TeleLite™

OPX Interface Card, Description and Installation Guide

925W720102-04E

POSITRON

Positron Inc.

Chapter 1 – General Information

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Chapter 1

General Information

1.1 Publication Information

TeleLite OPX Interface Card, Description and Installation Guide
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1.2 About this Guide

This guide introduces you to the TeleLite OPX interface card, its features and applications, and describes how to install one in a TeleLite shelf. This guide was designed to be read from beginning to end.

1.2.1 Related Documentation

The other guides in the TeleLite set are listed below. To order any manuals, please contact your customer service representative.

- 720000 TeleLite 6-position Shelf

1.2.2 Positron Products and Services

Positron engineers and manufactures high voltage isolation products to protect personnel and telecommunications circuits in high voltage areas that are susceptible to the effects of Ground Potential Rise (GPR).

Positron is the leader in isolation technology with its Teleline wireline products and TeleLite optical fiber wireline isolation/protection product families. Positron provides total flexibility in product configuration – from standalone units protecting a single circuit to high-capacity, multi-shelf HVI preconfigured systems.

Positron also provides a wide range of consulting, analysis and training services for communications companies and electrical utilities.

Full details and contact information are available at www.PositronPower.com

1.3 Compliance Information

1.3.1 FCC Part 15

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.3.2 FCC Part 68

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA (Administrative Council on Terminal Attachments). On the back of this equipment is a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXXX. If requested, this number must be provided to the telephone company.

You are required to request service from the telephone company before you connect the unit to a network. When you request service, provide the telephone company with the following information:

Table 1: Request Service Information

Product Identifier:	OPX-0
Facility Interface Code (FIC):	OL13B
Service Order Code (SOC):	9.0Y
Universal Service Order Code (USOC) jack:	RJ-11C
Network Address Code:	N
Equipment Code:	OT
REN:	Not applicable
Identification Numbers: US:	CT5OTNANPP-OPX-0

A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA. A compliant telephone cord and modular plug is provided with this product. It is designed to be connected to a compatible modular jack that is also compliant. For details, see installation instructions.

The Ringer Equivalent Number (REN) is used to determine the number of devices that may be connected to a telephone line. Excessive RENs on a telephone line may result in the devices not ringing in response to an incoming call. In most but not all areas, the sum of RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company. For products approved after July 23, 2001, the REN for this product is part of the product identifier that has the format US:AAAEQ##TXXXX. The digits represented by ## are the REN without a decimal point (for example, 03 is a REN of 0.3). For earlier products, the REN is separately shown on the label.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with the TeleLite product, please contact Positron for repair or warranty information. If the equipment is causing harm to the telephone

network, the telephone company may request that you disconnect the equipment until the problem is resolved.

Positron Inc. located at 5101 Buchan street, Montreal in Canada hereby certifies that the TeleLite bearing labeling identification numbers mentioned above complies with the Federal Communications Commission's (FCC) Rules and Regulations 47 CFR Part 68, and the Administrative Council on Terminal Attachments (ACTA)-adopted technical criteria TIA-968-A-2, Telecommunications - Telephone Terminal Equipment -Technical Requirements for Connection of Terminal Equipment To the Telephone Network, January 2004.

1.3.3 Laser Safety

This laser class 1 product complies with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.

1.3.4 Product Safety

This equipment is compliant with CSA CAN/CSA-C22.2 No. 60950-1-03

1.3.5 NEBS Compliance

This equipment has been tested and found to comply with the following Telcordia specifications:

- GR-63-CORE
- GR-1089-CORE
- GR-487-CORE

1.4 Service and Support

Positron Contact Information

General information:	Positron Inc. 5101 Buchan Street, Suite 220 Montreal, Quebec, Canada H4P 2R9 US and Canada: 1-888-577-5254 International: 1-514-345-2220 Fax: 514-345-2271 E-mail: info@positronpower.com Website: www.positronpower.com
Customer Service and Repairs:	US and Canada: 1-888-577-5254 International: 1-514-345-2220 E-mail: customerservice@positronpower.com

1.4.1 Technical Customer Support

Positron is committed to providing excellent ongoing technical support to its customers. A team of specialists is always available for telephone consultations or for on-site visits to assist in the maintenance and troubleshooting of Positron equipment.

For pricing information or assistance in the planning, configuration and implementation of the installation of equipment, contact Technical Customer Service.

1.4.2 Customer Training

Full customer training courses on High Voltage Interface (HVI) are also available. For more information, contact Positron.

1.4.3 Repair Service

All warranty repairs are performed at no cost. Positron reserves the right to repair or replace any equipment that has been found to be defective.

For information about out-of-warranty repairs, contact Positron's Repair Department. Due to the varied nature of repairs, no specific turnaround can be guaranteed, but average turnaround time is 20 working days from date of receipt. In emergency situations, special arrangements can be made. All repaired items are warranted for a period of 90 days.

Before returning any items to Positron for repair, warranty repair or replacement, call the Repair department to obtain a Return Material Authorization (RMA) number. Parts returned without RMA numbers cannot be accepted. The RMA number must always be clearly marked on all boxes, crates, and shipping documents. Bulk repairs (more than five items) will require additional processing time, so please take this into consideration when requesting an RMA number.

To accelerate the repair process, whenever possible, include a report detailing the reason for return with the unit(s). Also, please include the name and phone number of a person who can be contacted should our Repair department need further information.

When packing items being returned for repair, please ensure they are properly packed to avoid further damage. TeleLite plug-in cards should never be shipped while installed in a shelf; this will cause damage that can extend the repair period.

1.5 TeleLite Warranty

Subject to the provisions of this paragraph, Positron warrants that the equipment shall perform in accordance with Positron's specifications. The warranty remains valid for one (1) year from the date of shipment. The warranty fully covers workmanship, materials and labor. Positron shall, at its sole discretion, repair or replace the problem unit.

Freight costs to ship defective equipment to Positron are borne by the Customer, with return of replaced or repaired equipment to be at Positron's expense.

1.5.1 Limitation of Liability

Subject to anything to the contrary contained herein, Positron's sole obligation and liability and the customer's sole remedy for Positron's negligence, breach of warranty, breach of contract or for any other liability in any way connected with or arising out of, the equipment or any services performed by Positron shall be as follows:

- In all situations involving performance or non-performance of the equipment or any component thereof, the customer's sole remedy shall be, at Positron's option, the repair or replacement of the equipment or said component.
- For any other claim in any other way related to the subject matter of any order under, the customer shall be entitled to recover actual and direct damages; provided that Positron's liability for damages for any cause whatsoever, and regardless of the form of the action, whether in contract or in tort (including negligence), shall be limited to the value of the order.

Positron shall not be obligated to repair or replace any item of the equipment which has been repaired by others, abused or improperly handled, improperly stored, altered or used with third party material or equipment, which material, or equipment may be defective, of poor quality or incompatible with the equipment supplied by Positron, and Positron shall not be obligated to repair or replace any component of the equipment which has not been installed according to Positron specifications.

IN NO EVENT SHALL POSITRON BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SIMILAR OR ADDITIONAL DAMAGES INCURRED OR SUFFERED INCLUDING LOSS OF PROFITS, LOSS OF REVENUES, LOSS OF DATA, LOSS OF

BUSINESS INFORMATION, LOSS OF GOODWILL, LOSS OF EXPECTED SAVINGS OR BUSINESS INTERRUPTION ARISING OUT OF OR IN CONNECTION WITH THE EQUIPMENT, A PURCHASE ORDER SUPPLIES, MAINTENANCE SERVICES OR OTHER SERVICES FURNISHED HEREUNDER, EVEN IF POSITRON HAS BEEN ADVISED OR IS AWARE OF THE POSSIBILITY OF SUCH DAMAGES.

EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, POSITRON DISCLAIMS ANY FURTHER CONDITIONS, REPRESENTATIONS OR WARRANTIES, WHETHER WRITTEN OR ORAL, EXPRESSED OR IMPLIED, INCLUDING THE CONDITIONS AND WARRANTIES OF MERCHANTABILITY, MERCHANTABLE QUALITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE, PERFORMANCE AND THOSE ARISING FROM STATUE, TO THE EXTENT PERMITTED BY LAW. POSITRON DOES NOT WARRANT THAT THE SYSTEM WILL OPERATE WITHOUT INTERRUPTION OR THAT IT WILL BE ERROR FREE.

1.5.2 Cancellation and Rescheduling Charges

Should the customer cancel, prior to shipment, any part of an order, the customer agrees to pay to Positron cancellation charges, not as a penalty, which shall total all expenses, including labor expenses, incurred by Positron prior to said cancellation. Equipment that has been specially developed for the customer's specific applications shall not be subject to cancellation. Cancellation or rescheduling is not permissible after shipment of the System.

Chapter 2

Overview

2.1 TeleLite System Introduction

TeleLite provides electrical isolation between two points on a telecom landline. Its purpose is to increase electrical isolation between the CO (Central Office) side and Station side. The increase in electrical isolation is achieved by using a fiber optic link. The Station side unit is located either inside or outside the building. The CO side must be located far enough from the Station side so that the GPR does not increase above 300 V with respect to the CO.

The TeleLite system is divided into two parts: the **CO side unit** and the **Station side unit**. Each unit is composed of one shelf. Each shelf has six slots for line cards and one slot for a power connection. The shelf backplane does not provide for any telecom connection since all connections (except local power) will be made directly to the RJ-11C/RJ-45 connectors, located on the front panel of each card.

The communications link between the CO side unit and the Station side unit supports two types of fibers, single-mode or multi-mode, depending on the customer installation. For information, see section 2.1.1 on page 17.

NOTE The appropriate fiber type must be used for each line card (multi-mode or single-mode).

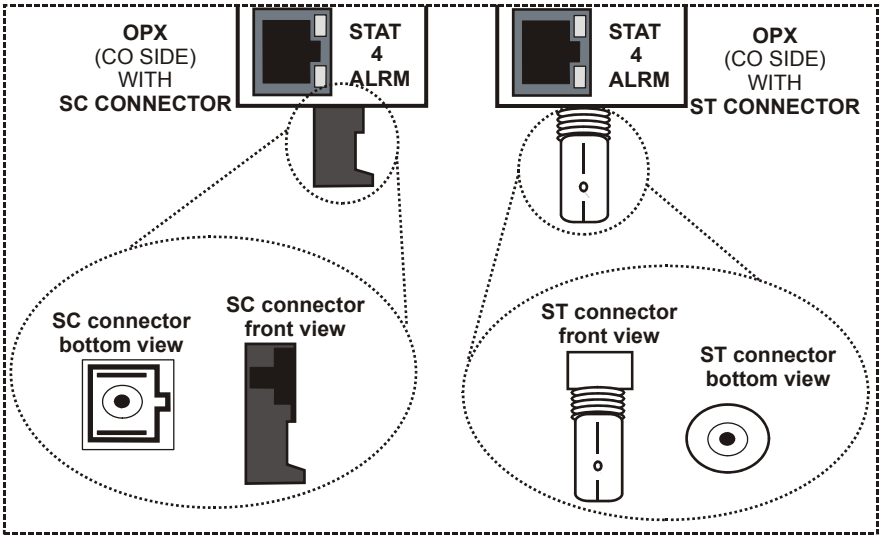
2.1.1 Fiber Connectors

The fiber interface is located on the bottom front panel of each line card. Each of these fiber interfaces will support one of two types of fiber connectors: ST or SC.

Table 2: Fiber Connectors

Fiber Connector	Description
SC	A plastic snap-on optic connector.
ST	An optical fiber connector used to join single fibers together at interconnects, or to connect them to optical cross connects.

Figure 1: SC and ST Fiber Connector Types



2.1.1.1 Multi-mode fiber type

For short distances, less than 1.2 miles (2 km), the fiber type will be **multi-mode** using an 850 ηm wavelength LED.

2.1.1.2 Single-mode fiber type

For longer distances, up to 9.9 miles (16 km), the fiber type will be **single-mode** using a 1310 ηm wavelength laser.

2.2 Card Model Numbers

For information, contact Positron customer support.

Table 3: Quad OPX Interface Card Model Numbers

Card Type	Model Number
Quad OPX FXO Station side Multi-mode ST Connector	720800MST
Quad OPX FXO Station side Single-mode SC Connector	720800SSC
Quad OPX FXS CO side Multi-mode ST Connector	720810MST
Quad OPX FXS CO side Single-mode SC Connector	720810SSC

Table 4: Dual OPX Interface Card Model Numbers

Card Type	Model Number
Dual OPX FXO Station side Multi-mode ST Connector	720840MST
Dual OPX FXO Station side Single-mode SC Connector	720840SSC
Dual OPX FXS CO side Multi-mode ST Connector	720850MST
Dual OPX FXS CO side Single-mode SC Connector	720850SSC

2.3 Introduction to the OPX Interface Card

The OPX interface card comes in two variations:

- The **Quad** isolates up to 4 lines using a single fiber link.
- The **Dual** isolates up to 2 lines using a single fiber link.

The **CO side** uses a Foreign Exchange Subscriber (FXS) interface card. The FXS interface card is powered from a power source of -48 Vdc at the CO side. It provides battery feed with polarity reversal, ringing, and battery disconnect to the CO side equipment.

The **Station side** uses a Foreign Exchange Originating (FXO) interface card. The FXO interface card is powered from the backplane supply of -48 Vdc. The card interfaces with the PBX and provides an off-hook circuit, line polarity detection, ring detection and battery disconnect detection.

Figure 2: Quad OPX Interface Cards (CO and Station side)

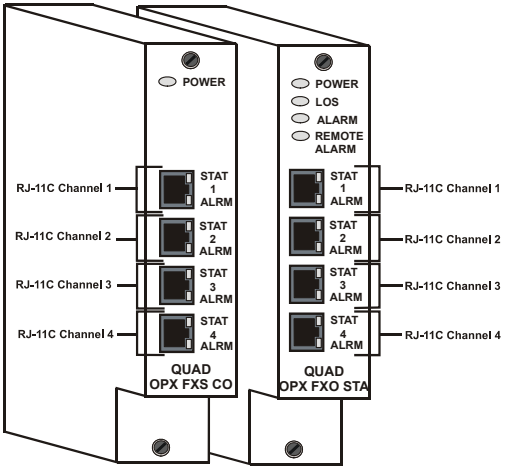
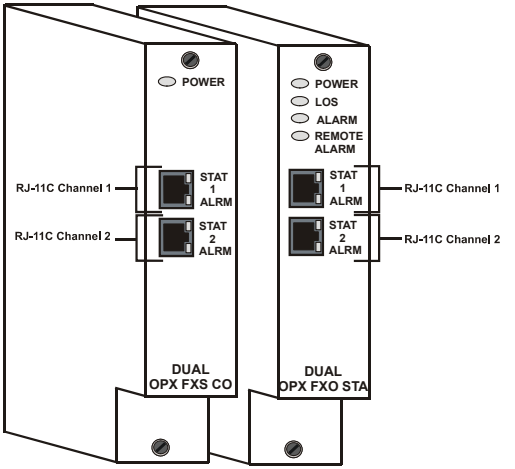


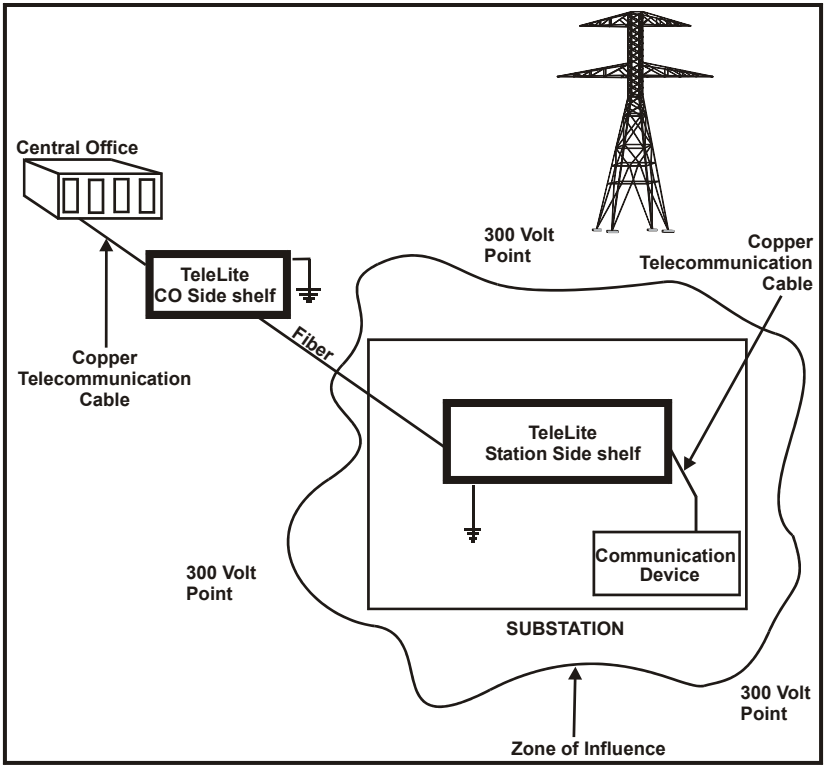
Figure 3: Dual OPX Interface Cards (CO and Station side)



2.4 Applications

- Off premises loop start telephone
- Off premises fax/modem up to 56.6 kb/s
- Automatic ring down
- Calling Number Delivery (CND) compatible
- Calling Number Delivery on Call Waiting (CNDW) compatible
- Call Waiting compatible
- Open Switching Interval (OSI) compatible (brief battery disconnect)
- Battery reversal compatible

Figure 4: OPX Interface Card Application



2.5 Front Panel LEDs and RJ-11C Connectors

The interface card front panel features LEDs and RJ-11C connectors.

2.5.1 Front Panel LEDs

Some LEDs are located on the top portion of the front panel, and some LEDs are located on the RJ-11C connectors, on the lower portion of the front panel.

Figure 5: LED Descriptions for the Quad OPX Interface Card (CO side)

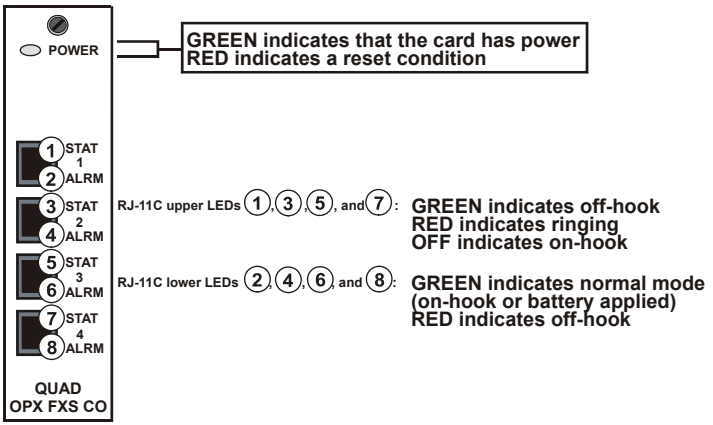


Figure 6: LED Descriptions for the Quad OPX Interface Card (Station side)

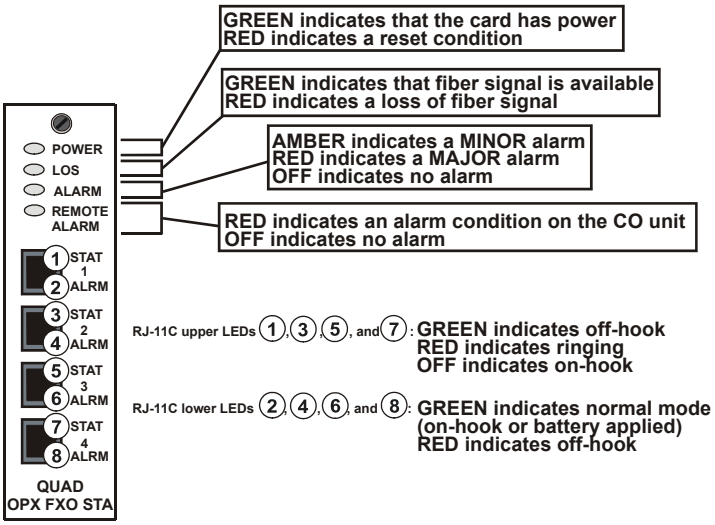


Figure 7: LED Descriptions for the Dual OPX Interface Card (CO side)

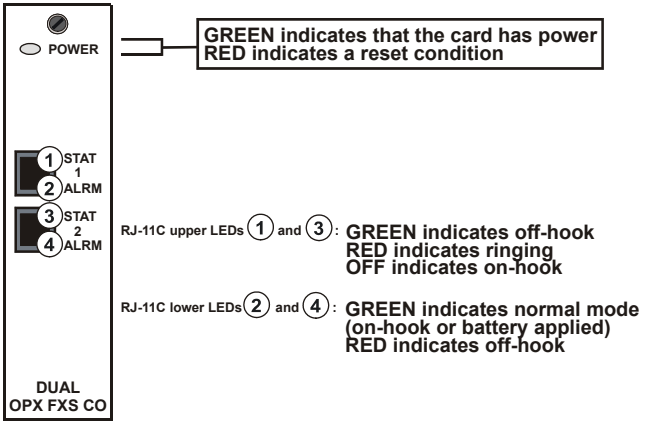
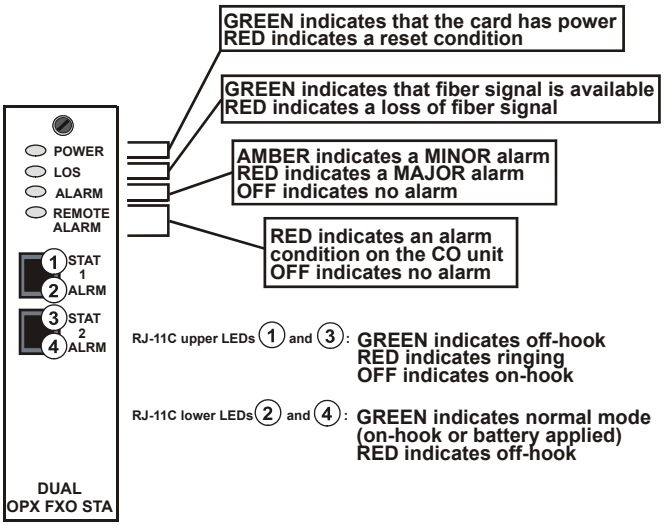


Figure 8: LED Descriptions for the Dual OPX Interface Card (Station side)



2.5.2 RJ-11C Connectors

NOTE

- The pinouts for the CO side (FXS) Quad cards are the same for the Station side (FXO) Quad cards.
- The pinouts for the CO side (FXS) Dual cards are the same for the Station side (FXO) Dual cards.

Figure 9: Pinout Assignments for the Quad OPX Interface Cards (CO and Station side)

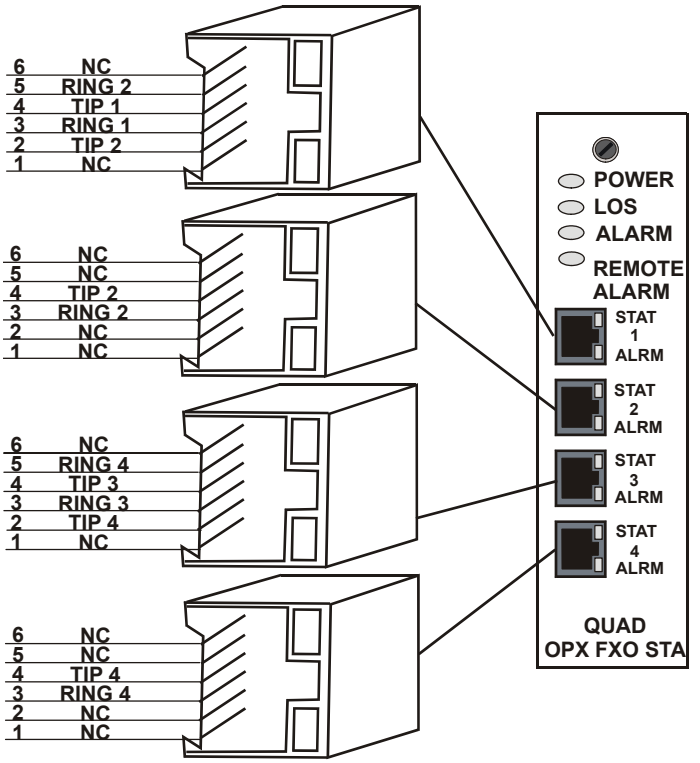
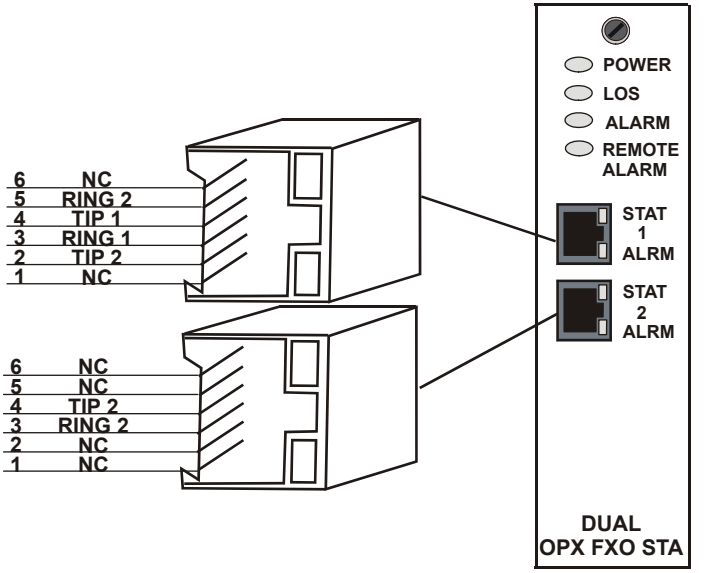


Figure 10: Pinout Assignments for the Dual OPX Interface Cards (CO and Station side)



2.5.2.1 ~~Boot Sequence~~

~~When the unit is powered up, it will perform an automatic LED test according to the following sequence:~~

- ~~All green LEDs will turn on and off for 250 milliseconds~~
- ~~All red LEDs will turn on and off for 250 milliseconds~~
- ~~Each green LED will turn on and off for 100 milliseconds~~
- ~~Each red LED will turn on and off for 100 milliseconds~~

2.6 Line Length Settings (CO and Station side)

The CSW1 DIP switch is used to set the cards (CO and Station side) line length:

- Line length settings for the **CO side** (FXS) interface card are measured from the Central Office to the TeleLite CO side.
- Line length settings for the **Station side** (FXO) interface card are measured from the TeleLite Station side to the Customer Premise Equipment (CPE).

NOTE

- To locate switch CSW1, see Figure 11 on page 28.
- For line lengths, see Table 5 on page 28.

2.6.1 Short Line Length Settings

➤ **To Set a CO Side or a Station Side Interface Card for a Short Line Length Setting**

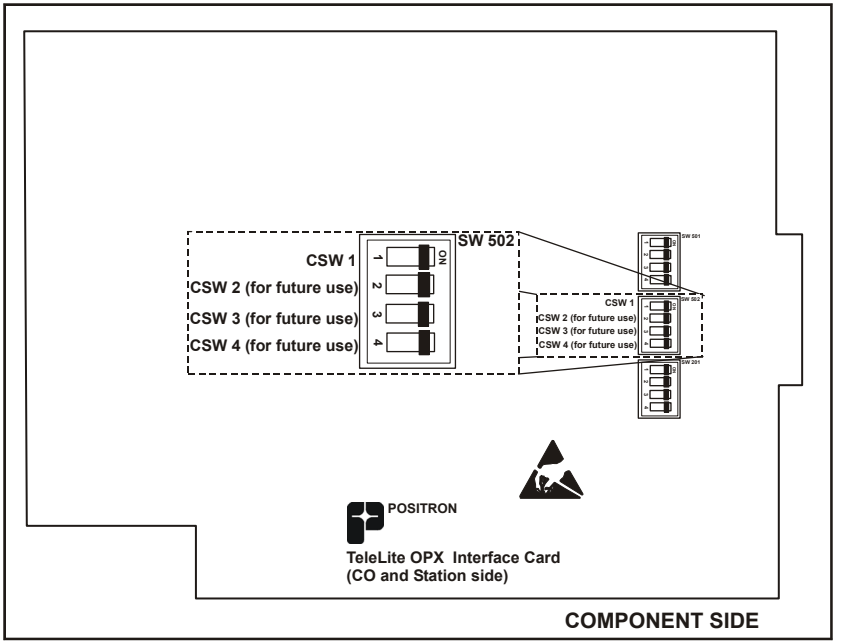
1. Set switch CSW1 on the CO side or Station side OPX Interface Card to the right (set to ON).

2.6.2 Long Line Length Settings

➤ **To Set a CO Side or a Station Side Interface Card for a Long Line Length Setting**

1. Set switch CSW1 on the CO side or Station side OPX Interface Card to the left (set to OFF).

Figure 11: CSW1 on the OPX Interface Card (CO and Station side)



NOTE

- By default, all DIP switches are set to the ON position.
- CSW2, CSW3, CSW4 and switch SW201 are for future use.
- There is no low power setting for the CO side (FXS) and Station side (FXO) OPX interface cards.

Table 5: OPX Interface Card Line Lengths

Card Type	Line Setting	Line Length (short and long)
All of these settings apply to the Quad and Dual cards	CSW1 switched to ON	0 to 3000 ft (0 to 914.4 m)
	CSW1 switched to OFF	> 3000 ft (> 914.4 m)

2.7 Specifications

Table 6: OPX Electrical Specifications

Parameter	Specification
Station side (FXO) card power consumption	2 W maximum
Station side (FXO) card power dissipation	4 W maximum
CO side (FXS) card power consumption	6 W maximum
CO side (FXS) card power Dissipation	4.5 W maximum
Station side (FXO) loop specification	As per FCC part 68
CO side (FXS) loop current	25 mA min. with at least -48 Vdc on-hook voltage
CO side (FXS) ringing voltage	90 V_{rms} nominal, unbalanced
Maximum ringing load	5 REN per line, 8 REN per card
Fiber optic interface	ST/SC type connector
Transceiver wavelength	850 ηm or 1310 ηm
Fiber optic type	Multi-mode fiber: 62.5/125 µm Single-mode fiber: 9/125 µm
Maximum fiber span distance	Multi-mode fiber: 850 ηm (1.2 miles or 2 km) Single-mode fiber: 1310 ηm (9.9 miles or 16 km)

Table 7: Environmental Specifications

Parameter	Specification
Operating temperature	-40°F to 149°F (-40°C to 65°C)
Storage temperature	-40°F to 185°F (-40°C to 85°C)
Humidity (non-condensing)	20 to 80%
Altitude	-200 ft to 10,000 ft (-60.96 to 3048 m) above sea level

Chapter 3

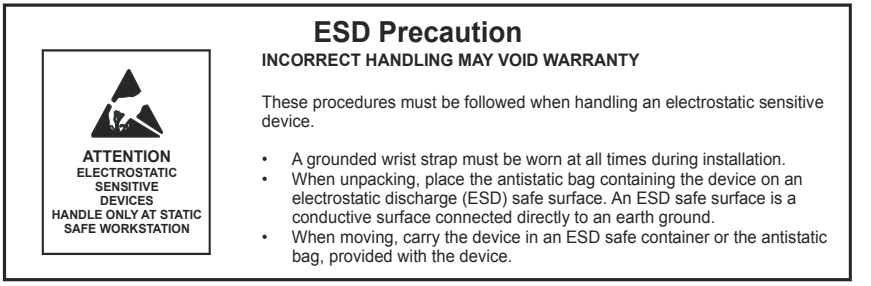
Installation

3.1 Installing an OPX Interface card

After a shelf has been properly installed and all the wiring is complete, the plug-in card can be installed. For information on how to install a shelf, see the *TeleLite 6-position Shelf Description and Installation guide*.

Follow the ESD precautions shown in Figure 12.

Figure 12: ESD Precautions

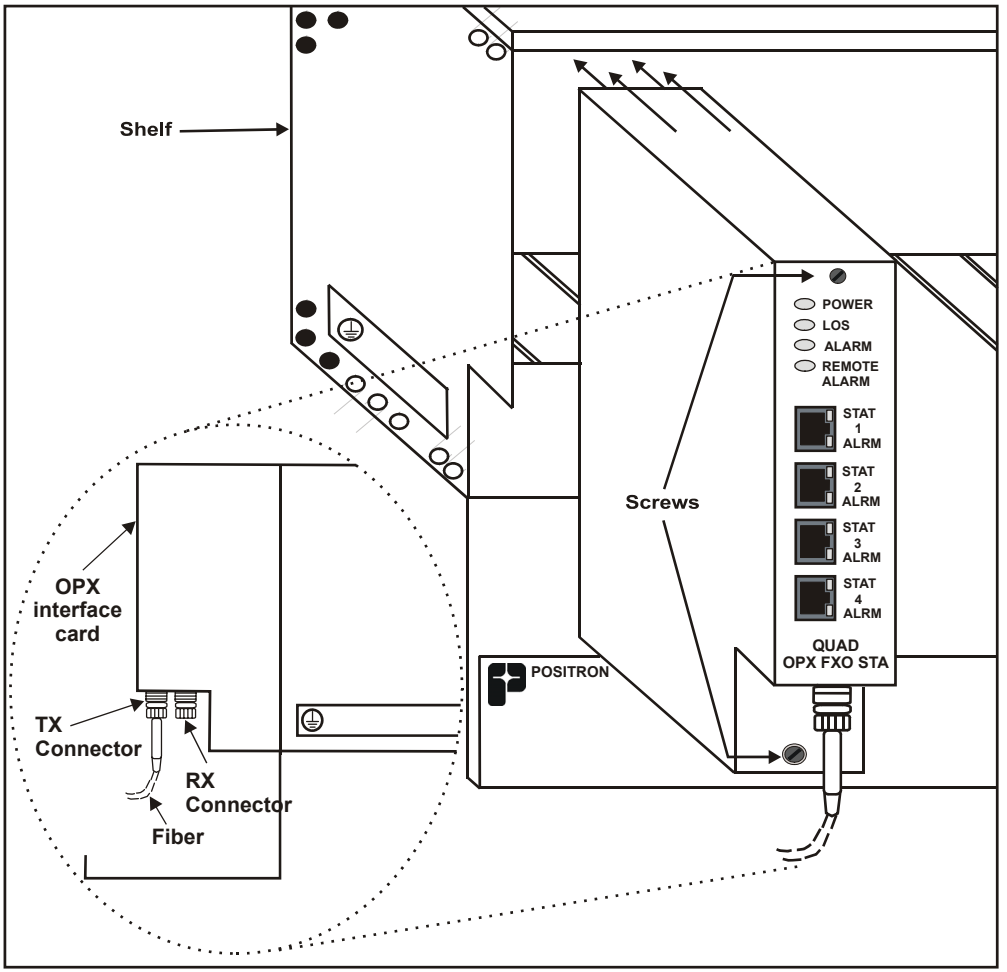


➤ To Install an OPX Interface Card in a Shelf

NOTE The installation procedure for the CO and Station side cards is the same.

1. Take the card out from its protective packaging.
   - Set the appropriate line length settings; see Table 5 on page 28.
2. Make sure the card is right-side up, align the card with the appropriate slot of the shelf, and slide it in as show in Figure 13 on page 33.
3. Hand-tighten the top and bottom screws, to secure the card in place.
4. Connect cables to and from the fiber side using the SC or ST type connectors located on the bottom front panel of each card, then connect them to the TX and RX fibers.
5. Dress the fiber cables using the fiber tray at the front of the shelf, then secure them using a cable guide.
6. Connect the phone line to the RJ-11C connector found on the front panel.

Figure 13: Installing an OPX Interface Card in a Shelf



NOTE | This illustration is a general guideline only.

3.2 Serving Cable

CAUTION

The serving cable to the CO unit must be routed and installed according to local regulation.

The CO unit must be installed outside the zone of influence, beyond the 300 V point (see Figure 4 on page 21).

Use a fiber and conduit between the CO and Station side unit that is non-conductive and follows local regulations.

3.3 Earthing Connector

CAUTION

To ensure safety of personnel, Positron recommends following these guidelines:

- The return of the DC supply must be grounded at the source.
- This equipment must be permanently connected to earth (Refer to the 6 positions shelf documentation).
- The field wiring should include a readily-accessible disconnect device. The disconnect device shall disconnect both poles (-48 Vdc and RTN).
- This equipment is connected directly to the DC supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the DC supply system earthing electrode is connected.
- This equipment must be located in the same immediate area (such as adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same DC supply circuit and the earthing conductor, and also the point of earthing of the DC system. The DC system shall not be earthed elsewhere.
- The DC supply source must be located within the same premises as this equipment.
- There shall be no switching or disconnecting devices in the earthed circuit conductor between the DC source and the point of connection of the earthing electrode conductor.

3.4 Testing

Make sure that the front panel LEDs and RJ-11C LEDs have the following status:

- **PWR**: Green (card is active)
- **LOS**: Green (clock is synchronized)
- **Alarm**: Off (no alarm)
- **Remote Alarm**: Off (no alarm)
- **RJ-11C upper**: Green (normal mode)
- **RJ-11C lower**: Off (normal mode)

3.4.1 Boot Sequence

When the unit is powered up, it will perform an automatic LED test according to the following sequence:

- All green LEDs will turn on and off for 250 milliseconds
- All red LEDs will turn on and off for 250 milliseconds
- Each green LED will turn on and off for 100 milliseconds
- Each red LED will turn on and off for 100 milliseconds

3.4.2 Troubleshooting

Before calling customer service, make sure that:

- The circuit cards are properly powered; see section 3.1 on page 32.
- The TX and RX fibers are connected correctly and are not reversed.
- The line length settings are set properly; see section 2.6 on page 27.

Appendix A

Acronyms

A 1 Acronyms

AWG	American Wire Gauge
CO	Central Office
CND	Calling Number Delivery
CNDW	Calling Number delivery on call Waiting
CPE	Customer Premises Equipment
CT	Center Tap
DC	Direct Current
DID	Direct Inward Dialling
DIP	Dual Inline Package
DTU	Data Terminal Unit
ESD	Electro-static Discharge
FXO	Foreign Exchange Originating
FXS	Foreign Exchange Subscriber
GND	Ground
GPR	Ground Potential Rise
LED	Light-emitting Diode
LOS	Loss of Signal
MTBF	Mean Time Between Failures
NC	No Connection

OPX	Off Premises Extension
OSI	Open Switching Interval
PVC	Poly Vinyl Chloride
NIU	Network Interface Unit
NTU	Network Terminating Unit
RMA	Return Material Authorization
RMT	Remote
RTN	Return Conductor
RX	Receive
SMT	Surface Mount Technology
TX	Transmit