, mainframe hosts, and more. With a router interface, users can connect LAN to WAN directly without an additional bridge/router.

The Loop-E1500 CSU/DSU series supports local control and diagnostics using a 2-line by 16-character LCD display / keypads or through a RS232 console port. This allows users to execute in-service diagnostics and fault isolation. An in-band management channel with GUI is available. The Loop-E1500 CSU/ DSU also provides multicolor LED indicators on the front panel. Using SNMP network management and a Telnet connection, users can remotely control and diagnose Loop-E products from anywhere.

Application Illustrations

Loop Telecom

PBX

E1

Loop-E1500

Router

E1

E1 Network

Loop-E1500
Inband Extraction

Inband Insertion

Other Loop products

LoopView
(SNMP Manager)

LAN

Loop-E1500

Loop-E1500

Digital Data Network E1

D&I

DTE1

DTE1

D&I

Channel Bank

CLUSTER CONTROLLER

HOST COMPUTER

Channel Bank

Loop-E1500

Loop-E1500

Digital Data Network E1

DTE1

DTE2

DTE1

DTE2

Bridge/Router

Bridge/Router
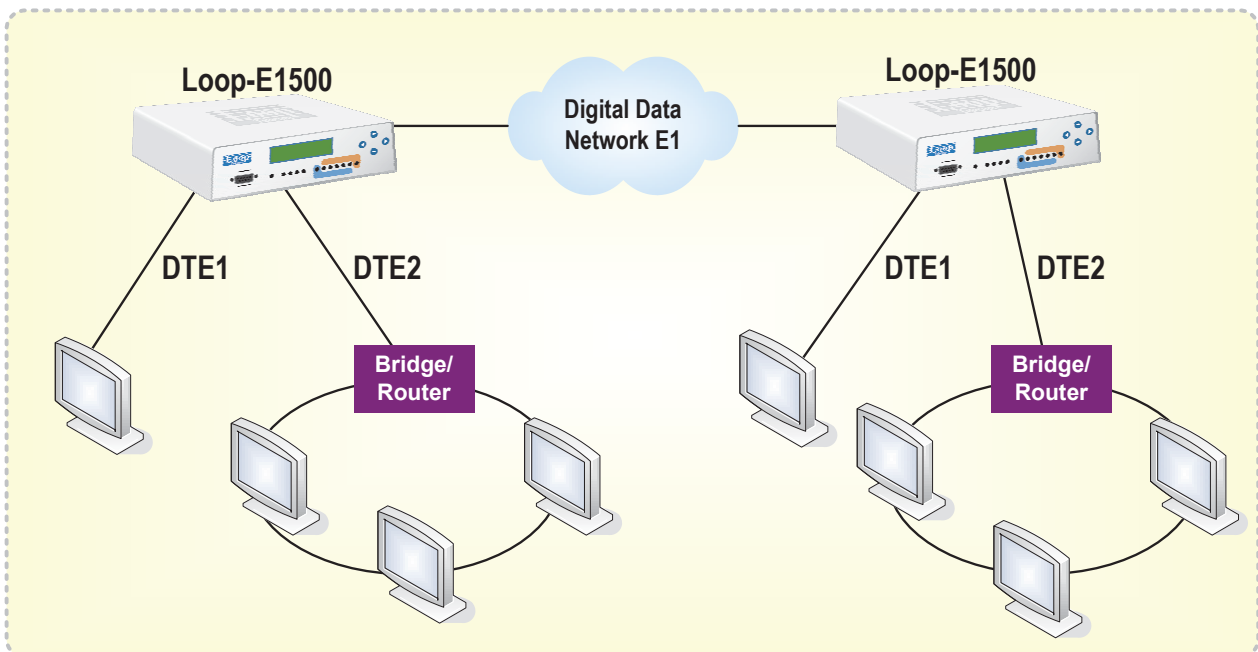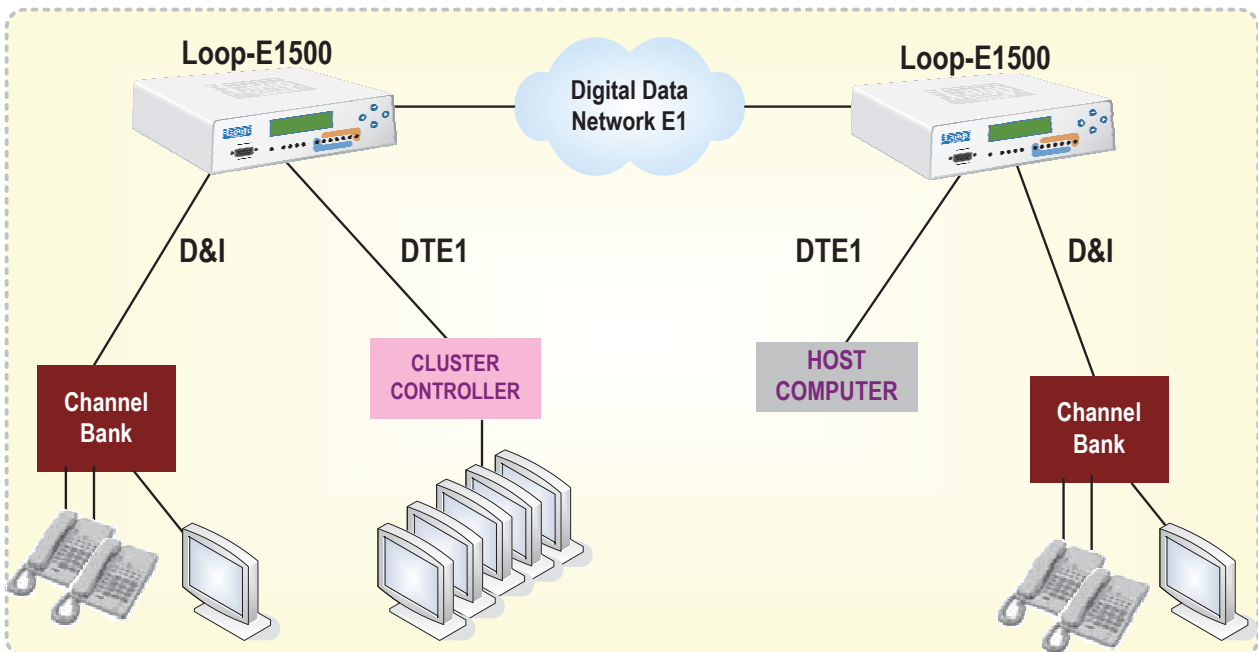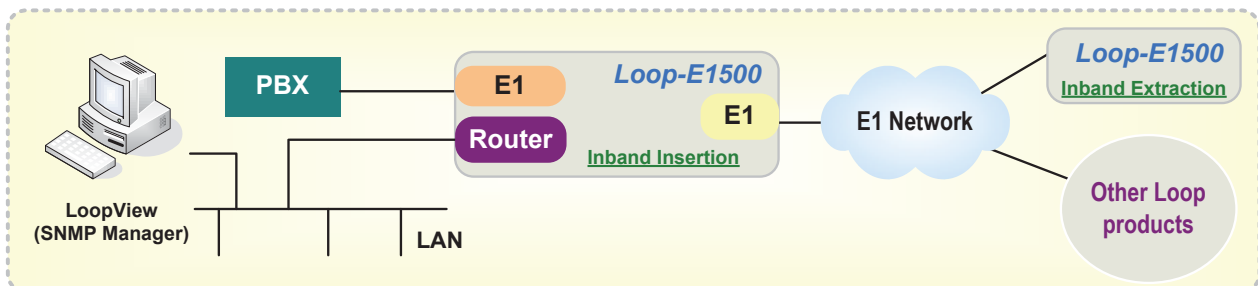
Alarm Input Application-SNMP Trap

System Control

SNMP Trap

Loop-E1500-2S

Alarm Input Interface

Alarm Inputs   Alarm Inputs

Point to Point Application-SNMP Trap

Control Site

SNMP Trap

Loop-E1500-2S

E1

SNMP

Loop-AM3440

Alarm Input Interface

Dry Contact

Alarm Inputs

Alarm Panel

Dry Contact Control Outputs

Test Station Application Illustrations

E15002S
(Golden Sample)

E15002S
(Device under Test)

E1

TX   BNC Cable   RX

RX   TX

E1

DTE2 (X.21)

X.21 Loopback Tool

Plug in   ALM Input Test Tool
Plug out

DTE1 (ALM Input)   N2

N1

Plug in   ALM Input Test Tool
Plug out

Console   Console

COM Port

COM Port

LabView

Loop-E1510 E1oDTE Standalone

Features

- 1U height, desktop or rack mount with a tray
- WAN port
  - Single V.35 (M34, DCE, female)
  - Rates
    - Payload rate: N x 64K bps, N=1 to 31 (64K to 1984K bps)
    - Synchronization rate: 64K bps
    - Bit Rate: (N x 64 K + 64K) bps, N=1 to 31 (128K to 2048K bps)
- Tributary port
  - Single E1 or fractional E1
- Power
  - Single AC or DC power
    - AC: 100 to 240 Vac, 50/60 Hz
    - DC: -48 Vdc (-36 to -72 Vdc)*
- Maintains both E1, fractional E1 and time slot 16 integrity between local E1 and remote E1
- Management
  - Multicolor LED indicators
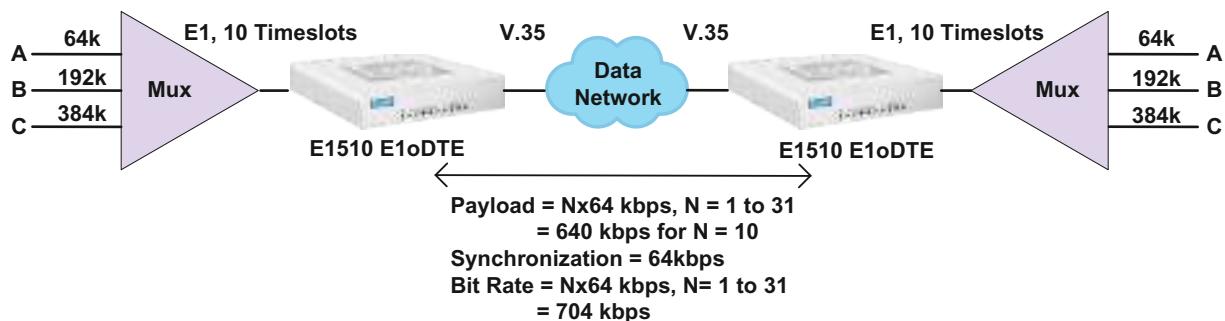 - DIP switch for configuration and loopback

* Future option

Description

The Loop-E1510 E1oDTE (E1 over DTE) provides an economic solution to extend the E1 distance via V.35 data network. The V.35 WAN port operates from 128K bps to 2048Kbps to transport the payload of E1 or fractional E1 (64K to 1984Kbps), and maintains the E1 time slots integrity between local E1 and remote E1.

The E1 port supports framed format with HDB3 (High Density Bipolar 3) coding. The E1 time slot 0 (TS0) framing will be terminated at local side, only the fractional E1 payload (64K to 1984K bps) will be transported to remote.

The configuration and loopback are provided via the DIP switch. The LEDs on the front panel provide status indications for both V.35 WAN port and E1 tributary port.

Application Illustration

Payload = Nx64 kbps, N = 1 to 31
= 640 kbps for N = 10
Synchronization = 64kbps
Bit Rate = Nx64 kbps, N= 1 to 31
= 704 kbps

# Loop-T2500-2S FT1 CSU/DSU Series Standalone

Features

- DSU functionality integrated with an intelligent CSU in a compact package
- Customer equipment interfaces include T1, DTE, and Router
- SNMP network management or terminal console port
- Supports In-band Management
- A GUI management system with Windows based available
- Connection to LAN/WAN, CAD/CAM, or Hosts to T1 Network Services
- Optional advanced jitter performance
- One 2-line by 16-character LCD display

Description

Loop Telecom's Loop-T2500 FT1 CSU/DSU series provides an economic solution to T1 network access cost when only a partial of 24 DS0 channels is needed. This product series support Extended Super frame Format (ESF) which makes possible continuous error checking, performance polling, and in-service diagnostics. Customer equipment interfaces include T1, series DTE, and Router. With a DTE port operating from 56 to 1536 Kbps, Loop-T2500 FT1 CSU/DSU allows users to interconnect LANs and WANs, CAD and CAM, video conference, mainframe hosts, and others.

Loop-T2500 FT1 CSU/DSU series supports local control and diagnostics using 2-line by 16-character LCD display and keypads or RS232 console port. This allows users to execute in-service diagnostics and fault isolation. The multicolor LEDs on the front panel provide both line side and DTE side with status indicators. An in-band management channel with GUI is available. Using SNMP Network Management Systems or Telnet connection, users can remotely control and diagnose Loop-T products from anywhere. A GUI Windows based SNMP manager, LoopView, is available.
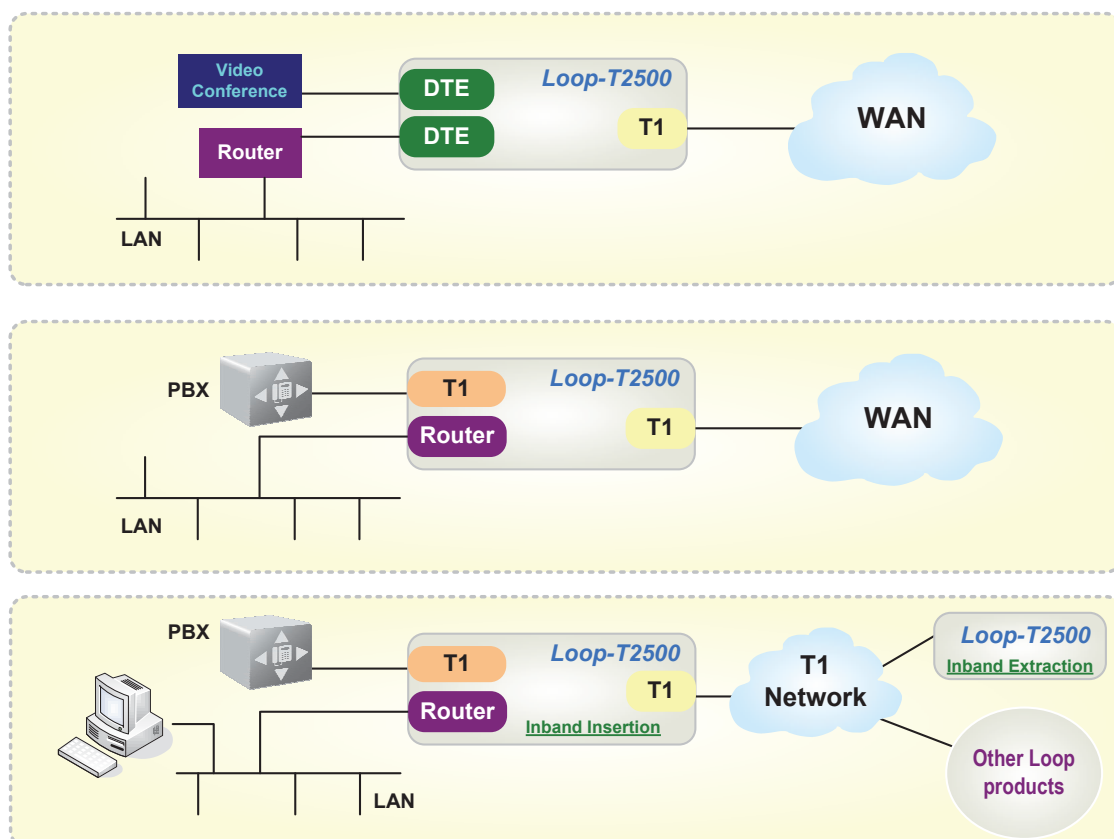
Application Illustrations
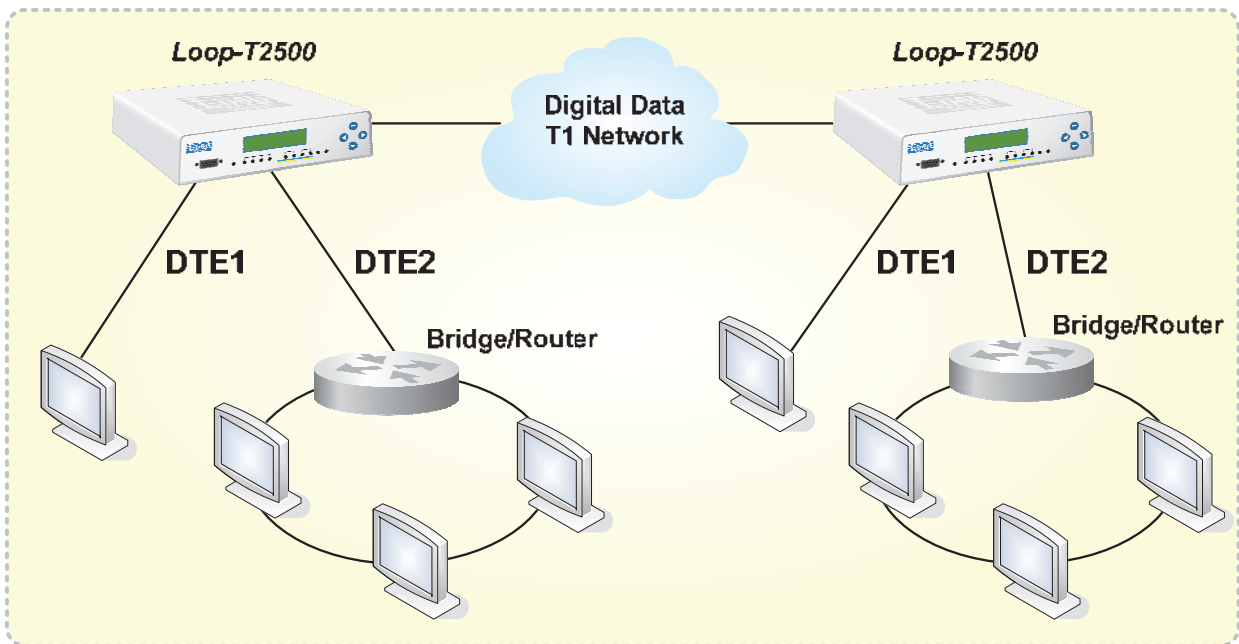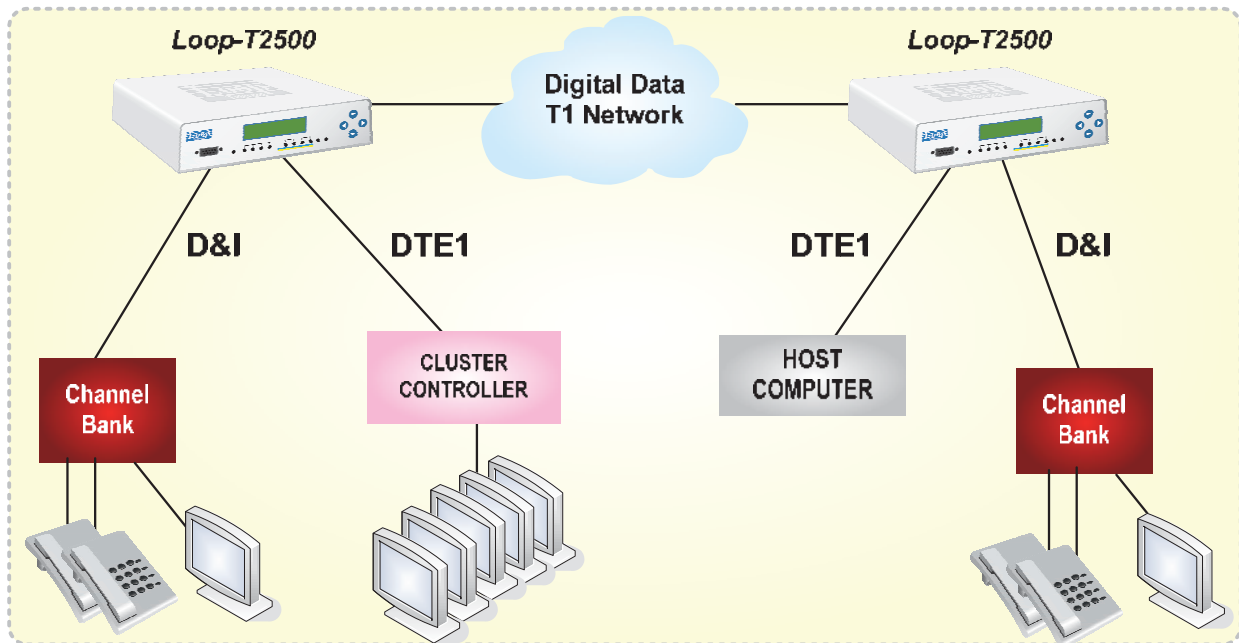
Loop-C5600 Multi-Services Shelf

C5600 5U chassis

C5600 6U chassis

Features

- Front and back access (ANSI) unit with optional fan tray and LCD
- Supports dual controller cards*
- Number of plug-in line cards
  - Single controller with 15 slots for plug-in line cards
  - Each line card is fully independent
- Accepts rack card of type:
  - Loop-H3308R Ethernet over Bonded G.SHDSL.bis
  - Loop-H3304R High Density G.SHDSL
  - Loop-H3304RA High Density G.SHDSL.bis
  - Loop-O9340R Multi-Services Gigabit FOM
- Power modules
  - Hot-swappable DC plug-in modules (-48 Vdc: -36 to -75 Vdc), dual for redundancy
- Alarm relay
- Log in and password security protection
- Firmware download
- Configuration upload/download
- Management port and interface
  - RS232 console port with VT-100 menu
  - Two 10/100M fast Ethernet SNMP ports
  - SNMP v1 with 5 trap IP
  - Telnet with Secure Shell (SSH) protocol
  - Access Control List (ACL)
- RoHS compliant

Description

The Loop-C5600 is a high density multi-services shelf designed to accept a mix of Loop series rack cards. These include the Loop-H3308R, Loop-H3304R, Loop-H3304RA, and Loop-O9340R. The C5600 provides one common controller to manage up to 15 plug-in cards and a dual controller* to manage up to 14 plug-in cards.

- For 1 controller card C5600 chassis
  - 15 single slot H3308R (2/4-pair G.SHDSL.bis)
  - 7 dual slot H3308R (8-pair G.SHDSL.bis)
  - 14 single slot H3304R
  - 14 (2Ethernet + 4E1) and 1 (2Ethernet only) H3304RA
  - 7 dual slot O9340R

- For dual controller card C5600 chassis*
  - 14 single slot H3308R (2/4-pair G.SHDSL.bis)
  - 7 dual slot H3308R (8-pair G.SHDSL.bis)
  - 14 single slot H3304R
  - 14 (2Ethernet + 4E1) H3304RA
  - 7 dual slot O9340R

Loop-C5600 Integral Access Shelf supports local configuration and diagnostics by using a local or remote terminal. Users are able to address and identify each rack card's position and its card type. This enables users to execute in-service diagnostics and fault isolation.

By using SNMP or Telnet connection on the shared controller card of the rack unit, users can remotely control and diagnose Loop rack cards from a centralized location.

* Future option

Application Illustrations

H3308R Application

Tributary

Ethernet#1

Ethernet#2

Central Office
Loop-C5600 Shelf with Loop-H3308 Rack Card (Master)

WAN
2/4/ 8 pairs G SHDSL bis
Line rate: 5.704 Mbps each pair

Remote Site
Loop-H3308S (Slave) Ethernet

SNMP (Ethernet)   Console (RS232)

- SNMP Manager
- GUI EMS: Loop-iNET*
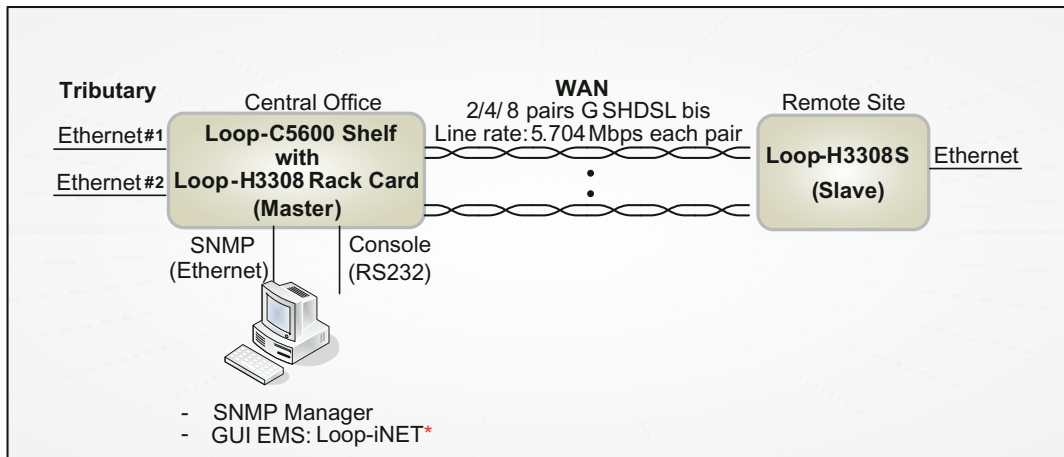
* Future option

H3304R Application

Tributary ports

One or Two 4E1 Ports

tributary card

E1
E1
E1
E1

Central Office
H3304R G.SHDSL in C5600 shelf (Master)

RS232 / Ethernet

WAN ports
1-pair/2-pair
G.SHDSL

Remote units

H3310 (Slave) E1
H3310 (Slave) E1
H3300-3S (Slave) E1
H3300-3S (Slave) E1

Network Management System

H3304RA Applications

C5600/H3304RA

2 Ethernet (10/100)

4 E1

1 pair G.SHDSL.bis (5.7 Mbps)   Ethernet   E1   H3310

1 pair G.SHDSL.bis   Ethernet   E1   H3310

1 pair G.SHDSL.bis   Ethernet   E1   H3310

1 pair G.SHDSL.bis   Ethernet   E1   H3310

SNMP

Ethernet and E1 Share 1-pair G.SHDSL.bis (5.7 Mbps)

C5600/H3304RA

2 Ethernet (10/100)

4 E1

2 pair G.SHDSL.bis (11.4 Mbps)

H3310

Ethernet

E1

2 pair G.SHDSL.bis (11.4 Mbps)

H3310

Ethernet

E1

SNMP

Ethernet and E1 Share 2-pair G.SHDSL.bis (11.4 Mbps)

O9340R Applications

Tributary ports

C5600
Chassis

O9340R
Rack Card

Aggregate ports

Proprietary GbE (1+1) protection

Protection Line (optional)

O9340S
Standalone

Tributary ports

Dual slot card:
Choice of E1/T1 or Combo GbE ports

Up to 4 cards, combination of 4E1/T1, 8E1, or 2 Combo GbE plug-in card

Rack Application

The C5600 shelf supports up to 7 O9340R dual plug-in cards:
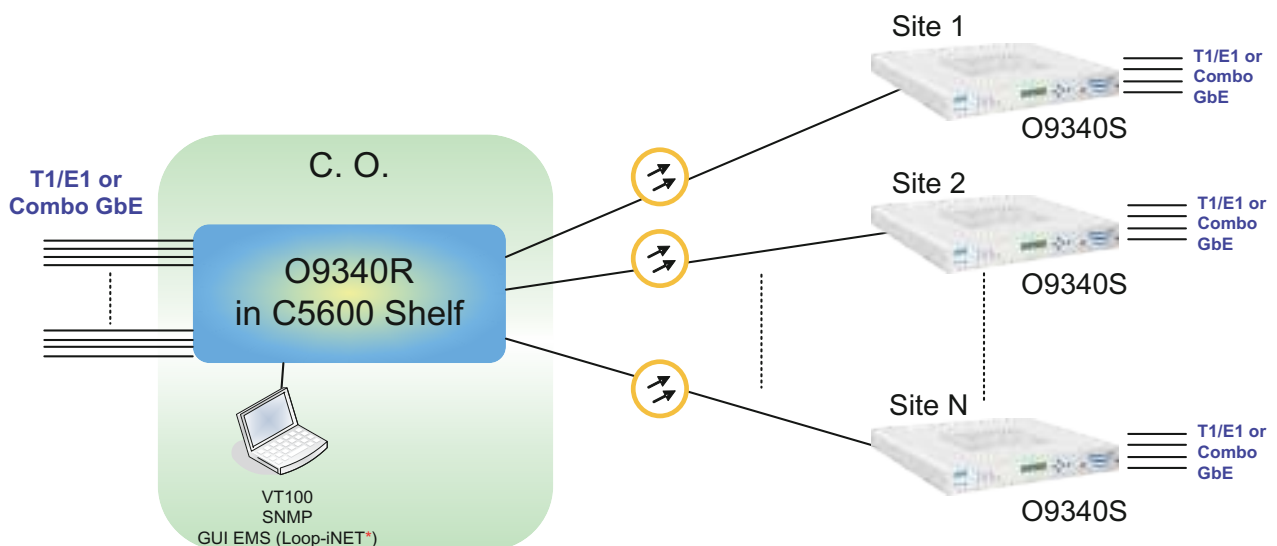
- Combination of 4/8/12/16 ports of E1/T1 or 2/4/6/8 ports of Combo GbE

C. O.

T1/E1 or Combo GbE

O9340R
in C5600 Shelf

VT100
SNMP
GUI EMS (Loop-iNET*)

Site 1

T1/E1 or Combo GbE

O9340S

Site 2

T1/E1 or Combo GbE

O9340S

Site N

T1/E1 or Combo GbE

O9340S

12

IIOT

Environmental Security Monitoring Loop-IOT0510

Description

The IOT0510 Environmental Monitoring is specifically designed and developed for Data Center/IT Room /Confidential Lab operators to meet the demands for environmental security, energy conservation, and remote management for the next decade.
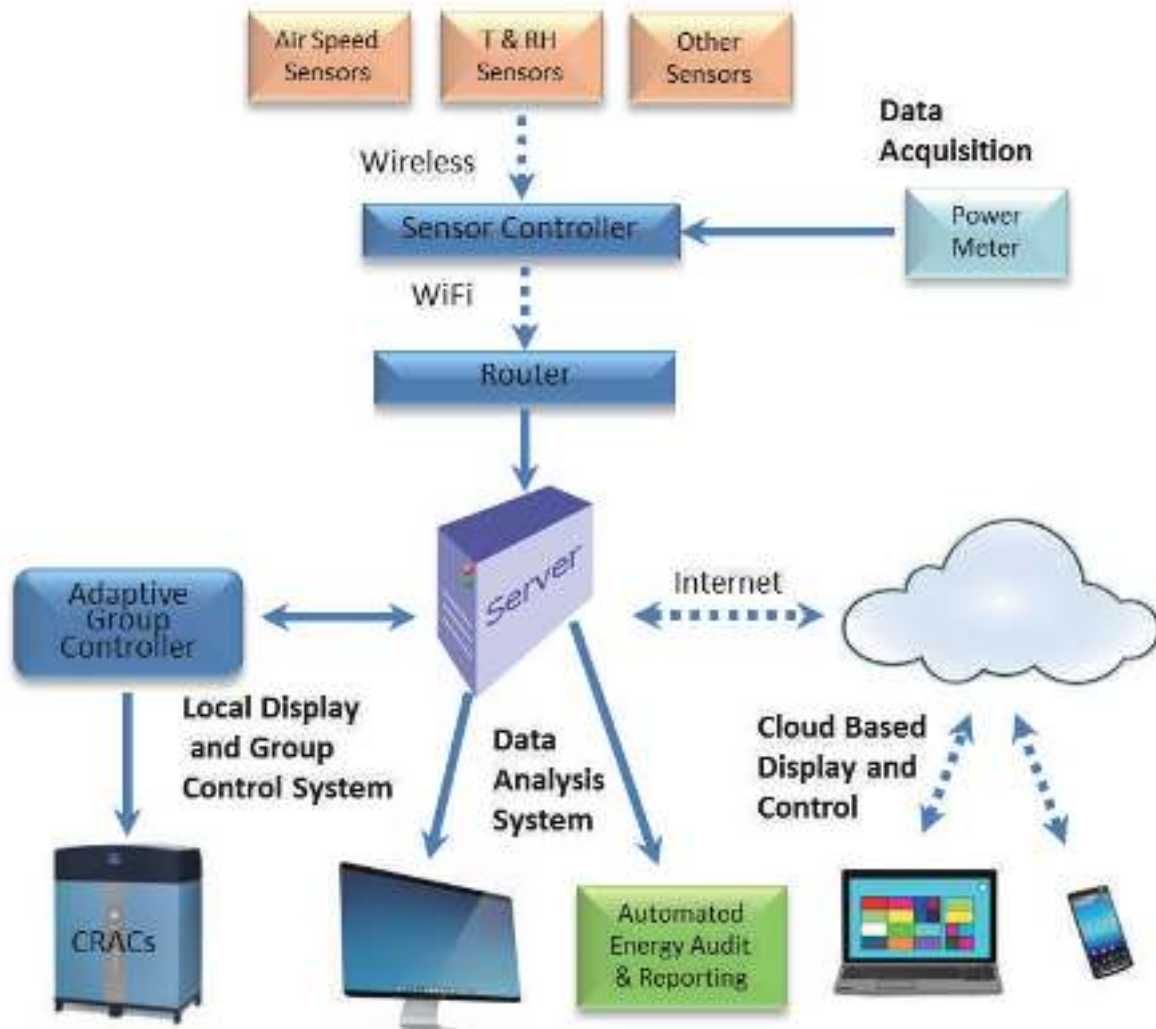
Figure 1 Architecture of IOT0510

Features

The IOT0510 System has the following functions and features:
(1) Simple and easy-to-use user interface. With a simple training session, users can operate the entire system through its cloud-based GUI either locally or remotely, with a secure communication link or via Internet.
(2) 3D virtual graphic showing temperature, humidity, airflow speed, power consumption, rack access, IT assets and other mission critical profile.
(3) Computer room air conditioning (CRAC), analysis, data center's Power Utilization Efficiency (PUE), AC load percentage, rack load percentage, airflow index, cooling index (overheat or overcool) and air quality (i.e., airborne particle counts, PM1.0, PM2.5, PM10, etc.) and other parameters.
(4) Monitored data and alarms in real time in table and graphic formats.
(5) Historic data and alarms in table and graphic formats.
(6) Multiple levels of user privileges (configuration, set points, search, warning trigger points, data export, user notification, etc.).
(7) Historic data and alarm search, export and print in table or graphic formats.

(8) Data export to back up storage devices for compliance audits, AI performance analysis and improvement.
(9) User-defined warning threshold for every monitoring point.
(10) Warning signals can be sent to audible alarms, mobile devices, or email addresses through text messages from unmanned data centers.
(11) Automatic and semi-automatic CRAC group control.
(12) Web-based system for multi-user and multi-location access via cloud service.
(13) User accounts and privileges.

Sensors

Wireless Sensor Specifications

Parameter	Nominal Range
Maximum number of sensors	One built-in and two optional external sensors with custom cable lengths (temperature and humidity, water leak, door open/close status, AC current/power consumption) for Wireless Sensor
Cable length for external probes	Standard 0.5 meter or custom cable length
Sensor data transmission	Ultra low power proprietary wireless network with meshed network redundancy
Battery type	Two AA Lithium batteries, included
Battery operational life	About 10 years
Number of wireless sensors	One built-in and two optional external sensors for -40°C to +100°C measurements, door open/close status. Water leak, AC current/power consumption
User interface	Cloud or private server base GUI with 3D visualization
Data storage	Cloud based service or private server
Sensor size	75 x 75 x 19.5 (mm)
Weight	120 g
Gateway	WiFi or Ethernet data based

Wireless(433Hz) Temperature Measurement Specification

Parameter	Test condition	Min.	Typ.	Max.	Unit
System operating temperature range		-20	–	+50	°C
Temperature measurement range for external probes	With external probes	-40		+100	°C
Temperature measurement resolution			0.1		°C
Data refresh rate	Change > 0.5°C		30		Sec
Temperature accuracy	15 to 40 °C		±0.5		°C
	0 to 15°C and 40 to 60°C		±1		
Temperature response time			30		Sec
Temperature long term drift	0 to 50 °C			0.05	°C/yr

Wireless(433 Hz) Humidity Measurement Specifications

Parameter	Test condition	Min.	Typ.	Max.	Unit
Operating humidity range		0	–	100	% rH
Humidity measurement resolution			1		% rH
Humidity accuracy	20 to 80 % rH		±4.5		% rH
	Otherwise		±6		
Humidity hysteresis			±1		% rH
Data refresh rate	Change > 5%		30		Sec

Door open/close sensor (used on both wireless sensor and controller)

Parameter	Type	Min.	Max.	Accuracy	Unit
Door open/close detection	Door status	Closed	Open	N/A	Open/ Close

Water leak sensor (used on both wireless sensor and controller)

Parameter	Type	Min.	Max.	Accuracy	Unit
Water leak detection	Sensor rope length	1	1,000	15 mm DIA x 2.5 mm water puddle	Ft

AC power consumption sensor (used on both wireless sensor and controller)

Parameter	Type	Min.	Max.	Accuracy	Unit
AC power consumption	AC current	0	60/200	±5% / ±10%	A A/KW
	AC power consumption	0	10	±5% / ±10%	KW

Dry Relay for controlling auto dialer, facility alarm, flash light, etc. Used on Controller only.

Parameter	Type	V On	V Off	Switching Voltage/ Current	Operating Temperature
Dry relay	TTL driven reed relay	>2.25V	<0.5V	200V AC or DC	-40°C to +85°C
	SPST	Normal open		250mA	Non-polarized on both TTL and relay sides

Controller

Air quality Sensor Specifications:

Parameter	Nominal Range	Unit
Measured Air Particle Size	0.3, 0.5, 1.0, 2.5, 5.0, 10 / PM1.0, PM2.5, PM10	um / PM
Response Time	2	min
Operating Temperature	0 to 50	°C
Flammable Gas	H2, LPG, CH4, CO, propane Detection range: 200 – 10,000 Resolution: 10 Accuracy: +/- 10%	ppm
Operating Humidity	0 to 99	%

Airflow Speed Specifications:

Parameter	Nominal Range
Measurement range	0 to 10m/s
Accuracy (at 25°C)	±5% of full scale
Response time	Reach 90% of ultimate value within 1 sec.
Media	Airvvvvvv
Recommended operating temperature	15 to 35°C
Working environment, relative humidity	10 to 90%
Storage temperature	-10 to 60°C

Air Pressure Specifications:

Parameter	Nominal Range
Measurement range	30,000 Pa - 126,000 Pa (absolute)
Accuracy	±200 Pa
Response time	Reach 90% of ultimate value within 1 sec.
Recommended operating temperature	0 to 50°C
Working environment, relative humidity	10 to 90%
Storage temperature	-10 to 60°C
Storage temperature	-10 to 60°C

General Purpose IO Ports Specifications:

Parameter	Nominal Range
Number of GPIOs	Three digital GPIOs and one analog input
Configuration	Cloud configurable
Types of GPIO	IO1 to IO3: - Digital input active low (DIAL); - Digital input active high (DIAH); - Digital output active low (DOAL); - Digital output active high (DOAH); IO4: - Analog input: (0.0V to 10.0VDC)
Analog measurement accuracy	+ 0.05V
Analog measurement resolution	0.01V
Measurement frequency	Every 30 sec
Input impedance	>3.9K
Output sink or source current	>10 mA

Cloud Server

This Cloud Server manages all system data, records and analytics in local as well as cloud-based storage for user sharing, remote monitoring, and management. Its WEB based architecture allows multi-user and multi-location access, both locally and remotely. The data center operator can log in through a secured VPN to view, control, and manage every aspect of the data center's environmental conditions.
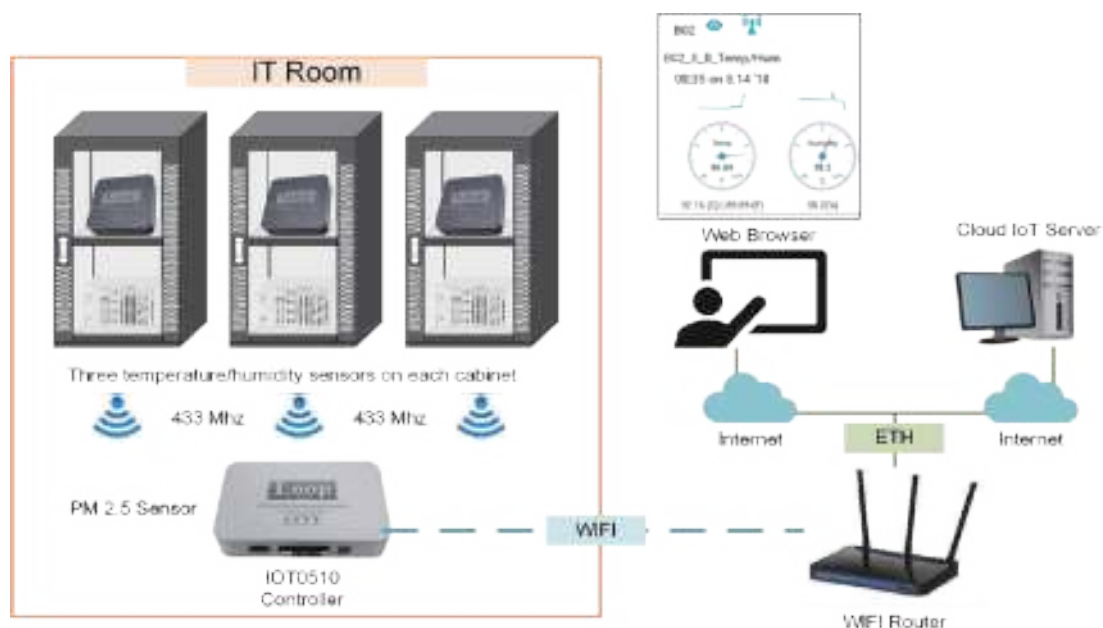
Application Diagram

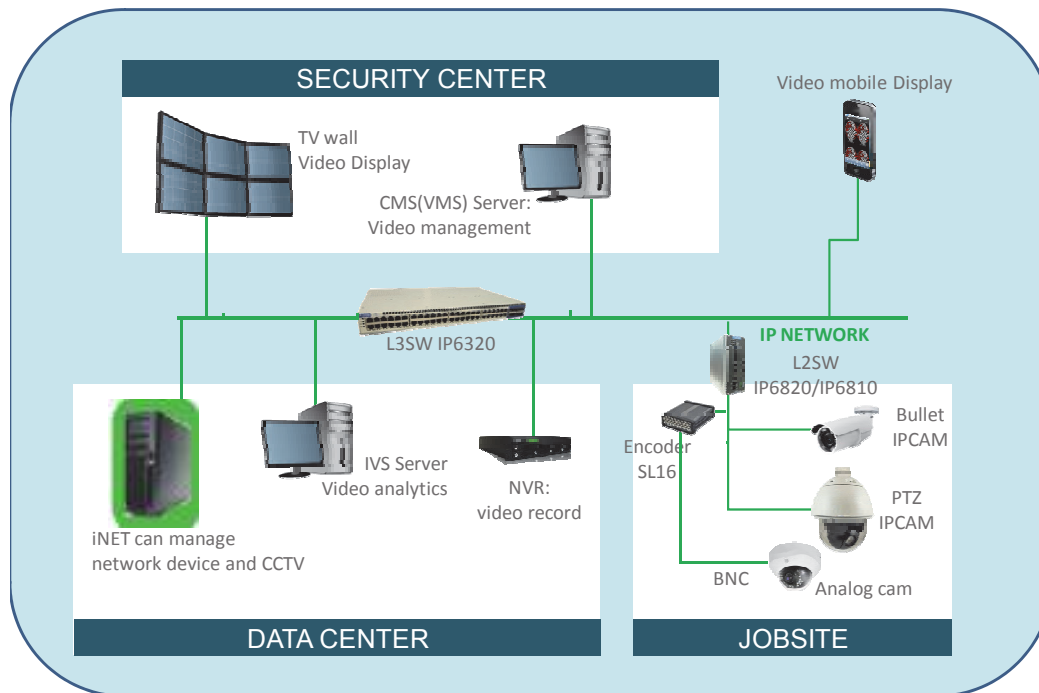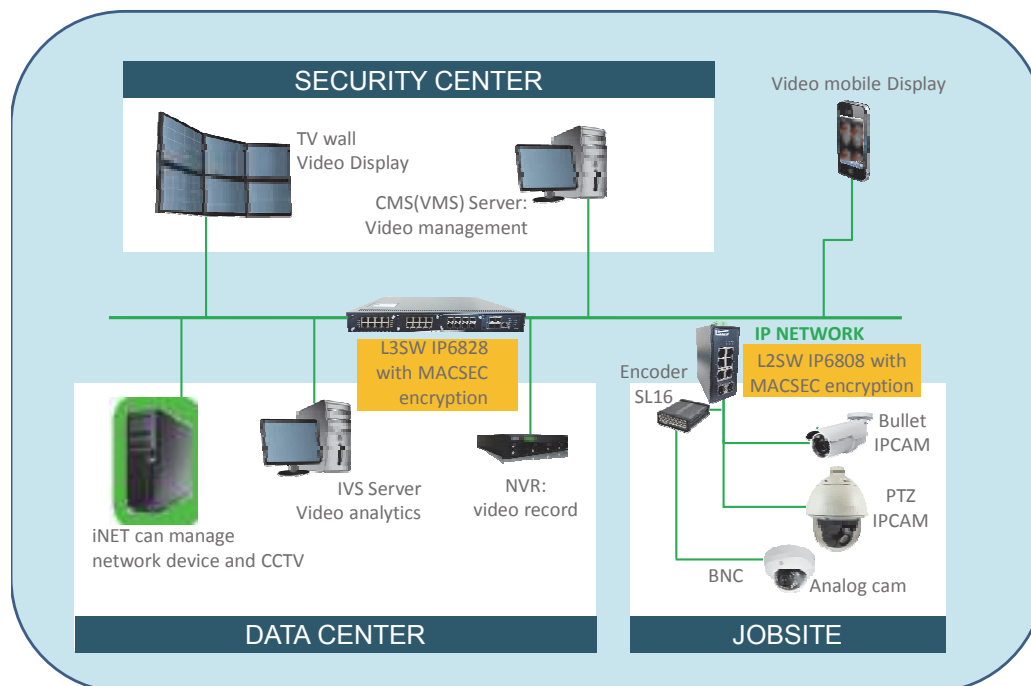Figure 2 IOT0510 Application Diagram at IT Room

Loop-CCTV0710
Video Surveillance Solution for Substation or Campus

Description

Nowadays, global terrorism and crimes are rapidly increasing in number. To meet your security requirements for the substation or campus, Loop Telecom provides our total security solution and video surveillance system. Loop Telecom's video surveillance system includes easy-to-install IP cameras, bullet ones and dome ones, as well as sufficient management tools: NVR, CMS, TV Wall, IVS and EMS.

Architecture of CCTV, Network and iNET

Architecture of CCTV, Network w/ Encryption and iNET

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For the latest product news, updates, technical support and more, please visit our website.

Features

The Core Network can deploy L3SW IP6320. Access Switch can deploy L2SW IP6820/IP6810.
- The Core Network w/ Encryption can deploy L3SW IP6828. Access Switch can deploy L2SW IP6808.
- At Job Site, there are IP cameras connect to IP6820 via POE. Analog camera can connect to Encoder SL16 which converts analog video signal to be IP packets.
- At Data Center, there are NVRs which are to do video record. There are IVSs which are to do video analytics.
- EMS iNET can manage network device and CCTV simultaneously.
- At Security Center, there is CMS server which is to do video management. There is TV Wall which is to do video display.

IPCAMs

IPCAM Q2V6-E. The application is for Parking Lot and Main exit.
- Fixed Bullet IPCAM
- 3 Megapixel with 1080p
- Day & Night
- PoE
- 30 fps at 1920 x 1080p
- Waterproof IP66

IPCAM Z4SF-F . The application is for Dangerous Zone.
- 8 Megapixel with 4k2k(3840x2160)
- Day & Night
- PoE
- 30 fps at 4k2k
- Waterproof IP66 and Vandal Proof IK10

IPCAM Z4SA-D. The application is for Conference Room.
- Mini Fish-Eye IPCAM
- 6 Megapixel with 1080p
- Day & Night
- PoE
- 30 fps at 1920 x 1080p
- Waterproof IP66

IPCAM 820Z2-G4. The application is capable of remote directional and zoom in/out control.
- PTZ (Pan/Tilt/Zoom) Speed Dome IPCAM
- 2 Megapixel with 1080p
- Day & Night
- 30x Optical Zoom Lens WDR, PoE
- 30 fps at 1920 x 1080
- Pan & Tilt
- Waterproof IP66

Analog Encoder L8. The application is to convert analog camera signal to IP packets.
- Video input :8 BNC
- Video Standard : NTSC/PAL
- Video Compression: Dual H.264+MJPEG
- RS485 for PELCO D,PELCO P

Management

NVR 5464(Network Video Recorder)

- Manage up to 64 cameras or video encoders
- Recording up to 64 channels
- Live view local up to 64 channels, remote up to 64 channels
- Synchronized playback local up to 64 channels
- Export video with RAW & AVI formats
- Event trigger, response, and notification
- Mobile Client, Web Client, Workstation
- Location-based management with eMap

CMS CC5404 (Central Management System)

- Live view local up to 64 channels
- Synchronized playback local up to 64 channels
- Export video with RAW & AVI formats
- Event trigger, response, and notification
- TV wall support

TV-Wall NC5406

- 76 video streams up to D1@30fps
- Layout: 1x1,2x2,3x3,4x4,3x2,4x3,5x3,5x5,6x6,8x6,8x8 and custom layout
- Flexible TV wall server layout management, adjustable size and position.
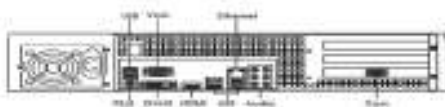
IVS 5400(Intelligent Video Surveillance Server)

- Operating System: Win7 Pro 64bit
- Supported Channels/Rules: 16/1
- Resolution: CIF
- Frame Rate:10
- Streaming Protocol: RTSP/ONVIF
- Video Input: Camera

IVS Function

INTRUSION (Virtual Fence)

Detection and signaling of the intrusion within virtual areas of the crossing of virtual lines in a certain direction (tripwire) by subjects of interest.

GATE FLOW(People Counting)

Counting and collection of the number of persons crossing virtual gates in a certain direction

OCCUPANCY RATE

Estimation and collection of the percentage of occupancy of virtual areas by subjects of interest, and for each area signaling of an occupancy percentage higher than a defined threshold

LEFT OBJECT

Detection and signaling of objects left unattended within virtual areas for longer than a defined time

STOLEN OBJECT

Detection and signaling of objects removed from virtual areas

LOITERING

Detection and signaling of subjects of interest that remain within virtual areas for longer than a defined time

SLIP FALL

Detection and notification a person falling and remaining on the ground for longer than a defined time

LPR

Detection and reading of vehicles license plates for access control management
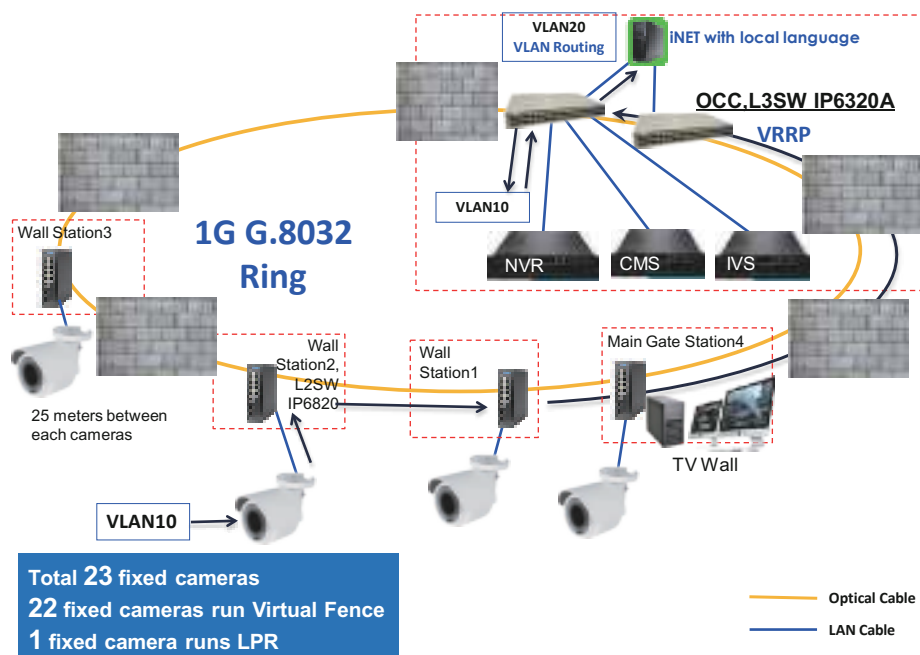

Parking LOT

Detection and notification of the status (free/occupied) of configured parking areas

iNET EMS

- Integrated networking system with complete solution for CCTV Video Surveillance application
- Centralized or distributed system architecture includes CMS, NVR, TV Wall, and NMS
- Event-driven video playback & snapshot, remote I/O control and PTZ control for selected IP CAM model.
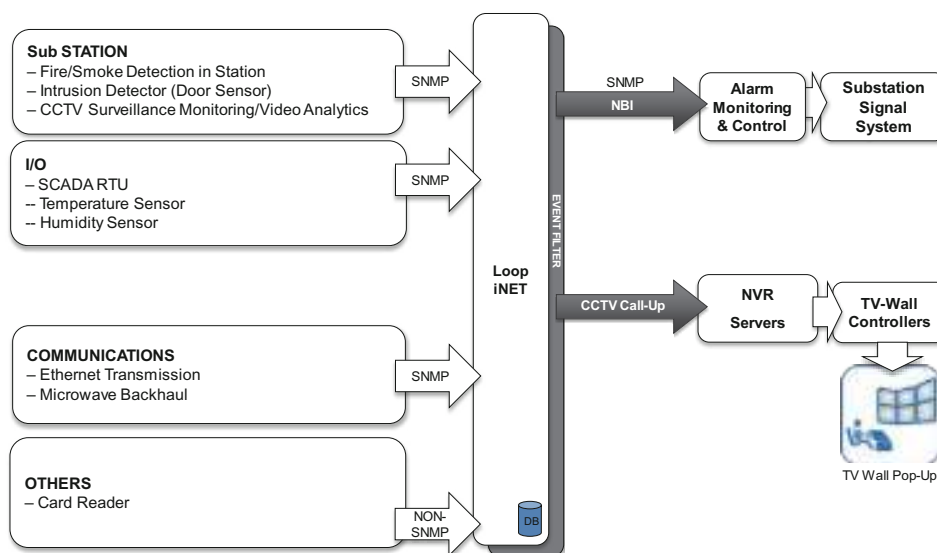- Please refer to iNET brochure and manual for details.

Applications
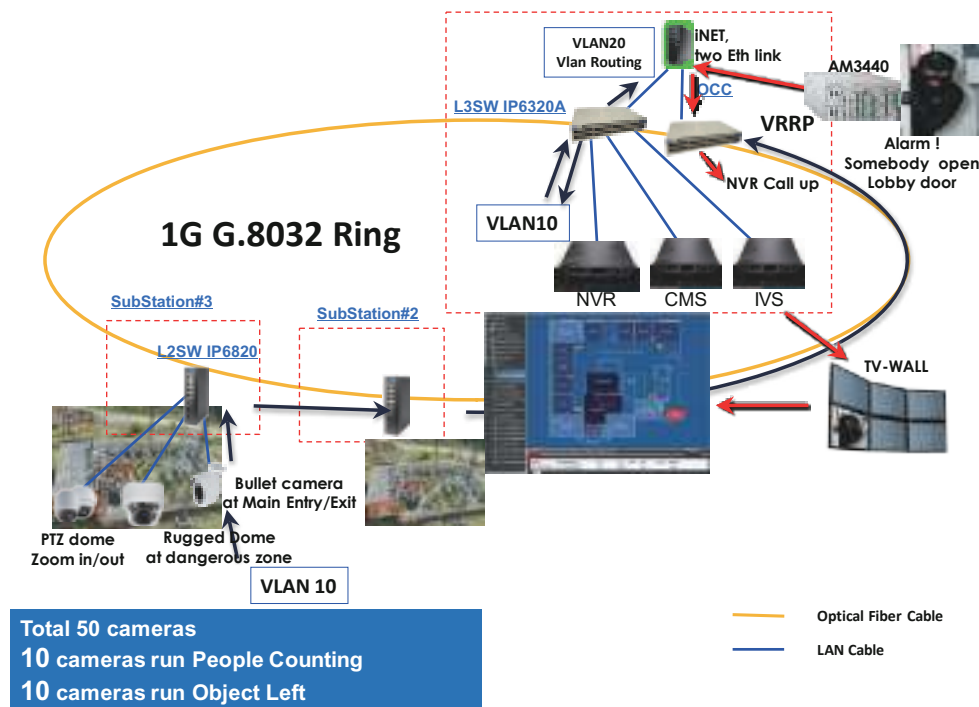
Application Diagram for Substation

Step1   Create G.8032 ring by IP6320A and IP6820
Step2   IP6820 connects to IPCAM.
        Bullet Cameras are deployed at Main Entry/Exit.
        Rugged Dome cameras are deployed at dangerous zone.
        PTZ Dome cameras are deployed for Zoom in/out.
Step3   L3SW IP6320A connects to NVR, CMS/IVS
Step4   L3SW IP6320A connects to iNET
Step5   IPCAM Vlan10 to NVR Vlan10
Step6   INET VLan20 to NVR Vlan10
Step7   When INET receives alarm, it will call up NVR
Step8   NVR triggers TV-WALL for Lobby video
Step9   NVR will show eMAP on lobby location

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1G G.8032 Ring

VLAN20
VLAN Routing

iNET with local language

OCC,L3SW IP6320A

VRRP

VLAN10

NVR   CMS   IVS

Wall Station3

Wall Station2, L2SW IP6820

Wall Station1

Main Gate Station4

TV Wall

25 meters between each cameras

VLAN10

Total 23 fixed cameras
22 fixed cameras run Virtual Fence
1 fixed camera runs LPR

Optical Cable
LAN Cable

Application Diagram for Campus

- The total length of Campus wall is 535 meters.
- Each bullet camera is allocated with Virtual Fence every 25 meters. So there are 535/25=22 cameras.
- Then there's a bullet camera with LPR allocated at Main gate.
- Totally 22+1=23 bullet cameras.

Sub STATION
– Fire/Smoke Detection in Station
– Intrusion Detector (Door Sensor)
– CCTV Surveillance Monitoring/Video Analytics

SNMP

I/O
– SCADA RTU
-- Temperature Sensor
-- Humidity Sensor

SNMP

COMMUNICATIONS
– Ethernet Transmission
– Microwave Backhaul

SNMP

OTHERS
– Card Reader

NON-SNMP

EVENT FILTER

Loop iNET

DB

SNMP
NBI

Alarm Monitoring & Control

Substation Signal System

CCTV Call-Up

NVR Servers

TV-Wall Controllers

TV Wall Pop-Up

Application Diagram of iNET at Substation

Step1.   Substation got intrusion detection, it will send SNMP trap to LOOP iNET.
Step2.   Card reader maybe be power failure, LOOP iNET can PING(NON-SNMP) this card reader.
Step3.   iNET send SNMP trap to Alarm Monitoring &Control via NBI(North Bound Interface)
Step4.   iNET will call up NVR server.
Step5.   NVR will trigger TV WALL.

13

Accessories

Loop Airflow Guide Rack
Applicable to O9400R/V4150

Description

The Loop Air Flow Guide is an easy to use supporting module for the V4150/O9400R units. You can install it on the top or bottom of the V4150/O9400R depending on your heating requirements.

Installing the Airflow Guide both at the top and bottom of the unit creates perfect air circulation, which guides the relatively cold air into the rack and hot air out of the rack, thus keeping the temperature down and preventing damage due to overheating.
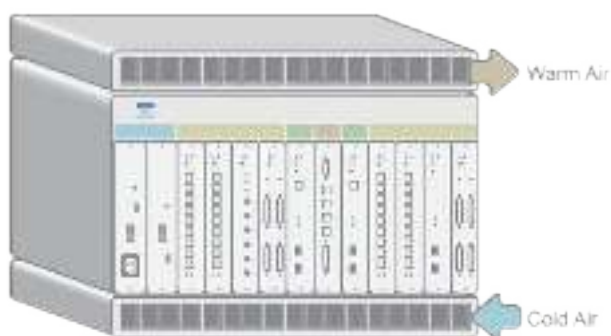
To see how the Airflow Guide functions to guide the cold air in and hot air out, refer to the application illustration section on the following page.
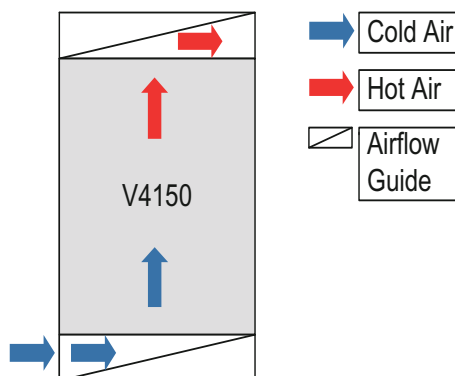
Application Illustration

The following drawing shows the front and side view of two units that are equipped with two Airflow Guides at the top and bottom.

Note that the Airflow Guide can also be flipped and installed in reverse so that cold air can enter from the back and hot air can exit from the front of the rack. Proper installation depends on the site's air conditioning requirements.

Front View

Side View

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Cable Management with Air Filter
Applicable to O9400R/V4150

Side View

Front View

Description

The Loop Cable Management with Air Filter accessory is an easy to use supporting module for the V4150/O9400R unit. It is the best solution for mounting an Air Filter without interference from the cables.

With the help of Cable Management, engineers no longer need to trace through messy cables, better heat dispersion can be expected, and simplified troubleshooting and rack card expansion are assured.

Accumulated dust on the surface of the unit will keep heat inside the operating unit, which could damage the internal circuitry. The Air Filter on the bottom of the Cable Management can help to keep the dust away from the machine, providing a clean and safe operating environment.

The Cable Management can be installed together with Loop Telecom's Airflow Guide. To understand what the Cable Management can do with the Airflow Guide Rack, refer to the Application Illustration section on the following page.
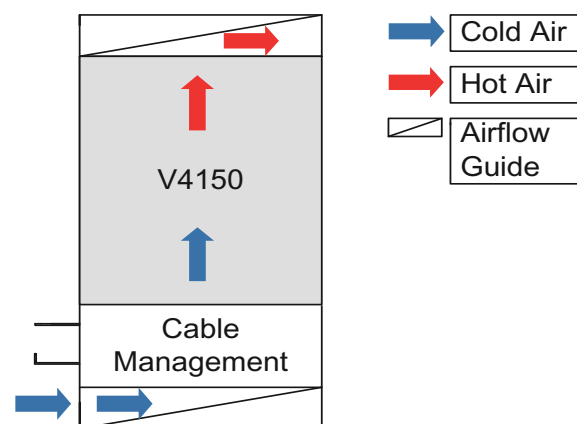
Application Illustration

Installing Cable Management together with the Airflow Guide

Front View
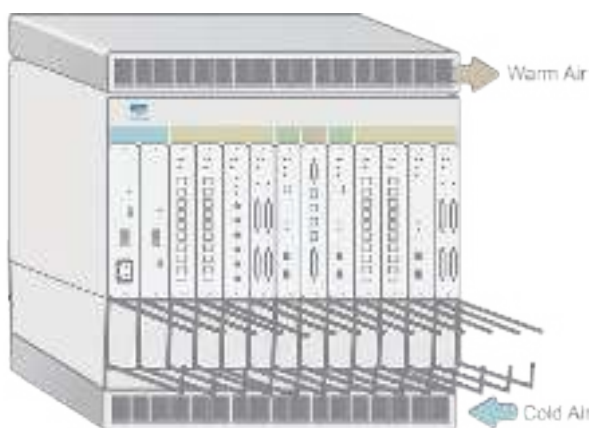
Side View

Conversion Panels, Y-Boxes, Y-Box Panels

Description

Loop Telecom offers conversion panels, Y-boxes, and Y-box panels available to E1/T1 cards in AM3440, O9400R, and O9500R products.

The conversion panel is one SCSI to 16 BNC, 16 RJ, or 16 Wire-Wrap connectors which available for O9400R, and O9500R. The Conversion Panels is for high density E1/T1 cards in O9400R and O9500R.

The Y-Box is used for protection switching of terminal equipment, but not the transmission line connecting the terminal equipment. There are two types of Y-Boxes: the Y-Box for Quad E1/T1 cards in O9500R and Quad E1/T1 and Mini Quad E1/T1 AM3440 series; the Y-Box Panels for high density E1/T1 cards in O9400R and O9500R.

Ordering Information

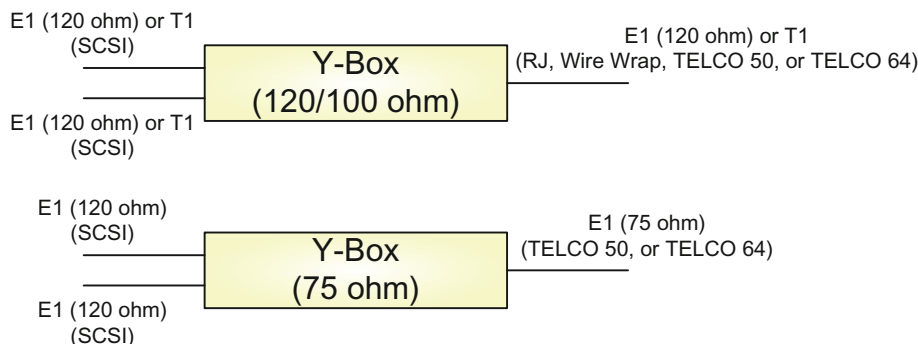### Conversion Panels: Applicable to O9500R, O9400R , and O9400S

Unit	Model	Description
	Loop-ACC-P-1SCSI-16RJ-**G**	One SCSI to sixteen RJ (1u height) without cable; 432x44x23mm (WxHxD)
	Loop-ACC-P-1SCSI-16BNC-**G**	One SCSI to sixteen BNC (1.5u height) without cable; 432x66x53mm (WxHxD)
	Loop-ACC-P-1SCSI-16WW-**G**	One SCSI to sixteen Wire Wrap (1u height) without cable; 432x44x40mm (WxHxD)

Y-Box: Applicable to O9500R, AM3440

Unit	Model	Description
	Loop-VV-B-**G**	1 for 1 protection Y-Box with BNC connectors (4-E1)
	Loop-VV-R-**G**	1 for 1 protection Y-Box with RJ48C connectors (16-E1)
	Loop-VV-T-**G**	1 for 1 protection Y-Box with RJ48C connectors (16-T1)

Y-Box Panels : Applicable to O9500R, O9400R
1u height: 432x44x100mm (WxHxD)

E1 (120 ohm) or T1
(SCSI)

```
Y-Box
(120/100 ohm)
```

E1 (120 ohm) or T1
(RJ, Wire Wrap, TELCO 50, or TELCO 64)

E1 (120 ohm) or T1
(SCSI)

E1 (120 ohm)
(SCSI)

```
Y-Box
(75 ohm)
```

E1 (75 ohm)
(TELCO 50, or TELCO 64)

E1 (120 ohm)
(SCSI)

| Unit	Model	Description
	Loop-ACC-Y-2SCSI-16RJ-G	1u Y-box 16-port panel for two SCSI (E1(120 ohm) or T1) to 16 RJ (E1(120 ohm) or T1) connectors without cable
	Loop-ACC-Y-2SCSI– 16WW-G	1u Y-box 16-port panel for two SCSI (E1(120 ohm) or T1) to 16 Wire Wrap (E1(120 ohm) or T1) without cable
	Loop-ACC-Y-2SCSI- 1T64P16-16TE-G	1u 16-port Y-box panel 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- 1T64P16-16E75-G	1u 16-port Y-box panel for two SCSI (E1(120 ohm)) to one TELCO 64 (E1(75 ohm)) connectors (16 ports per TELCO connector) straight without cable
	Loop-ACC-Y-2SCSI- 2T50P8-16TE-G	1u 16-port Y-box panel in (E1(120 ohm) or T1) for two SCSI to two TELCO 50 (E1(120 ohm) or T1) connectors (8 ports per TELCO connector) without cable
	Loop-ACC-Y-2SCSI- 2T50P8-16E75-G	1u 16-port Y-box panel for two SCSI (E1(120 ohm)) to two TELCO 50 (E1(75 ohm)) connectors (8 ports per TELCO connector) without cable
	Loop-ACC-Y-4SCSI- 2T64P16-32TE-G	1u 32-port Y-box panel 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
	Loop-ACC-Y-4SCSI- 2T64P16-32E75-G	1u 32-port Y-box panel 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- 3T50P12-32TE-G	1u 32-port Y-box panel 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- 3T50P12-32E75-G	1u 32-port Y-box panel 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
	Loop-ACC-Y-4SCSI- 4T50P8-32TE-G	1u 32-port Y-box panel 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
	Loop-ACC-Y-4SCSI- 4T50P8-32E75-G	1u 32-port Y-box panel for four SCSI (E1(120 ohm)) to four TELCO 50 (E1(75 ohm)) connectors (8 ports per TELCO connector) without cable

Conversion Panel Applications

E1/T1 Connector Conversion Panel Illustration

One conversion panel supports up to sixteen ports. For 16E1/T1 cards, one conversion panel is required; for 32E1/T1 cards, two conversion panels are required; for 63E1/T1 cards, three conversion panels are required.

E1/T1 Card — SCSI Cable — Conversion Panel — 16 x RJ Connectors / 16 x BNC Connectors / 16 x Wire Wrap
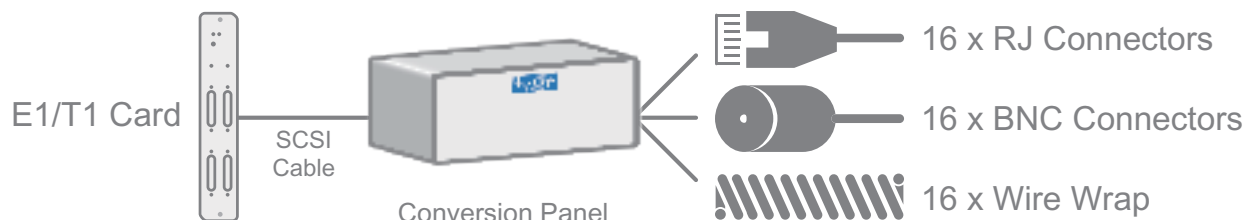
Y-Box Applications

A Y-Box is used for protection switching of terminal equipment, but not the transmission line connecting the terminal equipment. In a conventional protection-switching scheme, both the terminal equipment and the line connecting the terminals are protected.

West 1 — Line 1 — East 1
West 2 — Line 2 — East 2
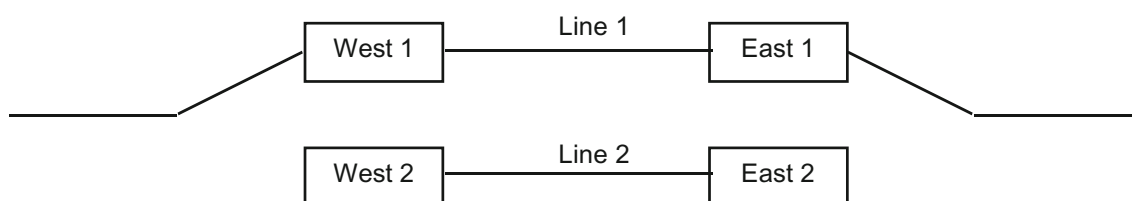
In the above example, the signal normally traverses from Terminal West 1 — Line1 — Terminal East 1. The protection path is West 2 — Line 2 — East 2. In case of a fault either in West 1 or East 1, or Line 1, protection switching takes place and the path will become as follows.

West 1 — Line 1 — East 1
West 2 — Line 2 — East 2
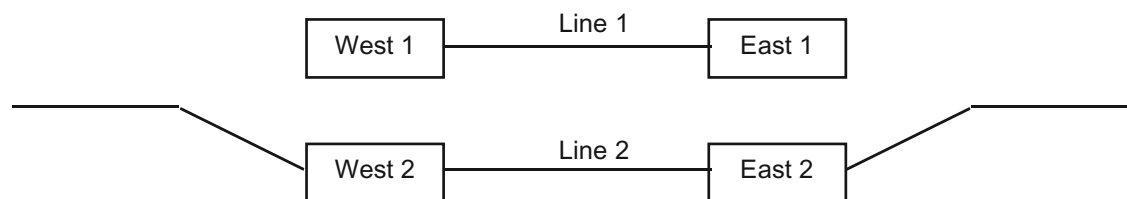
There will be situations where, due to cost, the line is not protected, only the terminal equipment is protected. In such cases, the Y-box is used.

West 1 / West 2 — Y — Line 1 — Y — East 1 / East 2
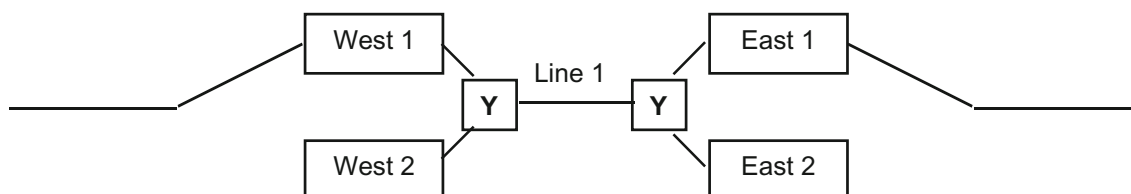
In the above example, the line is not protected, but the terminal equipments are.
In summary, the Y-box is used when terminal equipment needs to be protected but the transmission line is not.

Y-Box for QE1/T1 cards of AM3440 or O9500R illustration

If you are using the BNC type Y BOX, use BNC cables to connect it to the AM3440 or O9500R. Using AM3440 as an example shown in the figure below. For illustration purposes, only Port 1 is protected in this sample diagram. To protect other ports you must connect them in a similar manner.
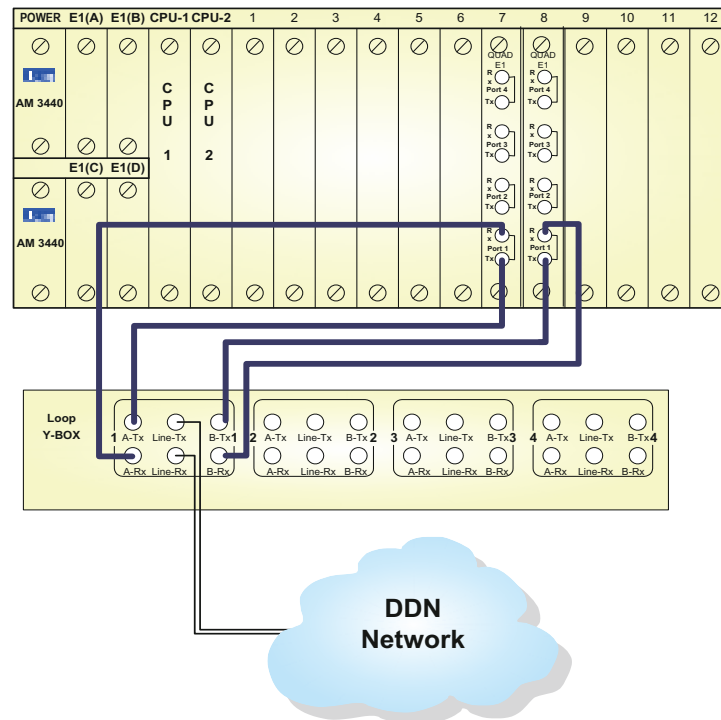
If you are using the RJ48C type Y BOX, connect it to the AM3440 or O9500R. Using AM3440 as an example shown in the figure below. For illustration purposes, only Port 9 is protected in this sample diagram. To protect other ports you must connect them in a similar manner.

Accessories
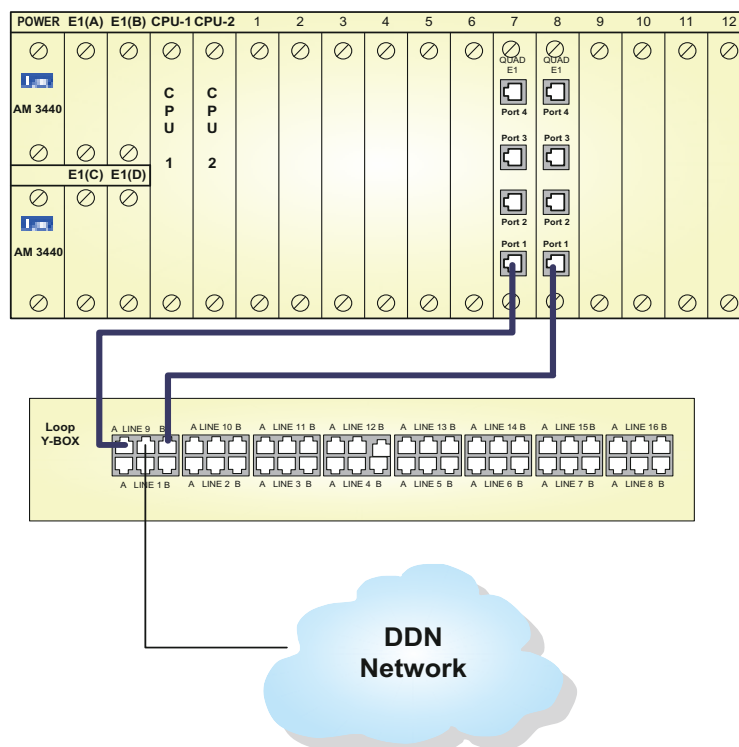
Y-Box for E1/T1 cards of O9400R, or O9500R illustration

Using O9400R as an example shown in the figure below.

Port 1-16

RJ Connector

TELCO Connector

SCSI
Cable

Wire Wrap

Y-Box for Protection

16E1/T1

16E1/T1
Backup

Port 17-32

Port 1-16

Port 1-16

Y-Box for Protection

Port 17-32

32E1/T1

32E1/T1
Backup

Port 17-32

Port 1-16

Port 1-16

Port 17-32

Port 49-63

Port 33-48

Port 33-48

63E1/T1

63E1/T1
Backup

Two Y-Boxes

Port 49-63

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SFP/SFP+ Optical Modules

SFP / SFP+ modules:

1   10G SFP+ Ordering Info
2   2.5G SFP Ordering Info
3   1.25G SFP Ordering Info
4   622~155M SFP Ordering Info
5   622M SFP Ordering Info
6   125M/155M SFP Ordering Info
7   1x9 155M/125M/1~100M Ordering Info
8   1x8 155M Ordering Info
9   2M SFP Ordering Info
10   155M / 1.25G SFP EE Transceiver Module for SDH only

Description

For all Loop products, a SFP port requires an additional SFP optical module for wire connection. Loop products compatible with each SFP model are listed under section titles. For optical modules that are not listed in this chapter, please contact your nearest Loop sales representative.

NOTE: It is strongly recommended against purchasing non-Loop branded SFP modules in use with Loop products as compatibility is not proven.

Ordering Info Guideline of SFP/SFP+ modules for SFP/SFP+ housing

The code for each module contains 5 characters for specification as listed below, specifying the options for *Mode, Data Rate, Wave Length, Distance*, and *Connector* in the exact order. An example for the code **GQB2D** would have the specifications of *SFP+ Single-mode, 10.3G ~1.25 Gbps, 1310 nm Commercial, 20 KM*, and *LC connector with DDM*. See the next sections for available combinations.

	Mode		Data Rate		Wave Length		Distance		Connector
E	SFP Electrical Transceiver (EE)	R	1~100M	A	850 nm Commercial (0~+70°C)	A	100 m	D	LC connector with DDM
G	SFP+ Single-mode& CWDM&DWDM&BiDi	E	10/100M	B	1270~1310nm~1430 nm Commercial (0~+70°C)	B	300 m	W	LC connector without DDM
M	SFP Multi-Mode	F	125M	C	1450nm~1550(nm) ~1610nm Commercial (0~+70°C) including 1550 EML(nm)	F	500 m	S	SC connector
P	SFP Single-Mode& CWDM&DWDM&BiDi	G	1.25G to 125M	D	TX1310nm / RX1490~1550nm Commercial (0~+70°C)	T	2 KM	F	FC connector
T	SFP+ Multi-Mode	H	155M	E	TX1490~1550nm / RX1310nm Commercial (0~+70°C)	D	5 KM	C	Coaxial connector
N	1*9 Single-mode(SM) & CWDM Single-Mode& BiDi	J	622 to 155M	F	TX1310nm / RX1550nm Industrial (-40C~+85°C)	1	10 KM	T	ST connector
Q	1*9 Multi-Mode	C	622M only	G	TX1550nm / RX1310nm Industrial (-40C~+85°C)	2	20 KM	R	RJ45 connector
Z	1*8 Multi-Mode	T	1.25G	K	1490nm Commercial (-0~+70°C)	3	30 KM		
S	TSOP (Transparent SONET/ SDH over Packet) Smart SFP	S	2.5G single rate	T	1310nm Industrial(-40~+85C)	4	40 KM		
		L	2.5G multi rate	L	1550nm Industrial(-40~+85C)	5	50 KM		
		Q	10G to 1.25G multi-data rate	P	850nm Industrial (-40~+85°C)	6	60 KM		
		N	10G BASE (9.95 - 10.5 Gbps)	H	10G TX to RX (0~+70°C)	7	70 KM		
				J	10G RX to TX (0~+70°C)	8	80 KM		
						9	90 KM		
						U	100 KM		
						V	110 KM		
						X	120 KM		
						W	140 KM		
						R	160 KM		
						S	180 KM		
						Y	200 KM		
						Z	240 KM		

Note 1: DDM: digital diagnostic monitoring

Note 2: Commercial (0 to 70°C); Industrial (-40 to 85°C) unless otherwise noted.

Note 3: BiDi: Bi-directional.

Accessories

For DWDM SFP+ Optical Modules

■ A special defined -Dxx ordering code is used to select frequency and wavelength:

Code	Channel	Frequency(THz)	Center Wavelength(nm)
-D17	17	191.7	1563.86
-D18	18	191.8	1563.05
-D19	19	191.9	1562.23
-D20	20	192.0	1561.42
-D21	21	192.1	1560.61
-D22	22	192.2	1559.79
-D23	23	192.3	1558.98
-D24	24	192.4	1558.17
-D25	25	192.5	1557.36
-D26	26	192.6	1556.55
-D27	27	192.7	1555.75
-D28	28	192.8	1554.94
-D29	29	192.9	1554.13
-D30	30	193.0	1553.33
-D31	31	193.1	1552.52
-D32	32	193.2	1551.72
-D33	33	193.3	1550.92
-D34	34	193.4	1550.12
-D35	35	193.5	1549.32
-D36	36	193.6	1548.51
-D37	37	193.7	1547.72
-D38	38	193.8	1546.92
-D39	39	193.9	1546.12
-D40	40	194.0	1545.32
-D41	41	194.1	1544.53
-D42	42	194.2	1543.73
-D43	43	194.3	1542.94
-D44	44	194.4	1542.14
-D45	45	194.5	1541.35
-D46	46	194.6	1540.56
-D47	47	194.7	1539.77
-D48	48	194.8	1538.98
-D49	49	194.9	1538.19
-D50	50	195.0	1537.40
-D51	51	195.1	1536.61
-D52	52	195.2	1535.82
-D53	53	195.3	1535.04
-D54	54	195.4	1534.25
-D55	55	195.5	1533.47
-D56	56	195.6	1532.68
-D57	57	195.7	1531.90
-D58	58	195.8	1531.12
-D59	59	195.9	1530.33
-D60	60	196.0	1529.55
-D61	61	196.1	1528.77

For CWDM SFP Optical Modules

■ A special defined **-Cxx** ordering code is used to select **wavelength**:

Code	Center Wavelength(nm)	Wavelength(nm)
-C27	1270nm	1264.5 --- 1277.5 nm
-C29	1290nm	1284.5 --- 1297.5 nm
-C31	1310nm	1304.5 --- 1317.5 nm
-C33	1330nm	1324.5 --- 1337.5 nm
-C35	1350nm	1344.5 --- 1357.5 nm
-C37	1370nm	1364.5 --- 1377.5 nm
-C39	1590nm	1384.5 --- 1397.5 nm
-C41	1410nm	1404.5 --- 1417.5 nm
-C43	1430nm	1424.5 --- 1437.5 nm
-C45	1450nm	1444.5 --- 1457.5 nm
-C47	1470nm	1464.5 --- 1477.5 nm
-C49	1490nm	1484.5 --- 1497.5 nm
-C51	1510nm	1504.5 --- 1517.5 nm
-C53	1530nm	1524.5 --- 1537.5 nm
-C55	1550nm	1544.5 --- 1557.5 nm
-C57	1570nm	1564.5 --- 1577.5 nm
-C59	1590nm	1584.5 --- 1597.5 nm
-C61	1610nm	1604.5 --- 1617.5 nm

1. 10G SFP+ Ordering Info

1.1 Commercial Range (0 to 70°C)

Compatible with G7860A, IP6320A, IP6320B*, PTN10G, G7820 and WDM1800*

*Future Option

Type	Code	Description	Note
10G (mini GBIC) Dual Fiber Commercial (0 to +70°C)	**GQB2D**	SFP+ single-mode optical module with dual uni-directional fiber, 10.3G ~1.25 Gbps, 1310nm, 20KM, LC connector with DDM, 10G Ethernet Links LR/LW	All 10.3G ~1.25 Gbps optical module downgrading to 1.25GMbps data rate will be workable
	GQC4D	SFP+ single-mode optical module with dual uni-directional fiber, 10.3G ~1.25 Gbps, 1550nm, 40KM, LC connector with DDM, 10G SONET Links ER/EW	
	GQC8D	SFP+ single-mode optical module with dual uni-directional fiber, 10.3G ~1.25 Gbps, 1550nm, 80KM, LC connector with DDM, 10G SONET Links ZR/ZW	
10G (mini GBIC) DWDM Dual Fiber Commercial (0 to +70°C)	**GQC4D-Dxx**	SFP+ DWDM single-mode optical module with dual uni-directional fiber, 10.3G ~1.25 Gbps, 1170~1610nm, 40KM, LC connector with DDM, 10G Ethernet Links ER/EW	• For Dxx, please choose code from -D17 to -D61 in the **For DWDM SFP+ Optical Modules** table. • All 10.3G ~1.25 Gbps optical module downgrading to 1.25GMbps data rate will be workable
	GQC8D-Dxx	SFP+ DWDM single-mode optical module with dual uni-directional fiber, 10.3G ~1.25 Gbps, 1170~1610nm, 80KM, LC connector with DDM, 10G Ethernet Links ZR/ZW	• For Dxx, please choose code from -D17 to -D61 in the **For DWDM SFP+ Optical Modules** table. • All 10.3G ~1.25 Gbps optical module downgrading to 1.25GMbps data rate will be workable

Type	Code	Description	Note
10G (mini GBIC) DWDM Dual Fiber Commercial (0 to +70°C)	**GQB4D-Cxx**	SFP+ CWDM single-mode optical module with dual uni-directional fiber, 10.3G ~1.25 Gbps, 1270~1430nm, 40KM, LC connector with DDM, 10G Ethernet Links ER/EW	• For Cxx, please choose code from –C27 to –C43 with each step 20nm in the **For CWDM SFP Optical Modules** table. • All 10.3G ~1.25 Gbps optical module downgrading to 1.25GMbps data rate will be workable
	GQC4D-Cxx	SFP+ CWDM single-mode optical module with dual uni-directional fiber, 10.3G ~1.25 Gbps, 1450~1610nm, 40KM, LC connector with DDM, 10G Ethernet Links ER/EW	• For Cxx, please choose code from –C45 to –C61 with each step 20nm in the **For CWDM SFP Optical Modules** table. • All 10.3G ~1.25 Gbps optical module downgrading to 1.25GMbps data rate will be workable
	GQC7D-Cxx	SFP+ CWDM single-mode optical module with dual uni-directional fiber, 10.3G ~1.25 Gbps, 1470~1610nm, 70-80KM, LC connector with DDM, 10GBase-ZR/ZW	• For Cxx, please choose code from –C47 to –C61 with each step 20nm in the **For CWDM SFP Optical Modules** table. • All 10.3G ~1.25 Gbps optical module downgrading to 1.25GMbps data rate will be workable

1.2 Industrial Range (-40 to 85°C)

Compatible with G7860A, IP6320A, IP6320B*, PTN10G, G7820 and WDM1800*

*Future Option

Type	Code	Description	Note
10G (mini GBIC) Dual Fiber Industrial (-40°C to 85 °C)	GNT1D	SFP+ single-mode optical module with dual uni-directional fiber, 10.3Gbps, 1310nm, 10KM, LC connector with DDM, 10G Ethernet Links LR/LW	
	GNT2D	SFP+ single-mode optical module with dual uni-directional fiber, 10.3Gbps, 1310nm, 20KM, LC connector with DDM, 10G Ethernet Links LR/LW	• Operating Temperature: -25~+85°C
	GNL4D	SFP+ single-mode optical module with dual uni-directional fiber, 10.3Gbps, 1550nm, 40KM, LC connector with DDM, 10G Ethernet Links ER/EW	
	GNL8D	SFP+ single-mode optical module with dual uni-directional fiber, 10.3Gbps, 1550nm, 80KM, LC connector with DDM, 10G Ethernet Links ZR/ZW	• Operating Temperature: -25~+85°C
	GQT2D	SFP+ single-mode optical module with dual uni-directional fiber, 10.3G ~1.25 Gbps, 1310nm, 20KM, LC connector with DDM, 10G Ethernet Links LR/LW	• Operating Temperature: -25~+85°C • All 10.3G ~1.25 Gbps optical module downgrading to 1.25GMbps data rate will be workable

2 2.5G SFP Ordering Info

2.1 Commercial Range (0 to 70°C)

Compatible with O9400R-CC16 and B2G5 card

Type	Code	Description	Note
2.5G **(mini GBIC)** **Dual Fiber** **Commercial** **(0 to +70°C)**	**PLB2D**	SFP single-mode optical module with dual uni-directional fiber, 2.5G, 1310nm, 15KM, LC connector with DDM	
	PLB4D	SFP single-mode optical module with dual uni-directional fiber, 2.5G, 1310nm, 40KM, LC connector with DDM	
	PLC8D	SFP single-mode optical module with dual uni-directional fiber, 2.5G, 1550nm, 80KM, LC connector with DDM	

Type	Code	Description	Note
2.5G (mini GBIC) Single Fiber Commercial (0 to +70°C)	**PLD2D**	SFP single-mode optical module with single bi-directional fiber, 2.5G, TX1310 /RX1550, 15~20KM, LC connector with DDM, compatible with IEEE 802.3ah, 1000Base-BX10	
	PLE2D	SFP single-mode optical module with single bi-directional fiber, 2.5G, TX1550 /RX1310, 15~20KM, LC connector with DDM, compatible with IEEE 802.3ah, 1000Base-BX10	
	PLD4D	SFP single-mode optical module with single bi-directional fiber, 2.5G, TX1310/RX1550, 40KM, LC connector with DDM, OC48/STM-16 application	
	PLE4D	SFP single-mode optical module with single bi-directional fiber, 2.5G, TX1550 /RX1310, 40KM, LC connector with DDM, OC48/STM-16 application	
2.5G (mini GBIC) CWDM Dual Fiber Commercial (0 to +70°C)	**PLD4D-Cxx**	SFP CWDM single-mode optical module with dual uni-directional fiber, 2.5G, 1470 ~1610nm, 40KM, LC connector with DDM	For Cxx, please choose code from -C47 to -C61 with each step 20nm in the **For CWDM SFP Optical Modules** table.
2.5G (mini GBIC) DWDM Dual Fiber Commercial (0 to +70°C)	**PLC8D-Dxx**	SFP DWDM single-mode optical module with dual uni-directional fiber, 2.5G, 1170~1610nm, 80KM, LC connector with DDM, SONET OC-48	For Dxx, please choose code from -D17 to -D61 in the **For DWDM SFP+ Optical Modules** table.

2.2 Industrial Range (-40 to 85°C)
Compatible with O9400R-CC16 and B2G5 card

Type	Code	Description	Note
2.5G (mini GBIC) Dual Fiber Industrial (-40 to +85°C)	**PLT4D**	SFP single-mode optical module with dual bi-directional fiber, 2.5G, 1310nm, 40KM, LC connector with DDM	
	PLL8D	SFP single-mode optical module with dual bi-directional fiber, 2.5G, 1550nm, 80KM, LC connector with DDM	

3. 1.25G SFP Ordering Info

3.1 Commercial Range (0 to 70°C)
Compatible with IP6704A, IP6750, IP6820, IP7925, O9340S, TDMoEA, 4GEoSDH, PTNext, 8GES4SWA and 8GES16SWA*

*Future Option

Type	Code	Description	Note
1.25G (mini GBIC) Dual Fiber Commercial (0 to 70°C)	**MTAFD**	SFP multi-mode optical module with dual uni-directional fiber, 1.25G~ 622M, 850nm, 500m, LC connector with DDM, 1000Base-SX	
	MTBTD	SFP multi-mode optical module with dual uni-directional fiber, 1.25G, 1310nm, 2KM, LC connector with DDM, 1000Base-SX+	
	PTB2D	SFP single-mode optical module with dual uni-directional fiber, 1.25G, 1310nm, 20KM, LC connector with DDM, 1000Base-LX	
	PTB2W	SFP single-mode optical module with dual uni-directional fiber, 1.25G, 1310nm, 20KM, LC connector, 1000Base-LX	

Type	Code	Description	Note
1.25G (mini GBIC) Dual Fiber Commercial (0 to 70°C)	PTB4D	SFP single-mode optical module with dual uni-directional fiber, 1.25G, 1310nm, 40KM, LC connector with DDM, 1000Base-LHX	
	PTB4W	SFP single-mode optical module with dual uni-directional fiber, 1.25G, 1310nm, 40KM, LC connector, 1000Base-LHX	
	PTC6D	SFP single-mode optical module with dual uni-directional fiber, 1.25G, 1550nm, 60KM, LC connector with DDM, 1000Base-XD	
	PTC6W	SFP single-mode optical module with dual uni-directional fiber, 1.25G, 1550nm, 60~80KM, LC connector, 1000Base-XD	
1.25G (mini GBIC) Single Fiber Commercial (0 to 70°C)	MTDFD	SFP multi-mode optical module with single bi-directional fiber, 1.25G, TX1310/RX1550, 500~550M, LC connector with DDM, GbE/1X fiber Channel	
	MTEFD	SFP multi-mode optical module with single bi-directional fiber, 1.25G, TX1550/RX1310, 500~550M, LC connector with DDM, GbE/1X fiber Channel	
	PTD2D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1310 /RX1550, 20KM, LC connector with DDM, GbE/1X fiber Channel	
	PTE2D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1550 /RX1310, 20KM, LC connector with DDM, GbE/1X fiber Channel	
	PTD4W	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1310 /RX1550, 40KM, LC connector, GbE/1X fiber Channel	
	PTE4W	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1550 /RX1310, 40KM, LC connector, GbE/1X fiber Channel	
	PTD4D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1310 /RX1550, 40KM, LC connector with DDM, GbE/1X fiber Channel	
	PTE4D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1550 /RX1310, 40KM, LC connector with DDM, GbE/1X fiber Channel	
	PTD6D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1310 /RX1550, 60KM, LC connector with DDM, GbE/1X fiber Channel	
	PTE6D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1550 /RX1310, 60KM, LC connector with DDM, GbE/1X fiber Channel	
1.25G (mini GBIC) CWDM Dual Fiber Commercial (0 to +70°C)	PTC4D-Cxx	SFP CWDM single-mode optical module with dual uni-directional fiber, 1.25G, 1470~1610nm, 20~40KM, LC connector with DDM, GbE/1X fiber Channel	• For Cxx, please choose code from –C47 to -C61 in the **For CWDM SFP+ Optical Modules** table.
	PTC8D-Cxx	SFP CWDM single-mode optical module with dual uni-directional fiber, 1.25G~622M, 1470~1610nm, 80KM, LC connector with DDM, GbE/1X fiber Channel	• For Cxx, please choose code from –C47 to -C61 in the **For CWDM SFP+ Optical Modules** table.

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3.2 Industrial Range (-40 to +85°C)

Compatible with IP6704A, IP6750, IP6820, IP7925, O9340S, TDMoEA, 4GEoSDH, PTNext, 8GES4SWA and 8GES16SWA*

<div align="right">*Future Option</div>

Type	Code	Description	Note
1.25G (mini GBIC) Dual Fiber Industrial (-40 to 85°C)	MTPFD	SFP multi-mode optical module with dual uni-directional fiber, 1.25G, 850nm, 500KM, LC connector with DDM, 1000Base-SX	
	MTTTD	SFP multi-mode optical module with dual uni-directional fiber, 1.25G, 1310nm, 2KM, LC connector with DDM, 1000Base-SX+	
	PTT2D	SFP single-mode optical module with dual uni-directional fiber, 1.25G, 1310nm, 15-20KM, LC connector with DDM, 1000base-LHX	
	PTT4D	SFP single-mode optical module with dual uni-directional fiber, 1.25G, 1310nm, 40KM, LC connector with DDM, 1000base-LHX	
	PTL6D	SFP single-mode optical module with dual uni-directional fiber, 1.25G, 1550nm, 60KM, LC connector with DDM, 1000base-ZX	
1.25G (mini GBIC) Single Fiber Industrial (-40 to 85°C)	PTF2D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1310/ RX1550, 20KM, LC connector with DDM, Gbe/1X fiber Channel	
	PTG2D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1550/ RX1310, 20KM, LC connector with DDM, Gbe/1X fiber Channel	
	PTF4D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1310/ RX1550, 40KM, LC connector with DDM, Gbe/1X fiber Channel	
	PTG4D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1550/ RX1310, 40KM, LC connector with DDM, Gbe/1X fiber Channel	
	PTF6D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1310/ RX1550, 60KM, LC connector with DDM, Gbe/1X fiber Channel	
	PTG6D	SFP single-mode optical module with single bi-directional fiber, 1.25G, TX1550/ RX1310, 60KM, LC connector with DDM, Gbe/1X fiber Channel	

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

4. 622~155M SFP Ordering Info

4.1 Commercial Range (0 to 70°C)

Compatible with O9400R, O9500R, O9550, V4150 and B155/622 card

Type	Code	Description	Note
622~155Mbps (mini GBIC) Dual Fiber Commercial (0 to 70°C)	PJB2W	SFP single-mode optical module with dual uni-directional fiber, 622~155M, 1310nm, 20KM, LC connector, S4.1/IR1	
	PJB2D	SFP single-mode optical module with dual uni-directional fiber, 622~155M, 1310nm, 20KM, LC connector with DDM, S4.1/IR1	
	PJCXD	SFP single-mode optical module with dual uni-directional fiber, 622~155M, 1550nm, 120KM, LC connector with DDM, Extend distance L4.2	

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

5 622M SFP Ordering Info

5.1 Commercial Range (0 to 70°C)

Compatible with O9400R, O9500R, O9550, V4150 and B155/622 card

Type	Code	Description	Note
622Mbps (mini GBIC) Dual Fiber Commercial (0 to 70°C)	PCB4W	SFP single-mode optical module with dual uni-directional fiber, 622M, 1310nm, 40KM, LC connector, L4.1/LR1	
	PCB4D	SFP single-mode optical module with dual uni-directional fiber, 622M, 1310nm, 40KM, LC connector with DDM, L4.1/LR1	
	PCC8W	SFP single-mode optical module with dual uni-directional fiber, 622M, 1550nm, 80KM, LC connector w/o DDM, L4.2/LR2	
	PCC2D	SFP single-mode optical module with dual uni-directional fiber, 622M, 1550nm, 20KM, LC connector, L4.2/LR2	
	PCC8D	SFP single-mode optical module with dual uni-directional fiber, 622M, 1550nm, 80KM, LC connector with DDM, L4.2/LR2	
622Mbps (mini GBIC) Single Fiber Commercial (0 to 70°C)	PCD2D	SFP single-mode optical module with single bi-directional fiber, 622M, TX1310/RX1550, 20KM, LC connector with DDM, S4.1/IR1	
	PCE2D	SFP single-mode optical module with single bi-directional fiber, 622M, TX1550/RX1310, 20KM, LC connector with DDM, S4.2/IR2	
	PCD4D	SFP single-mode optical module with single bi-directional fiber, 622M, TX1310/RX1550, 40KM, LC connector with DDM, L4.1/LR1	
	PCE4D	SFP single-mode optical module with single bi-directional fiber, 622M, TX1550/RX1310, 40KM, LC connector with DDM, L4.2/LR2	
	PCD6D	SFP single-mode optical module with single bi-directional fiber, 622M, TX1310/RX1550, 60KM, LC connector with DDM, L4.1/LR1	
	PCE6D	SFP single-mode optical module with single bi-directional fiber, 622M, TX1550/RX1310, 60KM, LC connector with DDM, L4.2/LR2	
622M (mini GBIC) CWDM Dual Fiber Commercial (0 to +70°C)	**PCC8D-Cxx**	SFP CWDM single-mode optical module with dual uni-directional fiber, 622M, 1470 ~1610nm, 80KM, LC connector with DDM	• For Cxx, please choose code from -C47 to -C61 with each step 20nm in the **For CWDM SFP Optical Modules** table.

NOTE: For other special/industrial optical modules, please contact your nearest Loop sales representatives.

6. 125M/155M SFP Ordering Info

6.1 Commercial Range (0 to 70°C)

Compatible with IP6702A, IP6704A, IP6810, O9150, O9400R, O9500R, O9550, V4150, 7FOM card, IP6510-LN, IP6510 and AM3430

Type	Code	Description	Note
155Mbps (mini GBIC) Dual Fiber Commercial (0 to 70°C)	MHBTD	SFP multi-mode optical module with dual uni-directional fiber, 155M, 1310nm, 2KM, LC connector with DDM, Fast Ethernet and compliant with ITU recommendation G.957	
	PHB2D	SFP single-mode optical module with dual uni-directional fiber, 155M, 1310nm, 20KM, LC connector with DDM, S1.1/IR1	
	PHC2W	SFP single-mode optical module with dual uni-directional fiber, 155M, 1550nm, 20KM, LC connector, L1.2/LR2	
	PHC2D	SFP single-mode optical module with dual uni-directional fiber, 155M, 1550nm, 15KM, LC connector with DDM, S1.1/IR1	
	PHB5W	SFP single-mode optical module with dual uni-directional fiber, 155M, 1310nm, 60KM, LC connector, L1.1 / LR1	

Type	Code	Description	Note
155Mbps (mini GBIC) Dual Fiber Commercial (0 to 70°C)	PHB5D	SFP single-mode optical module with dual uni-directional fiber, 155M, 1310nm, 60KM, LC connector with DDM, L1.1/LR1	
	PHC8D	SFP single-mode optical module with dual uni-directional fiber, 155M, 1550nm, 80KM, LC connector with DDM, L1.2/LR2	
155Mbps (mini GBIC) Single Fiber Commercial (0 to 70°C)	MHDTD	SFP multi-mode optical module with single bi-directional fiber, 155M, TX1310/RX1550, 2KM, LC connector with DDM, Fast Ethernet and compliant with ITU recommendation G.957	
	MHETD	SFP multi-mode optical module with single bi-directional fiber, 155M, TX1550/RX1310, 2KM, LC connector with DDM, Fast Ethernet and compliant with ITU recommendation G.957	
	PHD2D	SFP single-mode optical module with single bi-directional fiber, 155M, TX1310/RX1550, 10~20KM, LC connector with DDM, Fast Ethernet and compliant with ITU-T recommendation G.957	
	PHE2D	SFP single-mode optical module with single bi-directional fiber, 155M, TX1550/RX1310, 10~20KM, LC connector with DDM, Fast Ethernet and compliant with ITU-T recommendation G.957	
	PHD4D	SFP single-mode optical module with single bi-directional fiber, 155M, TX1310/RX1440, 40~50KM, LC connector with DDM, Fast Ethernet and compliant with ITU-T recommendation G.957	
	PHE4D	SFP single-mode optical module with single bi-directional fiber, 155M, TX1550/RX1310, 40~50KM, LC connector with DDM, Fast Ethernet and compliant with ITU-T recommendation G.957	
155M (mini GBIC) CWDM Dual fiber Commercial (0 to +70°C)	PHC4D-**Cxx**	SFP CWDM single-mode optical module with dual uni-directional fiber, 155M, 1470~1610nm, 30~40KM (30dB margin), LC connector with DDM, 155 Mbps SONET OC-3/SDH STM-1/125 Mbps Fast Ethernet	• For Cxx, please choose code from –C47 to -C61 in the **For CWDM SFP+ Optical Modules** table.
155M (mini GBIC) DWDM Dual fiber Commercial (0 to +70°C)	PHC8D-**Dxx**	SFP DWDM single-mode optical module with dual uni-directional fiber, 155M, 1470~1610nm, 80KM, LC connector with DDM, IEEE C37.94 Optical-Electrical Interface Conversion	• For Dxx, please choose code from –D47 to -D61 in the **For DWDM SFP+ Optical Modules** table.

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

6.2 Industrial Range (-40 to +85°C)

Compatible with IP6702A, IP6704A, IP6810, O9150, O9400R, O9500R, O9550, V4150, 7FOM card, IP6510-LN, IP6510 and AM3430

Type	Code	Description	Note
155Mbps (mini GBIC) Dual Fiber Industrial (-40 to +85°C)	MHPTD	SFP multi-mode optical module with dual uni-directional fiber, 155M, 850nm, 500M~2KM, LC connector with DDM, Fast Ethernet and compliant with ITU recommendation G.957	
	PHT3D	SFP multi-mode optical module with dual uni-directional fiber, 155M, 1310nm, 30~40KM, LC connector with DDM, S1.1/IR1	
	PHT6D	SFP multi-mode optical module with dual uni-directional fiber, 155M, 1310nm, 50~60KM, LC connector with DDM, L1.1/LR1	

Accessories

7. 1x9 155M/125M/1~100M Ordering Info

7.1 Commercial Range (0 to 70°C)

Compatible with O9310, V4200-9, AM3440, O9400R, O9500R, IP6810 and IP6820

Type	Code	Description	Note
1x9 155Mbps Dual Fiber Commercial (0 to 70°C)	QHATS	1x9, multi-mode optical module with dual uni-directional fiber, 155M, 850nm, 2KM, SC connector	
	QHBTS	1x9, multi-mode optical module with dual uni-directional fiber, 155M, 1310nm, 2KM, SC connector, 100Base-FX/OC3	
	NHB3S	1x9, single-mode optical module with dual uni-directional fiber, 155M, 1310nm, 30KM, SC connector, S1.1/IR1	
	NHB5S	1x9, single-mode optical module with dual uni-directional fiber, 155M, 1310nm, 50KM, SC connector, L1.1/IR1	
	NHC2S	1x9, single-mode optical module with dual uni-directional fiber, 155M, 1550nm, 20KM, SC connector, S1.2/IR2	
	NHC8S	1x9, single-mode optical module with dual uni-directional fiber, 155M, 1550nm, 80KM, SC connector, L1.2/LR2	
1x9 155Mbps Single Fiber Commercial (0 to 70°C)	WHD2S	1x9, single-mode optical module with single bi-directional fiber, 155M, TX1310/RX1550, 20~30KM(19db), SC connector, Fast Ethernet	
	WHE2S	1x9, single-mode optical module with single bi-directional fiber, 155M, TX1530/RX1310, 20~30KM(19db), SC connector, Fast Ethernet	
	WHD5S	1x9, single-mode optical module with single bi-directional fiber, 155M, TX1310/RX1550, 50KM(28db), SC connector, Fast Ethernet	
	WHE5S	1x9, single-mode optical module with single bi-directional fiber, 155M, TX1530/RX1310, 50KM(28db), SC connector, Fast Ethernet	
	WHD8S	1x9, single-mode optical module with single bi-directional fiber, 155M, TX1310/RX1530, 80KM, SC connector, extended L1.1/Fast Ethernet	
	WHE8S	1x9, single-mode optical module with single bi-directional fiber, 155M, TX1530/RX1310, 80KM, SC connector, L1.2/Fast Ethernet	
1x9 125Mbps Dual Fiber Commercial (0 to 70°C)	QFBTT	1x9, multi-mode optical module with dual uni-directional fiber, 125M, 1310nm, 2KM, ST connector	
	NFB3T	1x9, single-mode optical module with dual uni-directional fiber, 125M, 1310nm, 30KM, ST connector	
1x9 1~100Mbps Dual Fiber Commercial (0 to 70°C)	NHR2T	1x9, single-mode optical module with dual uni-directional fiber, 1~100M, 1310nm, 20KM, ST connector	• For AM3440 4C37-S • No safety certified

7.2 Industrial Range (-40 to +85°C)

Compatible with O9310, V4200-9, AM3440, and O9500R

Type	Code	Description	Note
1x9 155Mbps Dual Fiber Industrial (-40 to +85°C)	QHTTS	1x9, multi-mode optical module with dual uni-directional fiber, 155M, 1310nm, 2KM, SC connector, 100Base-FX/OC3	
	NHT3S	1x9, single-mode optical module with dual uni-directional fiber, 155M, 1310nm, 30KM, SC connector, S1.1/IR1	
	NHT5S	1x9, single-mode optical module with dual uni-directional fiber, 155M, 1310nm, 50KM, SC connector, L1.1/IR1	

Type	Code	Description	Note
1x9 155Mbps Single Fiber Industrial (-40 to +85°C)	WHF2S	1x9, single-mode optical module with single bi-directional fiber, 155M, TX1310/RX1550, 20~30KM(19db), SC connector, Fast Ethernet	
	WHG2S	1x9, single-mode optical module with single bi-directional fiber, 155M, TX1530/RX1310, 20~30KM(19db), SC connector, Fast Ethernet	

8. 1x8 155M Ordering Info

8.1 Industrial Range (-40 to +85°C)

Compatible with AM3440

Type	Code	Description	Note
1x8 155Mbps Industrial (-40 to +85°C)	ZHHTT	1x8, multi-mode optical module with separate TX and RX, 155M, 820nm, 2KM, ST connector	Separate transceiver and receiver

9. 2M SFP Ordering Info

9.1 Commercial Range (0 to 70°C)

Compatible with C37.94 card for AM3440 and O9500R

Type	Code	Description	Note
2Mbps Dual Fiber Commercial (0 to 70°C)	MRATD	SFP multi-mode optical module with dual uni-directional fiber, 2Mbps, 850nm, 2KM, LC connector with DDM, IEEE C37.94 Optical-Electrical Interface Conversion	Use 2 fibers for all SFP/SFP+ optical modules

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

10. 155M / 1.25G SFP EE Transceiver Module for SDH only

10.1 Commercial Range (0 to 70°C)

Compatible with PTNext, 8GES4SWA, 8GES16SWA* cards for O9400R and O9500R, G7860A, and IP6820

*Future Option

Type	Code	Description	Note
10/100/1000M Copper SFP Transceiver	EMOAR	Copper SFP Transceiver, 10/100/1000, RJ45 with four pair, CAT 5 UTP cabling Interface: SGMII	Typical cable length=100M

10.2 Industrial Range (-40 to +85°C)

Compatible with PTNext, 8GES4SWA, 8GES16SWA* cards for O9400R and O9500R, G7860A, and IP6820

*Future Option

Type	Code	Description	Note
155M Copper SFP Transceiver	EHNAC	Copper SFP Transceiver, 155M, Coaxial Connector (Din 1.0/2.3 75Ohm / Din 47279)	Typical cable length=100M
10/100/1000M Copper SFP Transceiver	EMNAR	Copper SFP Transceiver, 10/100/1000, RJ45 with four pair, CAT 5 UTP cabling Interface: SGMII	Typical cable length=100M

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