TeleLite™

Single 2W/4W Interface Cards,

(720460xxx & 720470xxx)
Description and Installation Guide

925W720104-08E

POSITRON
Positron Inc.

Contents

Acronyms

cHVI	Compact High Voltage Interface
CO	Central Office
CSA	Canadian Standards Association
DC	Direct Current
ESD	Electro-Static Discharge
FCC	Federal Communications Commission
FXO	Foreign Exchange Originating
FXS	Foreign Exchange Subscriber
GPR	Ground Potential Rise
HVI	High Voltage Interface
PBX	Private Branch Exchange
LED	Light-emitting Diode
LOS	Loss of Signal
NC	No Connection
NEBS	Network Equipment-Building System
POTS	Plain Old Telephone Service
RJ	Registered Jack
RTN	Return
RX	Receive
TX	Transmit

Chapter 1

General Information

1.1 Publication Information

TeleLite Single 2W/4W Interface Cards, (720460xxx & 720470xxx)
Description and Installation Guide
Part number: 925W720104-08E

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Positron Inc.
5101 Buchan Street, Suite 220
Montreal, Québec, Canada
H4P 2R9
US and Canada: 1-888-577-5254
International: 1-514-345-2220

1.2 About this Guide

This guide introduces you to the TeleLite Single 2W/4W interface cards (720460xxx & 720470xxx), their features and applications, and describes how to install each 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
- 720002 cHVI 2-slot Rack-Mount Shelf
- 720013 3-slot Swing-out Shelf

1.2.2 Positron Products and Services

Positron engineers and manufactures insulation testing and 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, public safety and security organizations 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:	PP-L24W-0
Facility Interface Code (FIC):	Metallic
Service Order Code (SOC):	9.0F
Universal Service Order Code (USOC) jack:	RJ14C
Network Address Code:	N
Equipment Code:	OT
REN:	Not applicable
Identification Numbers: US:	CT5OTNANPP-L24W-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

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 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 13.

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

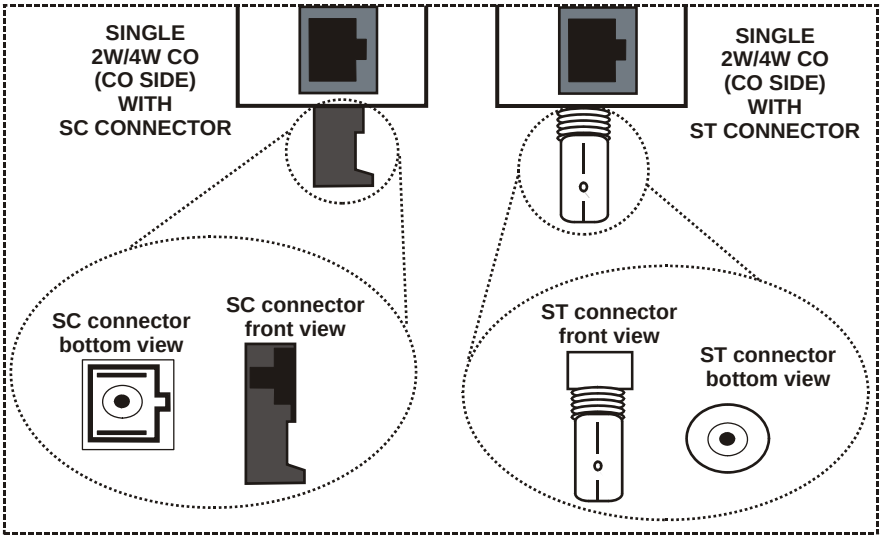
2.1.1 Fiber Connectors

The fiber interface is located on the bottom front panel of each line card (except for the TeleLite Access interface 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 5 km (3 miles), the fiber will be **multi-mode** using an 850 ηm wavelength LED.

2.1.1.2 Single-Mode fiber type

For longer distances, up to 50 km (31 miles), the fiber type will be **single-mode** using a 1310 ηm wavelength laser.

2.2 Single 2W/4W Interface Card Model Numbers

For information contact Positron customer support.

Table 3: Card Type and Model Numbers

Card Type	Model Number
Single 2W/4W Station Multi-mode ST connector	720460MST
Single 2W/4W Station Single-mode SC connector	720460SSC
Single 2W/4W Central Office Multi-mode ST connector	720470MST
Single 2W/4W Central Office Single-mode SC connector	720470SSC

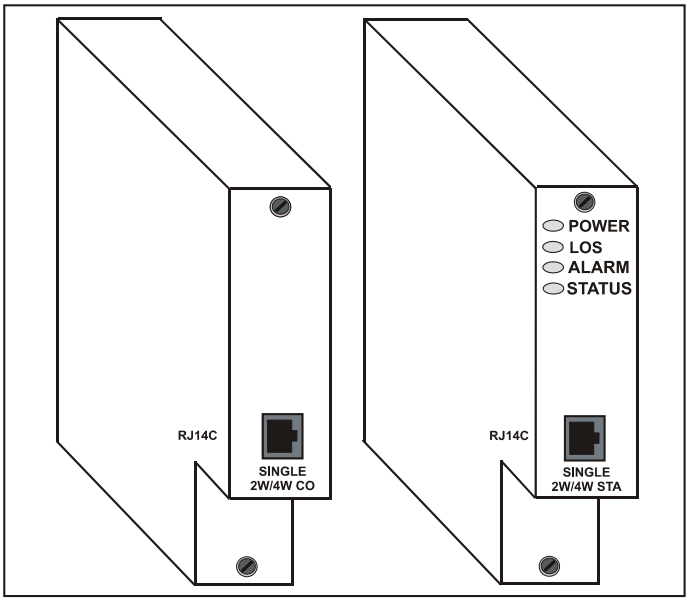
2.3 Introduction to the Single 2W/4W Interface Card

The Single 2W/4W interface card isolates a single 2-wire or a single 4-wire AC line using a fiber link. The interface card is provided in two variations:

- The **CO side** card can be powered from the line sealing current: loop sealing when operated in 2W mode, or simplex sealing when operated in 4W mode.
  - If line sealing current is not provided by the CO equipment, the card can be powered locally through the shelf's supply of -48 Vdc. When line powered, the card will operate with sealing currents as low as 10 mA.
  - The card will not reproduce the loop or sealing current on the Station side.
- The **Station side** card can only be powered locally from a -48 Vdc source.

For an illustration of a CO side and Station side card, see Figure 2 on page 14.

Figure 2: Single 2W/4W Station and CO Interface Cards



NOTE The illustration is a general guideline only.

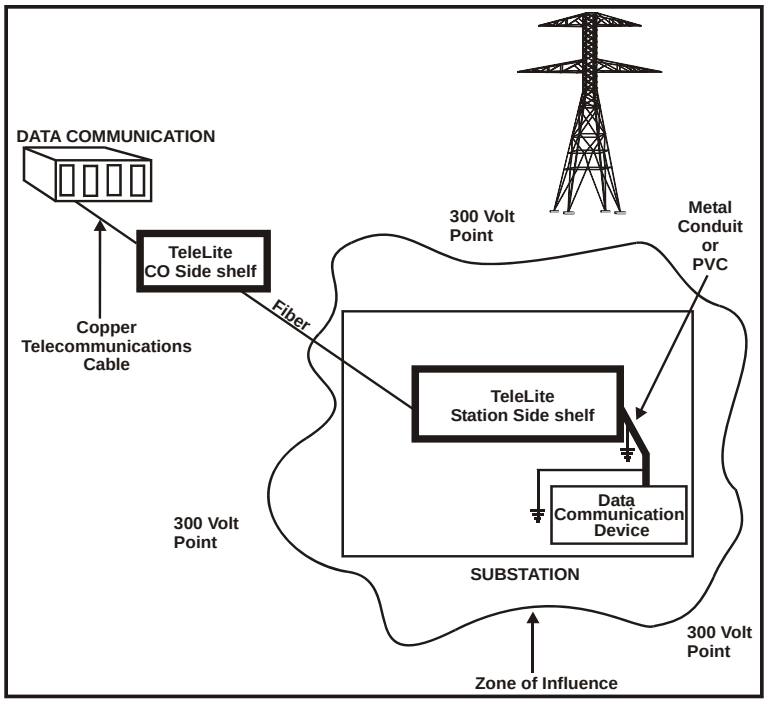
2.4 Applications

The applications for the Single 2W/4W interface card include:

- Any dedicated modem communicating over voice band, not compatible with dial-up modems
- Supervisory control and data acquisition (SCADA) systems
- Tone relay control systems
- Analog carrier systems
- Any other equipment using tone related signalling

The Single 2W/4W interface card uses a type of encoding on the fiber that reduces power consumption to a minimum, while still being able to transmit over 5 km (3 miles) of multi-mode fiber and 50 km (31 miles) of single-mode fiber.

Figure 3: Single 2W/4W Interface Card Application



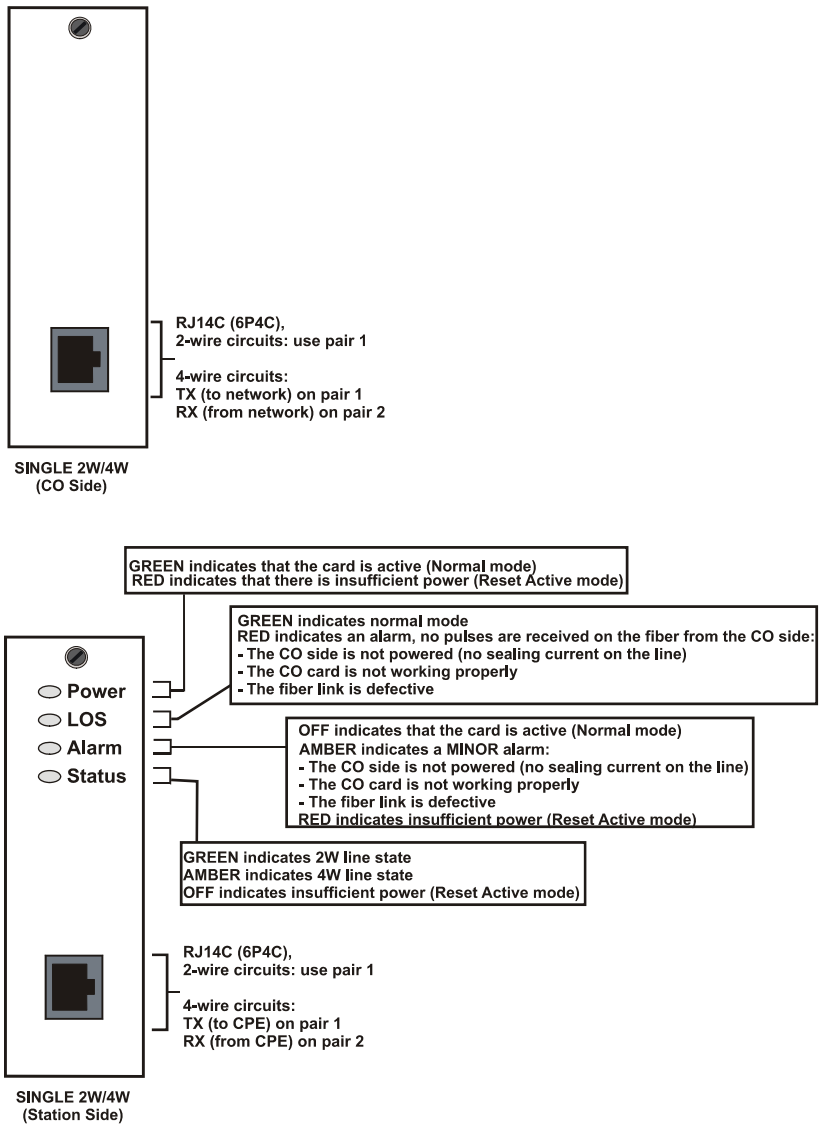
2.5 Front Panel LEDs, Switches and Jumpers

There are six jumpers on the CO side card. There is one switch on the PCB of the Station side card.

- For CO side card jumper locations, see Figure 7 on page 19.
- For Station side card switch locations, see Figure 8 on page 20.

Only the Station side card has LEDs. They are located on the front panel of the card.

Figure 4: Single 2W/4W Interface Card (CO and Station side)



2.5.1 RJ Connector Pinouts

The Single 2W/4W interface cards can be set to 2W or 4W mode. The cards pinouts are the same for CO side and Station side.

Figure 5: Pinout Assignments for 2W/4W Mode (CO side)

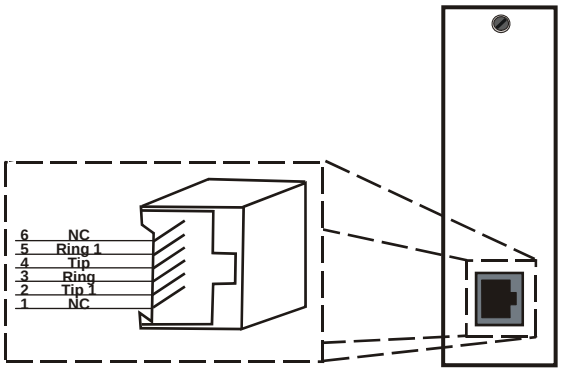
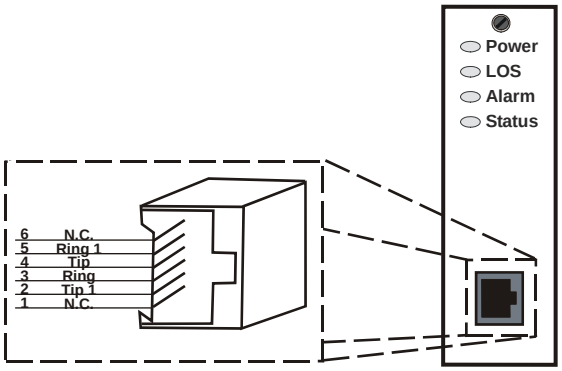


Figure 6: Pinout Assignments for 2W/4W Mode (Station side)



2.5.2 CO Side Jumpers (W1, W2, W3 and W201)

CO side card jumpers are used to set the card in 2W or 4W mode:

- When set in **2W** mode, the card will transmit and receive on the same pair (TIP/RING).
- When set in **4W** mode, the card will transmit to the CO on pair TIP/RING and receive from the CO pair TIP1/RING1.

NOTE All jumpers must be set the same way.

- For CO side card jumper locations, see Figure 7 on page 19.

2.5.3 CO Side Jumpers (W101 and W102)

The Single 2W/4W interface card can be:

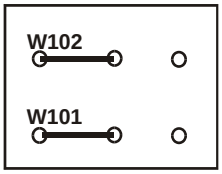
- **Span powered:** When set in span power mode, the card will operate from the loop/simplex sealing current, as low as 10 mA.
- **Locally powered:** When no sealing current is fed from the CO, the card will be set for local power and will get its power from the backplane's -48 Vdc.

NOTE

- When powered locally, the shelf must be powered through an Access Card (720001) or a Power Access Card (721123 or 721124).
- Both jumpers must be set the same way.

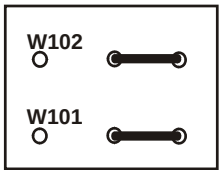
➤ For Your Single 2W/4W Interface Card to be Span Powered

1. Insert pins as illustrated:



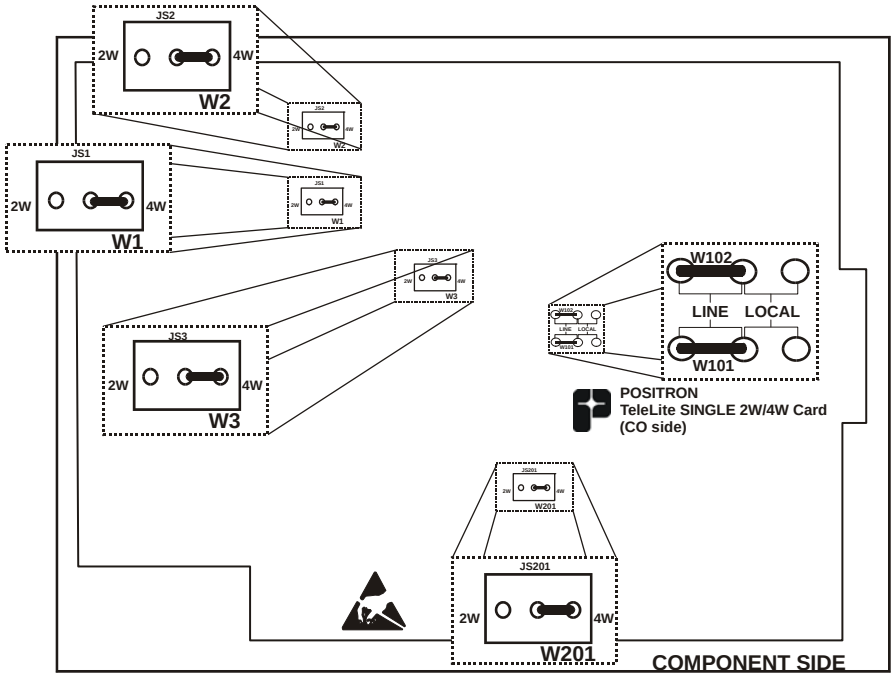
➤ For Your Single 2W/4W Interface Card to be Locally Powered

1. Insert pins as illustrated:



- For CO side card jumper locations, see Figure 7 on page 19.

Figure 7: Single 2W/4W Interface Card (CO side) Jumpers



NOTE By default, the jumper mode for a CO side card is set for “Line Power” and “4W” mode.

2.5.4 Station Side Switch SW201

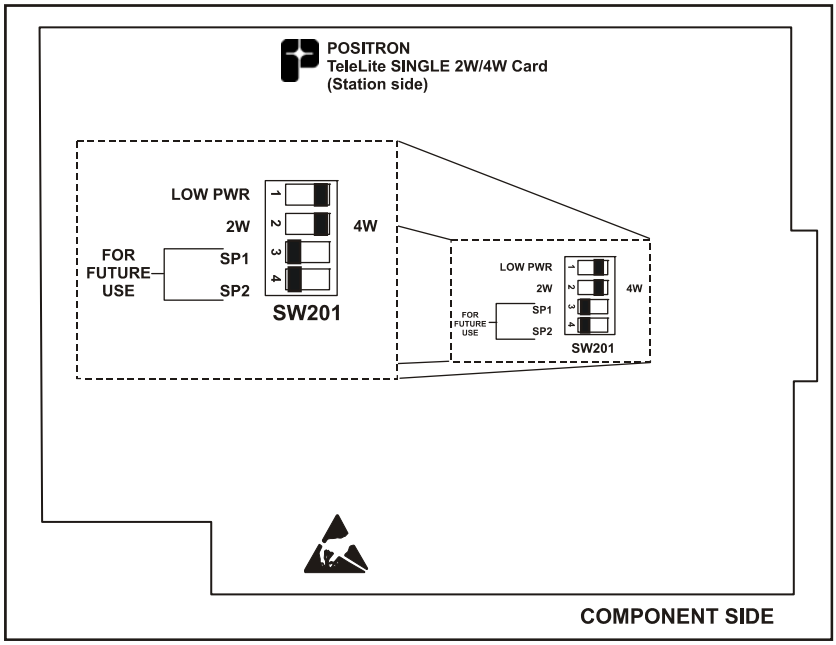
The SW201 switch has two settings:

- **2W** is used to set the Station card in 2W mode. When set to 2W mode (OFF), data will transmit and receive on the same pair (TIP/RING).
- **LOW PWR**: Low power mode. When set to Low Power mode (OFF), all LEDs are turned off. In this setting, the card draws little power, useful when operating from a solar panel.

> **NOTE** When not set to 2W mode, the card operates in 4W mode (ON). When set to ON mode, data will transmit to the Station side equipment on TIP/RING and receive from the Station equipment on TIP1/RING1.

- **SP1** and **SP2** are for future use.
- For Station side card switch locations, see Figure 8 on page 20.

Figure 8: Single 2W/4W Interface Card (Station side)



> **NOTE** By default, the switch settings for the station side card are LOW PWR disabled (normal operation) and “4W“.

2.6 System Specifications

Table 4: Electrical Specifications

Parameter	Specification
CO side power consumption	500 mW
CO side dissipation	500 mW
CO side Line length	5,486 m (18,000 ft)
Station side power consumption	1.5 W
Station side dissipation	1.5 W
Insertion loss	1 dB
Frequency response	300 to 3400 Hz
Echo return loss	Better than 15 dB
THD	2%
Signal to noise	40 dB
Station side Line length	6,096 m (2,000 ft)

Table 5: Optical Specifications

Parameter	Specification
Fiber optic interface	ST/SC type connector
Transmitter wavelength	Multi-mode: 850 ηm Single-mode: 1310 ηm
Transmitter power output	Multi-mode: -17dBm Single-mode: -11dBm
Receiver sensitivity	Multi-mode: -39dBm Single-mode: -39dBm
Fiber optic type	Multi-mode fiber: 62.5/125 μm Single-mode fiber: 9/125 μm
Fiber span distance	Multi-mode: 5 km (3 miles) Single-mode: 50 km (31 miles)

Table 6: Environmental Specifications

Parameter	Specification
Operating temperature	-40°C to 65°C (-40°F to 149°F)
Storage temperature	-40°C to 85°C (-40°F to 185°F)
Humidity (non-condensing)	20 to 80%
Altitude	-61 to 3048 m (-200 ft to 10,000 ft) above sea level

Chapter 3

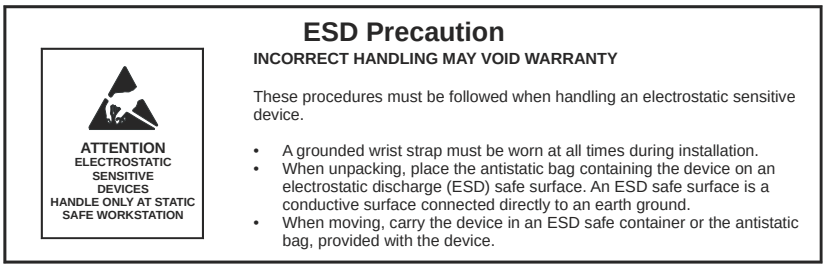
Installation

3.1 Installing a Single 2W/4W Card

After a shelf has been properly installed and all the wiring is complete, the plug-in card can be installed. For more information on how to install a shelf (720000, 720001, 720013), refer to its respective manual.

Follow the ESD precautions shown.

Figure 9: ESD Precautions

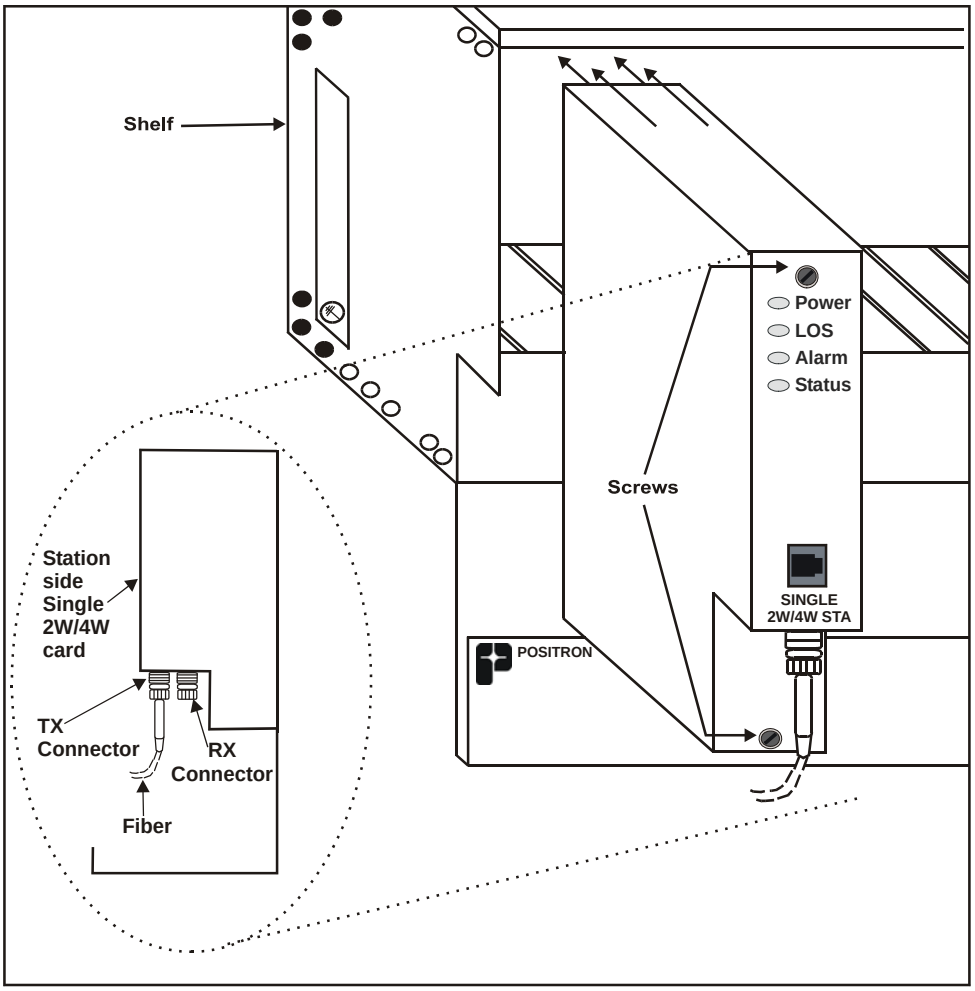


➤To Install a Single 2W/4W Card in a Shelf

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

1. Take the card out from its protective packaging.
   - If the card is a **CO card**, set all jumpers (W1, W2, W3 W201, W101 and W102) according to your installation requirements (jumpers must be set the same way - for information, see section 2.5.2 on page 18 and section 2.5.3 on page 18).
   - If the card is a **Station card**, set the 2W switch according to your installation requirements (for information, see section 2.5.4 on page 20).
2. Make sure the card is right-side up, align the card with the appropriate slot of the shelf and slide it in, as shown in Figure 10 on page 25.
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-14C connector found on the front panel.

Figure 10: Installing a 2W/4W card in a Shelf



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 state ground where the potential is less than 300 V.

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

3.3 Earthing (Grounding) 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 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.

Appendix A

Support and Warranty

A 1 Service and Support

A 1.1 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

A 1.2 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.

A 1.3 Customer Training

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

A 1.4 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 at 1-888-577-5254 (US and Canada) or 1-514-345-2220 (International). Due to the varied nature of repairs, no specific turnaround can be guaranteed, but average turnaround time is two weeks 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 Interface cards should never be shipped while installed in a shelf; this will cause damage that can extend the repair period.

A 2 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.

A 2.1 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.

A 2.2 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.