



# 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 and **Time Slot Cross Connect** 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.

## Product 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
- Temperature range from 0° to 75°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

### Tributary Interface

- Up to four T1/E1 ports per module with a max of 2 modules plus 2 T1/E1 on main board giving a maximum capacity of 10 T1/E1.
- 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

- Support 802.1q Port-Based VLAN on Ethernet/SNMP Port
- 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\*
- 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

### Cross Connect Capability

- Support full non-blocking DS0 cross connect matrix between TDM interfaces and TDMoE Pseudowires
- Suitable for DACS (Digital Access Cross-Connect System) and ADCB (Add/Drop Channel Bank) applications
- Auto A-law/μ-law conversion

\* Future option

| Model                  | IP6704A |
|------------------------|---------|
| # of fixed Mini-slots  | 2       |
| Max. E1 Ports          | 10      |
| Max. T1 Ports          | 10      |
| Max. PWs               | 16      |
| Cross-Connect Capacity | 52 Mbps |

## Ordering Information

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

| Main Unit   |   |  |
|---|---|--|
| Model   | Description   | Note   |
| Loop-IP6704A-S-PPM-aa-bb-c-c-dd-pp1-pp2- <b>opt1-G</b>      | IP6704A with G.823/G.824 traffic interface, Two Gigabit Ethernet (GbE) with SFP housing Two 10/100/1000 BaseT Ethernet, 1 SNMP port   | Where <b>aa</b> , <b>bb</b> , <b>cc</b> , <b>dd</b> , <b>pp1</b> , <b>pp2</b> are manufacture options defined in tables below.   |
| Loop-IP6704A-S-PPM-SyncE-DACS-aa-bb-cc-dd-pp1-pp2- <b>G</b> | Digital Access Cross-Connect System(DACS) IP6704A with G.823/G.824 traffic interface Support Synchronous Ethernet Two Gigabit Ethernet (GbE) with SFP housing Two 10/100/1000 BaseT Ethernet, 1 SNMP port | For E1, the capacity of DS0 cross connect: 10*E1 (32 DS0) + 16*PW =26*32 DS0.<br>For T1, the capacity of DS0 cross connect: 10*T1 (24 DS0) + 16*PW =26*24 DS0.<br><br>Where <b>aa</b> , <b>bb</b> , <b>cc</b> , <b>dd</b> , <b>pp1</b> , <b>pp2</b> are manufacture options defined in tables below. |

■ Where **aa** is used to select **E1/T1 Interface** on main board. If these modules are not required, leave this field blank.

| aa = | Description                     | Notes  |
|------|---------------------------------|--|
| E75  | E1 75 ohm with RJ48C connector  | RJ48 to BNC conversion cable for <b>E75</b> interface is not included. Please order conversion cable separately. Loop-ACC-CAB-RJ48M-28-2BNCF |
| E120 | E1 120 ohm with RJ48C connector |  |
| T1   | T1 with RJ48C connector         |  |

■ Where **bb** is used to select **E1/T1 Interface** on main board . If these modules are not required, leave this field blank.


| bb = | Description                     | Notes   |
|------|---------------------------------|---|
| E75  | E1 75 ohm with RJ48C connector  | RJ48 to BNC conversion cable for <b>E75</b> interface is not included. Please |
| E120 | E1 120 ohm with RJ48C connector |   |

|    |                         |   |
|----|-------------------------|---|
| T1 | T1 with RJ48C connector | order conversion cable separately.<br>Loop-ACC-CAB-RJ48M-28-2BNCF |
|----|-------------------------|---|

■ Where **cc** and **dd** are used to select **DTE, Voice, and E1/T1 Interfaces** on manufacturing option daughter board . If these modules are not required, leave these fields blank.

| cc, dd =       | Description  | Notes   |
|----------------|--|---|
| X21            | X.21 interface module with DB15 female connector                     |   |
| RS232          | RS232/V.24 interface module with DB25 female connector.              |   |
| QEMA-wr-m-Tn-x | Quad E&M voice module, adapter cable included for 4 RJ45 connectors. | <ul style="list-style-type: none"> <li>For <b>wr, m, n</b> and <b>x</b> option, please refer to the table below for detail information</li> </ul> |
| QFXSA-x        | Quad FXSA voice module   | <ul style="list-style-type: none"> <li>For <b>x</b> option, please refer to the table below for detail information</li> </ul>                     |
| QFXSA-M-x      | Quad FXSA with metering pulse 16KHz voice module                     |   |
| QFXSA-M12-x    | Quad FXSA with metering pulse 12KHz voice module                     |   |
| QFXSA-GS-x     | Quad FXSA with ground start voice module                             |   |
| QFXSA-GM-x     | Quad FXSA with ground start and metering pulse 16KHz voice module    |   |
| QFXO-x         | Quad FXO voice module  |   |
| QFXO-M-x       | Quad FXO with metering pulse 16KHz voice module                      |   |
| QFXO-M12-x     | Quad FXO with metering pulse 12KHz voice module                      |   |
| QFXO-GS-x      | Quad FXO with ground start voice module                              | For <b>x</b> option, please refer to the table below for detail information   |
| QFXO-GM-x      | Quad FXO with ground start and metering pulse 16KHz voice module     |   |
| QMAGA-12-x*    | Quad Magneto plug-in module w/ L1, L2                                | For <b>x</b> option, please refer to the table below for detail information   |
| QMAGA-1G2-x*   | Quad Magneto plug-in module w/ L1, L2, and L1. GND                   |   |
| V35            | V.35 interface module with DB25 female connector                     |   |
| E530           | EIA530 interface module with DB25 female connector                   |   |
| T1             | 1 port T1 module   |   |
| E75            | 1 port E1 module (75 ohm with BNC connector)                         |   |
| E120           | 1 port E1 module (120 ohm with RJ48 connector)                       |   |
| M1C37-LSFOM    | 1- channel C37.94 interface module                                   |   |
| TS*            | Terminal Server module   |   |
| ECA *          | Echo cancellation module   |   |
| 1ODP           | 1 OCU-DP interface module  |   |
| M4T1           | Mini Quad T1 Interface   | Includes a three meter conversion cable<br>(Loop-ACC-CAB-DB25M-300-4RJ48M)  |
| M4E75          | Mini Quad E1 Interface with 75 ohm                                   | Includes a three meter conversion cable<br>(Loop-ACC-CAB-DB25M-300-8BNCM)   |
| M4E120         | Mini Quad E1 Interface with 120 ohm                                  | Includes a three meter conversion cable<br>(Loop-ACC-CAB-DB25M-300-4RJ48M)  |
| CD             | 1-channel G.703 Interface at 64 Kbps data rate                       |   |

■ Where **pp1** is used to select **power module**. Must select one power module from the list below.

| pp1=  | Description   | Notes  |
|-------|---|--|
| P9    | Hybrid 100 to 240 Vac and -48 Vdc (-36 to -72 Vdc) coexist fixed power supply<br>If customer wishes to use 125Vdc power supply, wire to included IEC socket which plugs into AC connector | <ul style="list-style-type: none"> <li>Order two DC power modules for redundancy.</li> <li>For AC, choose an appropriate power cord.</li> </ul>  |
| ISD48 | Single -48Vdc power plug-in module (-42 to -56 Vdc)   | <ul style="list-style-type: none"> <li><b>pp2</b> option is not available if <b>P9</b> power module is selected in <b>pp1</b> option.</li> <li>For 125 Vdc, wires are included with IEC socket.</li> </ul>  |

■ Where **pp2** is used to select **redundant DC power module**. Leave the field blank if redundant DC power module is not required, or fixed **SA** power module is selected in **pp1** option.

| pp2=  | Description   | Notes   |
|-------|---|---|
| ISD48 | Single -48Vdc power plug-in module (-42 to -56 Vdc) | <ul style="list-style-type: none"> <li>Order two DC power modules for redundancy.</li> <li><b>pp2</b> option is not available if <b>P9</b> power module is selected in <b>pp1</b> option</li> </ul> |

■ Where **opt1** is used to select **SyncE**. Leave the field blank if it is not required

| opt1= | Description                  | Notes |
|-------|------------------------------|-------|
| SyncE | Support Synchronous Ethernet |       |

■ Special order information for distributors. Where daughter card is used to select **DTE, Voice, and E1/T1 Interfaces**. Distributors can open the case and change the daughter card by themselves.

|                          | Description   | Notes   |
|--------------------------|---|---|
| IP6704A-X21-G            | X.21 interface module with DB15 female connector with 4 screws and panel.                     |   |
| IP6704A-RS232-G          | RS232/V.24 interface module with DB25 female connector. with 4 screws and panel.              |   |
| IP6704A-QEMA-wr-m-Tn-x-G | Quad E&M voice module, adapter cable included for 4 RJ45 connectors. with 4 screws and panel. | • For <b>wr, m, n</b> and <b>x</b> option, please refer to the table below for detail information     |
| IP6704A-QFXSA-x-G        | Quad FXSA voice module. with 4 screws and panel.  | • For <b>x</b> option, please refer to the table below for detail information                         |
| IP6704A-QFXSA-M-x-G      | Quad FXSA with metering pulse 16KHz voice module with 4 screws and panel.                     |   |
| IP6704A-QFXSA-M12-x-G    | Quad FXSA with metering pulse 12KHz voice module with 4 screws and panel.                     |   |
| IP6704A-QFXSA-GS-x-G     | Quad FXSA with ground start voice module with 4 screws and panel.                             |   |
| IP6704A-QFXSA-GM-x-G     | Quad FXSA with ground start and metering pulse 16KHz voice module with 4 screws and panel.    |   |
| IP6704A-QFXO-x-G         | Quad FXO voice module with 4 screws and panel.  |   |
| IP6704A-QFXO-M-x-G       | Quad FXO with metering pulse 16KHz voice module with 4 screws and panel.                      |   |
| IP6704A-QFXO-M12-x-G     | Quad FXO with metering pulse 12KHz voice module with 4 screws and panel.                      |   |
| IP6704A-QFXO-GS-x-G      | Quad FXO with ground start voice module with 4 screws and panel.                              |   |
| IP6704A-QFXO-GM-x-G      | Quad FXO with ground start and metering pulse 16KHz voice module with 4 screws and panel.     |   |
| IP6704A-QMAGA-12-x-G*    | Quad Magneto plug-in module w/ L1, L2 with 4 screws and panel.                                | For <b>x</b> option, please refer to the table below for detail information                           |
| IP6704A-QMAGA-1G2-x-G*   | Quad Magneto plug-in module w/ L1, L2, and L1. GND with 4 screws and panel.                   |   |
| IP6704A-V35-G            | V.35 interface module with DB25 female connector with 4 screws and panel.                     |   |
| IP6704A-E530-G           | EIA530 interface module with DB25 female connector with 4 screws and panel.                   |   |
| IP6704A-T1-G             | 1 port T1 module with 4 screws and panel.   |   |
| IP6704A-E75-G            | 1 port E1 module (75 ohm with BNC connector) with 4 screws and panel.                         |   |
| IP6704A-E120-G           | 1 port E1 module (120 ohm with RJ48 connector) with 4 screws and panel.                       |   |
| IP6704A-M1C37-LSFOM-G    | 1- channel C37.94 interface module with 4 screws and panel.                                   | For LSFOM option, please refer to the table below for detail information                              |
| IP6704A-TS-G*            | Terminal Server module with 4 screws and panel.   |   |
| IP6704A-ECA-G*           | Echo cancellation module with 4 screws and panel.   |   |
| IP6704A-1ODP             | 1 OCU-DP interface module with 4 screws and panel.  | Only non-RoHS compliant model available   |
| IP6704A-M4T1-G           | Mini Quad E1 Interface with 4 screws and panel.   | <b>Limited Quantity</b><br>Includes a three meter conversion cable<br>(Loop-ACC-CAB-DB25M-300-4RJ48M) |

|                          | Description   | Notes  |
|--------------------------|---|--|
| IP6704A-M4E75- <b>G</b>  | Mini Quad E1 Interface with 75 ohm with 4 screws and panel.             | Includes a three meter conversion cable<br>(Loop-ACC-CAB-DB25M-300-8BNCM)  |
| IP6704A-M4E120- <b>G</b> | Mini Quad E1 Interface with 120 ohm with 4 screws and panel.            | Includes a three meter conversion cable<br>(Loop-ACC-CAB-DB25M-300-4RJ48M) |
| IP6704A-CD- <b>G</b>     | 1-channel G.703 Interface at 64 Kbps data rate with 4 screws and panel. |  |

**For QEMA module:**

■ where **wr** is used to select E&M wire type (manufacture option):

| wr | Description | Notes |
|----|-------------|-------|
| 2w | 2 wire      |       |
| 4w | 4 wire      |       |

■ where **m** is used to select E&M signaling side (manufacture option):

| m | Description   | Notes |
|---|---|-------|
| B | B (carrier side) connects to A side.  |       |
| A | A (exchange side) connects to B side. A side M lead to B side M lead, A side E lead to B side E lead. |       |

■ where **n** is used to select E&M signaling type (manufacture option):

| n | Description  | Notes   |
|---|--|---|
| O | For voice transmission only.   | • Circuit type does not matter.   |
| 1 | Type I (original) E&M signaling circuit  | • M lead provides discharge for the A side.   |
| 2 | Type II circuit. This design attempts to reduce ground noise by adding two leads: SB (signal to battery) and SG (signal to ground).  | • Reduced ground noise. Ground current is eliminated at the cost of two more wires per circuit. |
| 3 | Type III circuit. The SG lead serves as a discharge for the M lead. Reduces delay caused by combination of (a) low current electronic detectors, and (b) long runs of the E and M leads. | • Type III is area because ground currents on the E return would cause noise.                   |
| 4 | Type IV circuit. Based on the type II circuit. This E&M circuit provides symmetry.   |   |
| 5 | Type V circuit. For applications where ground noise is not an issue. Based on the type II circuit.   |   |

**For Voice modules (QEMA, QFXSA, QFXO):**

■ where **x** is used to select Voice module signaling bits (manufacture option). If this option is not required, omit the **x** field in the ordering code.

| Module Type | x = | Description  | Notes  |
|-------------|-----|--|--|
| QEMA        | E   | Follows ETSI signaling bits  | • For <b>S</b> (customer's special bit assignment), please contact your nearest Loop sales representative. |
|             | A   | Follows ANSI signaling bits  |  |
|             | S   | Follows customer's special bits assignment                             |  |
| QFXSA       | E   | Follows ETSI signaling bits  |  |
|             | A   | Follows ANSI signaling bits  |  |
| QFXO        | S   | Follows customer's special bits assignment                             |  |
|             | E   | Follows ETSI signaling bits  |  |
|             | A   | Follows ANSI signaling bits  |  |
|             | S   | Follows customer's special bits assignment                             |  |
|             | T   | Trunk condition OFF-HOOK   |  |
|             | AT  | Follows ANSI signaling bits w/ trunk condition OFF-HOOK                |  |
|             | ST  | Follows customer's special bits assignment w/ trunk condition OFF-HOOK |  |

**For Magneto Card:**

■ Where **x** is used to select ring generator type:

| x= | Description          | Note   |
|----|----------------------|--|
| 16 | 16 Hz ring generator | 20 Hz is the general setting for all MAG cards. For special settings (16, 25, 50), please specify your need by filling in the <b>x</b> option. |
| 20 | 20 Hz ring generator |  |
| 25 | 25 Hz ring generator |  |
| 50 | 50 Hz ring generator |  |

For mini LS Optical module (mini C37.94):

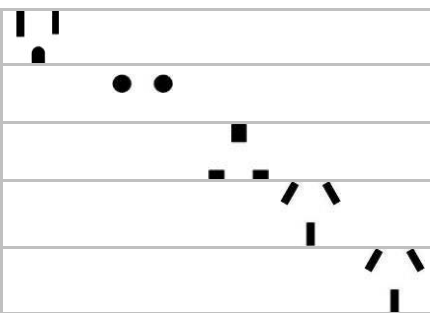
■ Where LSFOM is to select LS-Fiber Optical Module option, each module has 5 letters.

| LSFOM  | Description |                         |           |             |             |             |          |             |           |                 | Notes  |
|--------|-------------|-------------------------|-----------|-------------|-------------|-------------|----------|-------------|-----------|-----------------|--|
|        | Mode        |                         | Data Rate |             | Wave Length |             | Distance |             | Connector |                 |  |
|        | Code        | Description             | Code      | Description | Code        | Description | Code     | Description | Code      | Description     |  |
| ZRATT  | Z           | 1 * 8<br>Multi-mode     | R         | 2 M         | A           | 820nm       | T        | 2km         | T         | ST<br>connector | 1 * 8<br><br>Separate<br>transceiver<br>& receiver |
| QRATT  | Q           | 1 * 9<br>Multi-mode     | R         | 2 M         | A           | 850nm       | T        | 2km         | T         | ST<br>connector | 1 * 9  |
| *NFB3T | N           | 1 x 9<br>Single<br>mode | F         | 125 M       | B           | 1310nm      | 3        | 30km        | T         | ST<br>connector |  |
| *QFBTT | Q           | 1 x 9<br>Multi-mode     | F         | 125 M       | B           | 1310nm      | T        | 2km         | T         | ST<br>connector |  |
| *NHC2S | N           | 1 x 9<br>Single<br>mode | H         | 155 M       | C           | 1550nm      | 2        | 20km        | S         | SC<br>connector |  |

\* For the orders of the listed optical modules, please contact your Loop sales representative.

Accessories

Power Cord (All power cords are RoHS compliant)

|                 |                                  |   |
|-----------------|----------------------------------|---|
| 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          |   |

Tray

|                 |   |
|-----------------|---|
| 81.TRAY19.0000G | 1U 19" Tray for rack mount (One tray for two base units; Tray depth:17cm)<br>23" Extension kit for 23" rack mount |
| 81.TRAY19.3000G | 1U 19" Tray for rack mount (One tray for two base units; Tray depth:40cm)<br>23" Extension kit for 23" rack mount |

Blank Panels

|                 |                                     |
|-----------------|-------------------------------------|
| 30.002378.A00LF | Blank panel for empty DC power slot |
|-----------------|-------------------------------------|

Conversion Panels

|                         |   |
|-------------------------|---|
| Loop-ACC-P-4RJ45F-4WW-G | 4 ports RJ45 Females to 4 ports wire-wraps for QEMA module. |
|-------------------------|---|

Cable (All Cables are RoHS compliant.)

|  |   |
|--|---|
| Loop-ACC-CAB-DB25M-30-1M34F*             | DB25 Male to M34 Female Conversion cable for V.35 module. Length: 30 cm                                     |
| Loop-ACC-CAB-RJ48M-28-2BNCF              | RJ48C Male to two BNC Female Conversion cable for E1 75ohm module. Length: 28 cm                            |
| Loop-ACC-CAB-DB44M-100-2DB25F-1DB09F-TS* | DB44 Male to two DB25 Female and one DB9 Female conversion cable for Terminal server module. Length: 100 cm |
| Loop-ACC-CAB-DB44M-60-4RJ45M             | DSUB-44pin/Male to RJ45 Male (8P8C) Plug * 4 extension cable for QEMA module. Length: 60 cm                 |
| Loop-ACC-CAB-DB25M-100-8BNCF             | DB25/Male to eight BNC/Male cable; Length: 100 cm<br>For Mini Quad E1 Interface with 75 ohm                 |
| Loop-ACC-CAB-DB25M-100-8BNCF             | DB25/Male to eight BNC/Female cable; Length: 100 cm<br>For Mini Quad E1 Interface with 75 ohm               |
| Loop-ACC-CAB-DB25M-100-4RJ48M            | DB25/Male to four RJ48C/Male (8P8C Plug) cable; Length: 100 cm<br>Mini Quad E1 Interface with 120 ohm       |



|                               |  |
|-------------------------------|--|
| Loop-ACC-CAB-DB25M-300-8BNCM  | DB25/Male to eight BNC/Male cable; Length: 300 cm<br>For Mini Quad E1 Interface with 75 ohm                                      |
| Loop-ACC-CAB-DB25M-300-8BNCF  | DB25/Male to eight BNC/Female cable; Length: 300 cm<br>For Mini Quad E1 Interface with 75 ohm                                    |
| Loop-ACC-CAB-DB25M-300-4RJ48M | DB25/Male to four RJ48C/Male (8P8C Plug) cable; Length: 300 cm<br>Mini Quad E1 Interface with 120 ohm and Mini Quad T1 Interface |

#### User's Manual

|                      |  |
|----------------------|--|
| Loop-IP6704A-UM      | User's Manual (optional, paper printed copy). An electronic version of the manual on a CD is included with every order.  |
| Loop-IP6704A-DACS-UM | User's Manual (optional, paper printed copy). An electronic version of the manual on a CD is included with every order.<br>For Loop-IP6704A-S-PPM-SyncE-DACS-aa-bb-cc-dd-pp1-pp2- <b>G</b> use only. |

#### 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.

#### Separate Power Module

|                              |   |   |
|------------------------------|---|---|
| Loop-IP6704A-ISD48- <b>G</b> | Single -48Vdc power plug-in module (-42 to -56 Vdc) | <ul style="list-style-type: none"><li>• Power modules are the same as shown in the Main Unit section above. Use this ordering code if you are ordering backup or additional power modules.</li><li>• ISD48 power module can't work on IP6704A with fixed P9 power module.</li></ul> |
|------------------------------|---|---|

## Ordering Examples

#### Example 1:

Loop-IP6704A-S-PPM-X21-P9-**G**

IP6704A with G.823/G.824 traffic interface, Two Gigabit Ethernet (GbE) with SFP housing, Two 10/100/1000 BaseT Ethernet, one SNMP port, 1 x X.21 interface with DB15 female connector, Hybrid 100 to 240 Vac and -48 Vdc (-36 to -72 Vdc) coexist fixed power supply

#### Example 2:

Loop-IP6704A-S-PPM-E75-RS232-ISD48-ISD48-**G**

IP6704A with G.823/G.824 traffic interface, Two Gigabit Ethernet (GbE) with SFP housing, Two 10/100/1000 BaseT Ethernet, one SNMP port, 1 x E1 75 ohm with RJ48C connector, 1 x RS232/V.24 with DB25 female connector, two -48Vdc power plug-in module (-42 to -56 Vdc).

## Loop-IP6704A Product Specification

#### E1 Tributary Interface Module

|               |  |
|---------------|--|
| Line Rate     | 2.048 Mbps $\pm$ 50 ppm                        |
| Line Code     | HDB3 / AMI                                     |
| Framing       | ITU G.704 (CRC: on/off, CAS: on/off, unframed) |
| Output Signal | ITU G.703                                      |
| Input Signal  | ITU G.703                                      |
| Jitter        | ITU G.823                                      |
| Connector     | RJ48C  |

#### T1 Tributary Interface Module

|                |   |
|----------------|---|
| Line Rate      | 1.544 Mbps $\pm$ 32 ppm                   |
| Line Code      | AMI / B8ZS                                |
| Framing        | D4 / ESF/ ESF&T1.403/ OFF (clear channel) |
| Output Signal  | DS1                                       |
| Input Signal   | DS1                                       |
| Pulse Template | Per AT&T TR 62411                         |
| Connector      | RJ48C                                     |

#### Ethernet Interface (on board)

|                            |                   |
|----------------------------|-------------------|
| Number of Electrical Ports | 2 ports with RJ45 |
| Speed                      | 10/100/1000 BaseT |
| Number of Optical Ports    | 2                 |
| Connector                  | SFP               |

Speed 100/1000-LX

*Serial Tributary Interface*

Type1 DCE, V.35 or EIA530 or X.21  
Line Rate: Sync mode: V.35, EIA530 and X.21 N x 56 or 64 kbps, N = 1 to 32  
Interface/ Connector: V.35 DB25S  
EIA530 DB25S  
X.21 DB15S  
Type2 DCE, RS232/V.24  
Line Rate: Sync mode: RS232: N x 56 or 64 kbps, N = 1 to 2

Interface/ Connector: RS232/V.24 DB25S



### Voice Card (QEMA)

|                                       |   |
|---------------------------------------|---|
| Connector                             | One 44-pin connector, adaptor cable included for 4 RJ45 connectors.   |
| Alarm Conditioning                    | CGA busy after 2.5 seconds of LOS, LOF  |
| Encoding                              | A-law or $\mu$ -law, user selectable as a group   |
| Impedance                             | Balanced 600 or 900ohms   |
| Gain Adjustment<br>(Per-port setting) | -10 to +7 dB / 0.1dB step for transmit (D/A) gain   |
| Gain Variation                        | $\pm 0.5$ dB at 0 dBm0 input  |
| Frequency Response                    | $\pm 0.5$ dB from 300 to 3400 Hz, coincide with ITU-T G.712   |
| I/O Power Range                       | A/D Analog input level: -66 dBm (0.00039 Vrms) ~ + 3 dBm (1.09 Vrms)<br>D/A Analog output level: -66 dBm (0.00039 Vrms) ~ + 4 dBm (1.22 Vrms) |
| Longitudinal Balance                  | > 63dB  |
| Longitudinal Conversion Loss          | > 46dB  |
| Total Distortion                      | > 35 dB at 0 dBm0 input   |
| Idle Channel Noise                    | < -65 dBm0p   |
| Wire Mode                             | 2 wire and 4 wire   |
| Signaling                             | Type I, Type II, Type III, Type IV, Type V, and TO (Transmission Only)  |
| M Lead Output Current                 | 18 mA (maximum)   |
| E Lead Sensor Current                 | 0.3 mA (minimum)  |
| EM Type Setting                       | Jump Selectable   |
| Relative Humidity                     | 0% to 95%   |
| Carrier Connection                    | Side A and side B setup by Jump   |

All in-band signaling tones are carried transparently by the digitizing process.

Customer is responsible for in-band signaling compatibility between a telephone and a switch, or between a PBX and a switch.

### Voice Card (QFXO)

Quad FXO voice card (4 FXO per plug-in)

|                        |  |
|------------------------|--|
| Connector              | 1, 2, 3, or 4 FXO per RJ11 connector   |
| Alarm Conditioning     | CGA busy after 2.5 seconds of LOS, LOF   |
| Encoding               | A-law or $\mu$ -law, user selectable together for all  |
| AC impedance           | Balanced 600 or 900 ohms (selectable together for all)   |
| Longitudinal Rejection | 55 dB  |
| Loss Adjustment        | 0, 3, 6, or 9 dB transmit & receive  |
| Signal/ Distortion     | 1. > 46dB with 1004 Hz, 0dBm input   |
| Frequency Response     | 2. $\pm 0.5$ dB from 300 to 3400 Hz, coincide with ITU-T G.712   |
| FXS Loop Feed          | -48Vdc with 25mA current limit per port<br>Jumper Selectable: 25mA, 30mA, 35mA   |
| FXO                    | Ringing REN 0.5B (AC)  |
|                        | Detectable Ringing 25 Vrms   |
|                        | Loop Resistance $\leq 1800 \Omega$   |
|                        | DC impedance > 1M $\Omega$   |
|                        | (ON-HOOK)  |
| FXS Ringing            | DC 235 $\Omega$ @ 25mA feed  |
|                        | impedance(OFF-HOOK) 90 $\Omega$ @ 100mA feed   |
|                        | Support 2 REN per port (1 REN = 6930 $\Omega$ + 8 $\mu$ F)<br>20 Hz, other frequencies: 16.7Hz, 25 Hz, 50Hz (Jump selectable)<br>78 Vrms (sine wave) (45 Vrms to 86 Vrms wide range by Resistor selectable)<br>2 sec on 4 sec off, or 1 sec on 2 sec off optional for PLAR |
| Metering Pulse         | 12KHz/ 16KHz<br>• Power: 10dBm<br>• Sensitivity: -27dBm (-21dBm to -45dBm by Resistor selectable)  |
| Signaling              | Loop Start, GND-Start, Metering Pulse (12KHz, 16KHz), DTMF, Dialing Pulse, PLAR, Battery Reverse (supports Line Reverse Signaling for Billing)   |

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

**Voice Card (QFXSA)**

Quad FXSA voice card (4 FXS per plug-in)

Connector 1, 2, 3, or 4 FXS per RJ11 connector

Alarm Conditioning CGA busy after 2.5 seconds of LOS, LOF

Encoding A-law or  $\mu$ -law, user selectable

AC impedance Balanced 600 or 900 ohms (user selectable)

Longitudinal Rejection 55 dB

Gain Adjustment -21 to +3 dB / 0.1 dB step for transmit (D/A) &amp; receive (A/D) gain

Signal/ Distortion &gt; 46dB with 1004 Hz, 0dBm input

Frequency Response  $\pm 0.5$  dB from 300 to 3400 Hz, coincide with ITU-T G.712Loop Feed  $\pm 48$ Vdc with 25mA current limit per port

Jumper Selectable: 25mA, 30mA, 35mA

Ringing Support 2 REN per port (1 REN =  $6930\Omega + 8\mu\text{F}$ )

16.7Hz, 20Hz, 25 Hz, 50Hz (user programmable)

Default 78 Vrms (sine wave) (64 Vrms by Jumper setting)

2 sec on 4 sec off, or 1 sec on 2 sec off optional for PLAR (user programmable)

Metering Pulse 12KHz/ 16KHz (2.4Vrm/1Vrm user programmable)

Signaling Loop Start (Metering Pulse, DTMF, Dialing Pulse, PLAR), GND-Start (Tip Open, Ring GND), OOS Alarm, Battery Reverse

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

**C37.94 Interface****820nm****Ordering Code**

ZRATT

**Wavelength (nm)**

820

**Mode**

1\*8 Multi-Mode

**Distance (km)**

2

**Data Rate (Mb/s)**

2.048Mbps

**Connector**

ST

| TX Power (dBm Peak) |      |       |             | RX Power (dBm Peak) |      |      |             | Note  |
|---------------------|------|-------|-------------|---------------------|------|------|-------------|---|
| MIN.                | TYP. | MAX.  | Wavelength  | MIN.                | TYP. | MAX. | Wavelength  |   |
| -19.8               | ---  | -12.8 | 792/820/865 | ---                 | ---  | ---  | ---         | 50/125 $\mu\text{m}$ Fiber Cable            |
| -16                 | ---  | -9    |             | ---                 | ---  | ---  | ---         | 62.5/125 $\mu\text{m}$ Fiber Cable          |
| ---                 | ---  | ---   | ---         | -25.4               | ---  | -9.2 | 792/820/865 | Peak Optical Input Power<br>Logic Level LOW |

**850nm****Ordering Code**

QRATT

**Wavelength (nm)**

850

**Mode**

1\*9 Multi-Mode

**Distance (km)**

2

**Data Rate (Mb/s)**

2.048Mbps

**Connector**

ST

| TX Power (dBm Peak) |      |      |             | RX Power (dBm Peak) |      |      |             | Note                               |
|---------------------|------|------|-------------|---------------------|------|------|-------------|------------------------------------|
| MIN.                | TYP. | MAX. | Wavelength  | MIN.                | TYP. | MAX. | Wavelength  |                                    |
| -23                 | ---  | -11  | 790/---/870 | -32                 | ---  | -11  | 790/---/870 | 50/125 $\mu\text{m}$ Fiber Cable   |
| -19                 | ---  | -11  |             | -32                 | ---  | -11  |             | 62.5/125 $\mu\text{m}$ Fiber Cable |

**1310nm****Ordering Code**

NFB3T

**Wavelength (nm)**

1310

**Mode**

1\*9 Single-Mode

**Distance (km)**

30

**Data Rate (Mb/s)**

125Mbps

**Connector**

ST

| TX Power (dBm) |      |      |                | RX Power (dBm) |      |      |               |
|----------------|------|------|----------------|----------------|------|------|---------------|
| MIN.           | TYP. | MAX. | Wavelength     | MIN.           | TYP. | MAX. | Wavelength    |
| -15            | ---  | -8   | 1261/1310/1360 | -34            | ---  | 0    | 1260/---/1610 |

**1310nm****Ordering Code**

QFBTT

**Wavelength (nm)**

1310

**Mode**

1\*9 Multi-Mode

**Distance (km)**

2

**Data Rate (Mb/s)**

125M

**Connector**

ST

| TX Power (dBm) |      |      |                | RX Power (dBm) |      |      |               | Note   |
|----------------|------|------|----------------|----------------|------|------|---------------|--|
| MIN.           | TYP. | MAX. | Wavelength     | MIN.           | TYP. | MAX. | Wavelength    |  |
| -20            | ---  | -14  | 1270/1310/1380 | -32            | ---  | 8    | 1260/---/1610 | Output Optical Power<br>62.5/125 $\mu$ m fiber |
| -23.5          |      |      |                |                |      |      |               | Output Optical Power<br>50/125 $\mu$ m fiber   |

**1550nm****Ordering Code**

NHC2S

**Wavelength (nm)**

1550

**Mode**

1\*9 Single-Mode

**Distance (km)**

20

**Data Rate (Mb/s)**

155Mbps

**Connector**

SC

| TX Power (dBm) |      |      |                | RX Power (dBm) |      |      |               |
|----------------|------|------|----------------|----------------|------|------|---------------|
| MIN.           | TYP. | MAX. | Wavelength     | MIN.           | TYP. | MAX. | Wavelength    |
| -15            | ---  | -18  | 1480/1530/1576 | -34            | ---  | 0    | 1260/---/1610 |

**Network Line Interface Mini Quad E1**

|                     |  |            |                                  |
|---------------------|--|------------|----------------------------------|
| Line Rate           | 2.048 Mbps $\pm$ 50 ppm  | Framing    | ITU G.704                        |
| Line Code           | AMI or HDB3  | Connector  | DB25S                            |
| Input Signal        | ITU G.703 to -10dB   | Electrical | 75 ohm Coax/120 ohm twisted pair |
| Output Signal       | ITU G.703  | Jitter     | ITU G.823                        |
| Performance Store   | Last 24 hours performance in 15-minute intervals and last 7 days in 24-hour summary line, user, and remote site  |            |                                  |
| Performance Reports | Date & Time, Errored Second, Degraded Minutes, Unavailable Second, Bursty Errored Second, Severe Errored Second, Controlled Slip Second, and Loss of Frame Count |            |                                  |
| Alarm History       | Date & Time, Alarm Type (i.e. Master Clock Loss, RAI, AIS, LOS, BPV, ES, CS), and Location (i.e. line, DTE)  |            |                                  |
| Alarm Queue         | Alarm records which record the latest alarm type, location, and date & time  |            |                                  |
| Threshold           | Bursty Seconds, Severely Errored Second, Degraded Minutes  |            |                                  |

**Network Line Interface Mini Quad T1**

|                     |   |                |   |
|---------------------|---|----------------|---|
| Line Rate           | 1.544 Mbps $\pm$ 32 ppm   | Framing        | D4/ESF  |
| Line Code           | AMI/B8ZS  | Connector      | DB25S   |
| Input Signal        | ITU G.703 DSX-1 0dB to -30dB w/ALBO   | Output Signal  | ITU G.703 DSX-1 w/0, -7.5, -15dB LBO<br>ITU G.703 DSX-1 w/short (0-110, 110-220, 220-330, 330-440, 440-550, 550-660 feet) |
| Jitter              | AT&T TR 62411   | Pulse Template | AT&T TR 62411   |
| Data Rate           | n * (64) Kbps (n=1-24)  |                |   |
| Performance Store   | Last 24 hours performance in 15-minute intervals and last 7 days in 24-hour summary line, user, and remote site                   |                |   |
| Performance Reports | Errored Second, Unavailable Second, Bursty Errored Second, Severe Errored Second, Controlled Slip Second, and Loss of Frame Count |                |   |
| Alarm History       | Date & Time, Alarm Type (i.e. RAI, AIS, LOS, BPV, ES, CS), and Location (i.e. line, DTE)  |                |   |
| Alarm Queue         | Alarm records which record the latest alarm type, date and time   |                |   |
| Threshold           | Error Second, Severe Errored Second, Unavailable Seconds, and Control Slip Seconds  |                |   |

**OCU/DP Interface**

|                       |  |
|-----------------------|--|
| Ports                 | 1 Port for each card                                   |
| Line Status Indicator | Per Port 1 dual color LED; Red for LOS, Green for SYNC |

|                                     |  |
|-------------------------------------|--|
| Network Connector                   | RJ48S or Telco64   |
| Electrical network connection       | Tip/Ring and Tip1/Ring1  |
| Transmit Source Impedance           | 135 Ohms +/- 20%   |
| Receive Input Impedance             | 135 Ohms +/- 20%   |
| Receiver Sensitivity/ Dynamic Range | 0 to 43 dB loop loss at 72K & 56K<br>0 to 34 all other rates Automatic line equalization   |
| Pulse Amplitude                     | +/- 1.5 V (+/- 10%) peak, all rates except 9.6k<br>+/- 0.75 V (+/- 10%) peak at 9.6k<br>Bipolar Return to zero, 50% duty cycle   |
| Sealing Current                     | Typically 16 mA DC   |
| Operating Modes                     | 4-wire DDS<br>Switched 56 support is optional.   |
| Circuit Rates                       | SYNC: 2.4, 4.8, 9.6, 19.2, 56, 72kbps (64k) clear channel<br>Conforms with AT&T Pub 41458  |
| Encoding and decoding rules         | Use bipolar violation to indicate control information: Idle, out of service, Zero substitution using unframed loops  |
| Maintenance control                 | DSU Non-latching loop-back code (for 2.4, 4.8, 9.6, 19.2, 56k circuit rate)<br>DSU Latching loop-back (TIP, LSC, LBE, FEV) code (for 72k circuit rate)<br><br>Machine maintenance OCU/DP card operation:<br>Payload loopback<br>OCU loopback<br>Local loopback<br>Bi-directional loopback<br>V.54 remote loopback code |
| Fault and Performance               | Custom defined remote loopback code<br>BERT test supports all ones, all zeros, 2047,511,63 pattern.<br>LOS, OOS, ES, SES and UAS alarm.<br>Current, last 96 registry and 7 days performance storage.   |
| Environment                         | Operating Temperature: -20 - 65°C<br>Storage Temperature: -30 - 70°C<br>Humidity: Up to 90% RH non-condensing  |
| Specification Standard              | ANSI T1.410; AT&T Pub 62319, AT&T Pub 62310, ITU-T V.54  |

### Management and Administration

|                                |  |
|--------------------------------|--|
| Management ports               | Console RS232 port and and NMS RJ45 port |
| Remote login                   | SSH v2, Telnet                           |
| SNMP                           | SNMP v1, v3                              |
| Support RADIUS checking login. |  |

### Electrical

|                     |   |
|---------------------|---|
| ISD48 Power Module  | 48 V (-42 to -56 Vdc)   |
| P9 Power Module     | Hybrid 100 to 240 Vac and -48 Vdc (-36 to -72 Vdc) coexist fixed power supply |
| SD125 Power Module* | Single 125Vdc power plug-in module  |
| Power Consumption   | < 15 W for 1U height  |

### Physical and Environmental

|                       |  |
|-----------------------|--|
| Dimensions(W x H x D) | 213 mm x 41 mm x 290 mm (8.39" x 1.61" x 11.42") |
| Temperature           | 0°C to +75°C                                     |
| Humidity              | 0% to 95% RH (non-condensing)                    |
| Mounting              | Desktop stackable, rack mount, wall mount        |
| Cooling               | It is fanless unit                               |

### Standards Compliance

| IEEE   |                            | IETF    |                   |
|--------|----------------------------|---------|-------------------|
| 802.1d | MAC Table Learning and STP | RFC2236 | IGMP Snooping v2* |
| 802.1p | Priority Code Point        |         |                   |
| 802.1q | VLAN                       | RFC2495 | E1/T1 OAM*        |

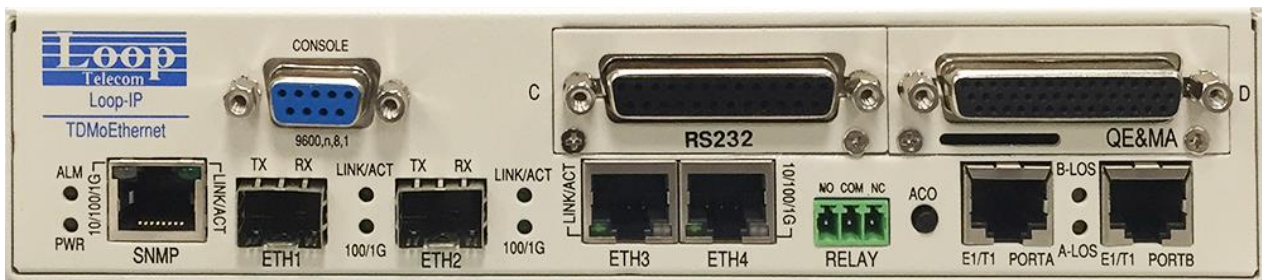
|         |                       |             |                   |
|---------|-----------------------|-------------|-------------------|
| 802.1s  | MSTP*                 |             |                   |
| 802.1w  | RSTP                  |             |                   |
| 802.1ad | Tag Stacking (Q-in-Q) | RFC 4553    | SAToP             |
| 802.3ad | Link Aggregation*     | RFC 5086    | CESoPSN           |
|         |                       | ITU         |                   |
| MEF     |                       | G.823/G.824 | Traffic Interface |
| 8       | CESoETH               |             |                   |

### Certifications

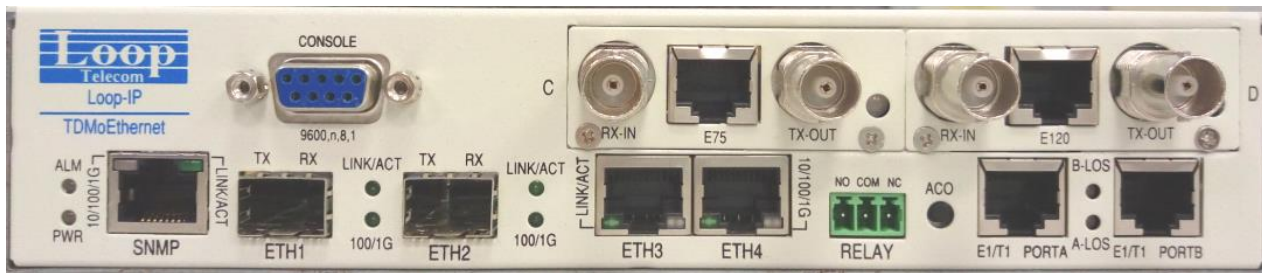
EMC EN55022 Class A, EN50024, FCC Part 15 Subpart B Class A,  
 Safety EN60950-1(CE), IEC 61850-3\* only Compliance on power module ISD48 -48Vdc.

\* Future option

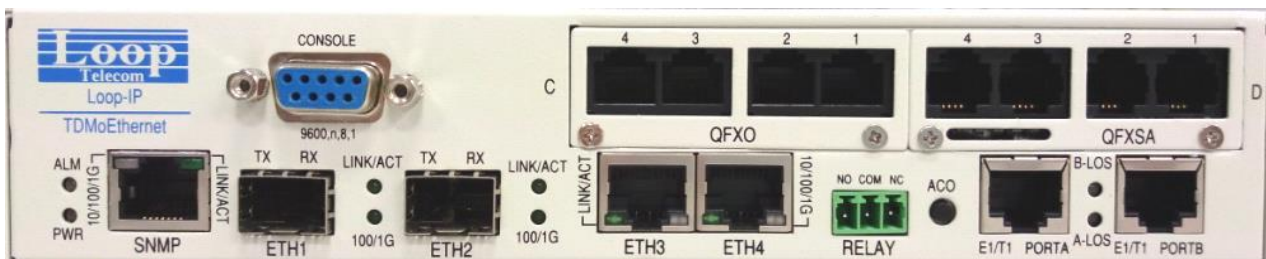
### Panel Views



Front Panel View with 2 X E1/T1, 1 x RS232, 1 x QE&MA Tributary



Front Panel View with 2 X E1/T1, 2 FE1 Tributary



Front Panel View with QFXO & QFXSA Tributary



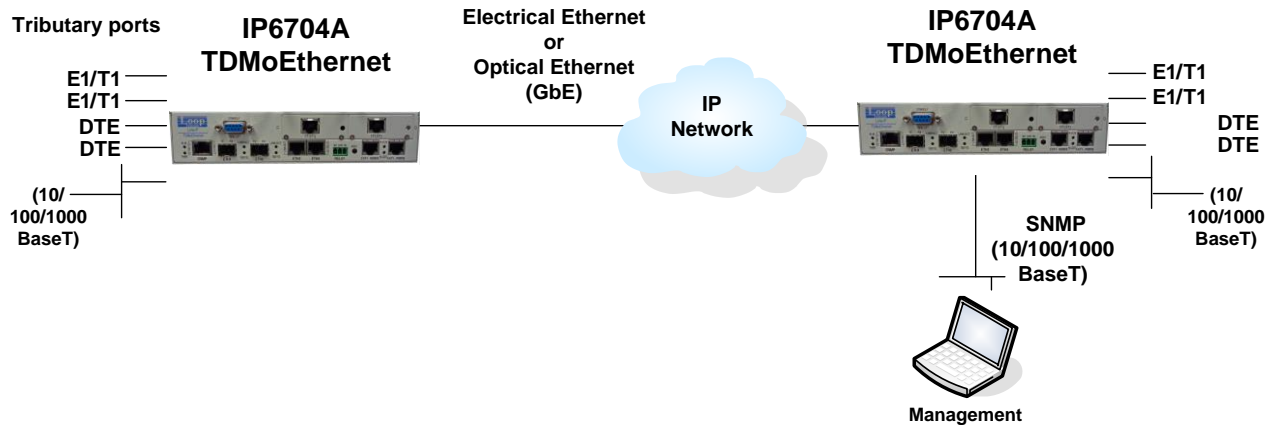
Rear Panel View with DC plug-in Power modules



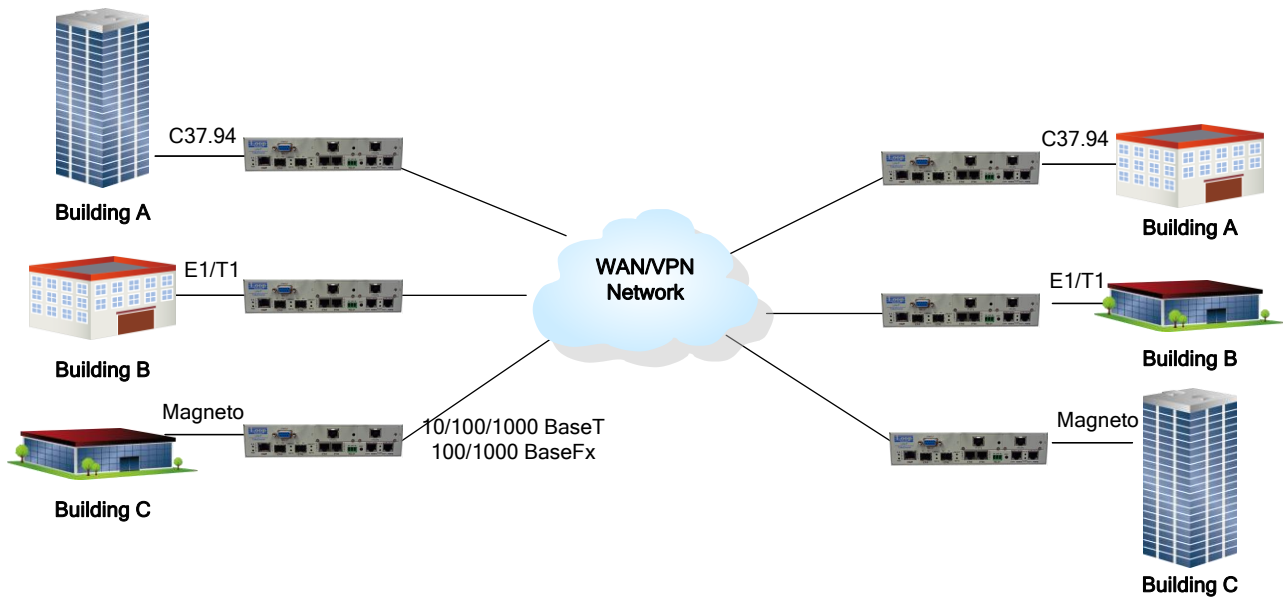
**Rear Panel View with P9 Power**



## Application Illustrations

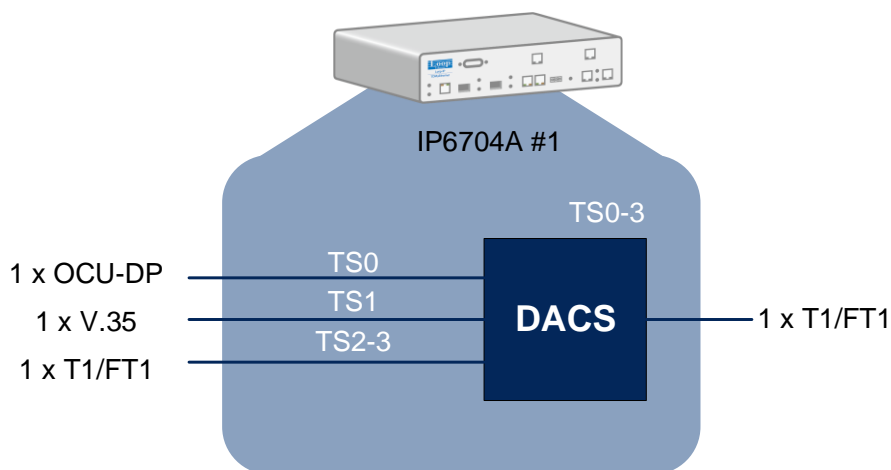


### IP6704A Point-to-Point Application.



### IP6704A on VPN Network





**IP6704A on Digital Access Cross-Connect System (DACS)**



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