DATA COMM FOR BUSINESS

Loop-IP6416
IP-IMUX

Features

- 1U height, ETSI unit (full front access) or ANSI unit (front and back access)
- Rack mount, and stand-alone
- WAN ports with 4 hot swappable slots
  - 4 E1/T1 ports per card; max up to 16 E1/T1 port per system
  - E1/T1 is software configurable
- Tributary ports
  - Fixed on main board
    - Up to four 10/100 Fast Ethernet (FE)
  - Optional daughter card fixed on panel with up to three 10/100 FE on main board
    - 1 Optical FE
    - 1 Optical FE (SFP housing)
    - 2 combo Gigabit Ethernet (GbE) with 2 RJ45 and 2 SFP housing
      - Ethernet Function
        - 802.1q VLAN
        - 802.1d bridging with MAC learning (up to 4096 entry)
      - CoS/QoS
        - 4 priority queue
        - Packet classification based on the 802.1p priority or DSCP (DiffServ).
        - Strictly Priority or Weighted Round-Robin (WRR)
        - Rate limiting
- Power modules
  - Hot-swappable plug-in modules, dual for redundancy
    - -48 Vdc (-36 to -75 Vdc)
    - AC plug-in module(100 to 240 Vac) (ANSI only)
  - AC and DC(coexistent) fixed module (100 to 240 Vac and -36 to -75 Vdc)
- WAN link with virtually concatenated n x E1/T1, where n can be 1 to 16
- Encapsulation protocol: LCAS, GFP, LAPS and PPP (without LCP)
- Differential delay, up to 256ms for E1 and 384 ms for T1
- VLAN packet transparency
  - Packet size up to 12,000 bytes; IEEE 802.1ad Q-in-Q
- Timing sources for primary and secondary clocks can be E1/T1, internal, external (manufacturing option)
- Alarm relay
- Firmware download to local unit and remote unit
- Management port and interface
  - LCD with keypad on ANSI front panel
  - Console port, VT100 menu-driven
  - SNMP port
  - SNMPv1
  - Telnet via SNMP port
  - LoopView GUI EMS
  - Inband management in traffic bandwidth
- RoHS compliant

ANSI Unit Front view

ETSI Unit Front View

Description

The Loop-IP6416 IP Inverse Mux is a media converter. It allows service providers to offer Ethernet services over the existing copper, optical, or microwave infrastructure carrying the E1/T1 network. Up to 16 E1/T1 lines can be enabled and concatenated to form a single channel. Ethernet frames are mapped into this single concatenated channel.

The IP6416 offers up to 16 E1/T1 ports with an LED for each port. It has automatic E1/T1 channel failure detection and can reassign the number of E1/T1 channels transporting Ethernet traffic. For example, if there are 16 E1s configured for 10/100 Ethernet traffic transport, and one E1 fails during service, the other 15 will pick up the entire load. This dynamic adjustment is achieved by LCAS protocol and thus minimizes the loss of IP packets.

The IP6416 provides flexible choices on tributary side. For light traffic, there are up to four 10/100 fast Ethernet ports. For heavy traffic or larger network, there are three options of fixed daughter cards available: one optical FE, one optical FE (SFP housing), or 2 combo GbE with switch functions.

Several power options exist including dual DC, front/back AC and hybrid AC/DC. The Loop-IP6416 has a console port which allows users to execute in-service diagnostics and fault isolation from a local or remote terminal. The Loop-IP6416 also allows remote site connection to Telnet via the Ethernet port. An Alarm Cut-Off (ACO) button is located on the panel.

Ordering Information

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

Model (RoHS compliant)	Description	Notes
Main Unit		
Loop-IP6416-S-1UA-4FE-s1-s2-s3-s4-pp1-pp2-add2-add3-**G**	1U height ANSI unit(front and rear access) stand-alone with 4 Fast Ethernet(FE) ports	
Loop-IP6416-S-1UA-4FE-s1-s2-s3-s4-AD-add2-add3-**G**	1U height ANSI unit(front and rear access) stand-alone with 4 Fast Ethernet(FE) ports and fixed AD/DC coexist power module	
Loop-IP6416-S-1UA-3FE-s1-s2-s3-s4-pp1-pp2-add1-add2-add3-**G**	1U height ANSI unit(front and rear access) stand-alone with 3 Fast Ethernet(FE) ports and daughter board	
Loop-IP6416-S-1UA-3FE-s1-s2-s3-s4-AD-add1-add2-add3-**G**	1U height ANSI unit(front and rear access) stand-alone with 3 Fast Ethernet(FE) ports and daughter board and fixed AD/DC coexist power module	Where **s1, s2, s3, s4**, **pp1, pp2, add1, add2,** and **add3** are defined in tables below The add 1 is not applicable for 4 FE For allowed pp1, pp2 combinations, refer to **NOTE 1**
Loop-IP6416-S-1UE-4FE-s1-s2-s3-s4-pp1-pp2-add2-**G**	1U height ETSI unit(front access) stand-alone with 4 Fast Ethernet(FE) ports	
Loop-IP6416-S-1UE-4FE-s1-s2-s3-s4-AD-add2-**G**	1U height ETSI unit(front access) stand-alone with 4 Fast Ethernet(FE) ports and fixed AD/DC coexist power module	
Loop-IP6416-S-1UE-3FE-s1-s2-s3-s4-pp1-pp2-add1-add2-**G**	1U height ETSI unit(front access) stand-alone with 3 Fast Ethernet(FE) ports and daughter board	
Loop-IP6416-S-1UE-3FE-s1-s2-s3-s4-AD-add1-add2-**G**	1U height ETSI unit(front access) stand-alone with 3 Fast Ethernet(FE) ports and daughter board and fixed AD/DC coexist power module	
Hot-swappable Plug-in modules		
Loop-IP6416-S-ETD-**G**	Quad E1/T1 with DB25 female connector (E1-120 ohms/E1-75 ohms /T1 software selectable)	Conversion cable is not included
Loop-IP6416-S-EM-**G**	Quad E1-75 ohm with 1.0/2.3 RF connector (75ohm impedance)	
Loop-IP6416-S-ETR-**G**	Quad E1/T1 with RJ48C connector (E1-120 ohms/T1 software selectable)	
Plug-in Power Modules:		
Loop-IP6416-S-SA-**G**	Single AC power plug-in module (100 to 240 Vac)	For power redundancy, order a second power module For AC, choose an appropriate power cord
Loop-IP6416-S-SD48-**G**	Single -48 Vdc power plug-in module (-36 to -75 Vdc)	
Accessories		
Power Cord		
Loop-ACC-PC-USA	AC power cord for Taiwan/America	
Loop-ACC-PC-EU	AC power cord for Europe	
Loop-ACC-PC-UK	AC power cord for UK	
Loop-ACC-PC-AUS	AC power cord for Australia	
Loop-ACC-PC-CH	AC power cord for China	
Conversion Cable		
Loop-ACC-CAB-DB25M-100-8BNCM	DB25 Male to eight BNC Male extension cable(Length: 100 cm)	
Loop-ACC-CAB-DB25M-100-8BNCF	DB25 Male to eight BNC Female extension cable(Length: 100 cm)	
Loop-ACC-CAB-DB25M-100-4RJ48M	DB25 Male to four RJ48C Plugs extension cable(Length: 100 cm)	
Loop-ACC-CAB-BNCM-100-RF75M	BNC Male to 1.0/2.3 RF connector (75ohm impedance) Male conversion cable(Length: 100 cm)	
User's Manual		

Loop-IP6416-UM	This is an optional, paper copy. A CD version of the manual is already included as standard equipment.
Firmware Upgrade	
Loop-IP6416-FWUPGR	Firmware Upgrade. Customers who have a desire to upgrade to the most current firmware can purchase this option. Upgrades contain the newest software features and functionality as they are available. Upgrades are downloaded using TFTP and are easily installed.
SFP Optical Modules	
Please place your order using the 5-digit alphanumeric codes listed in the separate SFP Optical Module Brochure. **Note**:Non-Loop SFP modules are not guaranteed to work with our equipments. It is strongly recommended to buy Loop-logo SFP modules.	
Ear Mounts	
19”/23” ear mounts	A pair of 19”/23” ear mounts is supplied as part of standard package. **Note:** For other sizes, please contact your nearest Loop sales representative.

■ Where **s1, s2, s3, and s4** are used to select hot swappable plug-in E1/T1 modules for slots 1-4 (must select one).

s1, s2, s3 and s4 =	Description	Notes
ETD	Quad E1/T1 with DB25 female connector (E1-120 ohms/E1-75 ohms /T1 software selectable)	Conversion cable is not included
EM	Quad E1-75 ohm with 1.0/2.3 RF connector (75ohm impedance)	
ETR	Quad E1/T1 with RJ48C connector (E1-120 ohms/T1 software selectable)	

■ Where **pp1** is used to select the 1st power module:

pp1 =	Description	Notes
SA	Single AC power plug-in module (100 to 240 Vac)	· All plug-in power modules are interchangeable. · For AC, choose an appropriate power cord · **NOTE 1**
SD48	Single -48 Vdc power plug-in module(-36 to -75 Vdc)	

■ Where **pp2** is used to select the 2nd power module. If pp2 is not required leave this field blank.

pp2 =	Description	Note
SA	Single AC power plug-in module (100 to 240 Vac) for ANSI only	· For redundancy purposes, ordering a second plug-in module will provide dual power. · You cannot order a second **SA** for ETSI unit. · For AC, choose an appropriate power cord · **NOTE 1**
SD48	Single -48 Vdc power plug-in module (-36 to -75 Vdc)	

NOTE 1: The combinations of pp1 and pp2 power modules:
For ANSI unit:
· **pp1=SA**(Single AC power plug-in in front or at rear)
· **pp1=SD48**(Single DC power plug-in at rear)
· **pp1=SD48, pp2=SD48**(Dual hot-swappable DC, both rear plug-in)
· **pp1=SA, pp2=SA**(Dual hot-swappable AC, one front and one rear plug-in)
· **pp1=SA, pp2=SD48**(Hot-swappable AC front and DC rear plug-in)
Note: For ANSI unit, DC power is available in rear panel only

For ETSI unit (all power modules in front):
· **pp1=SA** (Single AC power plug-in)
· **pp1=SD48** (Single DC power plug-in)
· **pp1=SD48, pp2=SD48** (Dual hot-swappable DC power plug-in)

■ Where **add1** must be used to select one daughter card.

	add1 =	Description	Notes
Optical Fast Ethernet daughter card	**NHB3S**	Single mode 1*9, 1310 nm commercial (0 to +70°C), 30 km, SC duplex optical connector	· Select one daughter card only · See **Product Specifications** below
	NHB5S	Single mode 1*9, 1310 nm commercial (0 to +70°C), 50 km, SC duplex optical connector	

	add1 =	Description	Notes
	NHB3F	Single mode 1*9, 1310 nm commercial (0 to +70°C), 30 km, FC duplex optical connector	for optical connector information. · Use **WHD2S** with **WHE2S** · Use **WHE2S** with **WHD2S**
	NHC2S	Single mode 1*9, 1550 nm commercial (0 to +70°C), 15 to 20 km, SC duplex optical connector	
	NHCUS	Single mode 1*9, 1550 nm commercial (0 to +70°C), 100 km, SC duplex optical connector	
	WHD2S	WDM mode 1*9(Bi-direction), Tx 1310 nm / Rx 1550 nm commercial(-0 to +70°C), 15 to 20 km, SC simplex optical connector	
	WHE2S	WDM mode 1*9(Bi-direction), Tx 1550 nm / Rx 1310 nm commercial(-0 to +70°C), 15 to 20 km, SC simplex optical connector	
Optical Fast Ethernet with SFP housing daughter card	**SFPC**	SFP(mini-GBIC) optical housing daughter card without SFP optical module	· Order SFP optical modules separately from SFP(FE) table below
Combo GbE daughter card	**CGbEC**	Combo Gigabit Ethernet (GbE) daughter card with two RJ45 twisted pair GbE and two SFP (mini-GBIC) optical housing without SFP optical module.	· Order SFP optical modules separately from SFP(GbE) table below

■ Where **add2** is used to select an external clock. If an external clock is not required leave this field blank.

add2 =	Description	Notes
EXT	External Clock	

■ Where **add3** is used to select a LCD display. If an LCD display is not required leave this field blank.

add3 =	Description	Notes
LCD	LCD(2 x 16) front panel display	LCD is supported for ANSI unit only

Examples 1:
Main unit: Loop-IP6416-S-1UA-4FE-ETD-ETD-ETD-ETD-SA-SD48-EXT-LCD
Description: An ANSI unit with 4 Fast Ethernet (FE) ports, quad E1/T1 with DB25 connector, quad E1/T1 with DB25 connector, quad E1/T1 with DB25 connector, quad E1/T1 with DB25 connector, 100 to 240 Vac power, -36 to -75 Vdc power, external clock and LCD.

Examples 2:
Main unit: Loop-IP6416-S-1UA-3FE-ETD-ETD-ETD-AD-SFPC-EXT-LCD
Description: An ANSI unit with 3 Fast Ethernet(FE) ports, quad E1/T1 with DB25 connector, quad E1/T1 with DB25 connector, quad E1/T1 with DB25 connector, 100 to 240 Vac and -48 Vdc(-36 to -75 Vdc) coexist fixed power supply, SFP housing daughter card, external clock and LCD.

Examples 3:
Main unit: Loop-IP6416-S-1UA-3FE-ETD-ETD-ETD-AD-CGbEC-EXT-LCD
Description: An ANSI unit with 3 Fast Ethernet(FE) ports, quad E1/T1 with DB25 connector, quad E1/T1 with DB25 connector, quad E1/T1 with DB25 connector, 100 to 240 Vac and -48 Vdc(-36 to -75 Vdc) coexist fixed power supply, Combo GbE daughter card, external clock and LCD.

Examples 4:
Main unit: Loop-IP6416-S-1UE-4FE-EM-EM-SA-EXT-**G**
Description: An ETSI unit with 4 Fast Ethernet(FE) ports, quad E1-75 ohm with 1.0/2.3 RF connector (75 ohm impedance), quad E1-75 ohm with 1.0/2.3 RF connector (75 ohm impedance), 100 to 240 Vac power and external clock.
Conversion cable: Loop-ACC-CAB-BNCM-100-RF75M
Description: BNC Male to 1.0/2.3 RF connector (75 ohm impedance) Male conversion cable (Length: 100 cm)

Examples 5:
Main unit: Loop-IP6416-S-1UE-3FE-ETR-ETR-ETR-ETR-SD48-SD48-SFPC
Description: An ETSI unit with 3 Fast Ethernet(FE) ports, quad E1/T1 with RJ48C connector, quad E1/T1 with RJ48C connector, quad E1/T1 with RJ48C connector, quad E1/T1 with RJ48C connector, dual hot-swappable -48 Vdc power and SFP(mini-GBIC) housing daughter card without SFP optical module.

Loop-IP6416 IP-IMUX Product Specifications

SFP Optical Module Characteristics (Please refer to SFP optical module brochure for detail)

WAN - E1 Interface

Line Rate	2.048M bps ± 50 ppm
Line Code	AMI/ HDB3
Framing	ITU G.704
Output Signal	ITU G.703
Input Signal	ITU G.703
Connector	RJ48C(120 ohm) DB25(120 ohm) with optional conversion cable 1.0/2.3 RF connector(75 ohm impedance) with optional conversion cable
Jitter	ITU G.823

WAN - T1 Interface

Line Rate	1.544M bps ± 32 ppm
Line Code	AMI / B8ZS(selectable)
Framing	ESF
Output Signal	DS1 with 0, -7.5, -15 dB LBO
Input Signal	DS1 with 0 dB to -26 dB ALBO
Connector	RJ48C DB25 with optional conversion cable
Pulse Template	Per AT&T TR 62411
Surge Protection	FCC Part 68 SubPart D

Encapsulation Protocol

Layer 2 protocol: LCAS(G.7042), GFP(G.7041), LAPS and PPP (without LCP)

Tributary-Fast Ethernet(FE)

Ethernet Functions	10/100BaseT, IEEE802.3 Auto-negotiation(10/100M) Auto MDI/MDIX Full or half duplex
Connector	RJ45

Tributary-Optical Fast Ethernet

Speed	100M Base-FX
Connector	FC/SC, LC

Tributary-Combo Gigabit Ethernet(GbE)

Speed	RJ45: 10/100/1000M bps SFP: 1000M bps
Ethernet Functions	802.1q VLAN IEEE 802.1d bridging MAC learning (maximum MAC table 4096 entry)
QoS/CoS Functions	Four priority queue Packet classification based on the 802.1p user priority or DSCP (DiffServ) The scheduling algorithm of the priority queue follows either Strictly Priority or Weighted Round-Robin (WRR). Rate limiting
Connector	RJ45 for twisted pair GbE, LC for optical GbE

Ethernet Bridge Function

VLAN packet transparency(up to 12,000 bytes)
Support IEEE 802.1q VLAN
Support IEEE 802.1ad Q-in-Q

SNMP Ethernet

Ethernet Functions	10/100BaseT, IEEE802.3 Auto-negotiation(10/100M) Auto MDI/MDIX Full or half duplex
Connector	RJ45

Clock Source

Primary Clock	E1/T1, internal, external BNC External BNC is manufacture option. The type can be any one of a) 2.048M bps E1-120, b) 2.048M bps E1-75 and c) 1.544M bps T1, which are software selectable
Secondary Clock	E1/T1, internal, external(manufacture option)

Alarm Relay

Alarm Relay	Fuse alarm and performance alarm

Management

LEDs	Multi-color LEDs
ACO	A button of alarm cut-off
LCD	2 line by 16 character LCD with keypad
Console Port	Electrical: RS232, DCE Protocol: Menu driven VT-100 Connector: DB9S, female
Telnet	Access via SNMP Ethernet port
SNMP	SNMPv1
Inband Management	Inband management in traffic bandwidth

Diagnostics Test

Loopbacks	E1/T1 Line Loopback
Bert	Off/QRSS/PRBS/2^11-1/2^23-1

Performance Monitor: E1/T1 Performance

Performance Store	Last 24 hours performance in 15-minute intervals and last 7 days in 24-hour summary line, user
Performance Reports	Date & Time, Errored Second, Unavailable Second, Bursty Errored Second, Severe Errored Second count.
Monitor Registers	User, Line
Alarm History	Alarm Type(i.e. Master Clock Loss, RAI, AIS, LOS, BPV, ES, UAS)
Alarm Queue	Maximum 100 alarm records which record the latest alarm type, location, and date & time
Alarm Threshold	BPV, ES, UAS

Power

AC Module	100 to 240 Vac
-48 Vdc Module	-36 to -75 Vdc
AC and DC Module	100 to 240 Vac and -48 Vdc(-36 to -75 Vdc) fixed on panel
Power Consumption	< 30 watts

Physical

Dimensions	438 mm x 44 mm x 228 mm(WxHxD)
Temperature	0 - 50°C
Humidity	0 - 95% RH(non condensing)
Mounting	Desk-top stackable, 19"/23" Rack mount

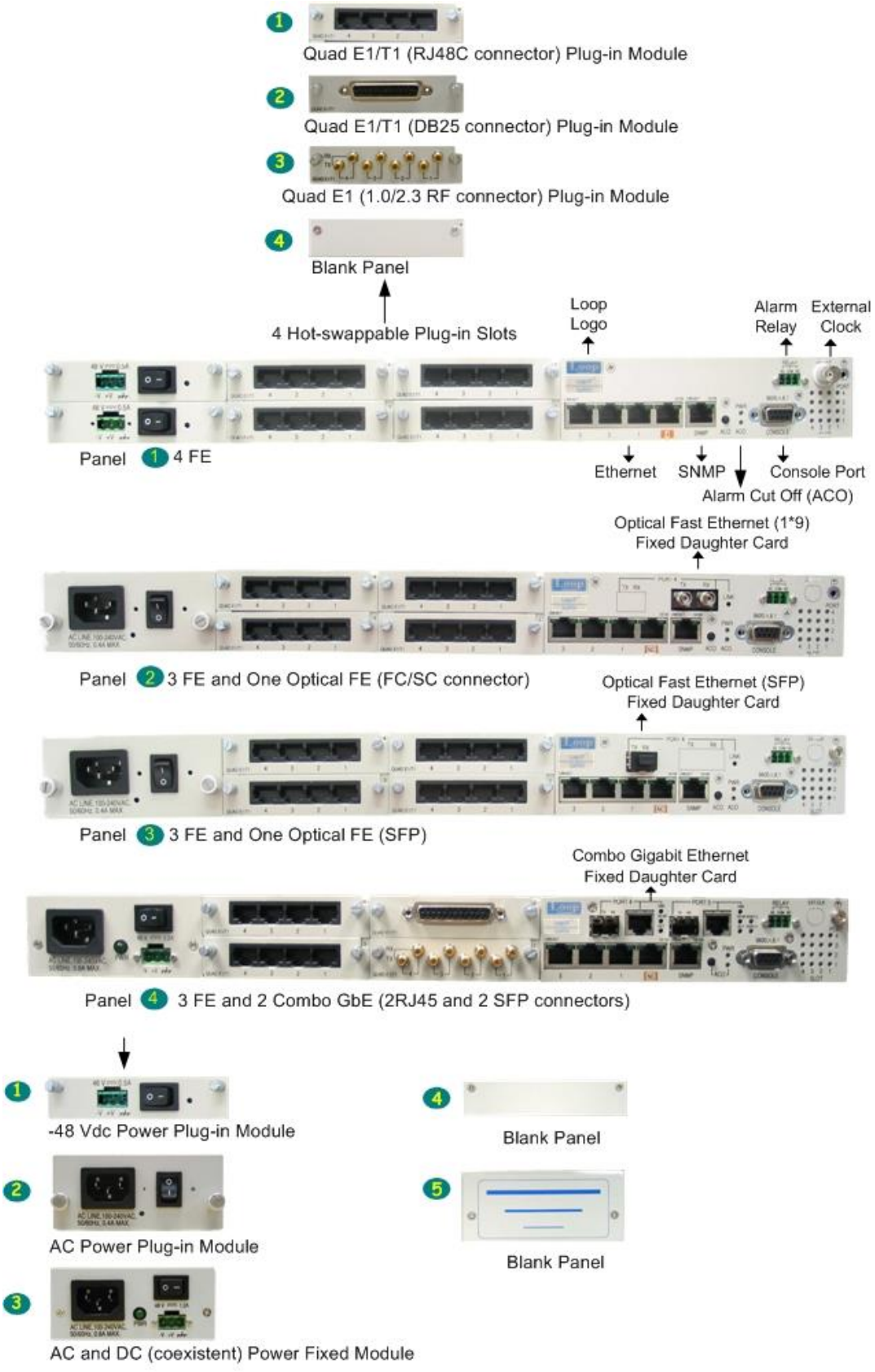
Certification

EMC	EN55022 Class A, EN55024, FCC Part 15 Class A
Safety	EN60950-1, IEC60950-1

Standards Compliance

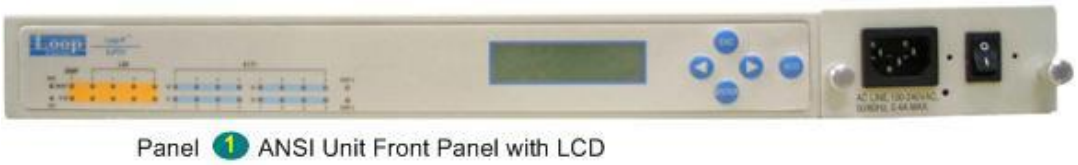
ITU-T	G.703, G.704, G.705, G.775, G.806, G.823, G.7041/Y.1303, G.7042/Y.1305, G.7043/Y.1343, G.8021/Y.1341, G,8040/Y.1340
ATIS/ANSI	T1.107
IEEE	802.3, 802.1q, 802.1d, 802.1p
IETF	RFC1661

ANSI Unit Rear Panel Views and ETSI Unit Front Panel Views



Note: ANSI: no logo, ETSI: with logo

ANSI Unit Front Panel Views



Panel 1 ANSI Unit Front Panel with LCD

Panel 2 ANSI Unit Front Panel without LCD

AC Power Plug-in Module

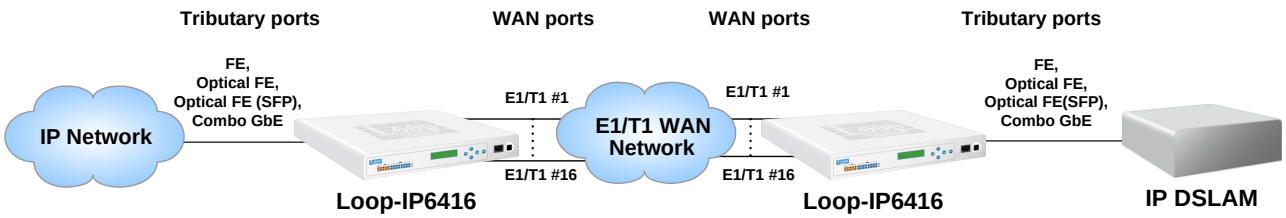
ETSI Rear Panel Views

Loop-IP6416 Maximum Capacity Reference Table

Maximum Capacity of WAN port	Maximum Capacity of Tributary Port on Main Board	Maximum Capacity of Tributary on a Fixed Daughter Card
16 E1/T1	4 FE	No daughter card
16 E1/T1	3 FE	1 optical FE
16 E1/T1	3 FE	1 optical FE(SFP housing)
16 E1/T1	3 FE	2 combo GbE

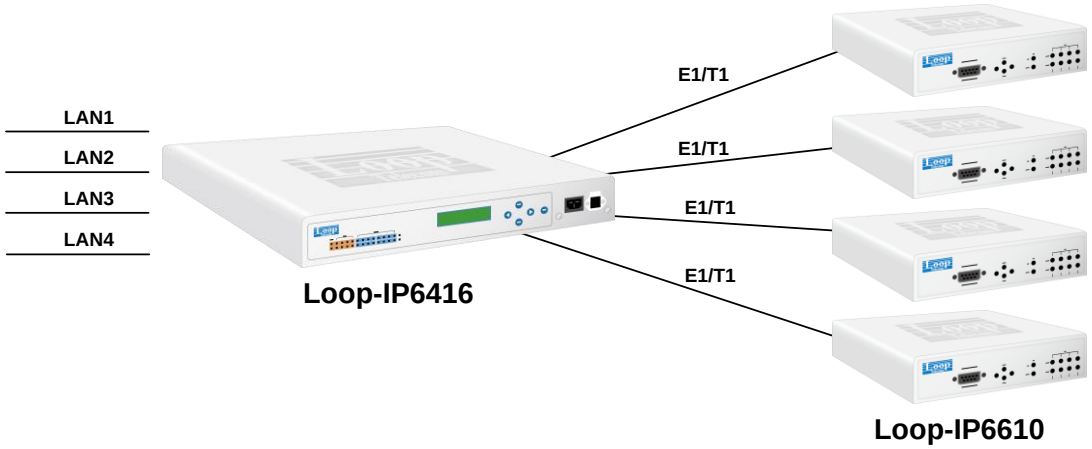
Application Illustration

Point to Point Application



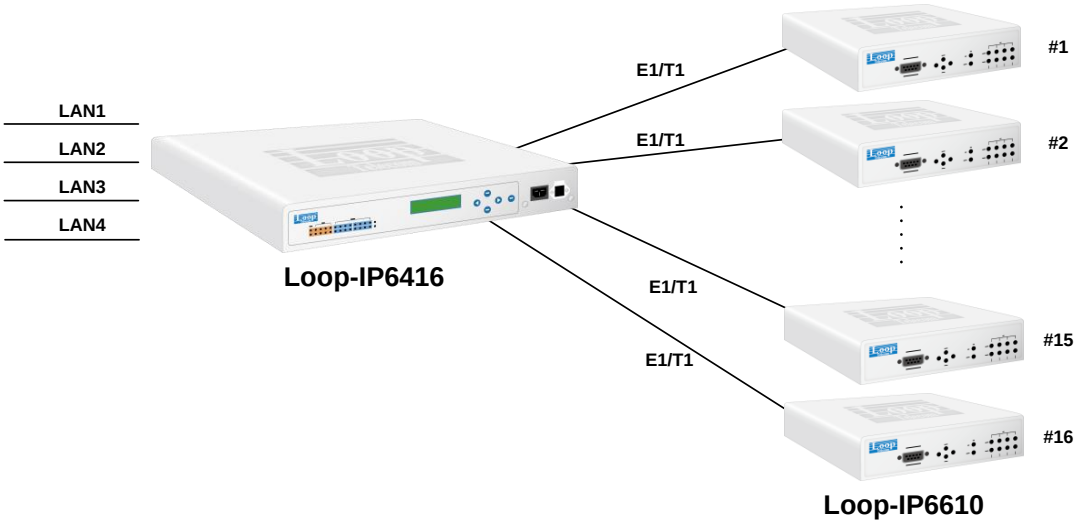
Point to Multipoint Application (VCAT disabled)

If all of the packets from four Loop-IP6416 LANs are untagged, then one Loop-IP6416 can be connected to a maximum of four Loop-IP6610 devices.



Point to Multipoint Application (VCAT disabled)

If all of the packets from four Loop-IP6416 LANs have different VLAN tags, then one Loop-IP6416 can be connected to a maximum of sixteen Loop-IP6610 devices.



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